MAIN STREAM NEW MEXICO

Compilation of Input on New Mexico Water Security Planning Act Discussion Draft Rule and Guidelines

Appendix I: Uploaded Documents

May 2025

brendle GROUP

Uploaded and Emailed Documents

Uploaded Documents

Document Name	Topic Summary
Norm Gaume Comments	Comments expressing no support and providing detailed comments and edits on the Discussion Draft Rule language along with a recommendation that much of the guideline content should be inserted into the Rule.
Mark Kelly Comments	Letter recommending more background information on the intent of the councils, rule, guideline, and projects, programs and policies.
Adjudication	Question related to if/how the completion of decades-long water rights adjudication will impact water security.
Bernalillo Greenprint criteria spreadsheet	Copy of Bernalillo County Greenprint goals, criteria, methodology, data, and sources.
Bernalillo County Public Works Letter	Letter providing general comments, accompanied by detailed edits. Comments are related to the western boundary of the Middle Rio Grande Council, council member representation structure and identification, funding and resource allocation and details, plan update requirements, requirements for the consideration of public welfare, and public input processes.
Ten-Year Cloud Seeding Plan for New Mexico	Report examining the anticipated increase in water demand across New Mexico, exploring the impact of water on the state's economy, and introducing cloud seeding as a practical and cost-effective alternative for boosting water supply.
Estancia Basin Water Planning Committee	Letter expressing general support for the proposed region boundaries and a proposal that Estancia Basin remain separated from closed basins to the South rather than be integrated into the Central Basin Council.
EDF	Letter providing comments on Rule Section 12. Recommendations include the establishment of clear overarching statewide goals and objectives for regional planning and the identification of specific considerations that must be include in plans to achieve established goals and objectives, including improved groundwater management. The letter proposes specific revised language for Rule Section 12.
New Mexico Acequia Association Redlines	Detailed redlines, including the proposed creation of an Acequia and Rural Water Security Advisory Working Group.

Document Name	Topic Summary
General Comment	Comment requesting revisions to clarify the elements required in water security plans, the process for evaluating plans, and engagement processes.
Guiding Principles for NM Regional Water Security Planning	Document outlining core principles and recommendations for regional water planning.
Laurie McCann Letter	Letter expressing gratitude and appreciation the discussion draft rule and guidelines and emphasizing the importance of NMISC supporting decision making among regional stakeholders and the development of trust and mutual respect. The letter addresses different forms of consensus-based decision making and suggests introducing the concept of modified consensus
Claunch-Pinto Soil and Water Conservation District Letter	Letter expressing general support for the proposed region boundaries and a proposal that Estancia Basin remain separated from closed basins to the South rather than be integrated into the Central Basin Council.
Approaches to Planning Water Resources Paper	2021 paper published in the Journal of Water Resources Planning and Management summarizing and organizing technical approaches to water resources planning.
New Mexico Land Grant Council Redlines	Detailed redlines, including the proposed creation of an Acequia and Rural Water Security Advisory Working Group.
Patrick McCarthy Thornburg Letter	Document providing detailed overarching and specific comments on the discussion draft rule and guideline language.
Elaine Hebard Comments	Letter providing comments and questions related to the discussion draft language, including a request for another draft for comments, consideration of sub-basins, and clarification of the rationale and objectives of regional water planning along with the consequences for not meeting requirements. The letter references the following attachments a. Template from the 2004 Regional Water Planning Handbook (pages 3-7), b. Table of Contents from the 2004 Water Plan for Region 12 (Middle Rio Grande) (pages 7-16), c. 2004 Water Plan for Region 12 10 Recommendations (pages 8-19), and d. ISC Meeting of January 21, 2025 - Public Comment -- Elaine Hebard (pages 19-22).

Document Name	Topic Summary
eNGO Letter	Letter providing detailed specific comments and edits to the discussion draft rule and guidelines language. Specific emphasis is placed on the importance of a consensus-driven approach, defining the process for considering future generations of New Mexicans, concerns about some rule sections being identified as subject to future funding availability, clarification of the difference between the rule and guidelines, and the need for additional details on project prioritization criteria and evaluation.
Simplify	Comment recommending simplified lists of suggestions and requirements for regional water planning, consideration of planning council size, and consensus-based decision making that is unanimous or free of major conflict.
New Mexico Water Advocates Markup	Document providing a summary of NMWA recommendations and detailed mark-ups to the discussion draft language, including removal of the guidelines.
Cathie R Eisen Comments	Letter expressing concern related to potential future constraints on water use and calling for additional publication of opportunities to engage in the rule and guideline development process.
EB Minimum Conservation Pool Report	Paper developed by the Elephant Butte Chamber of Commerce and Visitor Center calling for the establishment of a minimum conservation pool to protect the ecosystem at Elephant Butte Reservoir.
South Valley Regional Association of Acequias	Letter describing three objections to the Rule and Guidelines related to Acequia representation on the proposed regional councils, the consideration of water as a commodity rather than a common resource, and the development of a Regional Public Welfare Statement.
NMWA Concepts for Regional Water Planning	Document providing recommended minimum criteria for a regional water planning program, together with a re-write of several rule sections and proposed additional rule and/or guideline language on how regional water planning should work.

Emailed Documents

Document Name	Topic Summary
San Juan Water Commission Rule Comments	Detailed comments and redlines submitted by the San Juan Water Commission (SJWC) on the discussion draft rule.

Document Name	Topic Summary
San Juan Water Commission Guidelines Comments	Detailed comments and redlines submitted by the SJWC on the discussion draft guidelines.
Eric Olivas BernCo Letter	Letter providing overarching recommendations for revisions to the discussion draft rule and guidelines.
NCAC - RWP - NMAC edits	Detailed redlines, including the proposed creation of an Acequia and Rural Water Security Advisory Working Group.
New Mexico Acequia Commission Letter	Letter introducing redlines provided in a separate document (NCAC - RWP - NMAC edits)
New Mexico Water Advocates Letter	Letter providing overarching comments on the rule and guidelines and referencing a version of the draft rule provided separately to the NMISC as part of this feedback process.
City of Raton Comments	Letter from the City of Raton and Raton Water Works expressing support for the principle of regional water planning and project prioritization, concurring with the proposed Canadian Council geographical configuration, and providing recommendations on regional water council representation.
Hebard Regional Water Planning Comments	Letter emphasizing the need for a template for regional water planning and providing comments specific to several rule sections and guidelines.

Norm Gaume prepared these comments.

- There is nothing I support about the January 21, 2025, Discussion Draft rule set except the regional boundaries.
- These comments address only the Rules, not the Rules & Guidelines. Much of the guideline content should be inserted in the Rules.

General Comments about Rules

- Based on my personal experience being on the core team that prepared the Active Water Resource Management General Rules, the entire program must be conceptualized as a prerequisite to rule preparation and iterative refinement.
- There should be a minimum number of governance level guidance documents, issued by the ISC, such as Guidelines, Charters, Mandatory Charter language, etc. Each must be cited in the Rules. The purpose, interpretation, discretion, and changes to guidelines and other governance level guidance documents must be set forth in the rules.
- Recognize this program is voluntary and must be attractive to participants.
- If regions don't wish to participate, so be it, at least for the first round.
- ISC must market participation in the voluntary program by presenting the benefits of the planning process and having an approved plan.
- I question the efficacy of any conceptualization of the program that is behind these rules. These rules don't create a mandatory basis of a successful statewide regional water security planning program given the authorization of the statute.
- Do it right. Not cheap or faster than a collaborative, consensus seeking process can possibly reach thoughtful conclusions re water security given current overuse and shrinking water supplies.
- Recognize that the region is an administrative convenience. It's the communities security and the regional balance that counts. This is a complex matter that is essential to structure within the rules.

What the rules should accomplish.

- The rules should utilize the authority delegated to the ISC to create this program to achieve what New Mexico and its people need from competent water planning.
- The rules should include a charter for the statewide program that sets forth forth a holistic set of program Guiding Principles and Objectives.
- The rules must convey, at the highest level, the purposes and processes of the regional water planning program.

- Create and require adherence to minimum requirements for workable processes, such as for the PPPP generation.
- Detail the submittals and approvals the ISC requires.
- Rules specifying minimum requirements should reflect multidisciplinary thinking. They are best created through thoughtful discussion between lawyers and subject matter experts.
- Subject matter expertise in the good practical practice of multi-objective, rational water planning; complex project management; and collaborative process design is essential. Reference Jay Lund WRJ paper and relevant blogs.
- By declaring who gets to vote and who doesn't, the ISC seems to be rejecting fair modified consensus decision-making as a superior decision-making method for water planning.
- Require the delegation of authority of the council to an operating decision-making group that will dig in and do the work, assisted by staff and consultants.
- State the purposes for which ISC would exercise its authority. For example, to manage and conduct the program so it adds value and meets minimum requirements.
- The Rules need to set clear expectations for council members engagement and replacement for non-participation.
- Set performance standards for project management level communications between the council and the ISC. Distinguish between communications with ISC staff and formal annual reports to the Commission, appeals, etc.
- Provide for robust public education and engagement.
- Require a work plan.
- Require estimates to complete, a basic tool of project management both for the region to honest with itself and to provide the regions estimate of their progress with respect to their work plan schedule and budget.
- Require specific methods of vetting PPPP, such as outlined in my November 1, 2024 ,comments, inserted below.
- Include sufficient requirements so that regions do not spin their wheels initially on administrative tasks.
- Professional resources shall be utilized by the regions. Make those resources available through grants to regions that meet conditions or from ISC on-call contractors. Consider listing the essential disciplines of complex project management, collaborative process expertise, facilitation, hydrology, civil engineering, and others

- Provide for block grants for specified groups of tasks, such as organizing, planning their work, and working their plan, rather that depend on "ISC.
- Approval not Acceptance. Specify what approval connotes, specifically
- Set an elapsed time limit for regional planning tasks that
- Establish parameters for public outreach and communication with a budget established in the workplan.
- Establish requirements for grants and loans.
- Specify how regions are to expeditiously find, understand, and accept as useful all existing water planning information.

MRG region musings

- 17 incorporated municipalities
- 6 counties
- 1 conservancy district
- 8 pueblos
- 3 councils of government
- 6 SWCDs
- 1 unrepresented water utility authority
- 6 acequia reps appointed by counties
- 6 mutual domestic reps appointed
- 10 at large members appointed by the council
- 3 members from outside the region *shall be appointed*?
- 65 total

Problems

- Actual and Likely Perceived Equity and Fairness
    - There are numerous "census-designated places" in the Middle Rio Grande that contain a substantial rural population including irrigators that does not have a municipal government. Examples include Tome, San Antonio, Placitas, Cochiti Lake, and the South Valley. A mutual domestic gets representation but a rural population segment does not?
    - One environmental group representative is 1.5%. of the MRG Council numbering 65. Will *the environment* receive only a 1.5% weight in a multi-objective water planning endeavor/
    - What about National and State Wildlife Refuges?
    - What about the Water Utility Authority?

    - Why would Bernco, the WUA, and the City of Albuquerque be motivated to participate given the anti-metro bias of council membership as structured. Together, they would have three of 65 council members for probably two-thirds of the regional population. Similar concerns about the MRGCD.
    - Non-voting folks "familiar with the water resources" to replace any of the above if they are not to be found! The zealots the ISC encouraged falsely for the Gila diversion all claimed great familiarity with the water resources in question. Why not voting?
- Federal participation is needed regions where the federal agencies have direct jurisdiction.
- Why no minimum or encouraged qualifications or characteristics for the council as a whole
- Water science and facts also need representation.
- Updated continuously, not once every 10 years! Funding for this needs discussion.

What the rules should not be or do.

- Reductive. The objective rule is the prime example. Limiting the Statewide objectives to the three listed in the statute is another.
- Omit the purpose of exert ISC authority over the regions
- Unnecessarily place ISC on the critical path
- The rules must not limit the number of meetings supported by the state to make this huge voluntary effort workable. Skill facilitation is essential..
- The rules should not be written in passive voice and with vague references. These are examples of bad construction:
    - "A council 'can' also self-organize providing the 'criteria below' are met."
    - "The council shall adopt written operating principles that describe the following, at a minimum, and shall provide their operating principles to the commission."
- Confuse legitimate statewide objectives with the public welfare of the state, which is yet to be defined and should not be partially defined in these rules.
- Limit the statewide objectives of this regional water security planning program the ISC is charged with creating to the three cited in the statute. That's reductive. Does the state agency responsible for water planning that is a sister agency but independent from the water resource regulator have nothing to add?

Specific problems requiring correction

- Definition of ISC. There are three distinct roles that should not be muddled: ISC planning bureau, ISC Director, the Commission as a statutory agency acting in its official capacity.
- Rules language that merely restates statutory language. This style is rejected by applicable state guidance.

Revised for resubmission on February 21, 2025, as part of Norm Gaume's comments on the Discussion Draft WSPA Rules and Guidelines issued January 21, 2025. The original submittal was in hard copy to the ISC Director, Deputy Director, and General Council on November 1, 2024.

A benefit of having a draft set of rules is that it assists a reviewer with deep interest to identify what is missing or problematic.

1. **Legal**. Will ISC make increased resilience a Rules requirement, or will the ISC design the program such that a region that is using up its fossil groundwater is not precluded from concluding that continuation of the status quo is its plan?

2. **Statute features to capitalize on.** The statute includes concepts that should be used to full advantage, such as "statewide objectives." ISC shall, "support regional water planning entities by providing statewide objectives for regional water security plan development…," that include ESA and tribal water settlements. Preventing emptying aquifers by allowing pumping under permits to continue without limitation should be a statewide objective. At a minimum, the rules should use the words statewide objectives to include resilience of its communities, which means resilience of communities' water supplies.

3. **Unambiguous, declarative statements written in Active Voic**e. The Rules must be clear and unambiguous, and not grant regions the discretion to do or not to do essential components of planning. Rules must be declarative and written in the active voice.

4. **Building from Communities Needs to Become Resilient.** The problem of resilience must be addressed at the community level and include sufficient Rules content to describe the required relationship, incentives, and transactions between entities and communities.

5. **Standardization to Reduce Entity Tasks and Benefit the ISC.** The Entities have a huge job to do that ISC should make easier by not making every Entity come up with its own planning process and procedures from scratch. Standardize the voluntary, State-funded regional water planning as much as possible. Achieve economies of scale through steps such as ISC providing model charters/bylaws for regional amendment and adoption. Requiring a specific or alternative developed planning approaches, such as described below, will help both ISC and the entities. Plan structure (content of "chapters") should be standardized.

6. **Structure of the planning process.** Water planning requires structure to evaluate the many ideas for programs, policies, and projects and select a subset for the water plan's prioritization. Scientific integrity requires vetting the ideas. Practicality requires evaluating the projected effects of alternative portfolios of vetted ideas. Please consider this scheme or something equivalent for inclusion in the Rules.
    a. Each idea for a program, policy, or project must be vetted at the screening level, i.e., consider further or reject.
    b. Surviving ideas must be quantitatively vetted to estimate their effects on the region's water balance.
    c. Build scenarios by assembling programs, policies and projects from the vetted ideas into programs and program into scenarios amenable to modeling analysis that would assess hydrologic effectiveness and for evaluation of acceptability metrics.

d. Some scenarios should be required, including one that would retain the status quo and another that would "balance" water withdrawals with the supply or with an aquifer lifetime objective. These two scenarios bracket the possible solutions. Another might be to model the regional effects of all communities' water plans. Entities can define intermediate scenarios as they choose. Specify a maximum of say half a dozen alternatives that will be evaluated/modeled with State resources to inform the region's selection of one for refinement.
e. Refine the best scenario, at the Entity's option, for presentation in the plan.
f. There are many "semi-rigorous" standardized methods for doing this. No need to reinvent this wheel.

7. **Power.** The Entity's roles include acting on the need to change policy. Policy is determined politically A regional water planning entity must have inherent political credibility. That means the entity must be respected by the local governments within the region. Therefore, it must be political, because all policy is determined politically. The choice between elected or appointed entity members or a combination must address the reality that implementation of a meaningful plan **requires both credibility and political sponsorship** that can gain the buy-in of local governments.

8. **Some Regions Will Need External Skilled Help**. An Entity may require technical expertise that may not exist or be viewed as neutral by regional communities and local governments. The ISC should make qualified on-call contractors with the expertise available to assist the regions as requested. Regions could select and use state funds to pay locally available contactors with the necessary technical expertise.

9. **No-Surprises Requirement.** The Rules should provide for "no surprises" by emphasizing the Entity bringing the ISC and local

governments and institutions along as the planning proceeds to an Entity-approved plan.

10. **Regional Funding.** Requiring Entities to focus on local fundraising / matching funding would be a mistake. The absence of meaningful water planning in New Mexico is a state problem. The state can afford this, and will fund the program in my opinion if it sees a clear plan to achieve specific, measurable objectives. Make it clear that the state will fund the planning to produce and secure approval for each region's plan. The state then will require substance and value in exchange for that funding.

11. **Compacts compliance.** Compact compliance is legally not a regional responsibility. Compact compliance should be stated in the rules as a statewide objective. For those regions that are defined to encompass a whole Compact-defined reach, the regions' plans **must** provide for meeting that statewide objective. The regions' plans may choose priority administration or AWRM alternative administration schemes to achieve this. The concept of AWRM **must** be extended to preserve sufficient aquifer volume to meet the needs of future generations.

12. **Process for Entity to Secure State Funding.** A Rules or guidelines process is required to initially fund Entities. Initially, regions will need to self-organize to apply for a funding grant to get started. The Water Advocates propose ISC funding grants to a volunteer fiscal agent for the region's self-organized and actively aided effort to formally organize itself, create and name its RWP Entity, and then internally negotiate, prepare and present a detailed workplan to the ISC. The next step is negotiation of that work plan as required for the ISC to approve it. When an approved work plan exists, the entity will need to contract with the ISC, hire its staff and get started. State cash advances to the fiscal agent are required to timely make the Entity's monthly payments to contractors.

13. **Consistency of Entity plan with 40-year plans.** Achieving consistency with community and institutions water plans should not be a requirement of the entity, at least not until after the initial plan is fully approved.

14. **Statutory review of prior/existing plans and work.** The initial review of all existing plans and relevant work to find useful components and avoid reinventing the wheel must be objective, performed by a contractor under a scope of work that identifies the documents to be reviewed and the criteria to be used. This too should be standardized in the Rules or guidelines.

15. **Number of voting members.** The number of an Entity's voting members must be small enough so they can deliberate and make decisions. Five or seven, with a chair that votes to break ties, should be the maximum. Entity's members should commit to completing the job of an approved plan. Turnover will hinder progress.

16. **Progress reporting and Estimates to Complete**. Entity periodic progress reporting frequency and requirements should be designed to reveal problems and issues that are holding back progress. Each report must include what private sector consultants call "estimate to complete." The Rules should require each Entity's updated analysis of whether the entity is meeting its schedule and is within its budget, and if not, its "estimate to complete." This should be required twice a year for use in ISC progress tracking and reporting to the Legislature per the statute.

17. **Continuing Planning.** ISC must decide whether to include follow-on updates to plans in its Rules, that the Director intends to be sufficient for 40 years. Seems like a huge hurdle that will delay initial progress to try to think this through now but rather to say this aspect of the program is subject to a future rulemaking but that it will be a

required of regions who have an approved, state-funded regional water plan.

18. **Readability of the Rules**. Consider defining an organization principle for the order of the specific rules. Consider a chronological order that reflects the time sequence of each Rule within the set.

19. **Action Plan.** An implementation action plan must be an integral part of every regional water security plan. The implementation plan must provide for its administration, tracking, and reporting.

WSPA Rule and Guidelines Comments

I think there needs to be more background on what the point of these councils and PPP lists are. There should be more background on what the intention of the rules, guidelines, and planning councils are. In reading these documents I could determine some of the rules for membership but would not understand what the point was or what the goals are.

Thanks

Mark Kelly

Albuquerque Bernalillo County Water Utility Authority

Adjudication
I'm not sure if this is the place to address the ongoing process and lack thereof with the States Adjudication of water rights. Is the completion of the adjudication not important in the overall Security of the states water? Is it just implied? Should it be named (as the process has been ongoing for decades).

Bernalillo County Greenprint

1	2	3	4		6	7
Goal	**Goal Weights**	**Criteria**	**Criteria Weights**	**Methodology**	**Data** (Description, Date, Resolution)	**Data Source**
Protect Water Quality in Rivers and Streams	**30%**					
		WQ01:Protect natural lands along rivers, streams and arroyos, drains and acequias	40%	1. Created 300 ft buffer around larger rivers (rio grande and rio puerco) 2. Created 300 ft buffer around perennial NHD waterlines 3. Created 100 buffer around intermittant/ephemeral NHD lines with names, ditches, drains, acequias, arroyos (removed abandoned MRGCD facilities) 4. All buffers merged together 5. NLCD reclassifed to pull out natural land cover types 6. natural lands raster clipped by buffers	a) Rivers, 2005, polygon b) NHD Flowlines, 2016 c) AMAFCA Linear Drainage, 2016 d) Carnuel Conveyances e) East Mountain Drainages, 2006 f) MRGCD Facilities, 2013 g) Sandia Ditches h) NLCD, 2011	a) Bernalillo County Public Works b) USGS NHD c) AMAFCA d) Internal, from ABQ Greenprint e) Bernalillo County Public Works f) MRGCD g) Internal, from ABQ Greenprint h) MRLC NLCD Land Cover Data
		WQ02:Protect permeable soils on non-impervious surfaces	20%	1. Join the soil data with a pre-fab table of soil permeability averages for each map unit, (k_sat represents amount of water that would move vertically through a unit area of saturated soil) 2. Select all values > -9999 to remove records with no data 3. Reclassify NLCD impervious surface based on % of impervious surface per pixel. Natural breaks with 5 classes, with 100 being given value of NoData so it would be excluded from analysis 4. Added soil and impvervious rasters together; higher values mean more impermeable and less impervious 5. Reclassify on 0-5 scale.	a) NRCS Bernalillo County Soil Survey, 2014 b) USGS Area- and Depth-Weighted Averages of Selected SSURGO Variables Layer table, 2014 c)NLCD Impervous surface, 2011	a) USDA NRCS b) USGS c)MRLC NLCD
		WQ04: Protect Lands in aquifer recharge zones	40%	1. Ephemeral, intermittant & perennial rivers found within Sandia and Manzano mountains. These were buffered 100 ft, converted to raster and given a value of 4 2. Forested areas within the Sandia and Manzano mountains were reclassified and given a value of 3 3. Wetlands/woody wetlands within the Sandia and Manzano mountains were reclassified and given a value of 4. 4. Rio Grande, Rio Puerco, Tijeras Arroyo, San Pedro Creek, Calabacillas Arroyo, and Bear Canyon recharge all buffered 100ft, converted to raster and given a value of 5 5. irrigated fields (see LF01 for how these were determined) converted to raster and given a value of 5 6. Irrigation canals (except type abandoned) were buffered 100ft, converted to raster and given a value of 4 7. All of the above datasets combined with cell statistics maximum	a) NHD flowlines, 2016 b) NLCD, 2011 c) Rivers, 2005 d) Tijeras Arroyo (from NHD), 2016 e) San Pedro Creek (from NHD), 2016 f) Sandia ditches g) MRGCD Facilities, 2013 h) Land Use, 2011 i) Parcels, 2015 j) Known agriculture sites, 2014 k) Calabacillas Arroyo (from NHD), 2016 l) Bear Canyon Recharge	a) USGS NHD b) MRLC NLCD c) Bernalillo County Public Works d) USGS NHD e) USGS NHD f) Internal, from ABQ Greenprint g) MRGCD h) City of Albuquerque i) Bernalillo County j) Bernalillo County Cultural Mapping k) USGS NHD l) Digitized from aerial imagery
Preserve Local Agriculture and Food Production	**18%**					
		LF01: Preserve irrigable agricultural land	40%	1. Buffer acequias/ditches, channel, feeder, lateral, main canals by 0.25 mi 2. Select any type of agricuture from land use layer 3. Select parcels known to be ag, from BernCo Cultural Report 4. Select cropland that is within 0.25 mi of an acequia/ditch 5. Reclassify all areas that meet this criteria to 5, all else 0	a) Sandia GPS Ditch b) MRGCD Facilities, 2013 c) Bernalillo County land use, 2016 d) Bernalillo County parcels, 2015 e) Known agricultural sites, 2014	a) Internal, from ABQ greenprint b) MRGCD c) City of Albuquerque d) Bernalillo County e) Bernalillo County Cultural Mapping Report
		LF02: Preserve vacant lots in urban food deserts for community gardens	25%	1. Joined USDA food access table to Bernalillo County Census Tracts 2. Selected urban tracts that were low income with limited access to food 3. Selected vacant Bernalillo County parcels that were within the low income/low access to food urban tracts 4. Removed parcels on state trust land, or those that were within 0.25 mi from highway 5. Reclassify all tracts that meet this criteria to 5; all else 0	a) Bernalillo County Census Tracts, 2010 b) Bernalillo County parcels, 2015 c) USDA Food Access Research Atlas, 2013, table	a) US Census b) Bernalillo County c) USDA Economic Research Service
		LF03: New opportunities for agriculture	30%	1. Soils joined with muaggat table, soils with high capacity class when irrigated were selected (no prime farmlands in county), converted to raster and given value of 5 2. Ditch types appropriate for ag were selected and given a buffer of 0.25 miles, converted to raster and given a value of 5 3. Vacant parcels were selected, converted to raster, given value of 5 4. Datasets added together and reclassified so 15 = 5 (all criteria are met); 4 if two criteria are met; 2 of 1 criteria is met plus vacant; 1 if one criteria is met. 5. Lands classified as Agriculture in the land use dataset were removed 6. Selected historical ag areas from 1935 land use. If was ag, still is ag = 0; if was ag, now vacant or parks = 5; if was ag, now developed = 3 7. NLCD reclassified to find areas NOT appropriate for ag (water, developed, current ag, wetlands). This dataset was also subtracted from the result to get suitable areas	a) NRCS Bernalillo County Soil Survey, 2014 b) MRGCD Facilities, 2013 c) Sandia GPS Ditch d) Bernalillo County parcels, 2015 e) Bernalillo County land use, 2016 f) NLCD Land Cover, 2011, 30m g)1935 land use, 2002	a) USDA NRCS b) MRGCD c) Internal - from ABQ Greenprint d) Bernalillo County e) City of Albuquerque f) MRLC NLCD National Land Cover Dataset g)Bureau of Reclamation
		LF04:Grasslands on ranch land	5%	1. Selected ranch lands as parcels with ag value >0 and >25 acres 2. extracted grasslands from landfire existing vegetation type database. Wetland grasslands = 4; all other grasslands = 5 3. Combined datasets to find grasslands on ranchland	a) Bernalillo County Parcels, 2015 b)LANDFIRE, 2012	a) Bernalillo County b) USFS Landfire
Protect Wildlife Habitat	**22%**					

		WH01:Preserve Urban Tree Canopy	10%	1. Use census tract information to determine which tracts are urban (>2500 people) 2 Select tree canopy from landfire existing vegetation file, given value = 5 3. Raster calculator to find tree canopy in urban tracts 4. Removed forst service land since although in urban tracts, the area is not urban 5. Removed areas such as airport, miliary base, other areas known to be non-urban	a) Bernalillo County Census Tracts, 2010 b) LANDFIRE, 2012 c) Surface Ownership d) Bernalillo County Parcels	a) US Census Bureau b) USFS Landfire c) BLM d) Bernalillo County
		WH02: Protect wildlife movement corridors	30%	1. Cougar corridors from Meinke study given value of 5 2. Rivers buffered by 300 feet, given value of 5 3. AMAFCA drainage buffered by category so natural arroyo = 100ft; hard side channels = 300 ft; soft side channels = 200 ft. 4. Reclassify drainage so natural = 5; soft channel = 4, hard channel = 3 5. Combine all data with cell stats max	a) Courgar corridors, 2008 b) Rivers, 2005 c) Drainage channels, 2015	a) originally from Kurt Meinke, had data internally b) Bernalillo County Public Works c) AMAFCA
		WH03: Preserve wetlands	10%	1. Select wetland/riparian areas from CHAT Assessment, given value =5 2. NWI wetlands given value of 5 3. Datasets combined with cell stats max	a) CHAT Assessment, 2014 b) NWI Wetlands, 2015	a) NM Dept of Game and Fish b) FWS National Wetlands Inventory
		WH04:Priority wildlife and bird habitat	40%	1. Riparian habitat selected from USFS ecological response units 2. Final Chat score reclassified on scale 0-5 so 1 (best score) = 5 and 6 (worse score) = 0. 3. USFS Critical habitat given value of 5 4. GAP distribution data for Spotted Bat, Gray Vireo, Bald Eagle, tawny bellied coton rat given value 5 (key species) 5. Megan Friggens data USFS for SW Willow Flycatcher and Yellow Billed Cuckoo given value of 5 (key sepecies) 6. All combined with cell statistics sum 7. Results sliced into 0-5 based on natural breaks	a) Ecological response units, 20xx b) CHAT Assessment, 2014 c) Critical Habitat, 2015 d) GAP distribution data, 2015-16 e) Max-ent bird data (Friggens & Finch), 2015	a) USFS b) NM Dept of Game and Fish c) USFWS d) USGS GAP e) USFS
		WH05:Protect areas with known locations of threatened/endangered species	10%	1. T& E data for Bernalillo County, private land only, masked to 1 mile blocks was converted to raster and given value of 5	a) Threatened/Endangered species data, 2016. Oldest observation in data is 2011	a) Natural Heritage New Mexico
Protect Important Cultural and Historical Sites	**15%**					
		CH01:Preserve lands along historic corridors	10%	1. El Camnio Real buffered 250 feet 2. Historic Route 66 buffered 250 feet 3. Data combined with cell stats max, reclassified to have value of 5	a) El Camino Real Trail b) Historic Route 66 trail	a) National Park Service b) National Park Service
		CH02:Preserve identified cultural landscapes	25%	1. HPD historic districts given value of 5 2. CABQ Historic Zones given value of 5 3. South Valley historic architecture buffered by 0.25 mi, given value of 5 4. HPD Historic places, including archeology buffered 0.25 mi, given value of 5 5. CABQ Registered historic places buffered 0.25 mi, given value of 5 6. Layers combined with cell stats max	a) HPD Historic Districts, 2012 b) CABQ Historic Zones c) South Valley historic architecture, 2015 d) HPD Historic places, including archeology, 2016 e) Registered historic places, 2015	a) Bernalillo County Public Works b) City of Albuquerque c) Bernalillo County Public Works d) Bernalillo County Public Works e) City of Albuquerque (is national register of historic places)
		CH03:Preserve acequias and adjacent land	25%	1. Select MRGCD main canals and drains, buffer 100' and give value of 5 2. Select MRGCD other facilities, buffer 50' and give value of 5 3. Sandia GPS Ditches buffered 50' and gtiven value of 5 4. All features combined	a) MRGCD Facilities, 2013 b) Sandia (East Mountains) ditches	a) Middle Rio Grande Conservancy District b) data from internal source, used in ABQ Greenprint
		CH04:Preserve lands with traditional views	10%	1. Calculted viewshed for the following features: Tramway Blvd (1km spaced points to represent foothills); Rio Grande (1km spaced points);irrigable agriculture lands (centroid of parcels); Calabacillas Arroyo (1km spaced points); Tijeras Canyon (1km spaced points); Rio Puerco (1km spaced poitns); Volcanoes (highest points); Sandia Crest (highest piont) 2. Reclassify viewshed so 0 = not visible and 1 = visible 3. Determined areas where the following to-from were visible: from foothills to sandia crest; from rio grande to calabacillas arroyo; from foothills to rio grande valley; from rio grande to volcanoes; from rio grande to tijeras arroyo; from rio grande to rio grande valley; from ag lands to rio grande valley; from volcanoes to rio grande valley; from tijeras arroyo to I25; from ag lands to west mesa; from rio puerco to west mesa; from volcanoes to west mesa; from volcanoes to foothills/sandia 4. The above to-from each reclassified to value of 5 for the visible areas 5. The above to-from combined with cell statistics Sum 6. Result reclassified so areas with more to-froms visible are a higher priority	a) Tramway Blvd points 1km spacing b) Rio Grande Points 1km spacing c) Irrigable Ag lands points - parcel centroid d) Calabacillas Arroyo points 1km spacing e) Tijeras Canyon points 1km spacing f) Rio Puerco points 1km spacing g) Volcanoes poins - highest points from DEM h) Sandia Crest - highest point from DEM i) Elevation, 10m	a) created from national network b) created from NHD data c) created from result of model LF01 d) created from NHD data e) created from NHD data f) created from NHD data g) Bernalillo County h) created from DEM i) National Elevation Dataset
		CH05: Preserve historical agricultural landscapes	15%	1. Determine the change in ag land use from 1935 to current. 2. If was ag, is now vacant, given value of 3 3. If was ag, is now single family, given value of 1 4. Select all parcels with ag value >0 5. If was ag, is ag now, given value of 5 5. All data combined with cell stats max	a)1935 land use, 2002 b) Land Use, 2011 c) Bernalillo County Parcels, 2015	a) Bureau of Reclamation b) City of Albuquerque c) Bernalillo County
		CH06: Preserve tribal and land grant lands	5%	1. Land grants reclasified and given value of 5	a) land grants, 2006	a) BLM (given to us by BernCo)
		CH07: Preserve landscapes that support creative asset clusters	10%	1. Because the vector clusters were operlapping, some data manipulation cleaned the data so values would no longer overlap 2. Cluster value of 2 (lowest of hot spots), given value of 2; cluster value of 4 given value of 3; cluster value of 6 given value of 4; cluster value of 8 (center of hot spot) given value of 5.	a) Creative Asset Clusters, 2013	a) Bernalillo County, from Cultural Mapping Report
Provide Public Access to Healthy Outdoor Recreation	**15%**					
		OR01:Provide open space lands in or near low income urban neighborhoods	35%	1. TPL ParkScore Analysis run on all urban area in study area 2. Income weighted higher than kid density of pop density, so areas in low income would weighted more heavily in result.	a) includes several internal datsets, including parks, road network, US Census Data	a)Internal TPL data

		OR02:Preserve land that could connect gaps in existing trail network	20%	1. Based on conversations with Richard Meadows, BernCo Public Works, pulled out trails that are high priority to build 2. Pulled out gaps in 50 mi proposed loop 3. Pulled out high priority critical links from CABQ trails report 4. Pulled out tarils part of MRCOG long range transportation plan 2040 5. Digitized connection between PETR and Rio Puerco (info provided by Attila Bality, NPS) 5. Buffered these all 250' and given value of 5 6. Pulled out remainder of proposed trails, buffered 250 feet and gave value of 3. 7. Data combined with cell stats max	a) Bernalillo County Trails Existing and Proposed b) Rio Puerco Conservation Concept Trail	a) Bernalillo County Public Works b) digitized from information given by Attila Bality, NPS
		OR03: Provide opportunities for bird and wildlife watching	10%	1. Download and processed data observations from e-bird 2010 - 2016 2. Convert XY data to poins on map 3. Found sum of observations at each observation point 4. Run point density with1/8 mi neighborhood circle 5. Reclassify, remove 0 from classification so the data is not heavily skewed towards 0. 6. Scale 0-5 with 5 being areas with most bird observations	a) E-Bird data, 2016	a) Audubon & Cornell Lab of Ornithology
		OR04:Provide open space to improve public health	35%	1. TPL ParkScore Analysis run for whole study area 2. Population density heavily weighted during PS analysis (based on convervation with Tom Scharmen). Income and kid density were not factored in. 3. Public Health datasets were reclassified 1-5 using natural breaks so the lowest health outcomes = 5 and best = 1. Datasets are: APS elementary school obesity; no leisure time activity > 18 yrs old; children 10-17yrs obese; adult chronic disease deaths 4. Added together the reclassified results of these datasets such that a higher number means worse health outcomes. 5. Data reclassified to scale of 0-5 where 5 = worst health outcomes 6. Added health outcomes with results of park score analysis; areas with highest value are low access to parks, high popultion density and poor public health outcomes 7. Final result sliced on scale 1-5	a) for park score: several internal datsets, including parks, road network, US Census Data b) APS elementary school healthy weight assessment, 2013 c) Behavior Risk Factors, 2014 d) Child Obesity risk, 2010 e) Premature death from chronic disease, 2011	a) Internal TPL data b) from NM Community Data Collaborative (original is APS) c) from NM Community Data Collaborative (original is CDC) d) from NM Community Data Collaborative (original is CDC) e) from NM Community Data Collaborative (original is compiled from various sources)

Bernalillo County

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Mr. Andrew Erdmann,

On behalf of Bernalillo County, I appreciate the opportunity to provide comments on the draft Regional Water Security Planning Rule and Guidelines. While we recognize the New Mexico Interstate Stream Commission's (NMISC) efforts to build a structured, transparent, and comprehensive approach to regional water planning, several areas need further clarification and revision to ensure equitable representation, administrative efficiency, and a strong foundation for future water security planning.

The proposed boundaries for the Regional Water Security Planning Councils generally align with hydrological, geological, and administrative considerations, but some transitions remain unclear—particularly the western edge of the Middle Rio Grande Council. The representation structure also raises concerns about how government boundaries are split across multiple councils, potentially creating inconsistencies in stakeholder representation. Some governmental bodies may have a seat at multiple tables, while others will not. The rules don't specify whether individuals representing overlapping jurisdictions would serve on multiple councils or be limited to a single appointment. Given the broad list of entities eligible for representation, councils, especially in the Middle Rio Grande, could grow too large to function effectively.

Further clarification is needed on how council representatives will be identified and invited. It's unclear whether NMISC will solicit nominations from stakeholders or directly appoint members and, if so, how transparent that process will be. While councils have flexibility in how they convene, the rules should explicitly require public participation to ensure a fair and open process. The role of NMISC staff as liaisons also needs to be better defined to provide consistency in representation and governance across councils.

The draft is vague on funding allocation for council operations beyond administrative support for three meetings per year. It's unclear whether facilitation funding would cover conflict resolution and technical moderation or whether grants will be available to help with travel reimbursement, particularly for representatives from large or rural regions. Additionally, a defined meeting structure, whether in-person, virtual, or hybrid, would help ensure broad stakeholder engagement, especially for underrepresented communities.

Regarding plan implementation and accountability, the draft requires regional water security plans to be updated every ten years, with project, program, and policy (PPP) lists updated every five years. However, it does not address what happens if a plan isn't submitted or updated. There's also no clear guidance on how NMISC will support councils in navigating permitting hurdles and securing early funding for data collection and feasibility studies—both of which could significantly impact long-term project implementation.

Another key issue is the tension between regional determinations of public welfare and the State Engineer's discretion in water rights decisions. Section 13(B) currently allows—but does not require—the State Engineer to consider regional public welfare concerns, without any obligation to justify decisions when disregarding them. To improve transparency and accountability, we recommend changing "may" to "shall" in Section 13(B)(1) so the State Engineer must provide a documented basis for decisions related to public welfare considerations. Additionally, the ISC Commission's role in advising councils on priority projects and funding mechanisms should be clarified to strengthen regional planning efforts.

While the guidelines recognize the importance of public input, more mechanisms are needed to ensure meaningful engagement. Public participation should extend beyond scheduled meetings to include written comment periods and targeted outreach to underserved communities. Additionally, compliance with the Open Meetings Act should be explicitly required within the rules to ensure transparency and accessibility across all councils and for all New Mexicans.

The County appreciates the opportunity to weigh in on this process. Addressing these concerns will help ensure that regional water planning is not only effective but also equitable. We look forward to continued discussions with NMISC to refine the rule and guidelines in a way that best serves all stakeholders in New Mexico's water future.

Our detailed comments on the Discussion Draft Rule are on the following pages.

Submitted on behalf of Bernalillo County,

Dan McGregor, Natural Resource Services Section Manager
Corbin Carsrud, County Hydrogeologist

BernCo NRS Preliminary Comments on NMISC RWSP

Preferred Hydro-Administrative Boundaries

1. The suggested boundaries have an intuitively correct feel and balance with respect to river compacts, watersheds, geology, and grouping of declared groundwater basin. If the desire is to limit the number of regional planning counsels, this is probably a good blend and compromise of various considerations. An additional indicator of existing Declared underground basins on this map may help illustrate those relationships.
2. In several instances, counties, soil water and water conservation districts, and regional councils of governments may be split or included within two or more council areas. Is it the intent that representatives from "split" stakeholders be represented in each of the councils where overlaps occur? And is it the Commission's intent for an individual to sit on multiple regional water planning Councils?
3. It is unclear in some instances how the transition boundaries between planning councils may have been determined such as at the junction of the Middle Rio Grande with the Lower Colorado and Lower Rio Grance Council, and southeast boundary of the Upper Colorado Council and Middle Rio Grande Council.
4. In the Discussion Draft, there is some language establishing the possibility of a Sub-Region if a Council chooses, but there is no mention of Sub-Regions in the rules. If a Sub-Region is deemed necessary for a RWSP Council, the avenue for that must be included in the Composition section. For example, the concern is with having Santa Fe, Rio Rancho, and Albuquerque all within one planning region that then extends and includes Socorro and smaller river communities as well. The concern is that heavy municipal interests may be over-represented against more rural and agricultural interests. This may also make tribal and pueblo coordination a bit easier for all parties.

Draft Rule

.10 A

1. It indicates that the commission will invite the representatives, but it does not address how the council will develop the list of parties that will be invited – will the commission solicit a list of potential representatives from those entities, or will the invitation be made to the entities (rather than individual persons)? Will the invitation process be transparent and public? 10 A (8) is particularly vague.
2. Is the intent to have a given representative be the same person on multiple councils where entities that span multiple regions or are separate representatives for each entity envisioned? And must the representative for an entity reside within the planning region to which they are appointed. Would it make more sense if the representative resides in or actively works or has actively worked in the planning region?
3. The list of entities and stakeholders is wide reaching. However, this list may result in a planning council that could have upwards of 50 members in some planning councils such as the Middle Rio Grande. That seems cumbersome to coordinate and facilitate for the Commission. Is there a way to consolidate the individual municipal representatives or county representatives or the soil and water conservation districts to have one representative on the council? If a group of municipalities chose one individual to represent them, would that representative have a vote for each municipality?

.10B

1. Is the intent to have one representative per each of the listed stakeholders (if they exist within the planning counsel area). Could there be multiple at-large members that represent a similar group of stakeholders, i.e., 2 or 3 representatives for public higher education (UNM, CNM, NMT in the Middle Rio Grande).
2. Though perhaps a local matter, how does that commission envision existing planning committees such as the Estancia Basin planning committee be utilized or is there a need for such pre-existing committees to continue forward or should they be dissolved? While they could still be used on a sub-council basis, I suppose, that seems like a redundancy and duplication of effort and time to retain those committees.

.10F

1. While expedient geographically, having ANY ISC staff member that resides within the council region to be the liaison to the commission seems off somehow – so say the chair of the commission vs a technical staff member of the commission serving as liaison from different councils seems very unbalanced regarding hierarchy and representation back to the commission. With the proposed schedule, would it be

a better strategy to have a dedicated staff liaison that actively worked and coordinated these council meetings? In that way there would be equal facilitation between Councils and Commission.

.10G

1. Will the funding for the planning effort for each region be limited to only using that funding for the administrative support and facilitation for up to the three meetings, or will that support be in addition to other dedicated funding for each region? Does facilitation include moderation and conflict resolution?
2. Are meetings to be held virtually, in person, or hybrid? Will there be grants available for travel reimbursement for council membership who may need to travel and/or take off work to conduct RWP activities?

.12G (4)

1. Be developed using the best available science and considering climate resiliency and increasing aridification.

.12G (5)

1. This may not be possible given that many of those water rights are either not quantified or disclosed.

.12 (H)

1. What are the repercussions of failing to deliver/update a plan?

.12 (I)

1. The guidelines state prioritized PPP lists are updated every 5 years. Could this be included in the rule?

.13 (A)

1. This section needs some work, and it is unclear how local public welfare concerns are to interplay with state engineer prerogatives such as “contrary to water conservation of water within the state”. I do realize that we a threading a needle here, but it seems like that consideration of public welfare as developed locally is going to be subordinate to the state engineer determinations on other factors. Contrary to public welfare is also a factor that must be considered by the state engineer in case determinations. For instance, the OSE defines any beneficial use of water (such as a golf course) as consistent with public welfare, whereas the district court with jurisdiction for the Sandia Basin has indicated that public welfare is not served by such use because that water use is contrary to water conservation.
2. Should this be an area where the ISC can advise a given council on issues identified in the leap ahead analysis? This would give Councils a starting point to build upon and refer to. Will the ISC reject/advise certain PPPs? When developing PPPs will Councils have support with navigating permitting hurdles? Early funding opportunities to address data gaps. Contingency projects for emergencies or unforeseen changes. A project list for the next water planning round.
    a. ISC Commission also identifies existing funding mechanisms as well as identify grants

.13 (B)

1. The issue is with 13.B (1)- this should be changed to a “shall” from the current “may” and the dependent “if” clause should be deleted. The state engineer needs to clearly define how the consideration was made and the basis for the decision on whether and how a decision on that matter was determined – and yes, that will make it up for legal challenges. (3) Frankly, I am more concerned with the State Engineer’s reason for determining why a local welfare concern ISN’T going to be considered. The basis for decision needs to be elucidated in either case.

.14 (A)

1. This seems misplaced due to its reference to the procedures in section 12. I think the problem here is “may consider” as the steps in section 12 are a “consideration. I would suggest the language here be changed to “may adopt” “or ‘may include public welfare within the plan”

.14 (B)

1. I think what is being done here is an issue of primacy and trying to set boundaries on how far the councils can go with the public welfare statements. If that is truly the case, then state it as a constraint not as a consideration.

.15 (added)

1. Adoption of Open Meetings Act that includes avenues for public engagement in between meetings and takes public comments for consideration.

Draft April 2, 2007 Contact Sigmund Silber ssilber1@juno.com

Ten-Year Cloud Seeding Plan for New Mexico

This Plan was Prepared by The New Mexico Weather Modification Association

Table of Contents

I. Executive Summary

Development of the western United States has depended in part on securing water for agriculture, industry and basic human needs. With water, communities and families thrive. Without water, they must move to other locations. Except for periods of prolonged drought, New Mexicans have benefited from a reliable supply of water for the last 400 years. But that reliability has been clouded by doubts that water will be available for expected needs through the year 2040.

In fact, there are several reasons to be concerned about a decrease in historical water sources:

- Depletion of ground water reserves, particularly in eastern New Mexico.
- Increased loss to evapotranspiration due to an observed warming trend.
- Decrease in winter precipitation in our mountains due to the warming trend.
- Possible interference with natural precipitation due to pollution.

This report reviews the statewide projected growth in demand for water, discusses the impact of water on the economy of New Mexico and presents cloud seeding as a viable and relatively inexpensive water supply alternative. An attempt was made to minimize technical details in the body of the report; much important, detailed material is included in the Appendix.

Projected Growth in Demand for Water: While each of 16 Water Regions in the state has studied current water supply and made projections of demand for the next 40 years, there has been no attempt to summarize these findings. Until now, we have not known whether or not statewide water supplies are adequate to meet projected demand. We have reviewed the demand projections from the regional plans of each of the 16 Water Regions and have done our best to tabulate the data. Because the numbers were developed by 16 different organizations, possibly using different guidelines, it is likely that the totals are not completely accurate. Nevertheless, the tabulation of the data shows a large supply deficiency by the year 2040.

Demand is expected to increase from about 3,300,000 acre-feet per year (afy) in the year 2000 to about 4,000,000 afy in 2040. The increase in demand for agricultural use is difficult to predict but will be limited by available supplies, augmented by water from low-cost solutions such as conservation, cloud seeding and perhaps large-scale-surface-capture. The more costly solutions for increasing water supply are not practical for the agriculture sector for economic reasons

The most serious deficiency will be in Municipal and Industrial water use, which is projected to nearly double, an increase of about 400,000 afy. These figures do not include replacement of aquifer depletion, which has been occurring over the past 50 to 100 years. When this is factored in, the increase in demand may be in the order of

500,000 afy. To put this in perspective, this is about five times the amount of water allocated to New Mexico in the San Juan/Chama project.

Clearly, conservation could significantly alleviate the demand, and all efforts to conserve water should be vigorously encouraged. Also, higher water prices could further reduce demand. But we believe we should look for ways to increase supply before imposing punitive restrictions on water supplies, or by allowing massive transfers of water out of agriculture.

Meeting this demand presents real challenges. The Regions agree that no single supply alternative will satisfy their future needs for more water. It will require careful planning and employment of multiple alternatives. Cloud seeding has been listed as an alternative supply in many Regions; because of the large amounts of additional precipitation that can be created, cloud seeding should be considered as part of the State Water Plan.

Impact of Water on the Economy of New Mexico: Beyond the matter of availability of water is the question of cost. Costs greater than the value of water at some point could become a drag on a community's and perhaps the state's economy.

The literature indicates that there will be few buyers of water for agricultural use at a cost of $100 afy or more, and that there will be few buyers for commercial/industrial use at a cost of $500 afy or more. The lower value of water for agricultural use is the basis for the belief that water will continue to be reallocated from agriculture to municipalities. The value of municipal water is difficult to determine, as a community generally is willing to pay whatever they have to in order to survive, but at some point a lack of affordable water will threaten its growth and perhaps its existence.

There is good evidence that summer cloud seeding in the plains will produce water for $1 or less per acre foot of water, and that winter seeding in the mountains will produce snowpack for spring runoff for $10 to $25 per acre foot of water. Alternative sources, such as collection of storm runoff or desalination of shallow or deep (greater than 2500 feet) aquifers are estimated to cost from one to two orders of magnitude more than cloud seeding. It is important to the welfare of the state that the lower-cost water resources, such as cloud seeding water, be among the first water resources developed. The result of providing affordable water is that each sector of the economy is able to sustain itself and prosper.

Cloud Seeding as a Supply Alternative: Cloud seeding is a method of generating additional precipitation from clouds. This is done by introducing artificial nuclei into the clouds. Microscopic water droplets, which normally remain liquid well below the freezing point of water, freeze around the artificial nuclei, forming an ice crystal. The ice crystals grow until they are heavy enough to fall as snowflakes or raindrops.

There are two general provinces for cloud seeding: the plains, where seeding is done in summer, and the mountains, where seeding is done in winter. Plains seeding is done from aircraft, using state-of-the-art radar and a global positioning device in order to identify convective clouds suitable for seeding. The benefit is typically one-half to one

inch of additional precipitation over a summer season. With aircraft seeding covering millions of acres, this amounts to a great deal of water. Mountain seeding customarily uses ground generators, which take advantage of the orographic effect of upwelling air currents over mountain ranges to get the artificial nuclei into the cloud. Precipitation (snowpack) increases of 8% to 14% are reported in nearby states. The reported percentage increases in stream runoff are slightly higher.

Assessment is critical to demonstrate that the additional precipitation is the result of cloud seeding and not chance. This may be done by some combination of: 1) validating that the physical conditions necessary for a successful outcome are present, 2) measuring the additional precipitation and 3) measuring the impact of the additional precipitation (i.e., increased stream flow or crop yield).

Winter cloud seeding has been done commercially in California for more than 50 years, and winter cloud seeding operations have been conducted at one time or another in all southwestern states. In New Mexico, a successful winter cloud seeding experimental project was conducted in 1968-1972 in the Jemez Mountains, and a successful summer program in the plains of southeastern New Mexico and West Texas was conducted in 1999-2005.

Two questions are frequently asked about cloud seeding: “Are you taking water away from people downwind?” and “Are you damaging the environment by putting chemicals in the clouds?” As to taking water from those downwind, the opposite is true. Increased precipitation has been shown to occur as far as 50 to 100 miles downwind from the seeding area. As to environmental concerns, the most widely used seeding agent, silver iodide, is used in such minute quantities that practically no trace can be found after seeding. Silver is inert, and, when detected after cloud seeding has been done, occurs in concentrations of parts per trillion, which is one one-thousandth of the EPA standard. Over the past 50 years, many studies have been conducted, and all showed no adverse environmental affects.

Creation of the New Mexico Weather Modification Association: A cloud seeding workshop in 2004, with experts from around the country, concluded that a pilot cloud seeding project should be conducted in northern New Mexico. It was later determined that, for cloud seeding to gain public support, it be pursued on a statewide basis. Thus the New Mexico Weather Modification Association Inc. (a non-profit organization) was formed to take the lead on studying and promoting cloud seeding and, where appropriate, organizing cloud seeding projects. The NMWMA is headquartered in Santa Fe, but membership throughout the state is encouraged.

A Plan for Cloud Seeding in New Mexico: The NMWMA plans call for mountain and plains seeding as well as a statewide climatologic review. Elements of the plan include:

- Examining satellite imagery of storms in the state for four selected historical years coupled with an analysis of other climatologic data.
- As suggested by the Jemez y Sangre Water Planning Council and the Cloud Seeding Workshop, conducting a winter cloud seeding demonstration project in the western Sangre de Cristo and/or Jemez Mountains. The purpose of the project is to demonstrate that winter cloud seeding in New Mexico is feasible and

cost-effective. Although a mountain cloud seeding project like this is economic with small percentage increases in precipitation, our long-term goal is to show that cloud seeding at these southern latitudes, with warmer clouds, can increase precipitation by 10% or more.

- Seeding in the plains of southeastern New Mexico has proven to be beneficial and cost-effective, so plans will be made to extend summer seeding to a larger area in eastern New Mexico.
- Contingent on the success of the winter demonstration project in the western Sangre de Cristo and/or Jemez Mountains, other mountain ranges, such as the eastern Sangre de Cristos, the Sacramentos, the southern San Juans and the Black Range-Mogollons will be considered for winter cloud seeding.

Challenges to Cloud Seeding in New Mexico: We have found that a major challenge to cloud seeding is funding. Cloud seeding, particularly in our north central mountains, is not easily funded. Increased precipitation is not something that can be installed house-by-house like roof capture or gray water treatment systems…it is more like a public works activity. Like "The Problem of the Commons", landowners in the area will benefit from a cloud seeding project whether they contribute to it or not.

To date the NMWMA has raised $12,000 for the 2004 workshop, $9,000 for NMWMA operating costs and a matching pledge of $20,000 from the City of Santa Fe. We have resolutions of support from many sources, but we have been unable to raise sufficient funds to provide for a demonstration project, or even a far less costly feasibility study.

Our fund raising efforts during the past two years indicate that financing cloud seeding projects will require a combination of financial support from agricultural interests (such as acequia organizations, Irrigation /Conservancy Districts and Soil and Water Conservation Districts) and state organizations (such as the Interstate Stream Commission, and the Department of Agriculture). These organizations would all be direct beneficiaries and they represent that part of the public that would most benefit from increased precipitation.

Another challenge, one that overlaps and partially explains funding difficulties, is public skepticism. Some may also voice concerns about the environment. While a healthy degree of skepticism can be beneficial, attitudes of many toward cloud seeding in New Mexico are negative. The reasons for this are complex, but if we hope to move forward with cloud seeding in New Mexico, it will be necessary to initiate a program of education and public interaction. There are other significant challenges, which are discussed in the report.

Next Steps: It has become clear that the NMWMA on its own cannot bring about a cloud seeding project in New Mexico. That will require active participation on the part of the Governor and principals in the Legislature, officials in state government and agricultural and water organizations. It is imperative that the Interstate Stream Commission, or some other appropriate state government entity, hire a person to help organize and coordinate cloud seeding activities. Without the state's proactive support, it is unlikely that cloud seeding will be done in New Mexico in the near future.

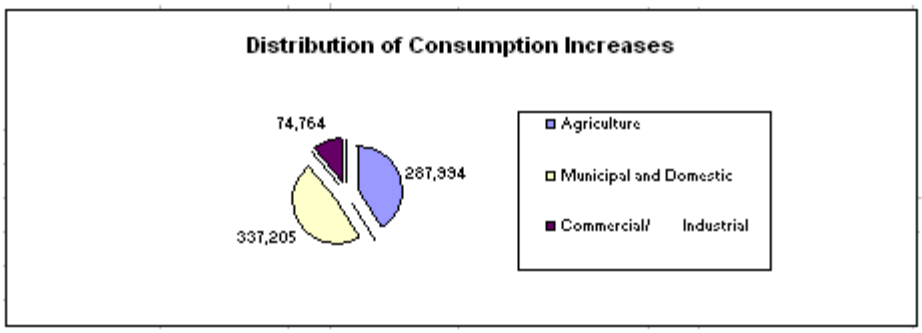
With that support and an adequate level of funding, we would then collect statewide climatologic data, conduct a demonstration mountain seeding project in northern New Mexico and renew plains seeding in southeast New Mexico with a robust assessment component. Successful, well-run projects, with an emphasis on documentation and assessment, are needed to demonstrate that cloud seeding really does produce more water. With that accomplished, we could then move forward with a long-term, statewide cloud seeding program and enjoy the benefits of the additional water.

II. Projected Growth in Demand for Water

A review of plans for each of the 16 Regions provided total demand figures for the year 2000 and projections for the year 2040. Details of the tabulation are provided in Appendix H. Statewide, demand is expected to increase from about 3,300,000 acre-feet per year (afy) in the year 2000 to about 4,000,000 in 2040. The greatest increase will be in Municipal/Domestic and Commercial/ Industrial water use, which is projected to nearly double, an increase of about 400,000 afy. Most of this increase will take place along the Rio Grande corridor. These figures do not include the depletions in ground water that, at some point, should be replaced. If these are included, the increase in demand may be in the order of 500,000 afy.

The increase in demand for agricultural use is difficult to predict, but consumption in the agricultural sector will be limited by the current supply of water, augmented by water from low-cost technological solutions such as conservation, cloud seeding and perhaps large-scale-surface-capture. The more costly solutions for increasing water supply are not practical for the agriculture sector for economic reasons. Also, as demand for water increases in municipalities, there will be increasing pressure to transfer water from agricultural use. The result is that there is not likely to be a significant statewide increase in agricultural water use.

AF Per Year	Agriculture	Municipal and Domestic	Commercial/ Industrial	Total
Year 2000	2,766,853	308,851	202,633	3,278,337
Year 2040*	3,054,847	646,056	277,397	3,978,300
Absolute Increase 2040 over 2000	287,994	337,205	74,764	699,963
Percentage Increase 2040 over 2000	10%	109%	37%	21%



Meeting the combined increase in Municipal/Domestic and Commercial/Industrial demand presents some very difficult problems which is another way of saying that the cost to New Mexicans will be very high.

The increasing demand for water along the Rio Grande corridor and overuse of ground water makes it difficult to deliver to Texas the amount of water required under the Rio Grande Compact**.** The Office of State Engineer (OSE) has recognized the problem and has co-sponsored a series of meetings among the three Regions comprising the Middle Rio Grande Basin to look for ways to deal with the current shortfall and meet the projected increase in demand.

Historically, the gap between supply and M/I demand has been met largely by transfers of water from agriculture to M/I. However, only two Regions have projected decreases in agricultural use (Mora-San Miguel and Middle Rio Grande Regions) and the rest have projected the same or increased use. The dairy farm industry in Lea County alone calls for doubling agricultural water consumption, more than offsetting the projected decrease in the two Regions showing a decrease. It may prove difficult to continue transferring large amounts of water from agricultural to municipal use. The impacts of such transfers may be severe such as the problems related to the migration of people from rural areas to metropolitan areas.

The projected increase in demand does not reflect any of the steps the Regions plan to provide for the increased demand. Neither have we taken into account any impact of climate change, which could reduce the supply. These figures should be seen as a first approximation, but they illustrate the size of the problem we are facing in New Mexico.

III. Impact of Water on the Economy of New Mexico

Water benefits both the individual user of the water and the community. Available literature (references in Appendix H) suggests that few farmers will currently pay more than $100 per acre foot and few industries will pay more than $500 per acre foot for an assured source of water. This base-line figure may be called the value to the user of the water. The difference between the value of the water and the cost of the water benefits the user and is the direct economic impact of water in New Mexico. New Mexico has a considerable amount of "free" or very low cost water and this water contributes to our economy and benefits the users of this water.

But the users of water are not the only beneficiaries. If a farmer cultivates more land, the farmer buys more seed and fertilizer and services, and spends part of the profit on items needed to live. In the commercial and industrial sector the amount of purchases made per dollar of water expense may be very high. The vendors who benefit from these purchases in turn make their purchases. The subsequent indirect impact of economic activity is usually substantial and a part of that impact remains within the New Mexico economy. Thus the ability to meet the demand for water in the 16 Regional Water Plans will have a large positive impact on our economy, whereas having to curtail water use (other than by conservation) will scale down this positive impact.

The lower value of water in the agriculture sector is the basis for the belief that, over time, water will continue to be reallocated from agricultural use to municipal/domestic and commercial/industrial use. Some are comfortable with that being an acceptable solution to our water problem. We need to better understand the ramifications of less agriculture in New Mexico before being totally comfortable that such an approach is desirable.

It appears that water needs to be provided at a cost of $100 or less per acre foot for agriculture and $500 or less per acre foot for commercial/industrial use for there to be a lot of willing buyers for this water. Projects that cost more than some multiple of $100 for agricultural water and $500 for commercial/industrial water may actually be shrinking the economy, even when there are buyers who are willing to lose money on these water purchases or whose purchases are subsidized. The price municipalities can afford to pay is more difficult to determine, since generally they are willing to pay whatever they must to survive. At some point, however, an unaffordable cost of water may cause a community to contract or die.

The fact that many water projects have Federal subsidies may be moving the negative impact of overspending on water to the U.S. taxpayer base. There is a need to consider that negative impact in order to make responsible decisions on water in New Mexico. Common sense suggests that lower-cost sources of water, such as cloud seeding water, should be utilized before higher-cost sources.

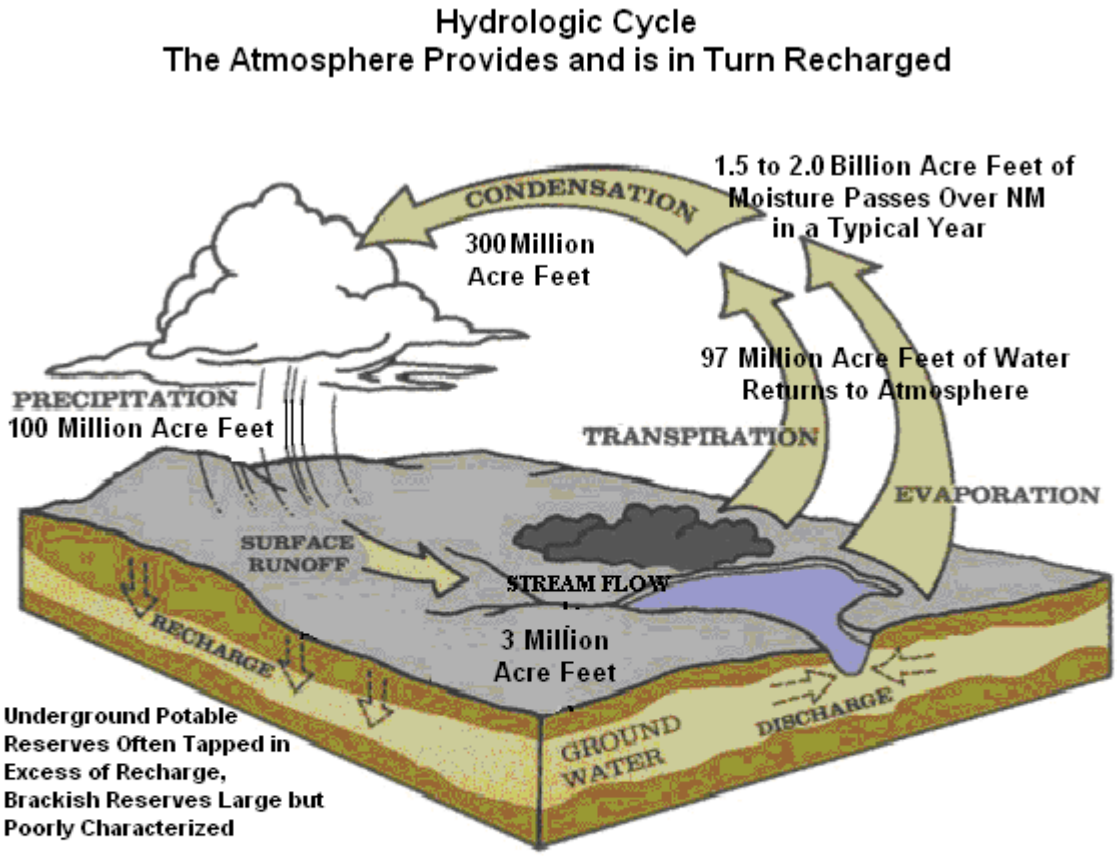
One would expect water prices to always be higher or equal to water costs and lower than the value of water to the particular user. Within those limits there is a lot of room for prices to vary. In New Mexico we are seeing prices of water exceeding what we estimate as the value. In such cases it appears that people believe that the value of

water, and hence the price, will continue to increase over time. They may be being overly optimistic as to how high water prices can go and be sustainable.

We may be approaching the point where both the availability of water and the price of water will be a drag on the economy of New Mexico. It behooves New Mexico to have a better handle on the value of water so that planning can be conducted on a sound basis. The result of providing affordable water is that each sector of the economy is able to sustain itself and prosper.

IV. Cloud Seeding as a Supply Alternative

A. How Cloud Seeding Works



Depiction of the hydrologic cycle. ***Precipitation is not "lost"****, but is recycled through runoff, evaporation, and transpiration. New Mexico data added to a drawing created by B. Hove, of the ND State Water Commission. Precipitation of 100 million af is an approximation derived by multiplying the area of the state times annual precipitation. If less than one-third of moisture in clouds falls as precipitation, then 300 million af of moisture passes over the state annually as clouds. If only 20% of atmospheric moisture condenses into clouds, then 1.5 to 2.0 billion af of moisture passes over New Mexico annually.*

Other than inflows from Colorado, our water supply is determined by the hydrologic cycle shown above. It rains or snows and this water falls to the ground and becomes ground water, runs off as surface water or is returned to the atmosphere through evapotranspiration (ET). Little, if any, water is destroyed. Generally speaking, the ET process works quickly (97% of precipitation is recycled by ET) or the water is put to beneficial use (3%) and then recycled by ET. We only borrow water. We don't consume it in the same sense that gasoline or heating oil is consumed.

In clouds, water does not freeze at zero degrees Centigrade (32 degrees Fahrenheit). The microscopic size of the water particles and the purity of the water means that it will

not freeze naturally until the temperature is well below zero degrees Centigrade namely -40ºF which as it turns out is also -40ºC.

This very cold but unglaciated (unfrozen) water is called “supercooled liquid water (SLW) because it exists in a liquid form below the normal freezing point of water. Since the temperature within clouds is rarely as cold as -40ºF/-40ºC the glaciation process would not work in pristine air masses.

Fortunately there are impurities in the air, mainly kaolin clay particles, that serve as ice nuclei (IN) and allow this SLW to freeze (glaciate) at approximately –15C (5F). This frozen moisture falls as snow in the winter or melts and falls as rain if temperatures near the ground are above freezing. There are so-called warm rain processes that work without having to first glaciate the moisture but at our latitudes almost all of our precipitation requires glaciation to take place. Even on the warmest summer day, the upper parts of clouds are very cold.

The reason that only about 30% or less of the SLW in clouds falls as precipitation is that at times the SLW is too warm for the natural IN to be effective. There may also be times when there are not enough of the ice nuclei available. Cloud seeding is a way of accelerating the freezing of water droplets that are too warm to glaciate or for which there are insufficient IN. The graphic below provides a semi-quantitative analysis of the processes involved.

The lined area below the curve that goes from almost the bottom left to the top right represents the amount of SLW (vertical scale is grams/cubic meter) that is available for glaciation at high elevations in New Mexico as a function of cloud temperature. Note that more water is available as the temperature increases. However, the leftmost curved line (red if seen on your screen or in a color printout) represents the relative quantity of natural ice nuclei Note that the quantity of ice nuclei (IN) that is able to glaciate tiny water particles increases slightly with colder temperatures. What is most significant however is that the effectiveness of the IN is close to zero at temperatures much above -15º Centigrade.

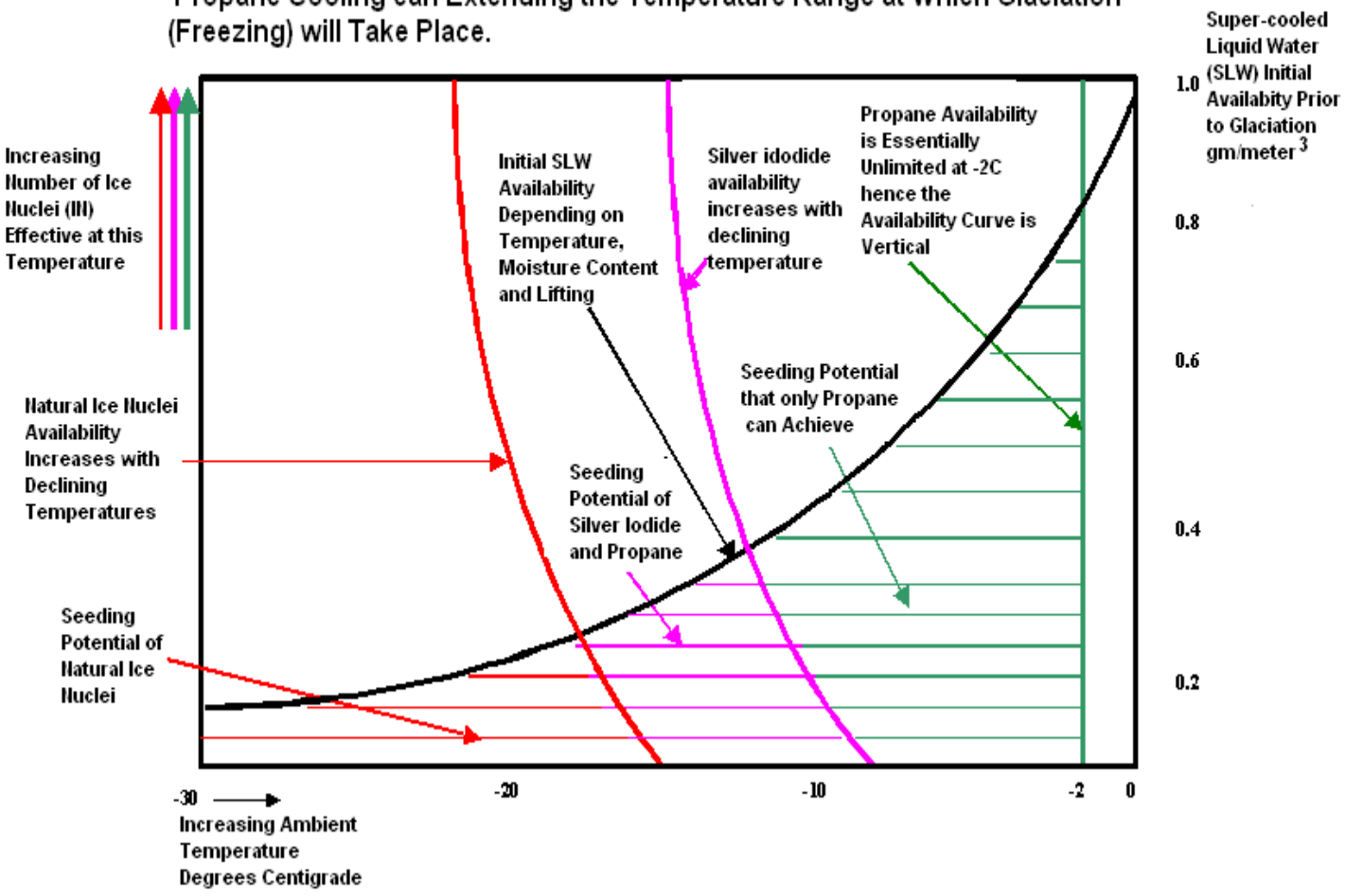
The area to the left of (colder than) the natural IN availability curve but under the SLW availability curve (shown as red lines on your screen or if printed in color) shows the amount of SLW that can be glaciated by natural ice nuclei. For states north of us this has been shown to be about 30%. For New Mexico it may be less, perhaps as low as 25%, for our mountains because our winters are warmer.

Thus only a small fraction of the available water in clouds is able to be converted into ice by the natural IN. Since only about 20% of the available moisture enters clouds the resulting precipitation is usually about 5 or 6% (25 to 30 percent of 20 percent) of the available moisture. That is why storms can move across the country. They only drop a small portion of the moisture available and they are being replenished by both ET and inflows from moisture-rich areas in our case the Gulf of Baja California and the Gulf of Mexico.

The semi-vertical curved line to the right of the Natural IN curve shows the effectiveness of silver iodide as a function of temperature. Because Silver Iodide is effective at warmer temperatures, more of the available SLW can be glaciated. That is the central scientific basis for cloud seeding. More information on how seeding with silver iodide works is provided in Appendix A.

Even more of the SLW, essentially all of it, can be glaciated by using propane to cool the air. More information on propane cooling is available in Appendix A.

Conceptual Model of how the Availability of Supercooled Liquid Water (SLW) and Natural ice Nuclei (IN) Vary with Temperature and how Silver Iodide Seeding and Propane Cooling can Extending the Temperature Range at Which Glaciation (Freezing) will Take Place.



B. Types of Cloud Seeding Projects

There are two main types of cloud seeding: plains seeding, done in the summer (growing season) by aircraft for precipitation augmentation or hail suppression, and mountain seeding, done primarily in the winter to achieve increased snowpack. The seeding agent for mountain seeding is usually released from generators on the ground because the zones of super-cooled liquid water (SLW) in winter clouds are very close to the ground.

The key differences are described in the following Table.

Factors Considered	Plains Seeding	Mountain Seeding
Beneficiaries	Farmers on whose land the rain falls.	• Water rights holders on streams or reservoirs. • Well owners benefiting from increased aquifer recharge.
Seeding agent	Silver iodide.	Silver iodide or propane.
Amount of benefit	One half to one inch of additional precipitation over a summer season.	8 – 14% increase in precipitation leading to a 9% to 17% increase in stream flow..
Cost	$1 per afy.	$10 to $25 per afy.
Size of area impacted	One aircraft can cover 2.5 million acres.	Relatively small target areas…100,000 to 500,000 acres.
Delivery method for the seeding agent	Aircraft to chase the clouds wherever they go.	Usually ground release to impact a particular target area.
Impact on the clouds	Increases convection, thus more moisture is pulled into the clouds, which in turn leads to more precipitation.	Increases the percentage of moisture in the clouds that is glaciated in the target area and to a lesser extent many miles downwind.

One important difference between plains and mountain seeding is that plains seeding covers a very large area, and the objective is to create much additional precipitation, even if the amounts landing on any one acre are not great. For mountain seeding, the goal is to create snowpack in the target area, where you want it, for spring runoff.

Plains seeding projects are frequently organized, funded and managed by local entities, while mountain seeding projects are often funded and managed by the state.

With plains seeding, the existence of improved radar and radar-based software means the aircraft has the ability to deliver the seeding agent to exactly where it is needed in the clouds, and to measure the impact of the seeding on cloud dynamics.

C. How Cloud Seeding Projects are Assessed

The goal of assessment is to verify that additional precipitation was the result of cloud seeding, not chance, and to quantify the additional precipitation. This is one of the most difficult, but most important elements in a cloud seeding project. If not done well, there will always be doubts that cloud seeding really works. There are three ways to perform assessment:

- Validate that conditions necessary for a successful outcome are present

  For cloud seeding to be successful, certain conditions must be met. The required conditions include:

  - That sufficient SLW exists
  - The SLW droplets are the right temperature: –15° C to –8 ° C which is 5 ° F to 18 ° F.
  - The seeding agent plume comes in contact with the SLW.

  These required conditions are often relatively easy to verify. Icing rate meters and temperature sensors can determine presence and temperature of the SLW, and chemical tracers on the ground or plume tracing by aircraft indicate whether on not the seeding agent was on target.

- Measure the additional precipitation

  Generally, the measure of the additional precipitation caused by cloud seeding is **indirect**. The total precipitation is measured and statistical techniques are used to estimate how the total precipitation differs from what would have been expected if cloud seeding had not taken place.

  These statistical techniques may involve establishing a target area and a control area. The precipitation in the seeded, or target area, is compared to what we would have expected in the target area if it had not been seeded. This estimate for the unseeded target area is made by taking the actual precipitation in an unseeded control area, and then using the historical relationship between precipitation in the control area and precipitation in the target area to forecast the expected precipitation without cloud seeding for the target area. Another approach to establishing a control is to define time slots and seed certain time slots selected at random and not seed the others, which then serve as the control. For plains seeding, individual pairs of similar clouds are selected, one of which is seeded and the other not seeded.

Because cloud seeding generally is expected to produce an 8% to 14% increase in precipitation, and the natural variability in precipitation far exceeds that amount, statistical approaches are difficult and generally require a long period of time before the data become statistically meaningful. Obtaining levels of confidence of 85% to 90% seems to be routine but getting to the 95% level of confidence that scientists seek is often not achieved. That is why it is desirable to first establish that the conditions for a successful cloud seeding project exist. If those conditions exist, additional precipitation is likely to have occurred even if it is difficult to measure the amount of the additional precipitation to a high degree (95%) of confidence.

- Measure the impact of the additional precipitation

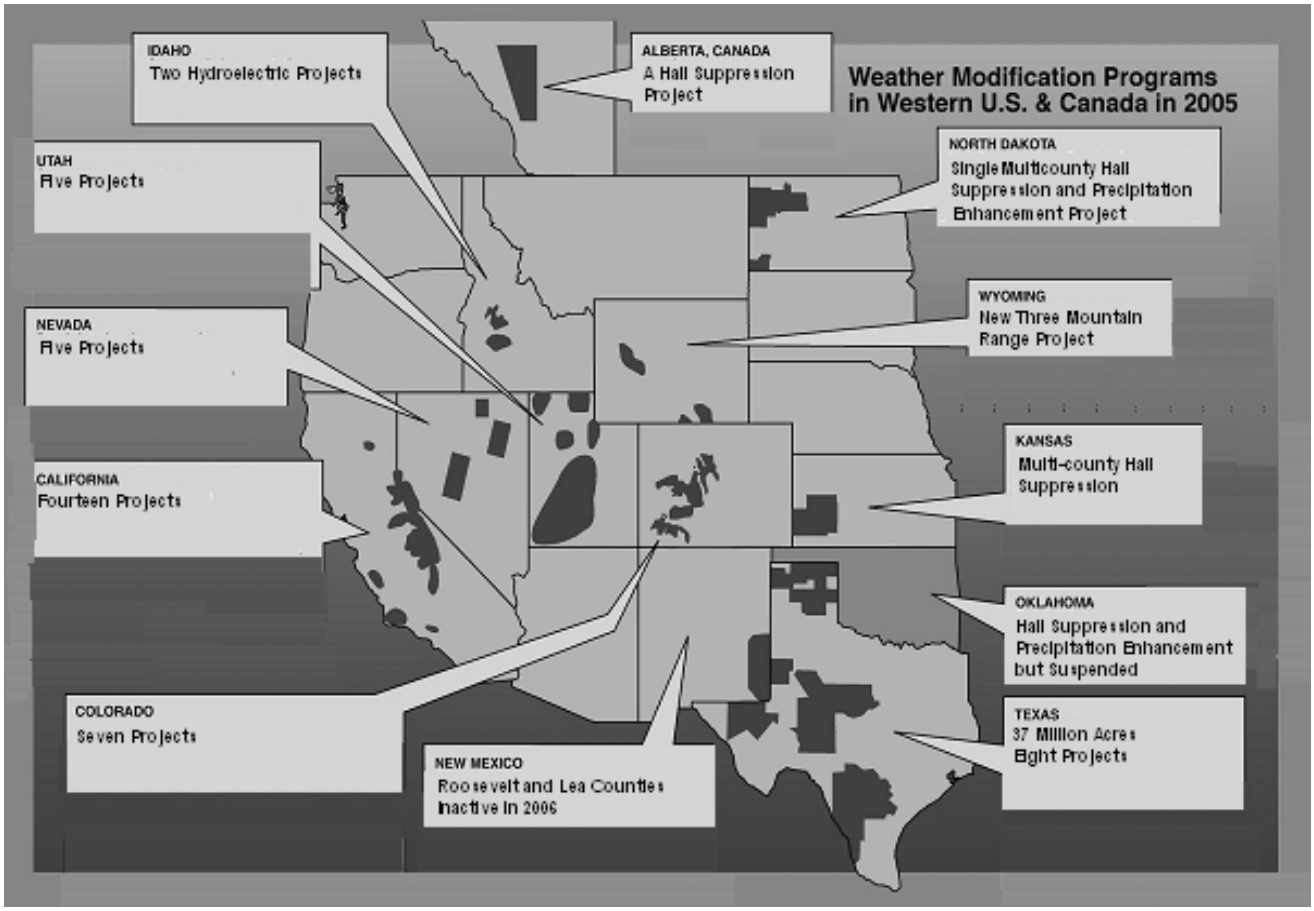
  The most visible impact of additional precipitation with mountain seeding is more water in streams. The impact of cloud seeding on precipitation may vary greatly from one location to another, but stream flow tends to average this out, so that stream measurements may be a good indicator of increased precipitation. As with direct measures of precipitation, stream flow analysis requires a control---usually a nearby stream originating in a watershed that was not seeded.

  An indirect indicator of increased precipitation is higher crop yields and rising ground water levels. Only applicable on the plains, measurements of hail damage claims are considered a good indicator of the effectiveness of hail suppression caused by cloud seeding. The reduction in aquifer pumping of the Ogallala Aquifer has proven to be a useful measure for New Mexico to monitor and lends itself to the computation of benefit to cost ratio.

Additional information on cloud seeding assessment is provided in Appendix B.

D. Cloud Seeding Projects in the Western U.S. and Elsewhere in the World

The map below shows cloud seeding activities underway or planned in western states in 2005. Mountain cloud seeding has been done in the Sierras in California for over 50 years, and every state in the southwest has had a cloud seeding program at one time or another. Not shown is a 7-state initiative under consideration to seed the Colorado River Basin; this project has the potential to add 1,000,000 afy to the headwaters of the Colorado River.



Additional information on current activities, which was obtained from the cloud seeding authorities in these states, is provided in Appendix C.

Reports indicate that some twenty-five nations currently have operational cloud seeding programs or are conducting cloud seeding demonstration projects. The list of nations active in precipitation enhancement and hail suppression cloud seeding includes Mexico, Canada, South Africa, United Arab Emirates, Oman, Syria, Israel, Pakistan, China, India, Russia, Australia, France, Germany, Italy, Greece, Bulgaria, Morocco, Burkina Faso, Libya, Indonesia, Saudi Arabia and Argentina.

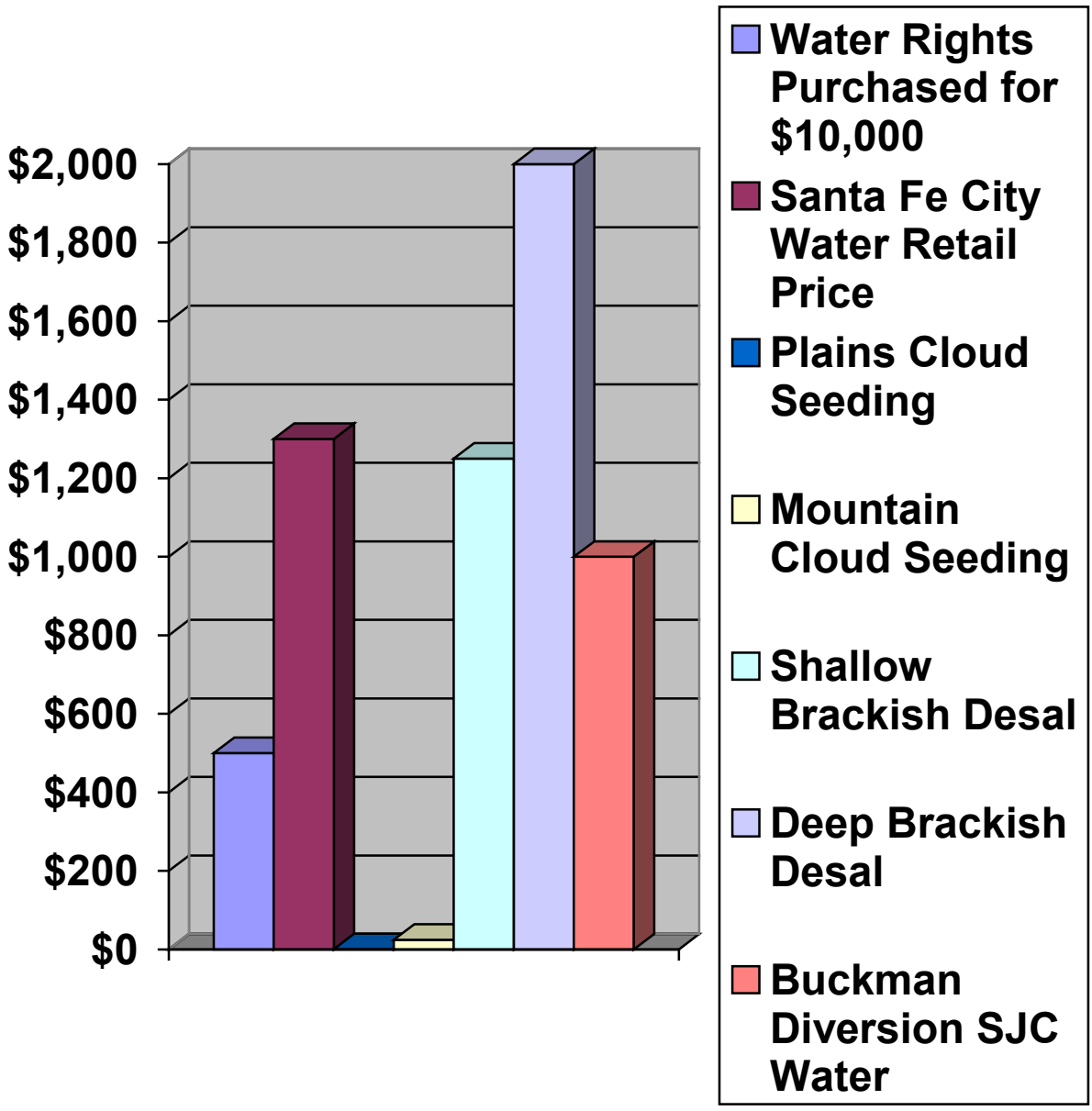
V. Comparison of Alternative Water Sources

There are many water sources that can be accessed with modern technologies, thus increasing our water supply. Some of these are listed below in order of increasing cost.

Water Source	Technologies Involved	Quantity Available.	Challenges	Cost per Acre Foot
Cloud Seeding	There could be a role for aquifer storage and retrieval.	Perhaps 100,000 to 200,000 afy per mountain project and one half to one inch per acre on the plains for summer season.	Public skepticism and difficulty in measuring the additional water produced.	Plains precipitation on farmers' lands--$1 Mountain stream flow--$10 to $25.
Large-scale Surface Capture	These projects might be done in combination with aquifer storage and retrieval.	Controlled by topography and near-surface clays. Perhaps in the order of tens of millions of acre-feet.	Possible impairment of aquifer recharge could be solved by water sharing arrangements.	Probably under $100
Shallow Brackish Water less than 2,500 feet deep and more than 1,000 PPM of dissolved solids	Will require desalination.	Recoverable reserve is in the order of millions of acre-feet.	This is too costly for agricultural use. Municipal use often will mean inter-basin transfers.	$750 to $1,500
Deep Brackish Water greater than 2,500 feet deep and more than 1,000 PPM of dissolved solids	Will require desalination. Horizontal drilling techniques would be beneficial.	Very large--in the order of hundreds of millions of acre-feet.	Possible impairment of surface and fresh water aquifers. Will need to show that deep aquifer is confined.	$1500 to $2500
Coal Bed Methane Water	Will require desalination.	About 20,000 afy.	Distance from market.	$500 to $2,000
Oil Field Water	Will require removal of organic compounds and desalination	About 80,000 afy	It is often cheaper to just inject the oil field water in wells	$2000 to $3000

While the amount of water potentially available by desalination (Deep Brackish, Shallow Brackish, Oil Field and Coal Bed Methane Waters) is very large, the costs are at least an order of magnitude higher than Large-scale Surface Capture and Cloud Seeding. Large-scale Surface Capture (meaning non-storm surface run-off on a scale larger than roof-top) confronts state rules and regulations that will have to be resolved. Cloud seeding has its own challenges, but measures up cost-wise against all alternatives as shown on the chart below.

Cost Per Acre Foot of Alternative Water Sources
(Capital Costs Converted to Annual Costs
Using a 5% Annual Cost of Capital)



The analysis which follows, shows the role cloud seeding might play in reducing the cost of meeting part of the projected gap between existing supply and demand projected for the year 2040. As noted earlier in this document~~,~~ a review of the 16 Regional Water Plans (RWPs), indicates that the existing annual demand is about 3,300,000 acre feet, and projected demand for the year 2040 is about 4,000,000 acre feet. The bulk of this projected increase in demand is in the combination of Municipal/Domestic and Industrial/Commercial water use, which combined is projected to increase about 400,000 afy. Factoring in the need to replace some of the ground

water being utilized in excess of the rate of recharge, the annual shortfall may be about 500,000 acre feet if supply remains constant.

Total Annual Amortized Cost of Providing Water where Needed for Municipal/Domestic and Commercial/Industrial Uses

Cost per Acre Foot	20 % of Shortfall 100,000 AF	40% of Shortfall 200,000AF	60% of Shortfall 300,000AF
$25 Cloud Seeding Water	$2.5MM	Probably can not meet more than 20% of gap with cloud seeding.	Probably can not meet more than 20% of gap with cloud seeding.
$100 Leasing Water Rights as With Pecos River Compact Approach	$10MM	$20MM	$30 MM
$500 Buying Water Rights or Land and Retiring Water Rights if Water Rights Sell for $10,000 per AF. Price is Increasing	$50MM	$100MM	$150MM
High-tech Solutions $1,500 E.g. Brackish Water, Oil Field Water.	**$150MM**	**$300MM**	**$450MM**

In the above table, the cost to meet 20%, 40% or 60% of the projected increase in demand are estimated for various approaches. One approach, the most expensive, is to utilize high-tech solutions, such as desalination (deep and shallow brackish water and oil field and coal bed methane water). Here, for ease of calculation, we used a cost $1,500 per acre foot of water in today's dollars. We recognize that each project has its own costs which can vary dramatically by project even if the technological solution is the same. But here we are tying to get a ball-park figure for planning purposes and to assist in making technological choices.

A second approach is to purchase water rights and transfer water from agriculture, or purchase land with water rights and retire the water rights. If water rights cost $10,000 per acre foot, the annual cost of financing the purchase, assuming an interest rate of 5%, is $500 per acre foot. A third approach is to lease water rights. The State Engineer is currently leasing water rights along the Pecos for $100 per year per acre foot of water. Such low rates may not exist in the future, so this is possibly an understatement

of the cost in future years. $100 per acre foot may however also approximate the cost of using large scale surface capture if the regulatory hurdles can be overcome.

In contrast, we show the cost if this water would come from winter cloud seeding. The cost of winter cloud seeding was used because most of the supply gap is along the Rio Grande and winter seeding of the Sangre de Cristo and Jemez Mountains would put spring snowmelt into the Rio Grande. Summer seeding of these mountains could also be considered in addition to winter seeding and this dual season seeding would increase the potential if the operational problems of seeding mountainous terrain can be overcome.

There is a wide range of costs to meet 20% of the projected deficit, from $2.5 million year using cloud seeding, to $150 million or more per year using high-tech solutions. To meet $60% of the shortfall could cost as much as $450 million per year. We limited the use of technology in the above table to 60% of the projected increase in demand. Conservation must play a large rule in reducing demand or providing additional water depending on how you account for conservation savings. The combination of conservation, high cost and low cost technology alternatives will determine the total cost of meeting the projected in crease in demand.

Municipal and domestic conservation alone is not likely to be able to close the gap between current supply and the projected increase in demand. If a 0.1 acre foot reduction per household (32,500 gallons or a 90 gallon reduction in daily use per household - perhaps a reduction of 35 gallons per person per day) is able to be achieved by in 2040 this would result in perhaps a 100,000 to 150,000 acre foot reduction in demand. Since the projected statewide increase in municipal/domestic usage is far more than that, realistically we are going to need more water as well as conservation achievement in the other sectors.

The social implications of removing a large amount of agricultural production to obtain water for municipalities need to be considered carefully. If this reallocation can be minimized, that may be beneficial in its own right. Also, with continued transfer of large amounts of water rights from agriculture, the price of water rights may escalate much higher than we have assumed. Some water rights in Northern New Mexico are already selling for in excess of $25,000 per acre foot so we conclude that closing the gap between supply and demand by transferring water from agriculture may turn out to be far more expensive than some anticipate.

Regional Water Plans observed that no single alternative water source would be sufficient to satisfy the projected increase in demand. New Mexico needs a plan which considers **all** alternative water sources as called for in Section C14 of the New Mexico Water Plan. This will require aggressive application of technology to our water situation. New Mexico does not need to be a water-starved state. With innovative approaches and organization, sufficient water can be made available to meet our needs.

VI. The New Mexico Weather Modification Association.

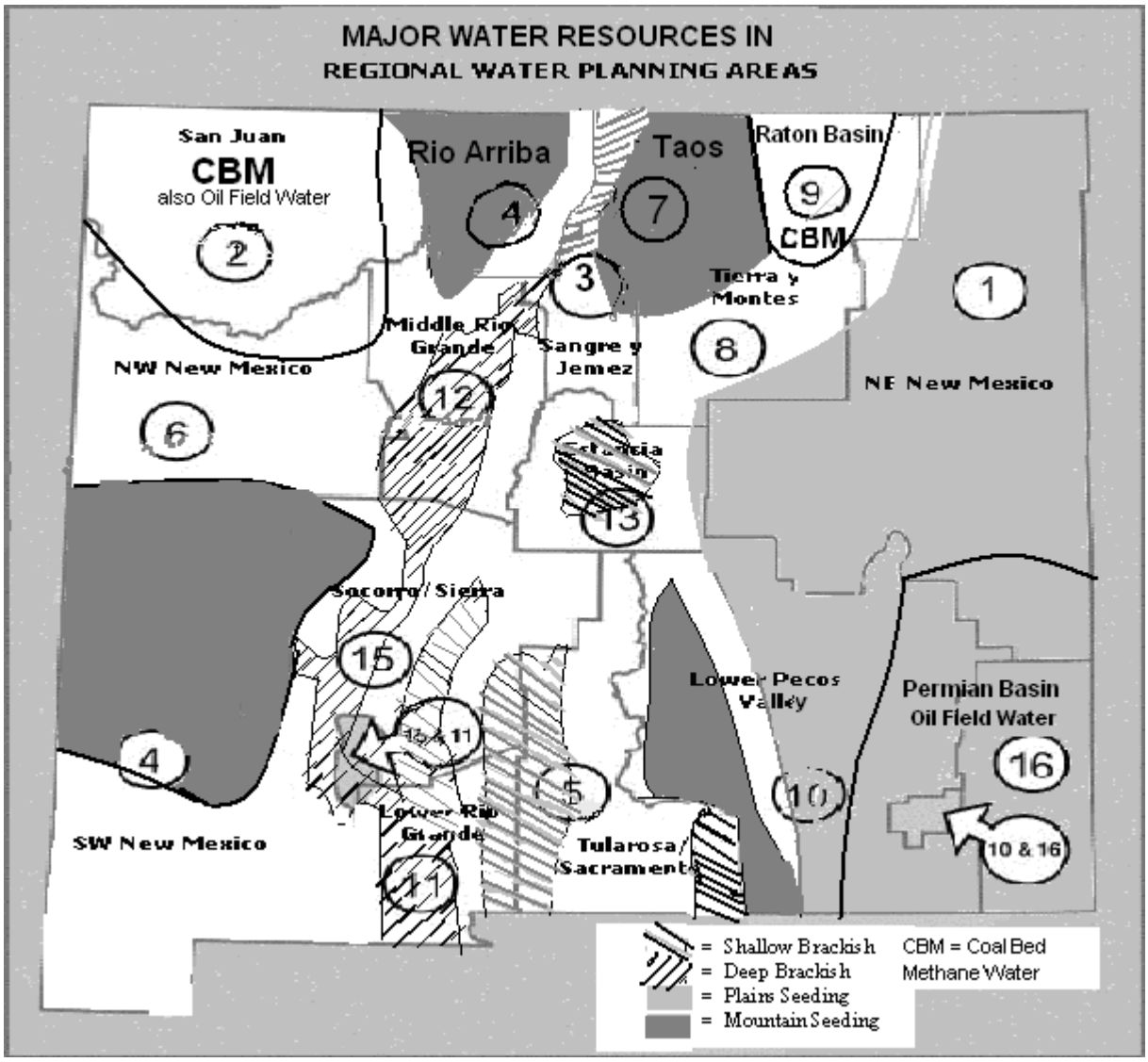
In 1987, 16 water planning regions were established and it was later decided that water plans should be made for each of these regions. The Jemez y Sangre Water Planning Region, Region 3, covers part of the Northern Rio Grande Basin, extending from Embudo to through the Galisteo basin and includes Española and Santa Fe. The Water Planning Council collected data, analyzed supply and demand, performed public outreach and education and outlined alternatives for satisfying future water demand

In 2003 the Region 3 Water Plan was completed at a cost of more than $500,000 and submitted to the Interstate Stream Commission, which approved the plan. After the plan was submitted, the Jemez y Sangre Water Planning Council elected to continue as a volunteer organization to monitor the performance against the plan and to be ready to update the plan as required. Continuing as a volunteer organization meant that the services of consulting organizations would no longer be available, so the Council created various committees to pursue the recommendations.

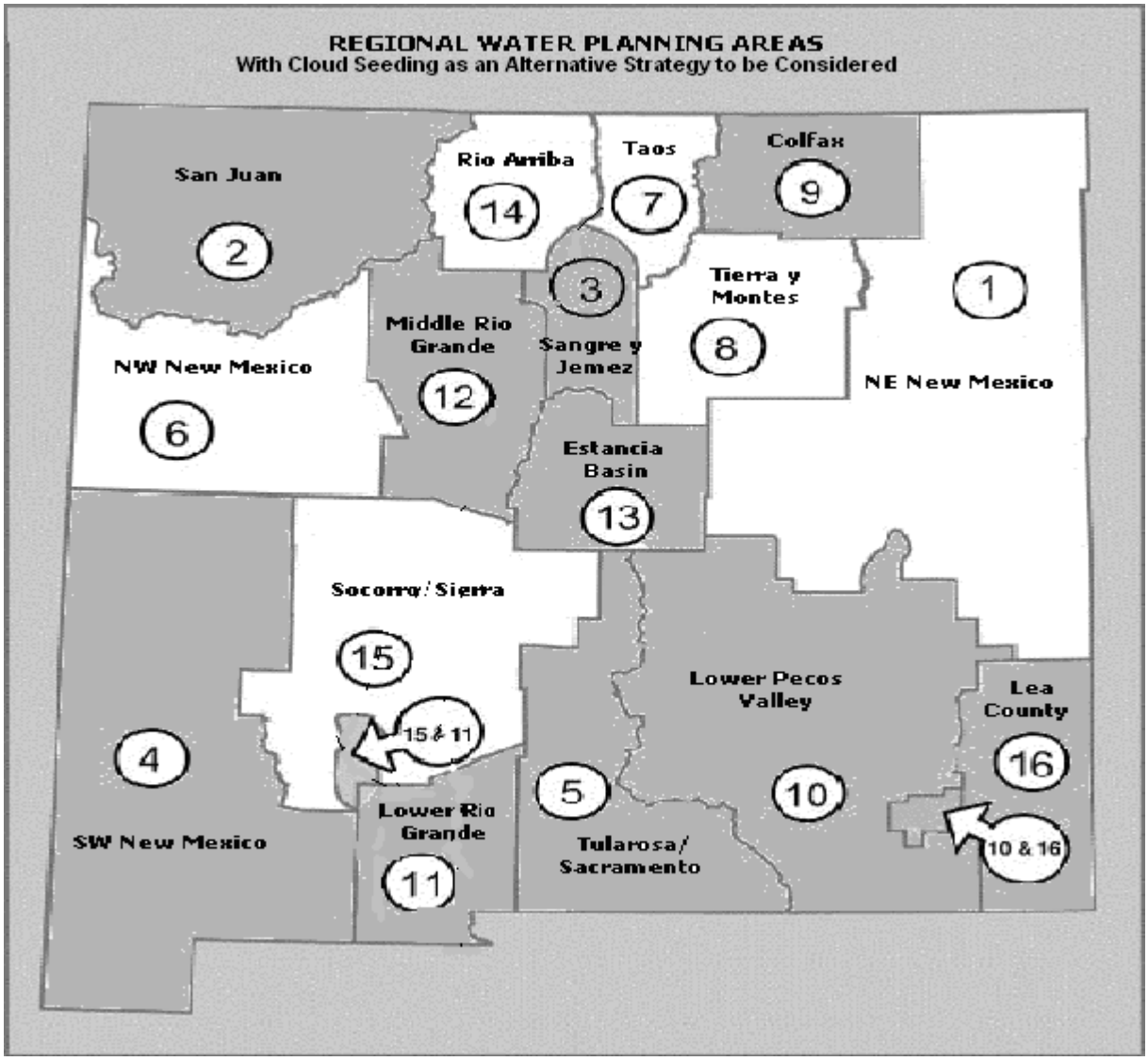
One of the Committees was the Technology Committee. This committee conducted a cloud seeding workshop, which was one of the recommendations in the Water Plan. The workshop was conducted in January, 2004, and there was a consensus to move forward with a cloud seeding pilot project. It was later determined that, to be successful, cloud seeding had to be pursued on a statewide basis. Thus the New Mexico Weather Modification Association, Inc., a non-profit organization, was formed to take the lead on studying cloud seeding, educating the public and, where appropriate, organizing cloud seeding projects.

VII. A Plan for Cloud Seeding in New Mexico

The map below shows those mountainous areas with potential for winter seeding, and plains areas where we believe that summer seeding is most applicable.



There is a rough correlation between where cloud seeding is most likely to be feasible and where the Regions have considered it. The map below shows those Regions (shaded in gray) that consider cloud seeding in their Water Plan.



The following table shows our current recommendations for cloud seeding in New Mexico. We will request input from the other 15 Regions and add or delete as appropriate. For additional information on cloud seeding opportunities in New Mexico, see Appendices D and E.

Cloud Seeding Opportunities in New Mexico

Mountain Seeding				Plains Seeding			
Geographical Area	**Additional Precipitation Expected AFY***	**Beneficiaries**	**Comments**	**Geographical Area**	**Additional Precipitation Expected AFY***	**Beneficiaries**	**Comments**
A. Demonstration Winter Project in the Western Sangre de Cristos Mts.	20,000	Reservoirs, rivers, acequia & irrigation organizations, Pueblos and municipalities,	The benefit to cost ratio is approximately 15:1 valuing the water at $500 per acre foot.	**A. Resume the summer cloud seeding program in Roosevelt and Lea Counties**	175,000 to 200,000	Farmers, who will reduce costs of pumping ground water.	Ongoing program. No collection system needed. Benefit to cost ratio exceeds 100 to 1 valuing the water at $100 per acre foot.
B. Extend the Demonstration to Include the Jemez Mts.	30,000 to 40,000	Middle Rio Grande farmers, municipalities, and the silvery minnow.	Rio Grande Inflows south of Otowi benefit the Middle Rio Grande reach.	**B. Extend the Seeding to become a true regional plains seeding program for New Mexico**	100,000 to 175,000 per 2.5 million acres seeded.	Need to better understand the mix of crops, grazing land and non-farmed land in throughout the potential target area.	Take advantage of managing the aircraft from multiple seeding entities as a single unit.
C. Seed the Sacramento Mountains	15,000 to 20,000	Focus would be on aquifer recharge.					
D. Extend the Sangre de Cristo Seeding North	100,000	The Southern San Juan Mountains may be a good target	Objective would be to benefit from economies of scale				
E. Extend the Sangre de Cristo Seeding East	10,000 per 100,000 acres seeded	San Miquel, Mora, and Colfax Counties					

* The Percentage of Additional Precipitation that Translates into Stream Flow and Aquifer Recharge will Vary by Geographical Area

VIII. Major Challenges to Cloud Seeding in New Mexico

All initiatives face challenges. Recognizing and addressing these challenges can lead to greater success. New Mexico can benefit from the experiences of other Western States in addressing these challenges.

Funding Challenges*:* Although less expensive than many other alternatives, cloud seeding faces unique challenges in obtaining funding. A major problem is matching beneficiaries to funders; stakeholders may benefit whether or not they contribute to the project.

A review of cloud seeding projects in plains and southwestern states (Appendix C) indicates two basic approaches to funding projects.

- Beneficiaries fund the project. Projects using this approach are usually plains seeding, where the additional moisture from cloud seeding falls directly on farmers' lands during growing season. Beneficiaries are local water or irrigation districts.
- The state funds the project. This invokes the creed of the "Common Good", where the state invests in low-cost cloud seeding for the public welfare; projects using this approach are usually mountain seeding where storage of spring snowmelt is required. The stream flow resulting from mountain cloud seeding is beneficial to water rights holders and the precise water rights holders benefited varies from wet to dry years. Recruiting a changing set of beneficiaries to fund this type of cloud seeding project is impractical.

Judging from the experience of nearby states, start-up and assessment costs may have to be funded by the state for both plains and mountain seeding. Assessment in particular is beneficial to all other communities in New Mexico who might consider cloud seeding and wish to know how well it works. In addition to the funding of cloud seeding projects, funds are required to perform feasibility studies and to educate the community. NMWMA has raised about $21,000 for a cloud seeding workshop in 2004 and for administrative activities. The City of Santa Fe has also committed to $20,000 in matching fund for a feasibility study for a demonstration project in the southern Sangre de Cristo Mountains.

Federal support is most likely years off, as the Bureau of Reclamation has supported only research projects and hail suppression projects in recent years. We plan to submit a proposal for Federal Funding of a cloud seeding project for Fiscal 2008 but there is no guarantee that such a proposal will survive the Federal legislative process. We have received letters of support from many organizations and municipalities, but we have been unable to raise money to finance feasibility studies or a demonstration cloud seeding project.

Operational Challenges*:* Great strides have been made in plains seeding by aircraft in southeastern New Mexico and West Texas in the last few years. However, there have been no mountain seeding projects in New Mexico since the Jemez Mountain demonstration project 34 years ago, and there is no expertise in the state to develop

new programs. Initially the use of outside contractors for mountain seeding projects will be required.

Public and Institutional Skepticism: Although cloud seeding research in the U.S. was initiated by New Mexico Tech in the 1950s, the current attitudes toward cloud seeding are negative. The reasons for this are complex, but, if we are to utilize cloud seeding in New Mexico, we must respond to the public and institutional skepticism. This will require a long-term program of public education and interaction. While the NMWMA can assist in this effort, the active participation of the OSE and the ISC is required to demonstrate the state's acceptance of cloud seeding.

Institutional Challenges: For Plains Seeding the Soil and Water Conservation Districts are appropriate entities to carry out cloud seeding. Similar entities for Mountain Cloud seeding generally do not exist. The target area for mountain seeding will not in general respect county boundaries and the beneficiaries will not be only agricultural interests. This problem is similar to the problem of the 16 Regions where generally there is no institutional framework for implementing the Regional Plans within each Region.

Because cloud seeding cannot create a new water right, private sector participation and funding of cloud seeding projects is limited except where the water is used by those whose land it falls on. Thus plains seeding and seeding of ski resorts and seeding for hydroelectric power can be funding in part or fully by the private sector but this will not work for mountain seeding except in very special circumstances. Some other mechanism needs to be found for funding cloud seeding considering that the alternatives to cloud seeding appear to be far more expensive.

Leadership Challenges: In the past 40 years, the state's leaders have been successful in obtaining only one additional source of future water—imported San Juan/Chama water, totaling about 80,000 afy. Given that we are now faced with the likelihood of a shortage of about 500,000 afy by the year 2040, it is essential that the leaders in the state step forward. This will require committing the required funds, and also instructing regulatory staff to look for ways to assist, rather than hinder, development of new water sources. This leadership is needed from:

- The Governor's office
- Advisors to the Governor
- Legislative leaders
- The OSE and ISC
- The Dept. of Agriculture
- State-supported Universities

There has been strong support from the House Water and Natural Resources Committee and the Senate Conservation Committee. The full New Mexico Legislature and the Governor's office have not yet responded to the counsel of these committees.

For additional information on this subject, please refer to Appendix F.

IX. Next Steps

The support of Legislative Committees in the past two years has been encouraging and we plan to build on that support. The Governor has announced that, for state priorities, “This is the Year of Water”, and we believe we can contribute to the dialogue. However, it has become clear that NMWMA on its own cannot bring about a cloud seeding project in New Mexico, let alone a series of projects capable of improving the water budget outlook. This will require active participation on the part of the Governor and principals in the Legislature, officials in state government and agricultural and water organizations. The following action is required to move cloud seeding forward in New Mexico:

- An essential step would be to fill and fund the position of cloud seeding meteorologist in the ISC, which the Legislature created several years ago. That person would take the lead in bringing together various state, federal and local organizations needed to organize and coordinate a statewide program. We have found that, even with the many hours we have spent attempting to fill that role, a volunteer effort is inadequate. It is imperative that the ISC, or some other appropriate state entity, hire someone for this task. (A budget of approximately $150,000 should be adequate)?

- Although plains seeding in southeastern New Mexico has proven to be successful, there was no funding for the program this past year. The infrastructure exists to continue that program, and, if there is local support, to expand the program to the west. This program, with a robust assessment component, should be funded (in the amount of $150,000 in the coming year.

- A demonstration mountain cloud seeding project is essential to demonstrate that winter cloud seeding can actually provide additional water. This will require at least three years and an expenditure of $1,400,000. The emphasis must be on assessment in order to satisfy skeptics that the additional water resulted from cloud seeding and not by chance. Efforts are currently underway to assemble a group of stakeholders in Region 3 to propose such a project at this years Legislative Session.

- A climatologic study of mountainous and plains areas in New Mexico would be very helpful in quantifying the potential for statewide cloud seeding. A relatively inexpensive and quick way to provide an inventory of seedable storm clouds is to review satellite imagery. The imagery is archived and a well-respected consultant is available to make the interpretations on a manual basis at a cost of $100,000. A more automated method and flexible method will also be investigated.

These steps do not necessarily have to be taken sequentially. What is essential is that the state will support some part of these proposals. Without the state’s proactive participation, it is unlikely that cloud seeding will be done in New Mexico in the near future. With support and an adequate level of funding, the state would then be prepared

to move on with a long-term, statewide cloud seeding program, and enjoy the benefits of the additional water.

Part II. Appendices to the New Mexico Weather Modification Association Business Plan

Appendix A: Additional Information on How Cloud Seeding Works.

In this appendix we provide information on the various mechanisms by which cloud seeding works. It is actually a discussion of how freezing works in nature and how that process can be accelerated with artificial seeding agents.

Contact Freezing and Temperature Dependence

Operating a silver iodide (AgI) cloud seeding generator results in burning both the acetone in which the AgI is in solution, and propane used to atomize the AgI-in-acetone solution and help burn it. One gram of silver iodide can generate many trillions of ice nuclei (IN) depending upon the supercooled liquid water (SLW) temperature. A tiny fraction of all AgI particles can activate ice crystals once the SLW cloud has been chilled to the "threshold temperature" near -6 deg C, but perhaps three orders of magnitude more effective AgI IN will exist if the SLW cloud is further chilled to about -16 deg C. Further chilling will not result in higher AgI IN yields. Moreover, concentrations of natural IN are usually sufficient for effective conversion of all available SLW to snowfall if cloud temperatures are below about -15 deg C. The exact temperature at which nature becomes efficient in snowfall production and there is no need for cloud seeding depends upon many factors and, accordingly, varies. But for simplicity in the following discussion we will assume that temperature is -15 deg C.

Pure AgI works by "contact" nucleation, requiring AgI particles to collide with existing SLW cloud droplets. This is a very slow process which can require several tens of minutes for all AgI particles with the potential to form ice crystals to do so. But it is generally best to form seeded ice crystals ASAP in order to maximize the time for seeded ice crystals/snowflakes to grow and settle to the surface.

Condensation Freezing

Condensation freezing with silver iodide is the most common method of winter cloud seeding in western U.S. mountain regions. Much of the AgI currently used for operational seeding is "doped" with traces of other compounds which will allow water vapor to condense on them, forming very tiny droplets on the doped AgI particles. These droplets can freeze if cloud temperatures become cold enough. The purpose of this doping is to speed up the ice nucleation process by so-called "condensation freezing." Condensation freezing reduces that time to about 5 minutes.

This approach works well for supercooled liquid water up to about –8° C. The number of effective IN per gram of AgI (called yield or effectiveness) usually does not increase much as temperatures become colder than -16 °C. But at that point, the natural IN are usually able to glaciate all of the available supercooled liquid water.

Forced Condensation Freezing

When an AgI generator is operated within a SLW cloud at -6 °C or colder, "forced condensation freezing" occurs. Rather large amounts of water vapor are combustion by-products of burning both acetone and propane. This results in very high supersaturations (several hundred percent) for a few to several feet just above the AgI

generator flame. The AgI (any type, pure or doped) will operate as a cloud condensation nuclei (CCN) in this high supersaturation environment resulting is the production of vast numbers of new tiny cloud droplets which immediately freeze if -6 °C or colder.

The same may happen over a generator located below cloud but the seeding-produced droplets and ice crystals will quickly evaporate and sublimate, respectively, if not in a SLW cloud environment where they can continue to exist and grow. Hence, the "forced condensation freezing" process is unique to AgI generators operated in-cloud at -6 °C or colder, and to summer seeding where the silver iodide can be precisely targeted to zones of SLW by the use of flares.

Propane Seeding

Expansion of liquid propane chills a small volume of air colder than -40°C. This is important because water cannot remain in the liquid state below -40°C but freezes without need of any ice nuclei. That process is called "homogeneous nucleation" as opposed to "hetrogeneous nucleation" when foreign particles, such as AgI or a natural clay particles, act as ice nuclei enabling SLW droplets to freeze. The very cold temperatures immediately downstream of the propane expansion nozzle result in the formations of vast numbers of tiny ice crystals.

Essentially, propane seeding is seeding with ice crystals as is forced condensation freezing. Both require the seeding devices to be within or just below the SLW cloud. One gram of propane can produce one trillion tiny ice crystals. These crystals cannot long survive unless they are transported with SLW cloud, or at least remain at ice saturation. Otherwise, they will quickly sublimate back into water vapor. Thus the success of a cloud seeding project using propane depends on the ability to site the propane dispensers in or just below SLW cloud base. Silver iodide generator placement is more flexible because the silver iodide particles released can travel long distances before reaching SLW cloud unlike the ice crystals created by the cooling action of liquid propane expansion. However, forced condensation freezing with AgI cannot be achieved unless the generators are located within SLW cloud at -6 °C or colder. Such high altitude generators must be remote-controlled as must propane dispensers. Use of manual AgI generators in mountain valleys is quite common and far less expensive. However, such generator siting creates serious targeting issues.

One advantage of seeding with propane-induced ice crystals is that these ice crystals, unlike silver iodide smoke, are effective at only slightly supercooled cloud temperatures, -2 °C and colder. This could be important particularly during early and late snow events and during warm winters. Moreover, investigations in the mountains of Arizona, California, Colorado, Montana and Utah have all demonstrated that a large portion of even mid-winter clouds are too warm for effective AgI seeding in the SLW zone which can be reached by ground-released plumes.

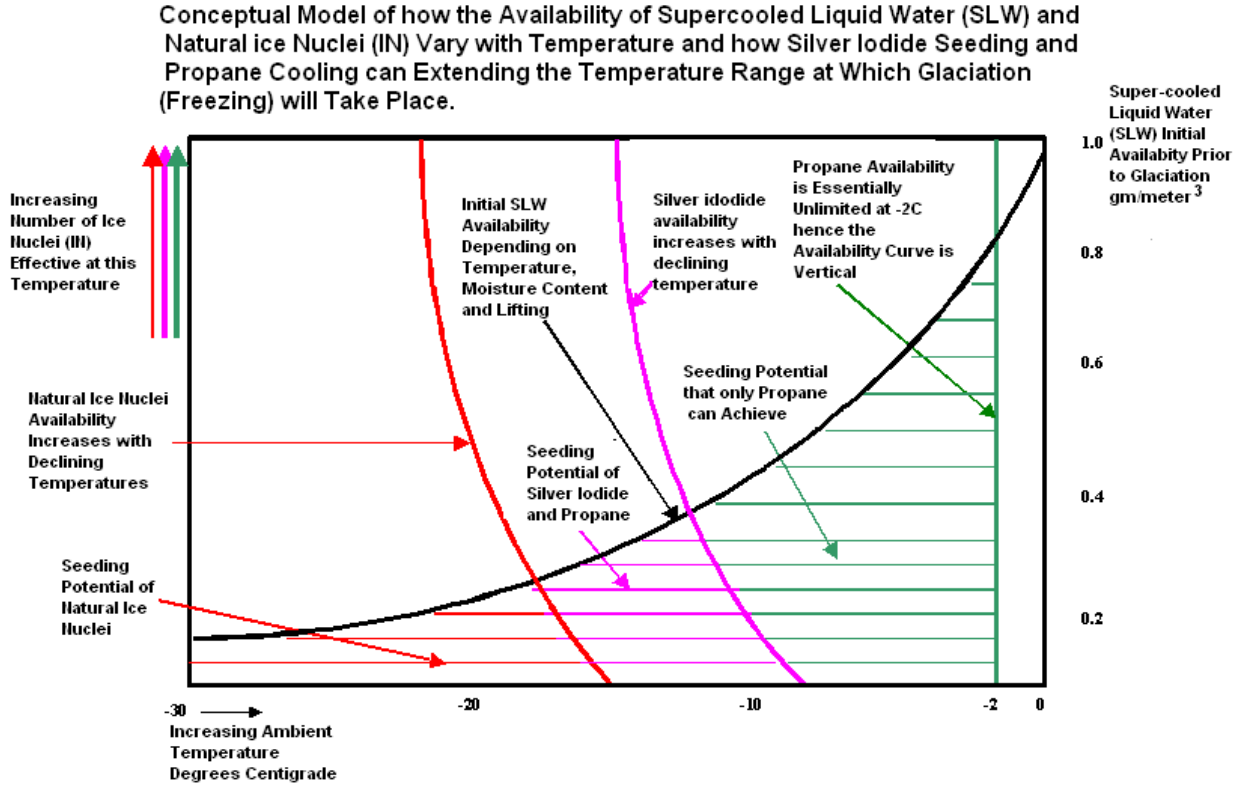
Choice of Seeding Method

The choice of seeding method depends on a number of factors:

1. Temperature distribution of the available SLW
2. Delivery mechanisms available
3. Community sensitivity to the choice of seeding agent

Climate Change Issues.

The Climate Study issued by NMENV warns of a warming trend and more variable year to year levels of precipitation. Warmer temperatures are not likely to negatively impact summer precipitation although the higher temperatures will increase evapotranspiration. But efficient natural winter precipitation requires supercooled liquid water (SLW) in clouds to be colder than approximately –15 °C for significant snowfall to develop. It is not certain that a warming trend will reduce the number of occurrences of SLW cloud being sufficiently cold for natural glaciation and snowfall to take place, but that seems likely. This is illustrated in the graphic below. Storms where the temperature of the SLW zone is greater than approximately -15 °C may not glaciate and produce snowfall.



All cloud seeding agents are designed to work at temperatures warmer than –15C. That is the basic principle of modern winter cloud seeding: to provide ice nuclei and/or seeded crystals that can be effective at warmer temperatures than possible with natural IN. This might be very significant with respect to the southern Sangre de Cristo Mountains as these mountains are south relative to other mountain states so if there is going to be a problem springing from a warming trend it is likely to happen in New Mexico's mountains. It is an even greater issue further south in New Mexico for example the Sacramento Mountains. Such a warming trend may tend to favor propane over AgI because it is effective at warmer temperatures than AgI although there is far more experience seeding with AgI.

We do believe that both methods of inducing glaciation should be considered in the detailed design either singly or in combination.

Environmental Considerations

Propane (C_3H_8) released into the atmosphere oxidizes within a month and thus is not considered an environmental hazard.

Silver iodide generators typically release less than an ounce of silver per hour which is transported over large areas. The AgI particles which do not produce seeded crystals are scavanged out of the atmosphere by natural precipitation. Resulting target area concentrations are very limited and downwind areas receive even less silver.

Quantities used with cloud seeding result in contributing to silver concentrations on the ground and in stream flow which are less than one one-thousandth of the EPS secondary standard for silver. Several comprehensive reports exist concerning potential environmental impact from AgI seeding. The general consensus is that such impacts are not a major cause for concern.

The presence of equipment on U.S. Forest Service (USFS) Land and access to that equipment could be an issue but perhaps an issue that has already been resolved in the Santa Fe area because of other activities by the City of Santa Fe in the Santa Fe Watershed. That work may be helpful with regards to other parts of the Santa Fe National Forest and other areas administered by the USFS. Seeding and monitoring equipment have been and are routinely used on USFS land in several western states. However, permission to operate monitoring equipment such as precipitation gauges within Wilderness Areas may be difficult or impossible to obtain.

It is not expected that communities to the east of a Sangre de Cristo target area would experience a decline in precipitation but precipitation in these communities should be included in the assessment analysis. Many studies show that cloud seeding using AgI increases precipitation up to 100 miles downwind of the cloud seeding project. Propane seeding may not have this effect because, unlike AgI, its impact is very local.

With summer seeding over the plains, the glaciation takes place very rapidly in a very small area and creates heat (heat is released when water freezes - 80 kcal for 1 kg) which improves convection and makes those clouds more robust, thus potentially benefiting communities downwind. This is called dynamic seeding. Dynamic seeding is not normally the goal of winter orographic seeding, so that positive impact is not likely to occur to any large extent for winter mountain seeding projects.

Too much precipitation over a season is not a major problem because a cloud seeding project can be stopped once the forecasted snow pack exceeds a predetermined level. Local roads would not generally be impacted so a need for additional snow removal is not anticipated. Concerns over violent weather apply more to summer seeding of convective clouds, in which case one needs to have well defined suspension criteria in place. This is not generally a problem for winter seeding of stratoform clouds.

Appendix B. Additional Information on how Cloud Seeding Projects are Assessed.

This supplements the discussion provided in Section IV. The most common technique used in the Rocky Mountains has been the target and control method. You find two areas that are historically related by a formula of the form Y = a +bX where X is the precipitation in the control area and Y is the precipitation in the target area. You seed the target area and you use the actual precipitation measured in the control area to predict the expected precipitation in the target area and observe the difference between the actual and predicted. This overcomes the problem that there is a variation in precipitation year to year and high levels in the year that you seeded could have happened naturally. The use of the regression line normalizes the results. It is possible to find these pairs of geography: control and target areas and have them be **very highly correlated**. But one may wonder if that correlation is predictive or happenstance. The way to do this is to select one pair of control and target areas based on the observed wind directions and other climatological factors and then do the regression analysis to see the extent of the correlation but most people try different pairs of areas until they get the pair with the highest correlation coefficient and this is not proper.

The target and control method can also be used for stream flow assessment using streams in nearby basins as the control.

And all of this (the creation of the regression line, the use of the control area to predict the precipitation in the target area and the comparison of actual/measured to predicted) depends on accurate measurements of precipitation. Where measurements are based on a column of snow taken at the end of the snow season, the criticism has been that there are loses due to snow melt which would complicate the interpretation of the data. This problem suggest that having the control area and target area be at similar elevations might be an advantage.

Also it is not possible to avoid the control area from being contaminated if the wind blows from the target area to the control area. This would increase the predicted precipitation in the control area thus leading to an **underestimate** of the increased precipitation (measured less predicted) resulting from cloud seeding.

Also the regression line is based on historical data. What counts is the relationship between the control area and the target area. If climate change impacts both areas in a similar way, there is likely not a problem, but if climate change impacts one or the other very differently, the predictive power of the regression line is called into question. This suggests that the selection of control areas for a target area should be based on a sound meteorological theory not just the presence of a historical high correlation.

The random method which was used in the Jemez seeding 1968 - 1972 and is often used in a different form in Texas is based on creating two sets of seedable events and seeding half of them and comparing the precipitation in the unseeded events with

precipitation in the seeded events. Many scientists recommend this method which is similar to the "double-blind randomized method" similar to that used in medical testing. Operational projects often do no want to use this approach as it reduces the number of seeded events and thus the water produced. Also one worries about something that we might call lumpiness: if most of the increased precipitation results from a few storms, the random selection of experimental units (EU) can easily be skewed towards having all of the good EU in either the target or the control group.

If one carefully examines the two methods one comes to the conclusion that they are very similar, in that both methods require the establishment of a control group (either a control area or a control set of time slots where the target area is not seeded) and the actual/measured precipitation in the target area is compared to the predicted precipitation in the target area based on the actual/measured precipitation in the control area or group of unseeded time slots.

The major difference is that for the target and control method, the predicted precipitation in the target area is based on the actual/measured precipitation in the control area using the historical regression line to predict the precipitation in the target area. For the random method, the predicted precipitation in the target area is based on the actual/measured precipitation of the time slots when the target area was not seeded.

In both methods there is a control group. The difference is what is used as the control group. In both cases there is a prediction made for the target group: the difference is how that prediction is made.

The target and control method has an additional step because of the regression line. The variance within that line as related to the historical data introduces an error (often two to five percent) that makes it difficult to achieve the highest levels of proof that there was additional precipitation. But the random method has a smaller number of samples in the target area because some fraction of the time slots are used as the control rather than being seeded. A sufficient number of time slots (experimental units) is needed to feel confident that the set of seeded EU and non-seeded EU are sufficiently similar from a meteorological perspective for the set of non-seeded EU to serve as a good control.

Sometimes the actual /measured readings in the random method are normalized in some way that seems to resemble the target and control method. Also the target and control method can be based on total season readings of precipitation whereas the random method requires that readings be made after each time slot. Thus if there are errors in the readings these errors can accumulate in the random method whereas they can not accumulate in the target and control method.

Our conclusion is that it is not clear which method is preferable even though it is clear that scientists prefer the random method which has the possibility of producing an assessment that has a 95% level of confidence in the findings. 85% to 90% is the norm for the target and control method. Many sponsors of cloud seeding projects are satisfied

with this lower level of proof but the results are not given the same degree of credibility by the scientific community as those from randomized projects.

The criteria for selecting one method or the other are discussed in the table below:

Selection Factor	Random	Target and Control
Level of confidence	Can produce 95% confidence under optimum conditions.	Unlikely to produce more than 90% confidence because the natural error in target and control area regression line adds a few percent to the error.
Ability to use for all projects	Should always be able to be used.	Depends on finding suitable control area which sometimes could be a problem.
Acceptability of results	Most scientists only accept the random method	Many project funders find target and control acceptable
Flexibility	Applies pretty much only to the amount of precipitation measured on the ground	Can be used for stream flow analysis also. Can be used for stream flow analysis even if random is used for precipitation on the ground analysis.
Impact on precipitation produced	Reduces and this often is the reason not used.	No Impact
Need for historical data	No requirement except possibly to normalize results to deal with bad draw problem	Generally need twenty years or more of historical data to generate a good regression line linking the precipitation in the target area to precipitation in the control area.
Number of rain gauges needed	Only in target area	Need gauges also in control area.
Type of gauges used	Must have gauges that have minimal errors and probably gauges that transmit their readings and can be controlled remotely.	Seasonal readings mean less complex gauges can be used but if simple column of season water in snow measurements are used, the early snowmelt problem must be addressed
Impact of rain gauge errors	Multiplied by need to measure precipitation for each experimental unit. Scientists tend to ignore this error component and the impact it may have on the confidence levels attainable	Minimized due to fewer readings involved.
Impact of small number of precipitation events impacted by seeding	Increases the number of seasons required to get significant results. Early results could be misleading.	No impact as seasonal totals are all that matter
Impact of variable latency: a variation in the time between seeding and precipitation reaching the ground	Tends to underestimate the impact of seeding by contaminating the control time slots. (See page A11)	No impact
Variability in wind direction	Could lead project team to not seed additional experimental units further reducing the precipitation produced and increasing the number of seasons need to achieve 95% confidence.	Tends to underestimate the impact of seeding by contaminating the control area. See Page A11.

For summer seeding you pick pairs of storms with equal seeding potential. For winter seeding you randomly select time slots. In the Jemez experiment the time slots were 24 hour periods. If the impact of seeding shows up as **making a few storms big snow producers**, it may be difficult to get two sets of events that had equal seeding potential. Shorter time slots would help but then you have a problem with latency...the impact of seeding happens some number of minutes after you seed and if that delay varies (perhaps due to variable wind speed storm to storm and also possibly temperature) you end up either contaminating your control time slots or under seeding your target time slots and again this tends to **underestimate** the impact of the seeding.

In both of those methods the challenge is to have a control that is valid --- either a control geographical area or a group of unseeded events. Fortunately, the major problems tend to underestimate the impact of seeding rather than inflating it, which would be disqualifying.

We will wait to see what our consultant recommends and perhaps will use both methods. Certainly we will supplement the statistical methods with physical methods.such as measuring the silver in the snow and perhaps using chemical tracers that have shown a lot of promise. It may even be possible to detect a different appearance of snow resulting from cloud seeding.

Most operational projects in Western States have been evaluated by the "historical target-control regression method" which uses non-seeded winters to develop a relationship between the intended target area for seeding and upwind or crosswind control area stations. This historical relationship is used to predict seasonal target snowfall amounts during seeded winters based on the measured snowfall in the control area. Observed departures from the predictions are assumed to be caused by the seeding.

Statisticians prefer to call the control area in the target and control method a “comparison group” as opposed to the unseeded time intervals in the random method which are recognized as possibly being a more valid control group. The control area in the target and control method can be considered as having challenges to its right to be considered a true control with internal integrity. The control area in a target and control approach is a surrogate for a true control rather than being a true control. If the correlation between precipitation in the control area and precipitation in the target area is very good, it may represent a reasonable alternative to the control group of time intervals in the target area which is better accepted by statisticians but which cuts productivity of the project in half.

Measurement errors may be more significant with the random method because measurements are taken for each time interval rather than seasonally as is the case with the target and control method. Latency is an issue with the random method because precipitation lags the release of the seeding agent so that seeding in one time interval may cause precipitation in the subsequent time interval. Latency is not an issue for the target and control method but something similar is: namely winds from unusual

directions may create additional precipitation in the control area. Both latency and control area contamination will tend to create underestimates of the impact of cloud seeding.

Both the Elk Cabin and Santa Fe SNOTEL stations are within the Santa Fe watershed. Elk Cabin is about 1.3 miles upstream of the NE end of McClure Reservoir and Santa Fe 1.5 miles south of Santa Fe Lake. Each has ten years of record, enough to develop historical target-control relationships with upwind or crosswind control stations.

Silver analysis and indium or cesium tracer studies would be applicable if silver iodide is used but not if only propane is used. These methods are very expensive to apply.

For most cloud seeding projects, the key issue is targeting Did the seeding agent go where you wanted it to go? Tracer gas can be included in the propane release plume or the plume can be tagged with silver iodide at the start and end of each propane release. An acoustical ice nucleus counter can be used to detect the passage of the AgI plume into the zone of SLW if the SLW intersects the ground, which is the usual case. Such plume tracing can also be done with aircraft although it may be unsafe to fly low enough to detect ground-released plumes during storm conditions.

Evidence from a number of mountain ranges, where plume tracing was conducted downwind of high-elevation release sites, provides considerable confidence that such sites will routinely target the SLW zone as desired. Determining that the seeding agent intersects the zone of supercooled water will, in the end, be the most reliable indicator of the possible effectiveness of the seeding effort. This is a necessary but not sufficient condition for concluding that precipitation was produced. It is very important because some cloud seeding projects would appear to be so poorly designed that augmented precipitation is very unlikely or able to occur only 30% of the time. We would like to see a design where closer to 100% of the available SWE is actually being seeded.

We are working hard to make the assessment the best that it can be because we all want to know:
1) how much more precipitation was created
2) how much more stream flow resulted and
3) how much more aquifer recharge resulted.

We are confident about being able to do a good job in estimating how much more precipitation was produced and how much more stream flow resulted. The aquifer recharge estimation may have to wait for a future project.

Appendix C. Additional Information Provided by State Regulatory Agencies on Cloud Seeding Activity in their State

Comparison of Current Cloud Seeding Activity in Western States Which do Mainly **Winter Mountain Seeding**

	Type of Seeding	Beneficiaries	How Organized	State Funding	Seeding Agent Used	How Seeding Agent is delivered	Role of Universities	Type of Assessment
California	• 13 Winter: Sierra Nevada and also some coastal areas • 1 Summer seeding high Sierra basin	• Public Water Supplies • Hydroelectric Power	• Electric Pwr Utilities • Water Districts • Cities and Counties • DRI for projects that also help NV	Very little	• Mainly Silver Iodide • Dry Ice • Hygroscopic	• Ground Generators • Aircraft	None	• Tracer Studies • Target and Control including interbasin comparisons
Idaho	• Winter Seeding	• Hydroelectric Power Plants • Farmers and ranchers	• Hydroelectric • Consortia of Counties	Currently 0 This may change	• Silver Iodide	Widely spaced valley generators.		
Nevada	• Winter Seeding • Airport fog clearing	• Municipalities • Agriculture • Recreational Lakes, • Terminal Lakes	Run by the state out of the state university system.	~95% for operational portion	• Silver iodide and variations • Experimentation with both contact and condensation snow production mechanisms	• Primarily ground based generators (19) • Occasional use of aircraft	DRI Design, Operations and Assessment. Conduct of research when funding is available	Mainly tracer studies – Specific research studies with federal funding when available
Colorado	Winter Seeding	• Ski Resorts • Stream Flow • Reservoir Replenishment • Hail Suppression	• Mixed Groups • Counties and Municipalities	25% CWCB	• Silver Iodide • Acoustical cannons for hail suppression.	Ground based generators	Assessment CSU	• Target and Control • Silver Measurements
Utah	Winter Seeding	• Ski resorts • Agriculture • Municipalities	• Utah Water Dev. Corp • Counties • Water Cons. Districts	Up to 50% cost sharing with a max of $150,000 annually	• Silver Iodide • Propane	• 138 SI generators • 3 propane dispensers	Some research in earlier years	Target and Control
Wyoming (Planned)	New Program Winter Seeding	90% to farmers	State Program WWDC	100%		• 24 Ground-based generators • Flares from aircraft		• Target and control • In-cloud measurements • Silver analysis

Comparison of Current Cloud Seeding Activity in Western States Which do Mainly **Winter Mountain Seeding** Continued

	Public Acceptance	**Acres Seeded**	**Reported Results**	**Cost per acre foot of new water**	**Value of water.**	**Staffing**	**Problems**
California	Limited concerns about • Long Term Toxic Impact off Silver Iodide • Downwind effects • Added snow removal cost	13,000 Square Miles in the Sierra Nevada and some coastal areas.	4% increase in stream runoff. 500 million KWH hydroelectric. Benefit may be impacted by pollution related losses.	$10 for existing projects; new projects might cost double this.	$50 to $600 per AF	Primarily use of contractors	
Idaho	Mixed acceptance	Hydro Electric seeding in the Upper Payette Basin ~ 938 sq mi.	8% to 20% increase in precipitation			County project relies on semi-volunteers	
Nevada	Generally accepted	~7,400 sq. miles	Est 4% - 10% increase in snow water	$7 to $18 AF of Snow Water	Highly Variable perhaps $200 per AF ave.	3 field technicians 2 half time faculty Aircraft flights subcontracted	Funding to expand for adequate seeding coverage of watersheds.
Colorado	• Some resistance from environmental groups • Concern about avalanches						NEPA
Utah	Some concerns about effectiveness and downwind impacts.	12,700 square miles	14% Runoff	$2 per af of runoff	>$55	• One part time professional • Seeding Contractors	Willingness of sponsors to make long-term commitments
Wyoming (Planned)			Planned 10% precipitation augmentation, 80% recovered as stream flow, 20% aquifer recharge no ET losses prior to stream entry	$6 per af of runoff	$20	• Program Manager • Propjet Captain • First Officer • Assn't Meteorologist • 2 Data Systems/Ground based generator technicians.	

Comparison of Current Cloud Seeding Activity in Western States Which do Mainly **Summer Plains Seeding**

	Type of Seeding	Beneficiaries	How Organized	State Funding	Seeding Agent Used	How Seeding Agent is delivered	Role of Universities	Type of Assessment
New Mexico	Summer Seeding	• Farmers • Aquifer Recharge	Two soil and water conservation districts	100%	Silver Iodide	Flares from aircraft	None	Random Method Sporadically applied
Texas	Warm Season (Mar – Oct) Seeding	• Farmers (precip enhancement) • Farmers (hail suppression) • Aquifer Recharge	• Cons. Districts • Water Districts • Aquifer Authorities • Weather Mod Associations	Originally 50% now essentially zero	Silver Iodide	• Flares from Aircraft • All programs operated by the sponsors i.e. not contracted out	Limited Role in Assessment	Statistical assessment using TITAN software with target and control clouds.
North Dakota	Summer Seeding	• Farmers (Hail suppression) • Farmers (Precip Enhancement)	Counties via property tax (7 mil max) approved in five year increments.	One third approved biennially				

Comparison of Current Cloud Seeding Activity in Western States Which do Mainly **Summer Plains Seeding** (Continued)

	Public Acceptance	Acres Seeded	Reported Results	Cost per acre foot of new water	Value of water.	Staffing	Problems
New Mexico	Varied and depends on extent of public education	4 million Roosevelt and Lea Counties	0.6 inch per acre which translates into 200,000 AF per year..	Under $1	$120 per AF the cost of pumping water from aquifer	One Pilot One Meteorologist out of Plains Texas Project	• Willingness of beneficiaries to contribute • Need for more public education
Texas		37 million acres	5% measured over the entire target area	5 cents per acre seeded producing one half inch of additional precipitation thus about $1 per AF			Funding
North Dakota	Generally positive possibly due to the nature of the benefit, hail suppression, which is easy to relate to	6.8 million acres					Need to seed to the west in Montana

Appendix D. Additional Detail on Plans for Cloud Seeding in New Mexico. (The expected precipitation and costs are planning estimates to be refined as project designs are carried to successive levels of refinement.)

Mountain Seeding	Plains Seeding
A. Winter orographic cloud seeding demonstration project for the Southwestern Sangres resulting in increased stream flow from the Sangres west into tributaries flowing towards the Rio Grande including the Santa Fe River, additional activity along the mountain recharge zone, and a longer snow-melt season resulting in improved forest health, • **Cost:** Initial program design and infrastructure costs of $450,000 then approximately $250,000 per year for three years depending on the size of the target area perhaps with the cost decreasing as experience is gained. The purchase of ground-based burners is assumed in this cost estimate. • **Acres Seeded:** 128,000 in the first year. • **Additional Precipitation Expected:** For a target area of 128,000 acres, the expected increase in precipitation would be 10% or 12,800 AFY: The percentage of this which will show up as stream flow was estimated as being 0.6 for purposes of estimating the benefits. It is known that percentage increases in precipitation translate into slightly higher percentages of stream flow. Aquifer recharge is another benefit. • Annual cost per acre foot of stream flow: $35 during the demonstration project. If aquifer recharge was included, the per acre-foot cost would decline to under $30. • Within this overall approach, a much smaller Santa Fe Watershed Project is a possible alternative to seeding a larger target area. It would be a much smaller project in terms of the area seeded and the water produced. The advantage would be that there already exists a governmental entity to organize and manage such a project. This could greatly reduce the cost of the project and make a smaller project economic. However Santa Fe has indicated that they prefer (partly due to the demand of the Buckman Diversion Project) a regional approach so we are pursuing a regional approach. **B. Extend the target area in Year 3 west to the Jemez** Mountains particularly the southern Jemez to produce early Stream flow with an origination south of the Otowi Gauge benefiting users and wildlife along the Middle Rio Grande. The Papadopulus Report prepared for the ISC indicates a need to provide 40,000 additional acre-feet of stream flow	**A. Continue the summer cloud seeding in Southeastern NM** • **Cost:** $100,000 per year assuming a continuation of the existing partnering arrangement with nearby Texas Counties. • **Acres Seeded:** 3.87 million acres, NM pays the Texas partner for only 3.0 million acres • **Additional Precipitation Expected:** 175,000 to 200,000 AFY • **Cost per acre-foot of water:** $0.50 - $0.75. This is additional rain on the ground not water in streams and it is partially subsidized by the Texas project to which it is appended. Because this rain reduces the need for pumping from the aquifer the benefit to cost ratio is very high and it prolongs the life of the Ogallala Aquifer. If the water is valued at $100 per AF (the cost of leased water to the ISC on the Pecos is perhaps the best known value) and costs under a dollar per acre foot, the opportunity cost of not doing this project is greater than $15MM per year. Additional funds (Perhaps $50,000 per year) for assessment most likely should be added to this project. There is a need for ongoing assessment of the results. **B. Extend the seeding in Roosevelt and Lea County to become a true regional Plains seeding program for New Mexico.** This could include counties north of Roosevelt which would benefit farmers in much the same way as the Roosevelt and Lea County seeding program. Seeding to the west would increase the number of farmers and ranchers who would benefit. Seeding the Guadalupe Mountains would provide

into that reach of the Rio Grande on a current basis.

- **Cost:** Initial design costs were included in Year 1 or the pre-seeding year of the Sangre de Cristo project. Additional infrastructure costs would be in the range of $60,000. Incremental operating costs would be minimal (assumes the Sangres seeding continues).
- **Acres Seeded:** 144,000 this could be increased.
- **Additional Precipitation Expected:** 14,400 AFY (10% increase).
- **Annual cost per acre-foot of water:** The per acre foot cost of stream flow for the Sangres plus Jemez considering operating costs only will be $10 an acre foot.
- **An alternative** to having Jemez seeding be an add-on to a Sangre de Cristo seeding project would be to have a Jemez only project perhaps a project focused on the Valles Caldera. Such a project could perhaps be funded at least partially by the Federal Government. These two areas should be concerned about the impact of a warming trend on their winter precipitation. We have talked to the Valles Caldera Trust but not to Bandelier. These two entities are part of the U.S. Department of Interior which conducted the western research projects of Project Skywater during the 1960- 70's.

C. Seeding of the Sacramento Mountains would contribute to recharge of the artesian wells of the Pecos Valley Artesian Conservancy District (PVACD) and run-off to the west may add water to the Salt Basin which could be of interest if that resource is to be developed.

- **Cost:** Equipment costs of perhaps $200,000, initial design costs of $75,000, and then perhaps $200,000 per year for a few years dropping to $100,000 assuming that this project is done as an add-on to other mountain seeding projects.
- **Acres Seeded:** To be determined perhaps 200,000 acres if a target area of this size can be found.
- **Additional Precipitation Expected:** 15,000 to 20,000 AFY (10% increase) of water in precipitation but it is not clear how much of this will be recovered as aquifer recharge.
- **Annual cost per acre-foot of water:** Most likely in the high end of the $10 to $25 range for mountain seeding and may even be higher if the yield of recharge to snow water equivalent of the snow pack is very low. There are many technical issues concerning winter seeding this far south, at relatively low elevations, as well as issues related to the yield as stream flow will not be a major component of this project. Summer seeding is also a some stream flow in the Black River south of the Carlsbad Irrigation District but this would be modest.

This would be aircraft seeding and the capability now exists to coordinate multiple aircraft from a single location using a centralized meteorological capability. The aircraft could be provided by multiple entities but utilized where the clouds are. This could lead to both cost efficiencies and enhanced performance.

Such a project could be undertaken in one stage or in increments of 2.5 million acres.

- **Cost:** Per planning unit of 2.5 million acres seeded, approximately $0.03 to $0.35 per acre per year incrementally to current seeding program in SE New Mexico not including first year costs of design and acquisition. Depending on which geographical units are added to the target area there is a possible need for installation of a new radar unit or possibly moving an existing radar unit. These first year costs would be at least $60,000 possibly as high as $100,000. In addition a robust assessment program is needed for both an expansion of Roosevelt and Lea County seeding and the Roosevelt and Lea County seeding itself. This cost is covered under Action Plan A but may increase as the number of seeding units increases.
  - **Acres Seeded:** Up to 2.5 million acres per seeding unit. The number of seeding units is not yet defined but could be as high as ten or more. Roosevelt and Lea County seeding count as two as that project involves 4 million acres. The seeding method would be glaciogenic or hygroscopic or a combined approach.
- **Additional Precipitation Expected:** Per seeding unit, 100,000 to 150,000 AFY of precipitation is realistic. The seeding of the Guadalupes is not likely to add more than 750 to 1,000 afy of stream flow to the Black River. This benefit might be in the range of $50,000 to $75,000

possibility but we are reluctant to seed mountains in the summer.

D. Extend the Sangres target area into Northern New Mexico possibly as far north as the southern San Juan Mountains to increase tributary flow into the Chama River and Rio Grande.

- **Cost:** An order of magnitude estimate would be $1,000,000 per year not including first-year costs. The costs might be much less if seeding is also taking place in the Southern Sangres and if there are substantial economies of scale.
- **Acres Seeded:** 1,000,000
- **Additional Precipitation Expected:** 100,000 AFY
- **Annual cost per acre-foot of water:** $10 on an ongoing basis.

E. Extend the Sangres target area further east in the Sangres to increase precipitation benefiting San Miguel and Mora Counties. This will also increase stream flow in the upper Pecos which will benefit CID but create additional deficits re Pecos River Compact Obligations. In very dry years, this type of seeding may be considered desirable because the benefits to beneficiaries other than the ISC may greatly exceed the negative impact to the ISC.

- **Cost:** Perhaps less than half of the cost per acre of the initial target area.
- **Acres Seeded:** TBD
- **Additional Precipitation Expected:** 10,000 AF per each 100,000 additional acres seeded.
- **Annual cost per acre-foot of water:** TBD but expected to be well under $25.

plus or minus $25,000 and would serve to reduce the net cost of the project to other beneficiaries.

- **Annual cost per acre-foot of water:** The cost per acre foot of water falling on the land is likely to be in the range of $1. The benefit per acre-foot will depend on the percentages of the land in the target area that are farmland, rangeland and unutilized. We need to identify the number of acres of farmland and rangeland that would directly benefit from more precipitation. We need some help on this or will need to retain a contractor and **the source of funding for such a contractor has not yet been identified**.

Comments

Since this is a developing plan the sequence and the parameters of future steps are likely to be revised as we learn more and the plan becomes more mature. The planned Satellite Image Analysis of four historical years will help greatly with this. The cost of doing this is likely in the order of $100,000 for full year analysis of all New Mexico target areas. A winter or summer analysis would cost less but at this point we believe a full year analysis is appropriate.

Proposed Jemez y Sangre Pilot Project

SENATE BILL 1029 48th legislature - STATE OF NEW MEXICO - first session, 2007
INTRODUCED BY Phil A. Griego

AN ACT: MAKING AN APPROPRIATION OF $300,000 FOR PREPARATION TASKS REQUIRED FOR A FUTURE WINTER CLOUD SEEDING PILOT PROJECT.

The requested funds would allow us to:

- **Quantify the potential** for cloud seeding in the different regions of New Mexico...mountains versus plains, and within the major mountain chains and large agricultural areas. This analysis will be of benefit to all regions of New Mexico who are planning or considering both winter and summer cloud seeding projects. Obtain more detailed information for the Sangre de Cristo and Jemez Mountains. This might involve the deployment of meteorological equipment and other means for obtaining the desired information.

- **Prepare a detailed design** for a pilot project in the Sangre de Cristo and Jemez Mountains. This design would include the detailed identification of the seeding target areas, the seeding agent and delivery method to be used, and the specific placement of the ground-based generators (or propane dispensers if they are part of the plan). Perform computer modeling to confirm the validity of the generator and/or propane dispenser placements.

- **Establish the plan for comprehensive assessment of the results** of the operational phase of a future cloud seeding pilot project.

- **Develop specifications for the most appropriate ground-based generator** and controls. If sufficient funds are available in the budget or can be obtained in some other way, acquire one ground-based generator for testing purposes.

- **Conduct a community outreach program** to provide information as to how cloud seeding works and what the results of cloud seeding are likely to be and how they will benefit as well as addressing any concerns raised.

- **Apply to the Interstate Stream Commission for a license** to perform cloud seeding in the selected areas. This is a lengthy process reviewing all aspects of a proposed cloud seeding project and includes public hearings.

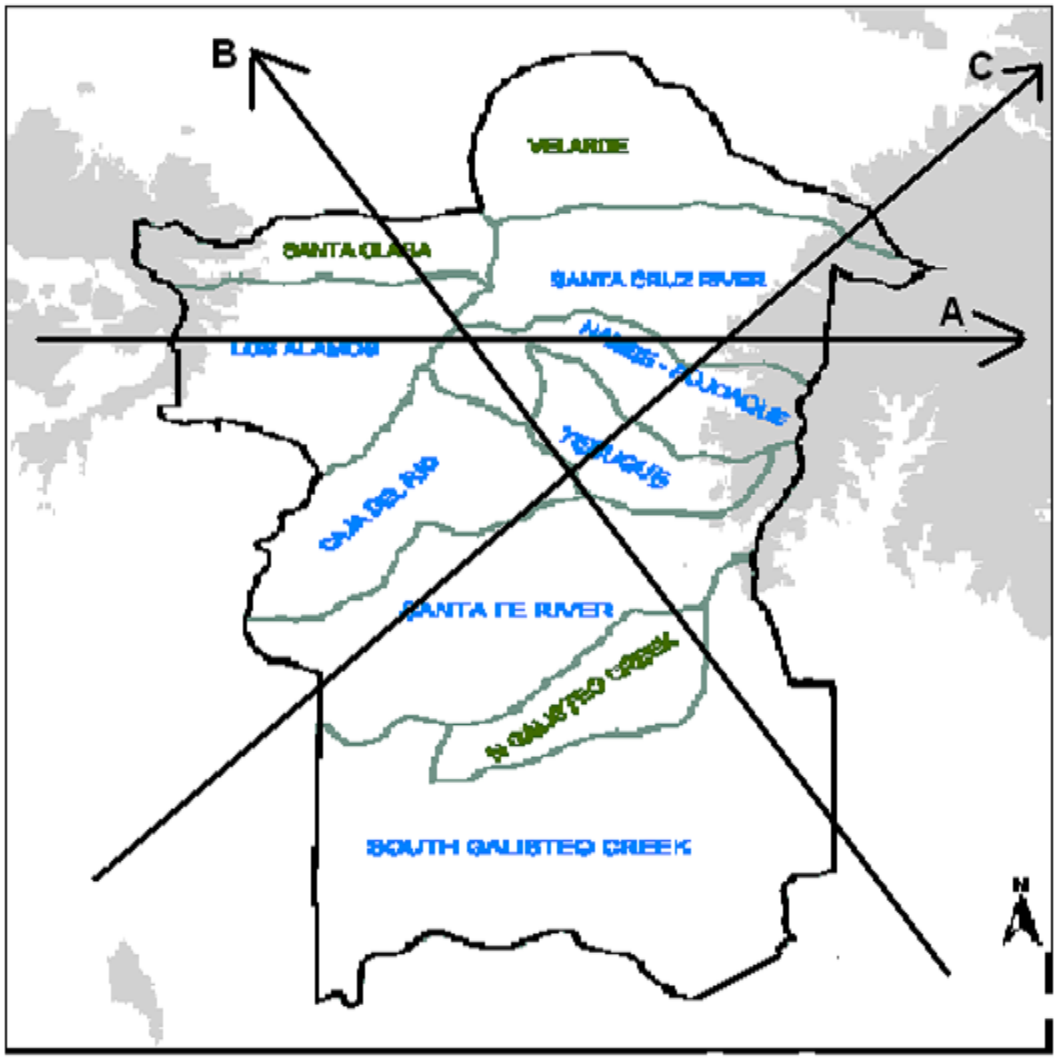
A future Pilot Project in the Sangre de Cristo and Jemez Mountains would:

- Confirm the effectiveness of winter cloud seeding in this area.

- Produce approximately 10,000 acre feet of additional stream flow per year off the Sangre de Cristo Mountains into Rio Grande tributaries and starting in the third year an additional 10,000 acre feet of stream flow coming off the Jemez Mountains.

Once the effectiveness of winter cloud seeding is confirmed, the area seeded can be expanded north to benefit Taos County and more of Rio Arriba County and to the east ultimately benefiting the Upper Pecos Watershed and tributaries coming off the Sangre de Cristo Moutains to the east i.e. benefiting San Miguel and Mora Counties. The target area i.e. where the enhanced precipitation is both desired and expected is based on many factors one of which is elevation. We look for areas above 9,000 feet. These are shown in the following graphic which was adapted from a graphic in the Region 3 Water Plan…wind directions of major storms has been superimposed on the original graphic.

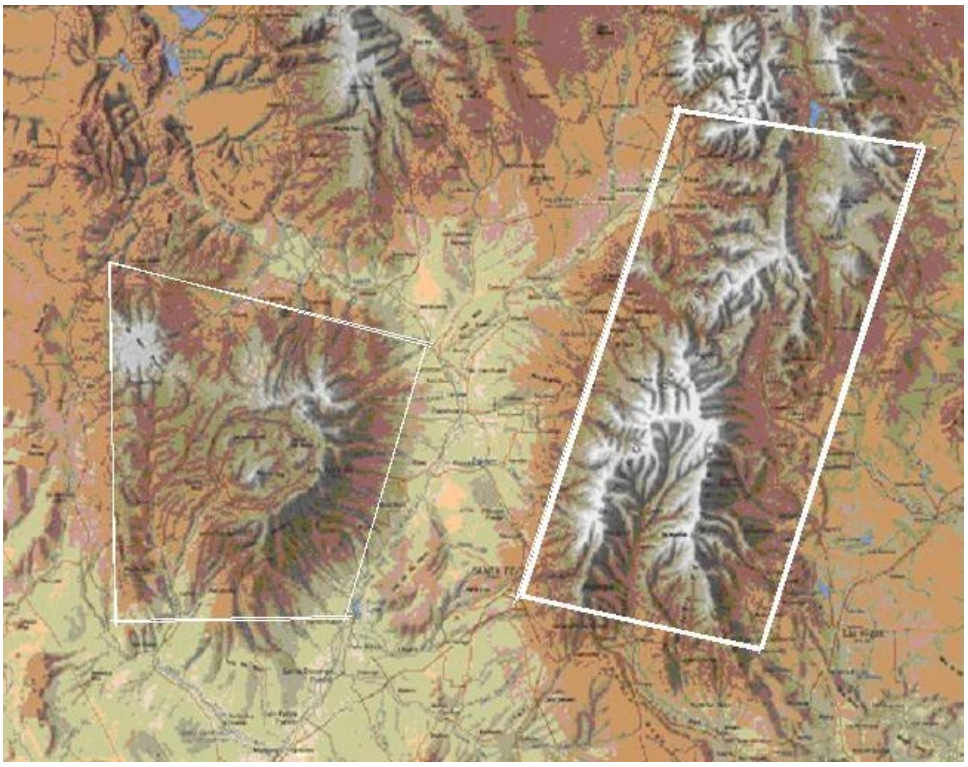
Storms Come From Many Different Directions



Working with the above and other factors the possible target areas were identified. It may make sense to start with a target area in the Sangre de Cristo Mountains and then add a target area in the Jemez and Naciamento Mountains. The exact target areas will be determined after the detailed design is performed and will be based at least partially on the desires of local communities to participate or not in the pilot project. The general area within which a target area or target areas will be selected is shown in the following graphic.

Primary and Secondary Seeding Targets

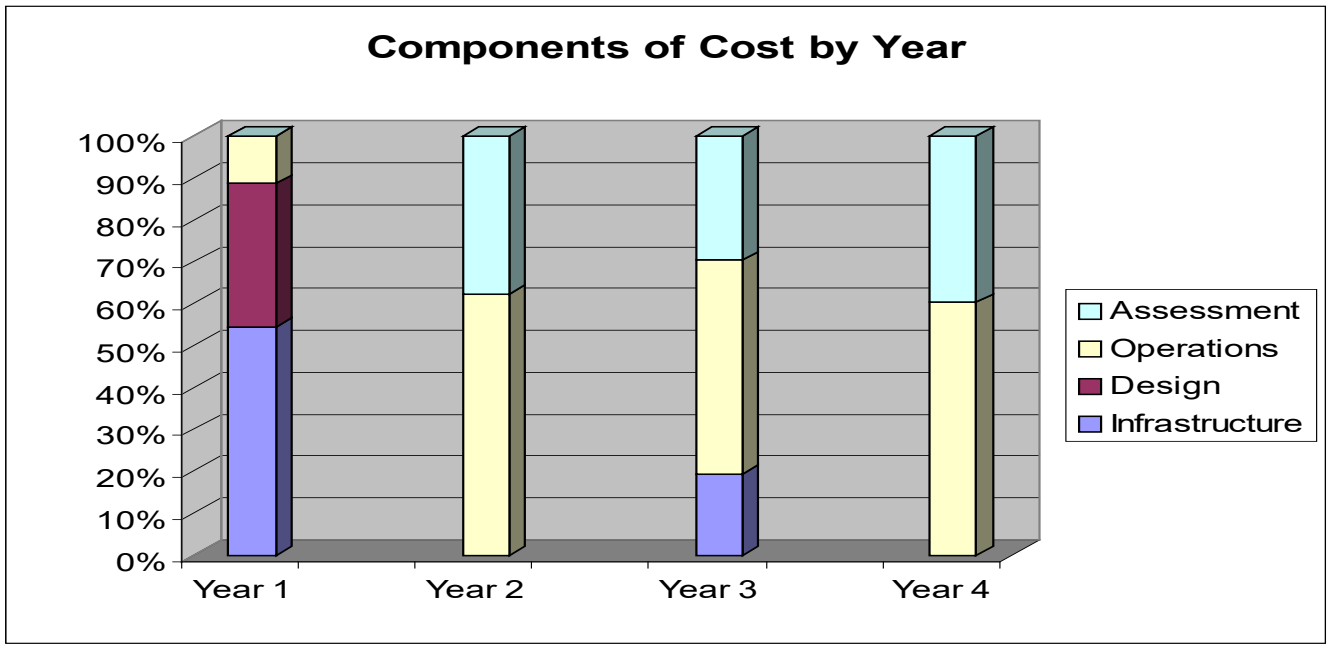
Sangre de Cristo Mountains are the primary target



The budget for this project was developed using a complex spread sheet that relates costs to the size of the target areas and the number of months during which cloud seeding is desired. The final costs will be revised after the detailed design is performed but we believe the budget estimate is realistic and the project will be able to be conducted within that budget.

Schedule of Disbursements
Based on Detailed MS Excel Model

	Preparatory Year	Year 1	Year 2	Year 3	Total Four Years
Infrastructure	$278,400	$0	$60,000	$0	$338,400
Design	$175,320	$0	$0	$0	$175,320
Operations	$57,750	$151,775	$158,375	$166,586	$534,485
Assessment	$0	$91,680	$91,680	$109,680	$293,040
Total Each Year	$511,470	$243,455	$310,055	$276,266	$1,341,245


Components of Cost by Year
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Year 1
Year 2
Year 3
Year 4
Assessment
Operations
Design
Infrastructure

Plan for Resuming Summer Cloud Seeding in Roosevelt and Lea County and Expanding the Seeding Program to Include Curry and Possibly Chavez Counties.

High Acreage Analysis for Various Watersheds Where Mountain Seeding May be Considered. This is not exhaustive but represents a pretty good start and can be expanded to cover additional high areas in New Mexico. (**prepared by John W. Brown)**

There is some variation on how to evaluate areas above various elevations in the watersheds. We have chosen to count everything in the watershed, not just that which flows into a particular area. For example, not all of the water in the Santa Fe watershed flows through Santa Fe. Some of it enters the Santa Fe River near La Cienega.

Here are our estimates for the various watersheds. In computing them we have used a transparency with a one section grid overlaid on BLM 1:100,000 maps. An estimate of 1/4 ,1/2 ,3/4 or 1 was then made for the designated elevation in each section. The three elevation ranges are 2250m-2500m, 2500m-2750m, and 2750m upwards.

Sangre de Cristos West into the Rio Grande

Castilla Creek (some or perhaps much is diverted into Sunshine Valley)

2250m-2500m (7425'-8250')	4,960 Ac.
2500m-2750m (8250'-9075')	22,720 Ac.
Above 2750m (9075')	124,800 Ac.
Total above 2250m (7425')	152,480 Ac.

Latir and Sunshine Valley

2250m-2500m (7425'-8250')	99,680 Ac.
2500m-2750m (8250'-9075')	10,560 Ac.
Above 2750m (9075')	24,320 Ac.
Total above 2250m (7425')	134,560 Ac.

Red River (Including arroyos North of Rio Hondo)

2250m-2500m (7425'-8250')	93,010 Ac.
2500m-2750m (8250'-9075')	16,480 Ac.
Above 2750m (9075')	83,680 Ac.
Total above 2250m (7425')	193,170 Ac.

Rio Hondo

2250m-2500m (7425'-8250')	6,560 Ac.
2500m-2750m (8250'-9075')	5,920 Ac.

Above 2750m (9075')	23,200 Ac.
Total above 2250m (7425')	35,680 Ac.

Rio Pueblo de Taos (Including arroyos North of The Embudo and South of Rio Hondo)

2250m-2500m (7425'-8250')	30,080 Ac.
2500m-2750m (8250'-9075')	60,320 Ac.
Above 2750m = 9075'	107,360 Ac.
Total above 2250m = 7425'	197,760 Ac.

Embudo

2250m-2500m (7425'-8250')	31,520 Ac.
2500m-2750m (8250'-9075')	23,040 Ac.
Above 2750m (9075')	87,840 Ac.
Total above 2250m (7425')	142,400 Ac.

Truchas, Entranas & Misc. Arroys

2250m-2500m (7425'-8250')	13,440 Ac.
2500m-2750m (8250'-9075')	5,760 Ac.
Above 2750m (9075')	4,640 Ac.
Total above 2250m (7425')	23,840 Ac.

Santa Cruz

2250m-2500m (7425'-8250')	17,280 Ac.
2500m-2750m (8250'-9075')	21,120 Ac.
Above 2750m (9075')	37,280 Ac.
Total above 2250m (7425')	75,680 Ac.

Pojoaque/Tesuque

2250m-2500m (7425'-8250')	10,880 Ac.
2500m-2750m (8250'-9075')	14,720 Ac.
Above 2750m (9075')	19,360 Ac.
Total above 2250m (7425')	44,960 Ac.

Santa Fe

2250m-2500m (7425'-8250')	12,160 Ac.
2500m-2750m (8250'-9075')	9,600 Ac.
Above 2750m = 9075'	7,680 Ac.

Total above 2250m = 7425'	29,440 Ac.

Galisteo Creek (excluding Ortiz)

2250m-2500m (7425'-8250')	32,800 Ac.
2500m-2750m (8250'-9075')	3,040 Ac.
Above 2750m = 9075'	1,440 Ac.
Total above 2250m = 7425'	37,280 Ac.

East & Southeast of Raton into the Canadian

Raton Creek

2250m-2500m (7425'-8250')	9,600 Ac.
2500m-2750m (8250'-9075')	0 Ac.
Above 2750m = 9075'	0 Ac.
Total above 2250m = 7425'	9,600 Ac.

Chicorica Creek and Tributaries (exc. Raton Creek to the North and Blosser Arroyo to the South)

2250m-2500m (7425'-8250')	37,120 Ac.
2500m-2750m (8250'-9075')	10,240 Ac.
Above 2750m = 9075'	0 Ac.
Total above 2250m = 7425'	47,360 Ac.

Blossler Arroya, Tinajo Creek

2250m-2500m (7425'-8250')	7,520 Ac.
2500m-2750m (8250'-9075')	640 Ac.
Above 2750m = 9075'	0 Ac.
Total Above 2250m = 7425'	8,160 Ac.

Rio del Plano – Very Little Above 2250m

Ute Creek

2250m-2500m (7425'-8250')	4,640 Ac.
Total above 2250m (7425')	4,640 Ac.

Sangre de Cristos East into the Canadian

Headwaters of the Canadian River and Western Tributaries North of Willow Creek (Bounded on the East by Raton Pass)

2250m-2500m (7425'-8250')	64,800 Ac.
2500m-2750m (8250'-9075')	12,320 Ac.
Above 2750m (9075')	160 Ac.
Total above 2250m (7425')	77,280 Ac.

Willow Creek, Crow Creek, Curtis Creek

2250m-2500m (7425'-8250')	19,360 Ac.
Total above 2250m (7425')	19,360 Ac.

Vermejo River, Van Bremmer Creek

2250m-2500m (7425'-8250')	85,120 Ac.
2500m-2750m (8250'-9075')	56,960 Ac.
Above 2750m (9075')	26,080 Ac.
Total above 2250m (7425')	168,160 Ac.

Cimarron River, Ravado Creek, Ponil Creek, Cerrososo Creek

2250m-2500m (7425'-8250')	92,000 Ac.
2500m-2750m (8250'-9075')	116,800 Ac.
Above 2750m (9075')	145,760 Ac.
Total above 2250m (7425')	354,560 Ac.

Ocate Creek

2250m-2500m (7425'-8250')	55,520 Ac.
2500m-2750m (8250'-9075')	21,760 Ac.
Above 2750m (9075')	24,800 Ac.
Total above 2250m (7425')	102,080 Ac.

Mora River (excluding Sapello) (including Coyote Creek, La Jara Creek)

2250m-2500m (7425'-8250')	97,440 Ac.
2500m-2750m (8250'-9075')	77,120 Ac.
Above 2750m (9075')	71,360 Ac.
Total above 2250m (7425')	245,920 Ac.

Sapello River, Manuelitas Creek

2250m-2500m (7425'-8250')	38,240 Ac.
2500m-2750m (8250'-9075')	15,680 Ac.
Above 2750m (9075')	14,720 Ac.
Total above 2250m (7425')	68,640 Ac.

Pecos Watersheds

Gallinas Creek, Bonito (The Gallinas Normally does not flow to the Pecos, but goes underground and resurfaces in Artesian Wells near Roswell)

2250m-2500m (7425'-8250')	24,800 Ac.
2500m-2750m (8250'-9075')	11,360 Ac.
Above 2750m (9075')	17,600 Ac.
Total above 2250m (7425')	53,760 Ac.

Tecolote Creek, Tres Hermanos Creek

2250m-2500m (7425'-8250')	13,280 Ac.
2500m-2750m (8250'-9075')	7,040 Ac.
Above 2750m (9075')	5,600 Ac.
Total above 2250m (7425')	25,920 Ac.

Cow Creek, El Rito & East to Telephone Canyon

2250m-2500m (7425'-8250')	25,920 Ac.
2500m-2750m (8250'-9075')	22,880 Ac.
Above 2750m (9075')	31,200 Ac.
Total above 2250m (7425')	80,000 Ac.

Glorieta Mesa East, Canon Blanco

2250m-2500m (7425'-8250')	15,840 Ac.
Total above 2250m (7425')	15,840 Ac.

Pecos (exc. Glorieta Mesa, Cow Creek & Watersheds East)

2250m-2500m (7425'-8250')	30,080 Ac.
2500m-2750m (8250'-9075')	34,880 Ac.
Above 2750m (9075')	96,480 Ac.
Total above 2250m (7425')	161,440 Ac.

Jemez Mountains, San Pedro Mountains, Sierra Nacimiento

Rio Puerco and Tributaries (There Are Two Rio Puercos in the area. This one flows off of the West Side of the San Pedro and Jemez Mountains)

2250m-2500m (7425'-8250')	33,600 Ac.
2500m-2750m (8250'-9075')	20,000 Ac.
Above 2750m (9075')	13,120 Ac.
Total above 2250m (7425')	66,720 Ac.

Rio Puerco Tributaries from the Jemez and Rio Gallina Tributaries from the San Pedros (The Flow from the Jemez and San Pedros into the Abiquiu Reservoir and into the Chama above the Reservoir)

2250m-2500m (7425'-8250')	51,520 Ac.
2500m-2750m (8250'-9075')	48,640 Ac.
Above 2750m (9075')	57,120 Ac.
Total above 2250m (7425')	157,280 Ac.

Abiquiu Creek – Rio del Oso – Santa Cruz Creek – Los Alamos Canyon
(Jemez Mountains into the Rio Chama Below Abiquiu Reservoir and into the Rio Grande Above the Otiwi Gage)

2250m-2500m (7425'-8250')	40,800 Ac.
2500m-2750m (8250'-9075')	19,200 Ac.
Above 2750m = 9075'	26,240 Ac.
Total above 2250m = 7425'	86,240 Ac.

Saludo Creek and Canyons to the West of the Jemez and below the Guadalupe Confluence

2250m-2500m (7425'-8250')	6,080 Ac.
2500m-2750m (8250'-9075')	5,220 Ac.
Above 2750m (9075')	0 Ac.
Total above 2250m (7425')	11,300 Ac

Guadalupe Creek and Tributaries

2250m-2500m (7425'-8250')	41,440 Ac.
2500m-2750m (8250'-9075')	79,520 Ac.
Above 2750m (9075')	27,520 Ac.
Total above 2250m (7425')	148,480 Ac.

Jemez River (exc. Rio Guadalupe & Tributaries, Canyons to the West above Rio Saludo and Rio Saludo)

2250m-2500m (7425'-8250')	21,760 Ac.
2500m-2750m (8250'-9075')	63,840 Ac.
Above 2750m (9075')	37,600 Ac.
Total above 2250m (7425')	123,200 Ac.

Mortandad Canyon to Borrego Canyon (Rio Grande below the Otiwi Gage)

2250m-2500m (7425'-8250')	35,360 Ac.
2500m-2750m (8250'-9075')	21,600 Ac.
Above 2750m (9075')	8,000 Ac.
Total above 2250m (7425')	64,960 Ac.

Sacramento Mountains East Towards the Pecos

Arroyo Del Macho

2250m-2500m (7425'-8250')	11,680 Ac.
2500m-2750m (8250'-9075')	4,160 Ac.
Above 2750m (9075')	1,280 Ac.
Total above 2250m (7425')	17,120 Ac.

Salt Creek

2250m-2500m (7425'-8250')	4,800 Ac.
2500m-2750m (8250'-9075')	2,400 Ac.
Above 2750m (9075')	960 Ac.

Total above 2250m = 7425'	8,160 Ac.

Blackwater Canyon

2250m-2500m (7425'-8250')	2,880 Ac.
2500m-2750m (8250'-9075')	1,280 Ac.
Above 2750m (9075')	480 Ac.
Total above 2250m (7425')	4,640 Ac.

Rio Hondo (Rio Bonito, Rio Ruidoso)

2250m-2500m (7425'-8250')	74,720 Ac.
2500m-2750m (8250'-9075')	28,000 Ac.
Above 2750m (9075')	16,160 Ac.
Total above 2250m (7425')	118,880 Ac.

Rio Felix

2250m-2500m (7425'-8250')	47,360 Ac.
2500m-2750m (8250'-9075')	2,720 Ac.
Total above 2250m (7425')	50,080 Ac.

Rio Penasco (Bluewater Creek)

2250m-2500m (7425'-8250')	121,760 Ac.
2500m-2750m (8250'-9075')	86,400 Ac.
Above 2750m = 9075'	22,080 Ac.
Total above 2250m = 7425'	230,240 Ac.

Sacramento Mountains South to Crow Flats and Southwest Aqueduct

Pinon Creek

2250m-2500m (7425'-8250')	7,680 Ac.
Total Above 2250m = 7425'	7,680 Ac.

Sacramento River & Southwest Aqueduct

2250m-2500m (7425'-8250')	14,080 Ac.
2500m-2750m (8250'-9075')	9,600 Ac.
Above 2750m = 9075'	4,000 Ac.
Total above 2250m = 7425'	27,680 Ac.

Sacramento Mountains West to Tularosa Valley

Corrizozo & Vicinity (Carrizozo BLM Map)

2250m-2500m (7425'-8250')	14,400 Ac.
2500m-2750m (8250'-9075')	6,080 Ac.
Above 2750m = 9075'	1,120 Ac.
Total above 2250m = 7425'	21,600 Ac.

Tularosa, Three Rivers & Vicinity (Ruidoso BLM Map)

2250m-2500m (7425'-8250')	64,480 Ac.
2500m-2750m (8250'-9075')	25,760 Ac.
Above 2750m = 9075'	6,560 Ac.
Total above 2250m = 7425'	96,800 Ac.

Alamogordo & Vicinity (Alamogordo BLM Map)

2250m-2500m (7425'-8250')	27,040 Ac.
2500m-2750m (8250'-9075')	15,200 Ac.
Above 2750m = 9075'	2,560 Ac.
Total Above 2250m = 7425'	44,800 Ac.

Appendix E. Conceptual Santa Fe Watershed Cloud Seeding Demonstration Project

The City of Santa Fe has expressed an interest in pursuing cloud seeding on a regional basis. This appendix is included to preserve the preliminary research that has been done in case there is future interest in this approach. And of course the Santa Fe Watershed could be a target area in any regional cloud seeding project. Many thanks to generous inputs from Arlin Super a Cloud Seeding Consultant asuper@astound.net

A. The Seeding Opportunity

The Santa Fe Municipal Watershed has two parallel crestlines only a couple miles or so apart. Winter storms which produce abundant SLW clouds over the Santa Fe watershed have approximately crestline level winds generally from the west, and forced by the terrain to be perpendicular to the ridgelines rather than moving up-valley. Winds at crestline elevations, give or take a couple of thousand feet, from the southwest to northwest quadrant produce forced upflow over the barriers. The upflow results in cooling of moist air which, in turn, may condense into SLW within the clouds. During periods of time when the mountain-induced clouds are not sufficiently cold, nature may be unable to convert the SLW into ice crystals and snowfall. Thus winter cloud seeding has the potential to significantly increase precipitation.

B. Seeding Strategy

It is likely that seeding from the windward side of the west crestline will begin the process by creating a large number of small ice crystals. Descending, warming, and drying air between the two crestlines (which are the watershed boundaries) will often fail to sublimate (convert back into water vapor) the seeded crystals and they will continue to grow while being lifted over the 2nd (eastern) crestline where a 2nd zone of supercooled liquid water (SLW) will be found. It is an ideal configuration for cloud seeding to be effective.

One approach (subject to a more detailed analysis) is to locate two or perhaps three high elevation remote-controlled seeding devices (AgI generators or propane dispensers) about midway (1,000 to 1,500 feet below the average crestline elevation) upslope from the road leading to the Santa Fe Ski Area to the crestline forming the western boundary of the Santa Fe Municipal Watershed target area. These silver iodide generators or propane dispensers could be turned on and off automatically based on the detection of SLW by sensors at the middle dispenser or at a crestline measurement station.

C. Anticipated Results

The randomized Bridger Range Experiment in SW Montana had a similar setup to the Santa Fe Watershed but with the parallel ridges further apart. All indications were that seasonal snowfall increases of about 15% would have been possible had all storms been seeded.

The observed results of the 2003/04 Utah randomized propane seeding experiment were limited to a distance from 2 to 6.5 km (1.2 to 4.0 miles) downwind of the propane dispensers. Gauges were not operated closer to or farther from the dispensers so one can only speculate about increases outside the 2 to 6.5 km range. It was estimated that approximately 10% seasonal snowfall increases might have been achieved over that downwind range if all seedable storm periods had been seeded. That distance range is similar to the range being considered for seeding the Santa Fe Municipal Watershed.

Establishing expectations that are too high can lead to disappointment later so we believe a goal of 8% seasonal increases (adjusted downwards by the percentage of seedable time units seeded if a random strategy is employed) might be realistic subject to a more detailed study by a cloud seeding expert. We would recommend that Santa Fe retain such an expert to develop a detailed plan for any cloud seeding demonstration project.

Because of the limited size of this demonstration, it is expected that some of any augmented precipitation would fall outside of the target area in particular north and east of the target area. And because areas to the north would not be seeded, there would not be a similar phenomenon benefiting the Santa Fe target area. If at some future time communities to the north decided to join in on this project Santa Fe might benefit to some extent from their seeding activity.

D. Choice of Seeding Agent and Equipment Placement

The SLW zone in about the lowest 2000 feet above crestline elevations can be seeded by silver iodide (AgI), a man-made ice nuclei (IN), if temperatures are below about -8^{o}C. This facilitates glaciation when the temperature of the SLW is warmer than -5^{o}C but colder than -8^{o}C.

Propane cooling works very differently than silver iodide seeding in that the propane does not directly function as an ice nuclei (IN) but rather works to create a large number of very tiny ice crystals that then function as ice nuclei. Expansion of liquid propane chills a small volume of air colder than -40^{o}C. This is important because water cannot remain in the liquid state below -40^{o}C but freezes at such a low temperature without the need of any ice nuclei. That process is called "homogeneous nucleation" as opposed to "hetrogeneous nucleation" when a foreign particle, such as clay or silver iodide, acts as an ice nuclei enabling SLW droplets to freeze.

In general it is desirable to locate the equipment that releases silver iodide (called silver iodide generators) or propane (dispensers) as close as possible to where the SLW is anticipated. Being close to the SLW increases the chances that the SLW will receive the benefit of the released material. Being further away however, would widen the coverage per release unit. Thus there is a tradeoff between close proximity and increased likelihood of being successful and greater distance, the resulting wider plume of released material, but less confidence that this plume is traveling to where it is desired.

If the cost of the release equipment is not a major constraint, propane dispensers or silver iodide (AgI) generators should be located well up the windward slope, approximately 1000 to 1500 feet below the crestline. With propane the need to be very close to or in the cloud is especially critical because if the tiny ice crystals formed by the cooling action of the propane do not reach the SLW they will sublimate and regain their form as water vapor. If these tiny Ice crystals do reach the zone of SLW they will induce glaciation at temperatures as warm as –2C (28.5F). It is a small detail but if silver iodide is released in the cloud the range of effectiveness of the silver iodide is expanded to as warm as –6C

Thus the pros and cons of the two approaches can be summarized as in the below table.

	Advantages	**Disadvantages**
Silver Iodide Seeding	• More industry experience with this method • More leeway in where to locate the silver iodide release units • One silver iodide release unit may cover a larger geographic area • May have a positive downwind effect • Could be used with chemical tracers for assessment but this is very expensive	• Limitations of use re warm (-8C to –2C) conditions • Public concern about the use of silver iodide but we believe this concern is not justified based on the information available. • Positive downwind effect probably is related to poor targeting of the primary target area.
Propane Cooling	• Handles warm conditions (-8C to –2C) better • The release equipment costs less • Propane is less expensive than silver iodide but neither are very expensive.	• Location of the release units is very critical • May not be practical for very large target areas.

E. Cost Estimates

To estimate the costs one needs to first estimate the requirements for equipment , manpower and seeding agent.

1. Equipment Requirements

- Two or three remote controlled propane generators with data logging. $15K each
- Possibly two additional remote controlled silver iodide generators with solution flow measurement and data logging. $30K each
- Icing rate sensor and temperature sensor
- Two or three precipitation gauges located from above McClure Reservoir to the top of the Santa Fe River drainage (near Santa Fe Lake). These may already exist and may not need to be purchased.

2. Manpower Requirements

This remains to be determined but with the correct equipment (ice sensor to identify when supercooled liquid water is present), a full-time meteorologist may not need to be involved. The low-cost scenario in the below table assumes that the Santa Fe Water Division can deploy and service the equipment. LANL's WRTAO as agreed in principle to perform the assessment for this project. An alternative would be for the Water Division to do the assessment with some participation from a local university. If a full time professional cloud seeding operator and team is required, the high cost scenario would come into play. We note that A similar project in Utah is self-managed by the local water authority and all of the projects in Texas are self-managed.

The initial placement of the generators, the design and procurement of the generators, and the selection of the seeding agent and perhaps the specifications for the assessment are one time activities that would be best performed by an expert retained by the Water Division.

The New Mexico Weather Modification Association Technical Advisory Group (TAG) would be available to assist in a similar way as the Santa Fe Watershed Association TAG assists re the forest thinning project.

A license from the Interstate Stream Commission is likely to be required although a scientific experiment exemption perhaps would be available initially. The NMWMA would be able to assist in the license process in particular helping to organize public meetings.

3. Cost of Seeding Agent

A typical AgI generator for a serious project outputs around 25 grams of AgI per hour, roughly half of which is silver.

- Gallons per hour 0.33
- Cost per gallon $22
- Possible hours per month per silver iodide generator 720
- Seedable hours assuming 15% of all hours are seedable (based on 20% in Utah) 108
- Cost per month per silver iodide generator =$784

The cost of the propane for a silver iodide generator is unknown but believed small as is the cost of propane for a propane seeding generator.

		Low Estimate	High Estimate
	Assumptions Used in Cost Estimate	**Santa Fe Water Division own cloud seeding operator and** **External assessment is not required**	**Fully Contracted Out because multiple jurisdictions involved.** **Very Extensive Peer Assessment because of need to get ISC, Governor Richardson's and Legislative Support.**
One Time First Costs	Infrastructure Costs	**$100,000**	**$150,000**
	Design Consultant	Probably similar to Cost for The Sangre de Cristo Project but only one site to be studied	**$75,000**
Recurring Annual Costs	Out of Pocket Operating Costs	**$25,000**	**$150,000**
	Manpower Cost of Santa Fe Employees	Not clear…the level of effort needs to be assessed	Very Low: Contractor does it all.
	Cost of Assessment	Part of cost of Santa Fe employees – Depends on desired level of assessment	**$100,000**

Appendix E. Challenges Related to Cloud Seeding In New Mexico

1. The "Problem of the Commons":

Challenge: With summer cloud seeding those where the rain falls benefit whether they contribute to the project or not.

Solution: Community or State funding is required…it is not realistic to be able to solicit individual beneficiaries to fund summer cloud seeding projects.

2. Cloud Seeding Currently does not Create New Water Rights.

Problem: It is difficult to see how the private sector can participate in winter cloud seeding when no additional water rights are created no matter how much additional water is created. For summer cloud seeding on the plains, the water falls where it falls and those under where it falls benefit whether or not they have water rights. But for mountain seeding there is a wide variety of beneficiaries and the project sponsor will benefit only if they hold some of these water rights.

Solution: Negotiate sharing arrangements with existing major water rights holders who will benefit from cloud seeding. There may only be a small number of such situations where there are a relatively small number of large water rights holders but such situations are worth looking for. Voluntary sharing arrangements with the funder of cloud seeding receiving the use of water in return for the funding are likely to be looked on favorably by the State Engineer.

Alternate Solution: Compensate entities which sponsor cloud seeding projects recognizing that the water produced will enter the water rights priority scheme and benefit mainly others.

3. Equipment Affordability

Challenge: Although the economics of cloud seeding appear to be impressive, affordability remains an important obstacle to implementation, especially for new projects. Equipment has a number of challenges. First of all, it is not usually used 12 months of the year. Second, it may not be needed every year. Recently it has been very wet in Utah and northern Colorado. We anticipate that some seeding projects there will not go forward in the winter of 2006 and 2007 and some equipment may not be utilized. For some reason, the lease costs on generators seem quite high if we have been given

the correct information…0% of the acquisition cost per month. That is essentially a two year payback.

Solution: It would be helpful if we could reduce the equipment costs for potential winter cloud seeding projects. One approach might be to have a centralized owner of cloud seeding equipment in New Mexico that leases the equipment to those wanting to undertake cloud seeding projects. Some sharing with operators in Utah and Colorado might also be warranted but there is a great disparity in the quality of seeding generators so this is a concern.

4. Design Affordability

Challenge: This is another major cost component, perhaps an upfront cost of $75K with annual costs of $10K to $20K thereafter for consultation. Can this expertise be provided at a lower cost?

Solution: One approach would be to have a cloud seeding expert housed at the ISC, Office of the State Climatologist, or at some New Mexico University. A $75,000 consulting job involves probably 50 to 75 days of consulting. Thus one full time cloud seeding expert might be able to support one or two new winter projects each year plus two or three ongoing winter projects, plus some summer seeding projects. It seems that a one person operation at a New Mexico University costs approximately $150,000. So perhaps $150,000 a year might provide the staff to support three or four or more cloud seeding projects in New Mexico.

Design includes getting all applicable licenses and would include complying with NEPA if that is required.

5. Operations Affordability

Challenge: The cost of operations depends on whether or not a contractor is required. The cost of the seeding agent is relatively minor. For a winter cloud seeding operation, the cost might be in the order of $800 a month per silver iodide generator. The cost for summer seeding might be in the order of $2,000 to $5,000 per storm seeded.

Solution: Self-managed cloud seeding programs. The larger cost is manpower and the cost of this manpower depends very much on whether or not it is contracted out. If done internally, the cost might be considered the cost of the time actually spent on cloud seeding activities. If contracted out, the cost will depend on the length of the cloud seeding season, not just the time spent on cloud seeding. If personnel are contracted for, they will be billed for the contractual period whether or not they are working on cloud seeding...i.e. they will be billed even during periods of no storms. A contractor will need office space, vehicles, living expenses, and profit none of which are likely to be major items for internal staff.

How might we determine if a possible cloud seeding sponsor is able to operate their own project? Unfortunately at this point we do not have the criteria for this. These criteria need to be developed. It is likely that there are a very limited number entities in New Mexico who might be able to do winter cloud seeding without a contractor.

We need to better understand the tasks involved with winter cloud seeding operations. Equipment has to be deployed before the winter starts, returned to storage after the winter and repaired as needed. To the extent that equipment is deployed in inaccessible areas (during the winter) the equipment has to be very reliable. If the generators are operated automatically when sensors indicate that supercooled liquid water is present, there is no need for any meteorological inputs during operations...but clearly that expertise is needed as part of the design.

With respect to summer seeding, in Texas there are no projects employing a contractor as a cloud seeding operator, they are all currently done internally. These programs are organized by Conservancy Districts, Water Districts, Aquifer Authorities, and special Weather Modification Associations. It may be that the comparable New Mexico organizations are not large enough to be able to have sufficient resources on staff to do projects internally. Fortunately, there are such organizations nearby in Texas willing to assist with projects in New Mexico. The delivery technology for summer seeding is aircraft and aircraft can cover a lot of territory.

Manpower requirements for summer seeding include pilots and meteorological expertise, as specific clouds have to be targeted and they need to be predicted in order for the aircraft to be there at the right time. Aircraft maintenance can be contracted out on an as needed basis.

One option is to retain a cloud seeding operator at least initially and then develop the expertise in-house. If there were enough projects in New Mexico, the ability to operate a cloud seeding project could become a shared resource. However there may not be enough of a demand to make cloud seeding operations a shared resource within New Mexico.

6. Assessment Affordability

Challenge: Knowing how much water is produced by cloud seeding programs is important to making good decisions about cloud seeding programs and maintaining support for cloud seeding in New Mexico.

Solution: Assessment is most likely needed during the initial years of operation. Data can be collected by non-statisticians and sent at the end of the year to statisticians for their analysis. This is not likely to be costly. But it would be useful if the ability to do assessment was available centrally so as to achieve economies of scale...so that is one institutional issue…how to have assessment done both in an economically way and in a way that carries some credibility. Assessment will need to be done for any project that is funded by the State or Federal Government.

Many users of cloud seeding will not desire a lot of assessment. Ski resorts and hydroelectric facilities are examples of entities that do not generally need assessment that meets scientific criteria. The fact that there is very little assessment being done today in the West means that most do not require it. This may be shortsighted in light of public skepticism.

7. Mismatch between Required Geography and Existing Entities.

Challenge: The geography of cloud seeding projects often does not correlate well with existing organizations. Thus there is no one to lead the project.

Solution: New organizations need to be created …possibly alliances of existing organizations.

Alternative Solution: Manage cloud seeding projects out of ISC or Dept of Agriculture.

8. Perceived Conflict of Interest at ISC

Challenge: The ISC is not comfortable both promoting cloud seeding and regulating cloud seeding

Solution: Consider moving the licensing role somewhere else.

I. Infrastructure deficiencies

Challenge: The required infrastructure to perform and assess cloud seeding projects is not always there.

The federal government, through a number of agencies, provides a multitude of useful data, but much of this is geared to weather forecasting or agricultural interests. Cloud seeding projects require additional specialized data not available from these sources.

- Radar: Modern weather radar with allied software programs and GPS-equipped aircraft has revolutionized summer (convective cloud) seeding. However, radar installations are limited to one National Weather Service (NWS) radar facility in Albuquerque, several military sites and a few commercial sites for TV weather forecasting. The NWS radar facility in Albuquerque is state-of–the-art NEXRAD (Next Generation Weather Radar), but, because of topography, only about 20% effective coverage (percent visible) is provided at a range of 140 miles. For technical reasons, radar has not been successfully used in orographic (mountainous terrain) winter seeding.

  Almost any area in New Mexico, other than the Española and Albuquerque Basins and two counties in southeast New Mexico, which SOAR has seeded in past

summers, would require acquisition of radar for summer seeding. Weather research in dual-wave length radar indicates the possibility of both rain and snow measurement, but this is not yet an operational tool.

- Rain/snow Gages: Accurate measurement of precipitation is essential to assessing results of cloud seeding. The NWS operates rain gages throughout the state, but their spacing is inadequate for most purposes-- typically one rain gage every 30 miles. Snow gages operated by the NWS are frequently placed at lower elevations, well below mountaintops. To augment upper-elevation snow pack measurements, the Natural Resources Conservation Service has installed Snotel (snow telemetry) stations near mountaintops. While helpful, there are a limited number of such stations in NM.

  Precipitation for summer cloud seeding projects can be inferred from radar (see above) where such facilities are available, but a winter seeding operation will require acquisition and placing of snow gages.

- Streamflow Data: Increase in streamflow during spring runoff may be an indication of increased precipitation as a result of winter seeding. Streamflow measurements are made routinely by the United States Geological Survey and are available to the public. However, snowmelt is not an accurate measure of precipitation because evapotranspiration (ET) in southern latitudes and aquifer recharge can be significant. Warm Chinook winds may sublimate snowpack rapidly. Also, heavy forest cover may serve as a canopy, preventing snow from reaching the ground and allowing the snowfall to sublimate. Variation in the thickness and nature of soil, as well as the density and type of plant life, affect the amount of ET. Aquifer recharge upstream from stream gages also reduces observed streamflow. Recharge is a function of lithology and degree of fracturing of bedrock, both of which are widely variable. No studies have been made to quantify ET and recharge in New Mexico, but reports of data from Arizona, at a similar latitude, indicate that they may account for 40% of winter precipitation.

  Further research is required before streamflow can be used as an accurate measure of the affect of cloud seeding. This would be a useful research project for any New Mexico university.

- Meteorological Data: The NWS provides much data useful for a cloud seeding operation. In addition to ground weather stations, balloon-born instrument packages, called rawinsondes, are launched twice daily in Albuquerque. They provide data such as wind direction and speed, temperature, humidity, atmospheric pressure and sky cover. However, there are no measurements of one set of data essential to successful cloud seeding…the presence of supercooled liquid water (SLW). Also, unless the balloons happen to rise in the vicinity of the target area, the data must be extrapolated, introducing an element of uncertainty.

Fortunately, the presence of SLW may be detected by either a microwave radiometer or an icing rate meter. The icing rate meter is much less expensive and may be rigged to automatically activate silver iodide generators or propane dispensers. It may be possible for us to borrow an icing rate meter, in addition to necessary auxiliary equipment, from the BOR in Utah. This equipment would be mounted on an existing tower, such as a chair lift tower at a ski basin, or at a Snotel station, and would give us real-time information on storm characteristics, occurrence of SLW and the number of seedable events in a given period.

Some of these data may also be observed in past storms by examining archived satellite imagery. Dr. William Woodley (consultant in Denver) and Dr. Daniel Rosenfeld (Professor at Hebrew University in Jerusalem, Israel) have perfected a technique to distinguish those clouds that were producing snow from those that had not yet begun snowing, but which had SLW at a temperature suitable for seeding. Dr. Woodley examined several satellite images of storms in New Mexico and illustrated the presence of seedable clouds over much of the state during a winter storm in 2004. He has proposed undertaking a one-year study of winter storms over the five major mountain ranges in NM for a four-year period. Cost of the proposed project is $45,000. This technique has not been used commercially, but if successful, would give us an inexpensive inventory of seedable winter storms and would identify those mountain ranges best suited for seeding.

Solution: The following approaches will address the infrastructure deficiencies

Summer cloud seeding projects will require acquisition of radar system in most parts of New Mexico, except for the Albuquerque and Española Basins and Southeast New Mexico.

Winter cloud seeding will require that we obtain much of our own meteorological data. The proposed project using satellite imagery offers a quick and inexpensive statewide inventory of winter storms and identification of the best mountain ranges to seed. Ground truth for validation of the satellite imagery interpretation could be provided by placing icing rate meters and auxiliary equipment on towers on one or more mountain tops.

Stream flow data promises to be a potent tool to measure effects of either summer or winter seeding. However, because of stream loss to evapotranspiration and aquifer recharge, additional research is required. We need to involve a New Mexico University in this project.

10. Prior Appropriation

Challenge: If we wait too long, we may lose the right to cloud seeding water. In New Mexico, precipitation is considered the waters of the State of New Mexico. Air masses cross state lines. Other states may in the future claim that efforts to increase precipitation by an upwind state have impaired their normal precipitation. As an aside, a similar argument could be made with respect to pollution in upwind states if it is ever proved that pollution impairs precipitation.

Solution: Establish cloud seeding as a normal water management technique within New Mexico. Treat cloud seeding activities like other forms of beneficial use so their initial date of operations and continued operation may establish right of New Mexico to utilize that water.

Also we need to view cloud seeding as part of the hydrological cycle. In almost all cases, water is not destroyed by usage but rather utilized by man, animals, and vegetation and then returned to the atmosphere or to aquifers. Increasing the velocity of the use of water increases the benefits of the available water. This is similar to the velocity of money, the faster money turns over, the more people benefit from any given supply of money.

11. Skepticism at NM Universities.

Challenge: There is some of skepticism about cloud seeding at NM Universities related to such questions as: (1) Does cloud seeding work? (2) Can the improvement in precipitation be measured to a high degree of confidence? (3) Are adverse weather consequences possible? Much of this skepticism is historical - dating back to the time when New Mexico Tech and Dr. Irving Langmuir made New Mexico an early leader in the application of cloud seeding.

Solution: The Office of the Governor needs to provide some leadership in getting New Mexicos Universities involved in cloud seeding. The possible implications of climate change on expected winter precipitation may provide an opening with the University community.

12. Skepticism and Concern of the Average Citizen

Challenge: In New Mexico there is both support and opposition to cloud seeding. Some of this skepticism and concern is due to lack of information and misinformation but some of the skepticism is legitimate: cloud seeding operators have sometimes exaggerated the level of additional precipitation produced and with summer seeding there is always a legitimate concern with respect to creating violent weather.

Solution: Create what might be called Citizen Action Committees to monitor cloud seeding programs where they exist and to provide an information transfer function for the public where cloud seeding programs do not yet exist.

13. Access May be Restricted

Challenge: Certain areas may be inaccessible for cloud seeding. Most of the mountainous areas in New Mexico are within National Forests, and large parts of the Sangre de Cristo, San Juan, Sacramento and Black Range/Mogollon Mountains are within Wilderness Areas. We do not anticipate great difficulty getting approval to operate in National Forests, but the parts designated as Wilderness Areas may present a challenge. There, the USFS prohibits vehicular traffic and construction (such as weather towers), and may prohibit placing of snow gages. Also, the Mescalero Indian Reservation in the central part of the Sacramento Mountains covers almost one-third of the mountain range, and the Taos and Picuris Indian Pueblos cover large parts of the northern Sangre de Cristo Range. We have made an effort to discuss cloud seeding with the Eight Northern Pueblo Indian Tribes, but so far they have not agreed to meet with us.

Solution: These are potential challenges we will have to deal with. There may be areas in New Mexico that will be out-of-bounds. We plan to talk with the Forest Service and Native American Indians to see what restrictions they may impose. In all mountain ranges, though, there are large areas of National Forests outside of Wilderness Areas and Reservations/Pueblos that should be suitable for seeding.

14. Federal Policies and Regulations may Delay or Prohibit Operations

Challenge: The Bureau of Reclamation (BOR), which funded cloud seeding operations from the 1960s, through the 1980s, currently funds no cloud seeding operations. There is legislation in the U.S. House and Senate that calls for renewed cloud seeding research, and it is possible that the BOR will reverse its policy. Any federal funding for cloud seeding operations will require an Environmental Impact Statement (EIS). This process may take two to four years. For these reasons, we have not requested federal funding.

Solution: As to federal funding, there are several projects the federal government might support that would not require an EIS, such as use of chemical tracers in assessment, satellite imagery interpretation, research on ET and aquifer recharge, and acquisition of data on SLW occurrence. We plan to pursue these possibilities through our Congressional Delegation.

15. Possibly Warmer Winter Storms

Challenge: We may be faced with challenges related to warmer winter storms. Successful cloud seeding with silver iodide, the conventional seeding agent, requires cloud temperatures of –8°C (18°F) or colder (see "Additional Information on How Cloud Seeding Works, Appendix A). This far south, we can expect cloud temperatures to be warmer than elsewhere in the Southwest where seeding has been successful. Additionally, in this Century, winter temperatures in New Mexico have increased at a rate of 0.11°F (.06°C) per decade; Albuquerque temperatures have increased three times as rapidly and it is believed that an even more rapid increase is taking place in our northern mountains and that this rate of increase may accelerate. In the absence of historic cloud temperature data, we may need to consider an alternative to silver iodide as a seeding agent.

Solution: There are seeding agents that are designed to work at warmer temperatures. Adding hygroscopic salts to silver iodide or placing the silver iodide generator within the clouds where the temperature is colder (forced condensation freezing) will encourage glaciation and precipitation (see Appendix A). Seeding with propane acts in a similar manner and is effective in temperatures as warm as –0.5°C (31°F). While not yet in wide spread operational use (except as a defogging procedure in airports), propane seeding was recently shown to be effective in Utah.

16. Narrow Target Areas

Challenge: Many of the mountain ranges in New Mexico are quite narrow. If the target area is too narrow and the storm clouds are moving, the glaciation process may not have sufficient time to produce snow in the target area.

Solution: This may be a serious challenge, but the consultants we have talked with suggest that the use of salt additives to silver iodide or using forced condensation freezing should accelerate the glaciation process. Much will be learned during a demonstration project. There is hardly any way to solve challenges like this without starting a project and seeing what works.

17. Drought

Challenge: There is evidence that Atlantic and Pacific Ocean temperatures are cyclical and that they affect precipitation in New Mexico. Dr. Charlie Liles (NWS, Albuquerque) concludes that, if the historical relationship between ocean signals and New Mexico precipitation can be used as a forecast tool, it is likely that "precipitation in New Mexico for the next couple of decades will be more that 20% less than it was during the period from the late '70s to mid '90s." That is not to say that we can expect the next 20 years to be as dry as this past winter; there will be normal and even wetter than normal years during long droughts. But there seems to be a good chance that we are in for an extended dry period. Cloud seeding should not be considered as a drought mitigation

measure; there are fewer storms to seed during a drought, and New Mexico cannot store water in the Rio Grande or its tributaries once Elephant Butte Reservoir drops below 440,000 acre feet, which occurs during drought. Cloud seeding should be considered as one tool in sound long-range water planning.

Solution: Seeding during normal or wet years will help fill reservoirs to tide us over during dry years, and, of course, any increase in precipitation during dry periods may aid farmers and ranchers significantly. Long-term water planning is essential and cloud seeding should be part of that plan.

18. Targeting

Challenge: The most important, and one of the most difficult, elements of a cloud seeding project is getting the seeding agent to the appropriate part of the cloud. One authority estimated that in most operational seeding projects, only 20% of the time did the seeding agent come in contact with SLW. The difficulty is that storms may have alternating phases with clouds already producing snow (no excess SLW, so no seeding potential) and clouds with SLW and good seeding potential.

Solution: As noted above in the section on Meteorological Data, either an icing rate meter or a microwave radiometer can record the presence of SLW. This may add to the cost of the project, but it could be quite rewarding. Considering that only 20% of storms may be properly targeted, and yet they yield, on average, an increase in precipitation of 10%, the possibility of increasing precipitation substantially by proper targeting is intriguing.

19. Watershed Health

Challenge: The full benefit of cloud seeding will be achieved with improvements to watershed health including vegetation management. We need a higher ratio of stream flow and aquifer recharge to precipitation…particularly the enhanced precipitation from cloud seeding.

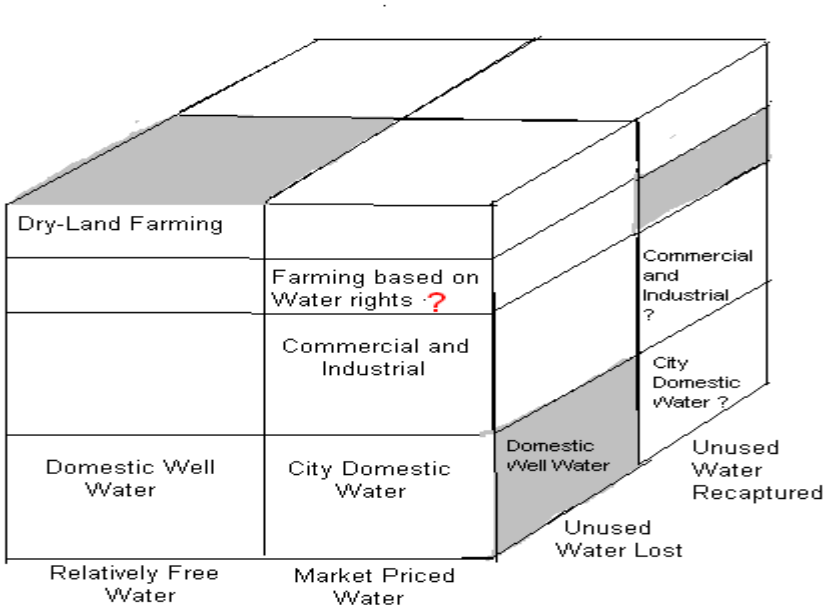
Solution: Cloud seeding should not be delayed until forest health is optimum but there may be opportunities for both approaches to be supportive particularly with respect to assessment. Forest health could be a factor in the selection of cloud seeding target areas.

Appendix G. Technologies for Increasing Water Availability

1. Conservation

There are many technologies available to facilitate water conservation in the municipal/domestic, commercial/industrial, and agricultural sectors. The range of costs per acre-foot of water saved is large so it would be very useful to catalogue these technologies and organize them by application and cost. There is much progress in conservation reported all around the World so a broad approach to this topic is indicated.

Some Characteristics of Water Use



There are three factors that drive conservation:

- Is the user paying market price for water? And if so can the user reduce their water bill by using less water or if the water is prepaid (ownership of water right) can the saved water be leased or sold. Subsidies, awards, and penalties can come into this part of the discussion.
- Is unused water lost? or does it become a useful return flow? If unused water is not lost but goes into return flow it doesn't make sense to pay for reductions in unused water which is the position that the OSE takes re reductions in ag water PDR's and FDR's.
- Is unused water that might otherwise be lost captured by sewer and waste treatment infrastructure? This applies mainly to cities and certainly isolated projects that have their own water capture and treatment capability.

The reason those three criteria are so important can be explained by considering the three sectors of water use:

a. Municipal and Domestic

- Domestic well water would appear to be one of the better targets for conservation because the water is not market priced, water saved is generally does not become a return flow and usually the water is not recaptured and reused other than by grey water systems for landscaping purposes which may be overstated re their effectiveness.

- There appears to have been significant reductions in water consumption per capita in certain cities. This has been achieved by a combination of market pricing the water and ordinances restricting water usage or requiring more efficient water technology inside the residence. Roof capture would appear to be an approach that captures water which otherwise would be lost to ET and thus can be viewed as either increasing the supply or reducing consumption by reducing the use of city water or domestic wells for landscaping purposes.

- It is not clear the extent to which waste water treatment provides a conservation benefit in the long term when looking at the Statewide water budget. The argument against waste water treatment would be similar to the argument in the agriculture sector that waste water treatment simply reduces return flows and thus does not in the macro sense impact the water budget. From a practical perspective It probably does conserve water because the untreated waste water most likely would not reach aquifers and streams without additional losses and to the extent such water enters aquifers it may not become available where needed in the short term. There is probably also a water quality benefit. And it certainly benefits the entity that treats the water as it provides water that otherwise would have to be acquired by that entity.

- A better understanding of how conservation is being employed and the results being achieved would be helpful in developing strategies to better utilize the available techniques throughout the State.

b. Commercial and Industrial

- Commercial and industrial activity in urban areas where there is waste water retreatment will probably have low returns on investment for water conservation investments except to the extent that they avoid having to increase the capacity of the waste water treatment plant. But being sure that market prices are paid for the water might be useful.

c. Agriculture: The Sector Which is the Largest Component of Water Usage in New Mexico

- To understand agriculture we need to understand three acronyms. CIR, FDR, and PDR.
  - The CIR is the Consumptive Irrigation Requirement which is the amount of water the plant needs less the amount of natural precipitation that is available. The CIR is the amount of water to which the farmer is entitled under the water right and the amount of water that they can transfer.
  - The FDR which is the Farm Delivery Requirement is the amount of water the farmer needs delivered to the farm in order to provide the CIR to the plants being cultivated.
  - The PDR or Project Diversion Requirement, is the amount of water that needs to be diverted in order to deliver the FDR to each farm. The PDR applies mainly where there are multiple farmers sharing a delivery system for example one of the major Irrigation Systems in the State such as the Elephant Butte Irrigation District.

- We have the problem that any reduction in the Project Diversion Requirement (PDR) that is required to deliver the Farm Delivery Requirements (FDR) to the farm is claimed by the OSE. Their general position is that reductions in the PDR tend to be equivalent to reductions in the return flow to aquifers and streams thus it really isn't a savings in water but simply a different routing of the water. Thus there is no incentive for anyone to make investments or take actions to reduce the PDR.

- Similarly any reductions in the Farm Delivery Requirement (FDR) are claimed by the OSE/ISC. Unlike the PDR which relates to getting water to the farmers' fields i.e. the management of the overall irrigation system, the FDR relates to what is happening on the farmers field. But similarly to the PDR any savings in the FDR belong to the OSE since again they believe that such savings are essentially equal to the resulting reduction in return flows to aquifers and streams. So again, the farmer has no financial incentive to do things that reduce the FDR.

- Even for the CIR, there is little incentive for the farmer to invest to reduce the CIR. The farmer in general is not allowed to transfer the reduction in the CIR or use the savings to irrigate additional acreage and any such reduction reduces the amount of water the farmer can eventually transfer. The farmer does have an incentive to increase yields so savings in the CIR which translate back into consumption of the original CIR but with a higher yield is an economic benefit to the farmer and perhaps to society and likely to the State Treasury due to higher profits and taxes but does not directly lead to more water being available to others.

- The correctness of the conclusion by the OSE that any savings in the PDR and FDR are really reductions in return flows and thus not a benefit to water budgets may vary from location to location (distance from where water is applied to where water can reenter watercourses) and may be very different for surface versus groundwater irrigation projects. There are always losses to evaporation and transpiration from non-cash crops (weeds) so the assumption by the OSE that

anything above the CIR is fully recovered as a return flow is of course only an approximation. Of interest the CIR may be increasing due to the warming trend in New Mexico but due to increased ET losses and possibly lower average precipitation in some parts of the state so that is also something that needs to be considered. It certainly increases the need for agricultural methods that reduce the CIR including consideration of different crops that have a higher ratio of profit to water usage.

- The above point explains the need for farming to be based on market priced water. Where farming is based on water systems but the prices paid are sub-market prices the price mechanism is not properly effecting decisions about water use per dollar of farm production so getting the price of water closer to market prices might be useful.

- Dry land farming is probably not a good area for water conservation efforts other than the incentive by the farmer to improve their yields by using water more efficiently.

- We estimate that New Mexico has 1.1 million acres under cultivation almost all of these being irrigated. If agricultural use of water is a little less than 2.8 million acre feet, this translates into a per acre consumption of about 2.5 acre feet of water per acre under cultivation. Many farmers believe that their CIR is 2.5 or a bit higher and the OSE in many areas says the CIR is only 2.0 feet (assumes 12 inches of natural precipitation during the growing season).

  Thus the maximum amount of water that is unaccounted by the CIR is 0,5 (2.5 - 2.0) times 1.1 million acres under cultivation or about 500,000 acre feet. This provides an estimate of the upper limit of what conservation efforts might achieve in agriculture if perfection were achieved other than by a change in crops or radical change in agricultural technology e.g. hydroponics. Since some of this 500,000 acre feet is lost to evaporation in getting the water to the plant and some is lost to ET by weeds, and it is not clear which is correct, the 2.5 estimate of the CIR by farmers or the 2.0 estimate of the CIR by the OSE, the potential for conservation in agriculture is most likely considerably less than 500,000 acre feet other than by a large change in the mix of what is cultivated and/or revolutionary changes in agricultural technology such as hydroponics.

<u>We rarely truly consume water, we mainly borrow it.</u>

Although the water budget for New Mexico is approaching 4,000,000 acre feet, the amount of water that is in the bodies of its citizens and all the cattle in the state is approximately 500 acre feet. One can add to that the water that is in all of the crops being raised in New Mexico. That is also probably a reasonably small number.

How does one explain the discrepancy between the large size of the water budget and the small amount of water that is actually being incorporated in man, beasts and crops? The answer relates to the rapid turnover of water in man, beasts, and crops. The water

is an input but there is pretty much an equal output so that the amount of water stored in man, beasts, and crops is quite small but the input requirement is large and there are substantial losses before the water is delivered to man, beasts, and crops.

This complex circulation of water complicates the analysis of how what appears to be conservation might impact the water budget. It also means that small additions to the water supply at strategic locations can have a major impact on the ability of the water budget to meet the needs of the citizens of our state.

There is some similarity to water and money. With money the amount that a person has in their possession at any one point in time may be small compared to the amount of money that changes hands. The ratio of the amount of money that changes hands as compared to the amount of money that is in circulation is called the velocity of money. Increasing the velocity of money increases the benefits to society and thus and increase in spending by individuals and business, which might be condemned on moral grounds, in reality translates into an increase in prosperity.

With water there is a similar ratio of water use as compared to the amount of water that is under the control of man. If we use water faster and return it to the system faster, there is an increased perception of the benefits received. An increased velocity of water results in more benefits from the same amount of water. Waste water treatment is an illustration of this approach and total reuse would be the extreme of that principle. The amount of water available for use would not increase but the benefits achieved would.

On the supply side, cloud seeding is a good example of increasing the velocity of water. We try to get the clouds to increase the rate of precipitation knowing that any increased precipitation will be quickly used and find itself via ET back into the atmosphere soon to provide precipitation elsewhere.

Increasing the velocity of water is probably always a good thing to do but it complicates the analysis of conservation. We may need a different model than the traditional water budget to understand how conservation efforts are providing an increase in benefits to society. Total reuse illustrates the limitation of annual water budgets as a planning tool. Reuse doesn't change the amount of water in circulation. In fact the objective of water reuse is to keep that amount a constant. But reuse increases the benefits that are realized from a smaller quantity of water. We can try to reflect this with our current planning tool by counting reuse as an increase in supply or a decrease in consumption but that might not be the best way to handle this. We might want to consider models that are related to the way currency is modeled if indeed we are increasing the velocity of water by reuse either in the form of waste water treatment, in home reuse systems, cloud seeding to speed up the atmospheric part of the hydrologic cycle, reductions in agriculture PDR's and FDR's or other similar approaches.

The general equation for dealing with the money supply is MV=PQ where M is the money supply, P is average price for goods and services in our economy and Q is the quantity of goods and services produced; PV is our gross domestic product. The V or velocity represents the multiple that relates the GDP to the amount of money in

circulation. A similar concept would be to relate the GDP of water, the beneficial usage of water, to the amount of water in circulation. The higher the V the more times the same water has been used during its journey from entering the control of man before exiting back into the atmosphere. For our water economy in New Mexico, the velocity of water would be a small fraction not a multiple as is the case for the overall economy. Only a small fraction of the water available is actually consumed. It may not be possible to apply the same approach that is used by economists managing the money supply to the management of water in New Mexico. But there is something to be learned from the concept that water mainly is not really permanently consumed but mainly borrowed and returned to the atmosphere.

2. Desalination--General*: Processes for removing salts and other chemicals from ground water have been available on a commercial basis for nearly 40 years. Today there are over 15,000 desalting plants in operation worldwide with a production capacity of 8.6 billion gallons of fresh water per day (about 10 million acre feet per year), enough water for 43 million people. Most of these plants are located along coastlines because of the ease of disposing of the waste brine, but, with the projected supply-demand gap, there is growing interest in desalination in inland areas. Las Vegas, Phoenix and Tucson are considering desalination plants to supplement water supplies, and Scottsdale, Abilene and Ft. Stockton, Texas have already built moderate size desalination facilities. El Paso is planning a desalination plant of 30 million gallons per day (mgd), which would be the largest inland desalination plant in the U.S. Even smaller cities are considering desalination plants; Alamogordo is planning a 10 mgd plant. The cost is high, but for municipalities concerned about long-term fresh water supply, desalination is a technically sound alternative.

New Mexico is fortunate to have a very large supply of fresh and brackish water, much of it in valley-fill sand and gravel aquifers in intermontane basins. Many of these basins are associated with the Rio Grande Rift, a structural depression which has determined the course of the Rio Grande. Additional brackish water is available as produced water (oil field and coal bed methane water). Surface water and fresh water aquifers should be adequate to meet needs in the Rio Grande corridor for the near term, barring a lengthy drought, but long-term water planning should take into account the large volumes of brackish water available for the future. Said another way, the problem is not a shortage of water in the future, but the cost of that water and legal constraints.

* References in the following text are available upon request.

Those constraints include the Rio Grande Compact, which guarantees Texas a certain amount of water flowing in the Rio Grande from New Mexico into Texas. The current interpretation of the Office of State Engineer (OSE) is that ground water in the region is connected to surface water, meaning that pumping of brackish ground water in Rio Grande rift basins would capture water that otherwise would flow into the Rio Grande. This could reduce the flow of water to Texas, in violation of the Rio Grande Compact. In such cases the OSE requires the transfer of water rights. A possible exception might be deep brackish water in Rio Grande Rift basins, discussed in Section 7 below.

Sources of brackish water in New Mexico are shown in the following table.

Water Type	Total Dissolved Solids Parts per Million(ppm)	Source
Fresh	<1000 (drinking water < 500)	surface water shallow and deep (>2500') wells
Brackish	1000-10,000	surface water (Pecos River) shallow wells (Estancia Basin) oil field and coal bed methane water deep wells (Rio Grande Rift Basins)
Saline	10,000 – 35,000 (seawater 35,000)	oil field water deep wells in the Artesia Basin
Brine	> 35,000	oil field brine

Rivers such as the Pecos River, may become brackish as the result of salt buildup downstream from irrigated fields or from upwelling saline formation water and may require desalination; this is discussed below in Section 4. The potential of shallow (<2500') brackish water aquifers, such as in the Estancia and Tularosa Basins is discussed in Section 5. Oil field and coal bed methane waters are discussed in Section 6. Deep wells in Rio Grande Rift basins are possible future sources of brackish water and are discussed in Section 7. Costs to process saline water will be much greater than for processing brackish water in New Mexico; desalination of saline water will lag far behind desalination of brackish water and is not discussed here.

Currently there are two processes to remove salts, thermal (distillation) and membrane (filtering). Filtering through a semipermeable membrane is called reverse osmosis (RO). Electrodialysis (ED) uses charged electrodes to cause dissolved ions to pass through semipermeable membranes, leaving behind fresh water. The best-known thermal process is distillation, where boiling the water and condensing the water vapor leaves fresh water. Most earlier plants were multistage flash distillation units, but membrane plant capacity now nearly equals that of thermal. ED is more economical when salinities are less than 3,000 parts per million (ppm), while RO is most frequently used at salinities from 5,000 to 10,000.

Costs vary widely as a function of salinity; the cost of desalting seawater (35,000 ppm) is three to five times that of desalting brackish water. Because energy costs may be 50% to 75% of operating costs, and because membrane processes use less energy, rising energy costs favor RO and ED. In remote areas, like the Navajo Indian Reservation in northwestern New Mexico, where ground water is becoming increasingly saline, a solar-powered desalination plant may be the cheapest option for the supply of

fresh water. The Jemez y Sangre Regional (3) Water Plan White Paper 4a notes that capital and operating costs (in 1985 dollars) for desalination of brackish water, using RO or ED, is in the range of $1.50 to $2.50 per 1,000 gallons of produced water, ($500 to $830 per acre foot), not including cost of brine disposal or distribution costs. Brine disposal may cost as little as $0.05 per 1000 gallons for lined evaporation ponds or $1.85 for crystallization and burial in landfills, the most likely methods of disposal. Pipeline costs are estimated at $25,000 per inch diameter per mile. When those are included, desalted water generally costs more than traditional water supplies. However, in 2003, a firm (represented by the former State Engineer) made a proposal to desalt brackish water in the Estancia Basin, dispose of the brine, and deliver 10 mgd to the City of Santa Fe for less than $4.00 per 1000 gallons, the current City water cost (see discussion in Section 2., below).

In the event of severe supply shortage, using desalted water should have less cultural impact than living without adequate water supplies. However, the need for transfer of water rights to produce brackish water would, over the long-term, put additional pressure on agricultural communities.

3. Desalination--Surface water: Salt buildup may occur in rivers downstream from intensive irrigation and may require desalination. South of Carlsbad, total dissolved solids (TDS) in the Pecos River, between the Pierce Canyon Gage and the Texas state line measure 10,000 ppm. In March, TDS in the river may reach over 15,000 ppm. It is possible that some of the salt is derived from upwelling of formation brackish water emerging beneath the Pecos River. Desalination would be an expensive alternative, but at some point it may be required to satisfy the Pecos River Compact.

4. Desalination--Shallow brackish water aquifers (i.e., Estancia, Salt and Tularosa Basins): Alamogordo has received approval from the OSE for about 3000 afy of water rights to begin treatment and operations for a 10 mgd desalination plant, using brackish water from the Tularosa Basin. The City Manager for Alamogordo said “the cost of acquiring new fresh water supplies has increased to a level that desalination of local brackish groundwater is now competitive with developing and bringing in fresh water from remote locations.” Reportedly, the Interstate Stream Commission has filed an application with the OSE for desalting brackish water in the Salt Basin in southern New Mexico for use by local municipalities, and to put the water into the Pecos River for delivery to Texas.

In January, 2003, a firm called Resource Solutions Group, LLC, whose principals include Eluid Martinez, former State Engineer, and Dr. John Hernandez, Professor, New Mexico State University, made a proposal to deliver to Santa Fe and northern Torrence Counties 10 mgd (about 11,000 afy) of desalinated water from the Estancia Basin. They said that they have identified about 1 million acre feet of brackish water which could be pumped from valley-fill sand and gravel without impairing existing water rights. Mr. Martinez stated that the recharge in the Estancia Basin was sufficient to expect that the life of the project would exceed 40 years.

Their proposal provided for drilling shallow wells to produce brackish water (about 2500 ppm) in the eastern Estancia Basin. The recharge for the Basin is primarily on the west side, from outcrops in the Manzano Mts. In the western part of the basin the water is fresh and is used for irrigation and for municipalities. The Resource Solutions Group claimed that withdrawal of brackish water for desalination from the eastern part of the Basin should not impact groundwater in the western part of the Basin. In fact, withdrawing brackish water in the eastern part of the basin should benefit users of water to the west by lowering the potentiometric head of brackish water relative to that of the fresh water.

Costs were estimated at about $80 million to be funded by the private sector. Plant construction costs would be about $17.5 million ($1.75 per gallon of capacity per day) and operating and maintenance would be roughly $1.35 per 1000 gallons. Brine disposal would be in lined evaporating pans. The remainder of the cost would be for drilling and completing the wells, plus a 65-mile pipeline to Santa Fe. The firm stated they could deliver 10 million gallons per day of fresh water to Santa Fe for less than $4.00 per 1000 gallons.

The proposal met objections from the Estancia Basin Regional Water Plan members and governmental agencies. They claimed that:

- The relationship between fresh water in the western part of the Basin and brackish water in the eastern portion should be documented by monitor wells.
- There may not be sufficient recharge on the eastern side of the Basin to supply the projected withdrawals for desalination.
- It may take many more wells than anticipated to achieve the projected production rates.
- Water should not be exported from the Estancia Basin until it has a sustainable water supply.

The Santa Fe City Council voted to reject the proposal, and to date no other interested parties have emerged. The Alamogordo desalination project apparently has been delayed by regulatory problems, and there is no reported progress on the Salt Basin proposal. While desalination holds great potential for providing fresh water to future generations, these cases indicate the difficulty in getting them approved and operational.

5. Desalination--Produced Water (oil field and coal bed methane water): For each barrel of oil produced in the U.S., an average of 10 barrels of water is produced. In New Mexico this amounts to a total of about 80,000 acre feet per year (afy), mostly in the Permian Basin in southeastern New Mexico. The produced water is fresh (100 ppm) to highly saline (100,000 ppm). A new source of natural gas since the ‘90s, coal bed methane (CBM) also produces large amounts of water, but the water is much fresher and contains bicarbonate, not sodium salts. CBM is natural gas produced from fractures in coal beds. New CBM fields are being developed in the Raton Basin in northeastern New Mexico, where associated water totals nearly 2000 afy, and in the San Juan Basin in northwestern New Mexico, where associated water amounts to about

10,000 afy. Regulation of brackish oil field waters and CBM water used for oil field operations or as a cooling agent in the generation of electricity is under the jurisdiction of the Oil Conservation Division, not the Office of State Engineer.

Produced waters require treatment to remove salts and chemicals and are a special case of desalination. Before removal of salts, oil field waters require removal of chemicals, especially organic compounds called BTEX (Benzine, Toluene, Ethelbenzine and Xylene). Sorption-based technologies are available, but costs vary widely, ranging from $0.20 to $8.33 per 1000 gallons of water with capital costs of up to $300,000. One promising process uses surfactant-modified zeolite (SMZ) for sorption of the organics, followed by air stripping and routing of the air stream to a bioreactor where bacteria use the BTEX as a food source. This process, coupled with air sparging, was estimated to cost as little as $0.49 per 1000 gallons with an initial operating cost of $18,300. Pretreatment of oil field brines before removal of salts is necessary because the organics will clog the salt removal filters. Estimated costs to treat oil field brines are shown in the table below, based on published transportation costs in the San Juan Basin, desalination and brine disposal costs as summarized in Section 1, above, and pre-treatment costs of $0.50 to $2.00 per 1000 gallons.

Processing Steps	Transport	Pre-treatment	Desalination	Brine Disposal	Total
Cost/1000 gals	$0.17-$0.76	$0.50-$2.00	$1.50-$2.50	$0.05-$2.10	$2.22-$7.36

Texas A&M University has developed a portable desalination unit using microfiltration membranes to remove substances that might plug RO membranes. Reject brine is injected into the formation from which it was produced. As much as 70% of the brackish water can be recovered as fresh water. The total cost of producing fresh water ranges from about $4.00 to $8.00 per 1,000 gallons, including disposal costs (but not including transportation costs), based on a 10-year lifetime and allowing for maintenance and replacement.

In contrast, transportation and disposal of the brine in salt water disposal wells (depleted oil wells) or water flood injection wells may cost only $0.29 to $1.02 per 1000 gallons. Partly because of the higher cost to treat the brine, as well as the value of the additional oil produced by water flooding, 95% of oil field brine in the U.S. is disposed of in salt water disposal or water flood injection wells. CBM water should require less treatment and may be suitable for a variety of uses.

Potential beneficiaries of produced water are those who may use the produced water to replace previously used fresh water; they are shown below:

Oil Field Water	CBM Water
• Oil field operations (water flooding, cement jobs, make-up water for frac jobs	• Power plant cooling • Agriculture • Drinking water

• Roads and construction • Long-range option—carbon sequestration: (brine + CO2 from power plant + catalyst + pH control = carbonate + treated brine for use in cooling power plant)	

6. Desalination--Deep Brackish Water Aquifers (>2500 feet) in Rio Grande Rift Basins: New Mexico is blessed with an abundance of deep ground water in basins along the Rio Grande Rift. The Rift is a deep, fault-bounded depression which originates in central Colorado and continues through central New Mexico into west Texas and Mexico. The largest of these basins in New Mexico are the Albuquerque Basin (40 miles wide by 100 miles long), the Espanola Basin (20 by 40 miles) and the Taos Basin (the southern part of the San Luis Basin in Colorado, 10 by 50 miles,). South of the Albuquerque Basin, the rift zone bifurcates into several smaller, shallower basins. Basin-fill sediments total up to 14,000 feet in thickness and consist of sand, gravel, clay, gypsum and associated volcanic rocks, together termed the Santa Fe Group. In the words of a veteran New Mexico geologist "This lithostratigraphic unit constitutes one of the great aquifer systems of southwestern North America" and holds "vast quantities of economically recoverable, fresh to slightly saline, ground water" (Hawley et al, 1994). No estimates have been made of the amount of water in storage (theoretically recoverable water) in the rift zone, but one estimate for the Espanola Basin alone totals 56 million acre feet, almost 30 million acre feet of which is below a depth of 2500 feet. The authors (Lewis and West, 1995) state that the "aquifer contains sufficient water to supply existing demands for many hundreds of years if legal and administrative issues are ignored".

In the larger basins the shallow section is fresh water-bearing and is the ground water supply for municipalities. Together with surface water, this large supply of fresh water should supply the region for many years. However, for purposes of long-range planning, it is important to include the deeper, brackish water as an additional future supply. Another reason for studying deeper aquifers is that the OSE does not regulate water below a depth of 2500 feet and with total dissolved solids (TDS) greater than 1000 ppm. The statute, NMSA72-12-25 [Aquifer containing nonpotable water at a depth of twenty-five hundred feet or more excluded from underground basin] reads "No past or future order of the state engineer declaring an underground water basin having reasonably ascertainable boundaries shall include water in an aquifer, the top of which aquifer is at a depth of twenty-five hundred feet or more below the ground surface at any location at which a well is drilled and which aquifer contains nonpotable water. Nonpotable water for the purposes of this act means water containing not less than one thousand parts per million of dissolved solids." (Frost, 2005). The State Engineer, however requires proof that the deep aquifer is not hydraulically connected to the Rio Grande and that withdrawals will not impact adjacent wells or impair the overlying fresh water aquifer.

There are only a handful of wells deeper than 2500 feet, all abandoned oil or gas exploratory wells, none of which tested the Santa Fe Group, so it will be very difficult to satisfy these requirements. However, doing so would point to a source of “new water”, so it is worthwhile to examine the possibilities that: a) the aquifer below 2500 feet may have TDS greater than 1000 ppm, b) the aquifer may be confined; that is, hydraulically separated from the overlying fresh water aquifer and the river and c) that porous and permeable aquifers exist at depth.

a) Total dissolved solids: There are very few references to TDS in New Mexico rift basins, and what data there are vary widely. Wilkens, (Wilkens,1998) reports that in the southern Albuquerque Basin a suface resistivity survey indicates sodium chloride (NaCl) concentration of about 8000 ppm at depths down to 1300 feet, in the western Albuquerque Basin a NaCl brine (>30,000 ppm) enters the fresh water aquifer due to upward movement of deep circulation water, and in the northern part of the basin chlorides as high as 1300 ppm with silica of 91 ppm indicate ground water flow from the Jemez geothermal reservoir. In the Mesilla Basin in southern New Mexico and northern Mexico, upward-flowing geothermal water with large concentrations of chloride is encountered in the southeastern parts of the basin and on the eastern side, geothermal water with large concentrations of chloride, silica and potassium mix with cooler, less mineralized water (Wilkins, 1998).

These scattered data, together with the occurrence of gypsum in the middle Santa Fe Group in the Albuquerque Basin indicate that we may expect that deeper aquifers with older water will have salinities greater than 1000 ppm.

b) Confined aquifers: The shallow aquifer in all rift basins is considered to be regionally unconfined; that is, hydraulically connected to the river. However, in the Espanola Basin, “lack of hydraulic connection between pumping wells in one layer and nearby observation wells in deeper of shallower layers has been observed in many tests, a further indication that either local confining conditions or very low vertical permeability values are common in the basin” (Keating et al, 2002) These locally confining layers are impermeable clay. If clay-rich lake beds covered a large area, it is likely that the impermeable clay would act as an aquitard (seal), and the underlying aquifer would be confined. That is what occurs in the center of the San Luis Basin, immediately north of the Taos Basin. A lake formed in the center of the basin in Pleistocene (Ice Age) time and probably earlier, depositing a thick sequence of clay. An abandoned oil exploratory well north of Alamosa, Colorado encountered 2000 feet of lake bed sediments (Chapin and Cather, 1994). “These clays (blue clay of drillers logs) form the highest aquitard between the upper unconfined aquifer and the lower confined (Alamosa Fm and Santa Fe Gp) aquifer in the basin, both of which are critical water resources in the basin” (Machette, 2004).

Lake beds are known to have been deposited also during the early phase of rifting. In the Socorro, La Jencia and Albuquerque Basins, the middle Santa Fe

Group consists of finer grained clastics as well as gypsum and mudstone deposited in playa lakes. In the Socorro and La Jencia Basins, the upper part of the Popatosa Formation is a confining unit consisting of playa deposits and mudstone. The remainder of the Popotosa Formation constitutes the lower part of the aquifer system (Wilkens, 1998).

Although there is no water production from deep Santa Fe Group aquifers in the Albuquerque Basin, the same playa lake facies is present on the flanks of the basin. “The lower Santa Fe Group records deposition in internally drained basins (bolsons) where streams terminated onto broad alluvial plains with ephemeral or intermittent playa lakes bounded by piedmont deposits“ (Connell, 2001). Lake beds have also been identified on the edge of the Espanola Basin. “Some of the mudstone deposits west of Pojoaque are associated with shallow lakes because locally greenish colors (indicating reduced conditions) grade laterally to more reddish colors (indicating more oxidized conditions)” (Johnson et al, 2004). Also, an abandoned oil exploratory well, Yates, LaMesa No. 2, on the south flank of the basin, encountered green shale with bryozoan (fossil) fragments and shaley, fossiliferous beds over a 70 foot interval overlying a basal sandstone unit. As much as 450 feet of clay and sandy clay in the Tesuque Formation are reported near the Santa Fe Airport and are interpreted as lake or playa lake deposits. (Koning, 2006).

It will require testing of selected abandoned oil exploratory tests, and perhaps additional drilling to prove the existence of deep, confined aquifers, but the geologic conditions indicate the possibility that confined aquifers exist.

c) Porous and permeable aquifers: During the early phase of rifting the climate was warmer and drier, and locally extensive, thick eolian sand (dune sand, Zia Formation) was deposited in the Albuquerque Basin (Bartolino and Cole, 2002 and Hawley et al, 1994). About 1100 feet of Zia Formation was measured in outcrops on the Zia Pueblo and 2500 to 2800 feet of Zia Formation was encountered in two exploratory test wells east of the outcrops (Connell, 2001). The dune sands are typically well sorted, massive to cross-bedded, weakly to moderately cemented and should be an excellent aquifer. Hawley and Haase (1992) note that the Zia Formation “may form a large part of a deep aquifer system in the northwestern Albuquerque Basin”.

In the southern Espanola Basin a water well had “an estimated 900 feet of moderately well sorted, nearly unconsolidated sand present in the silty basal portion of the Tesuque Formation---which may represent an ancient, unusually persistent stream channel” (Spiegel and Baldwin, 1963). Yates, LaMesa-2 logged 250 feet of sandstone in the basal Santa Fe Group, immediately beneath the lacustrine deposits. This section has been cased, so it is possible to reenter and test the aquifer at a minimum cost. A seismic reflection at the approximate level of this basal sand in the LaMesa-2 appears on all seismic lines reviewed in the southern Espanola Basin, indicating widespread distribution of the sand member.

Along the Santa Fe River, Koning measured about 300 feet of pebbly sandstone in poorly exposed basal Tesuque Formation outcrops (Johnson, et al, 2004). He interpreted this section as ancient Santa Fe River channel deposits and correlated it with the basal sand in LaMesa-2. At depth, porosity and permeability will be lower than in shallow aquifers, but, given the excellent reservoir characteristics, suitable deep aquifers should exist.

The major obstacle to claiming that deep, slightly brackish water may be exempt from OSE regulation and is "new water" seems to be the question of hydraulic connection with the river. While a case can be made for the possibility of a deep, confined aquifer, proving that claim will require reentry and testing of selected abandoned oil exploratory tests and probably drilling and testing of new wells.

Planners will have to consider a problem that has emerged in the Buckman Well Field in the Espanola Basin. Pumping at high rates has resulted not only in large cones of depression around the wells, but also reservoir compaction. This has resulted in surface subsidence and irreparable damage to the aquifer. An alternative to drilling vertical wells where the aquifer is stressed around the bore hole is to drill deviated or horizontal wells and distribute that stress over a distance of a quarter or half a mile. Drilling horizontal wells is a standard practice in the oil industry and costs may be competitive with the current very high costs of City of Santa Fe wells: the last four wells the City drilled and completed near the Buckman Well Field to a depth of about 1200 feet cost $2.75 million per well, or about $2500 per foot. The following cost estimates provide for drilling and completing near-horizontal wells with a production capacity of 460 afy per well, or 285 gpm per well (75% of the average production rate at Buckman from 1990 to 1999) and desalinating the brackish water.

Estimated Cost for a Deep, 10-well Field	$ million
Capital cost	
• 10 wells, 6000 feet deep @ $3 million	30
• 30 miles of 20" pipeline @ $25,000/inch/mile	15
	45

Annualized cost

• Capital cost ($ 45 million @ 6%)	2.7
• Operating cost ($10,000/well/month)	1.2
• Water treatment ($2.80/1000 gals or $910/af x 4600 afy)	4.2
	8.1

Unit cost

• Cost/afy ($8.1 million / 4600afy)	$1,760
• Cost/1000 gals ($1760 / 326)	$ 5.40

These costs are nearly competitive with current City of Santa Fe water rates and those rates are scheduled to increase. Drilling, completion and pipeline costs will certainly escalate in the future, but, most likely, so will the cost of alternative sources of supply.

There is little doubt that there is a very large supply of economically recoverable brackish water below a depth of 2,500 feet in Rio Grande Rift basins. This supply will not be called on in the near-term, because shallow, fresh water aquifers are available. However, it is a possible source of supply that water managers should be aware of and include in their long-term plans. In order to qualify as "new water", it will be necessary to demonstrate that deep, confined aquifers exist, which ensure that fresh water aquifers and surface water are not impaired. Geologic and hydrologic studies should be conducted on the Santa Fe Group sediments in abandoned oil exploratory tests, and plans should be made to reenter and test selected wells. A review of existing seismic reflection profiles may also be of use in mapping the extent of low velocity shale beds which may serve as confining beds.

Problems	Solutions
The residual salt is an environmental hazard and may be expensive to remove.	Not all methods of salt disposal are expensive. For instance, in the hot, arid Southwest, using lined evaporating pans and disposing the salt in landfills would be relatively inexpensive.
Use of desalinated surface water and shallow brackish water will require water rights, many of which will come from agriculture, putting additional pressure on a centuries-old culture.	Transfer of water rights from agriculture has been happening for many years. As long as there is a willing buyer and a willing seller, the market will prevail.
Water users in basins with shallow brackish water have objected to exporting the brackish water to municipalities in need of water.	In cases like the Estancia Basin, it may take many years before residents realize the benefits of developing the brackish water resources. As water prices escalate, it may be easier to put together a deal which will directly benefit all water users in the basin.

Problems	Solutions
Oil field water is expensive to treat. The alternative of disposing of it in abandoned oil wells costs less than half as much.	Most oil field water will remain untreated and will be used in oil field operations. In this case, produced water replaces fresh water that otherwise might be used.
Much of the oil field and coal bed methane water is produced some distance from municipalities or agricultural areas	In New Mexico, most of the CBM water is produced in the San Juan Basin in the northwest part of the state. There, CBM water could be used as a cooling agent in the large power plants.
Production of deep brackish water will require demonstrating the existence of a confined aquifer with good porosity and permeability. This will be expensive, with no assurance of positive results.	There are very few other potential sources of very large amounts of “new water”. While expensive, the rewards could be very large. Geologic conditions in several basins seem to favor the possibility of confined aquifers. Geophysical data and well samples from abandoned oil wells may be available at a modest cost.
Municipal wells produce at a high rate, which leads to water table draw-down, aquifer compaction and surface subsidence. Resting the wells may allow the water table to recover, but compaction and subsidence are irreversible and ultimately will limit productivity of the wells.	Horizontal or near-horizontal wells can be drilled in either shallow or deep aquifers. This distributes the stress of drawdown over thousands of feet instead of inches around a vertical borehole, thus reducing compaction. Although no additional water will be produced, experience shows that production rates in horizontal wells are higher than in vertical wells.
The Jemez y Sangre Regional Water Plan does not encourage the drilling of additional municipal wells. It notes that the groundwater resource is essentially non-renewable and that the ground water is being mined (outflows exceed recharge in the Buckman Well Field.	The drilling of wells for brackish water will require that neither the fresh water aquifer nor surface water will be impaired. Thus it could tap into a large water supply that otherwise would never be used, and, in doing so, would not endanger existing wells or the river.
We seem to have conflicting information on what the state considers “protectable water”. In the case of “produced water”, the Oil Conservation Division, not the OSE regulates the disposition of the water, regardless of salinity (as long as the fresh water aquifer is not impaired). All other brackish water is regulated by the OSE, except for aquifers deeper than 2500 feet with nonpotable water, defined as water having more than 1,000 ppm TDS. However, White Paper 4a defines nonpotable water as water with more than 10,000 ppm TDS, and states that new unappropriated water can be acquired by	It will be necessary to meet with a lawyer in the OSE.

Problems	Solutions
tapping aquifers deeper than 2,500 feet and salinities greater than 10,000 ppm. We need to clarify this important discrepancy.	

7. Large Scale Surface Capture. Although cloud seeding is the least expensive way of increasing the water supply in New Mexico, another approach which is also reasonably inexpensive is to capture water on the ground before it is lost to evapotranspiration (ET). This is an approach that can be utilized in all 16 of the New Mexico Water Regions.

Landscape water harvesting or large surface is one of the oldest known techniques for collecting usable water; the Indian nations used this technique as did ancient world civilizations.

Unlike Colorado, New Mexico allows roof capture and that is good, but landscape harvesting is much larger in scale. implicating larger projects and the capture of the water off of surfaces that are either naturally impermeable (rocks for example) or made impermeable by treatment. We are not talking about storm runoff, because storm runoff is likely to make it into streams and capturing that water would impair others. Landscape harvesting involves capturing water in situations where all or almost all of that water would otherwise be lost to evapotranspiration. Evapotranspirative losses are a large part of the problem with respect to closing the gaps in the water budget that are projected in this area and for most of the 16 Water Regions in New Mexico.

Large Scale Surface Capture is not something for the faint of heart to pursue. The State Engineer is reluctant to establish guidelines for allowable surface capture, but has indicted informally that they are willing to consider such projects on a case by case basis. We need to pursue surface capture projects that allow the State Engineer to develop guidelines for allowable surface capture projects. For example a rocky pool where there is little if any recharge and no outflows might be an ideal for a surface capture project. The State Engineer may initially take the position that although most of the water captured would otherwise be lost to ET, some of the water captured might have otherwise found its way into an aquifer and thus the permit should be denied. Such an approach is too inflexible and may eliminate an excellent source of water.

Perhaps 5% of the water captured might have entered the local aquifer. The operator of the project could be required to purify and inject into the aquifer twice the estimated potential impairment i.e. 10% of the water captured. For good measure, add another 10% of the water to be injected into the aquifer to assist with River Compact compliance and restoring the health of our aquifers. The operator in this case might then only receive 80% of the captured water and could decide if that level of capture would justify the cost of the project.

Operators of such projects could be individual farmers, acequias, municipalities, cooperatives, or private entities. After some experience, the various categories of possible impairment from such surface capture projects would be known. The levels of impairment might be related to surface permeability, distance down to groundwater, and topography. So the OSE could establish the sharing arrangements that would be associated with the various combination of factors determining the percentage of water captured that was really water saved from ET loss and thus the administration of a surface capture permitting program could become manageable. Perhaps only allow projects where the potential impairment was 20% or less of the captured water would be allowed. The 20% is.just a number that for discussion purposes and one might require that twice the potential impairment to downstream users be provided to them in one way or another plus some share provided back to the State for use for compliance with River

Compact Obligations. The goal would be to reduce the immediate losses to evapotranspiration and create win-win situations for all involved.

In an average year, 100 million acre feet of water falls on New Mexico and perhaps 97 million acre feet is lost immediately to evapotranspiration. For sure where rain and snow fall directly on cultivated land it benefits the farmer and a large percentage of our precipitation benefits ranchers. So the value of the 97 million acre feet of precipitation that is lost relatively quickly to ET is certainly greater than zero, there is some benefit from that precipitation but a lower level of benefit than is achieved by water that comes under the control of man. If we could capture some small amount of this 97 million acre feet of water that is lost to ET before coming under the control of man, it would really help our situation.

Also surface capture can be part of a conjunctive use strategy i.e. using water captured from the surface when available, which is determined by precipitation levels and the size of the storage pond or equivalent, in lieu of well water or stream flow. So surface capture can be viewed as an element of a conservation strategy as well as a source of additional water.

The cost of surface capture water depends on a number of factors including:

A. Will the surface captured water be the only source or will it be one of multiple sources

B. The uses of the surface captured water.

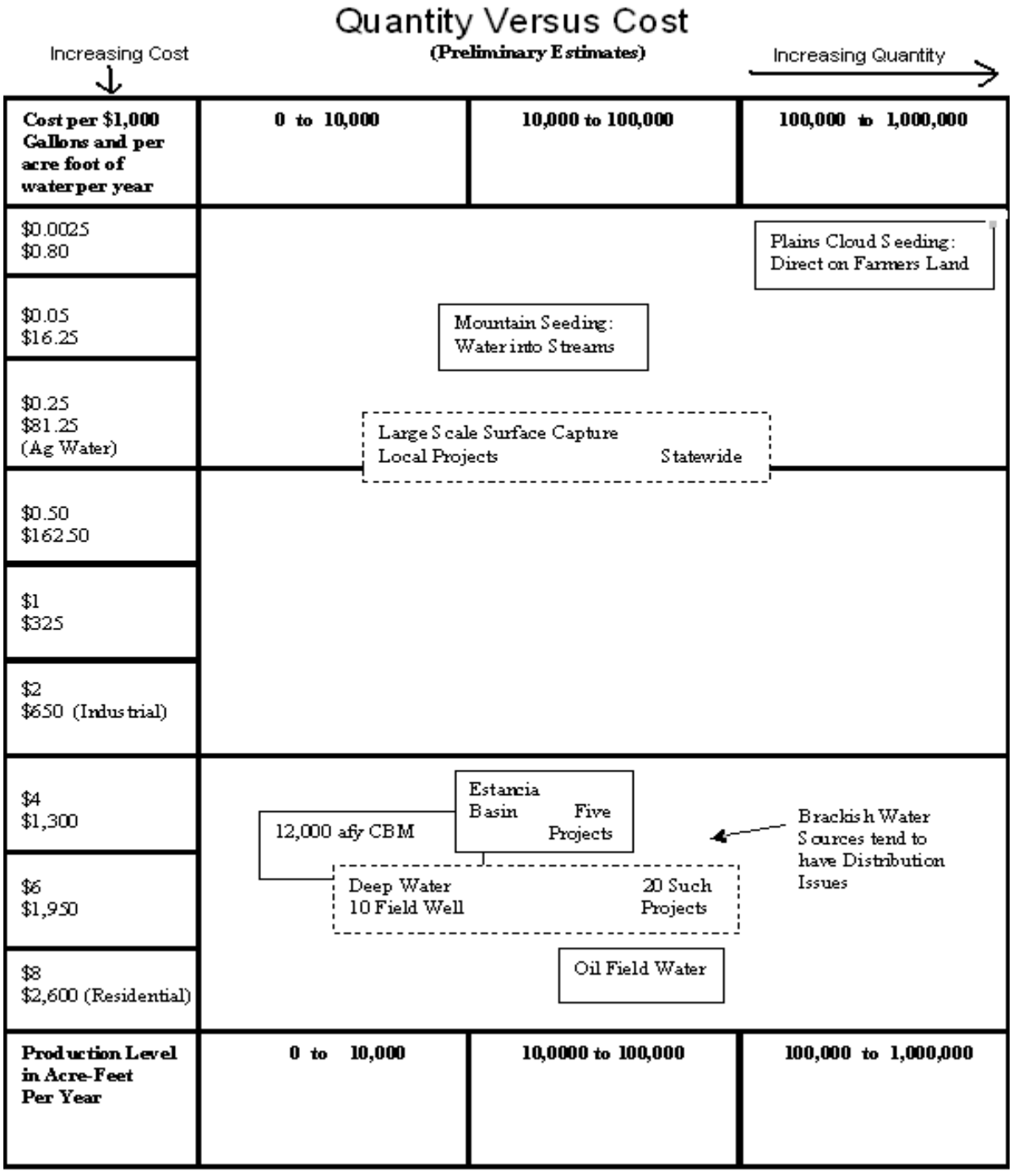
If surface captured water is to be the only source, then the storage capacity has to be very large. The cost of storage capacity is likely to be in the order of Cost = Capacity^x where x is likely to be less than 1. i.e. the cost of storage should be less than linear. As an example if capacity increases with the cube of the dimensions whereas costs are more likely to increase with the square of the dimensions, "x" would tend to be close to 0.67. That would be the case for above ground storage (tanks). If storage pits have to be totally hollowed out the cost would tend to be at least linear with the capacity since both would be related to the amount of material that has to be moved. But one should be able to find areas where a dam can be created without the need to fully excavate all of the material above the dam. Any area that is not perfectly flat would tend to have this characteristic.

The uses of the captured water will have an even larger impact on the cost. If surface captured water is to be used for agricultural purposes or domestic landscaping or for golf courses or municipal lawns, the treatment costs are likely to be very low perhaps clarifying to remove sediments out of the solution or perhaps no treatment at all. If surface captured water is to be used for industrial purposes or for domestic use the treatment may be quite costly.

More research needs to be done on the costs of surface captured water, but costs in the range of $100 an acre foot appear to be reasonable for applications where extensive treatment is not required and where the distance from the point of capture to the point of use is small.

8. Comparison of Costs Versus Quantity

It is not possible to assign a single cost to the various technologies. Every project is different. But generalizations can be helpful. The below compares many of these technologies. Conservation is not included because of the tremendous variation in the costs of the many different approaches to conservation.



Appendix H…Additional Information on the Impact of Water on New Mexico's Economy

Estimates of the value of water in various applications have come about from mainly studies of the impact of drought years on economic activity. The primary references we have used are

http://wrri.nmsu.edu/publish/techrpt/abstracts/abs317.html
http://www.fhsu.edu/docking/img/Archives/SW%20Groundwater-Ogallala/Part%207.Chapter%204.pdf
http://www.valleywater.org/media/pdf/DWR_Workshop/H_BobRaucher.pdf
http://www.nawc.org/pdf/monday/RaucherCommunicatingTheValueofWater.pdf
http://dnr.wi.gov/org/water/dwg/gw/pubs/costofgw.pdf
http://www.nrwa.org/whitepapers/bc/bca/bca.doc

The availability of water in the Western US is in short supply. This affects the price and cost of supplying the water to the user. Both the price and the cost of the water vary considerably over time, the location of the water, the location of the consumption of the water, and the amount of effort it takes to transport, store and prepare the water for use.

The following Table indicates the range of prices for selected water transactions during a specific time period in the Western US. (From, Choices, The Magazine of Food, Farm and Resource Issues, "*The Evolving Western Water Markets*" by Richard Howitt and Kristiana Hansen, First Qtr, 2005.)

State	Leased Thousands of AF	Sale Thousands of AF	Total Thousands of AF	Lease Sale Ratio	Lease Price $ per AF	Sale Price $ per AF
AZ	1,371	24	1,395	53	$73	$894
CA	3,127	227	3,354	14	$80	$1,207
CO	74	242	316	0.3	$22	$3,451*
ID	692	1	693	692	$10	$201
KS	4	0.2	4.2	20	$51	-
MT	5	-	5	-	$5	-
NM	338	10	348	34	$66	$1,233
NV	-	49	49	-	-	$2,572
OK	10	-	10	-	$59	-
OR	532	38	570	14	$283	$1,045
TX	877	322	1,199	3	$81	$864
UT	6	3	9	2	$6	$870
WA	68	13	81	5	$53	$513
WY	105	-	105	-	$40	-
Total	7,211	929	8,140	8	$86	$1,299

* CBT (Colorado-Big Thompson Project) sales omitted. If included, the average sale price is $7,801. Data Source: The Water Strategist.

The average lease price of $86 per AF is in line with the $100 per AF that the ISC pays along the Pecos. The $1.299 average price per acre foot of water sold seems low. It

would be higher if the Colorado CBT sales were included. Anecdotal evidence for NM is that the sales prices are higher and expected to increase rapidly.

A study was done for the ISC with respect to the Aamodt Settlement (http://www.ose.state.nm.us/water-info/AamodtSettlement/Appendix25.pdf). Water rights were projected to rise dramatically in price. Dr. Colby assessed pre-1907 MRG current prices to be $6,000 per acre-foot at the current time ($5,000 per acre-foot at the time of the writing of her 2003 study) and prices in the Santa Fe/Pojoaque Valley area to be $14,000 an acre foot. She projected these prices to increase at a rate of 24% per year.

This is a very big difference from what some other studies have shown. One thing to keep in mind is that the volume of water rights to be purchased influences the price. The lowest priced water rights will sell first and the next available will be higher in price. Thus, if we are talking about hundreds of thousands of acre-feet to be purchased, this suggests that the average price paid will be higher than the prices resulting from an occasional sale at the current time. Perception will also play a role. If the perception is that large quantities of water rights are to be purchased, the sellers will take that into account.

Also one has to go back to the economic principles involved. The price of any factor of production will sell for the marginal contribution of that factor. Thus for poor agricultural land the value of the water right is less than for better agricultural land. One would expect the price of water rights to increase as we require better and better agricultural land to be pulled out of service. The price of agricultural commodities will influence this process and is difficult to forecast. This concept also relates to the impact of withdrawing water from agriculture on the economic impact of such withdrawals. And of course cultural factors may have an influence on water rights prices. There may be a reluctance to sell water rights even if the price offered exceeds the agricultural value of that water.

Demand 2000 and 2040

The following is the consumption information in acre-feet from each of the sixteen regional water plans that we used to develop the totals that are presented in Section II of this Plan.

	2000				2040			
	Agriculture	Municipal/ Domestic	Comm/ Industial	Total	Agriculture	Municipal/ Domestic	Comm/ Industial	Total
Region 1 NE NM	410,520	9,823	405	420,748	412,160	42,600	887	455,647
Region 2 San Juan	172,964	15,955	53,310	242,229	363,682	34,994	73,812	472,488
Region 3 JyS	61,700	27,000	0	88,700	61,700	48,000	0	109,700
Region 4	207,400	1,050	27,020	235,470	207,400	1,060	13,730	222,190
Region 5	38,410	14,760	970	54,140	46,220	21,160	5,660	73,040
Region 6	9,194	11,075	7,927	28,196	9,190	13,680	7,927	30,797
Region 7 Taos	35,395	3,938	2,667	42,000	39,095	8,252	3,561	50,908
Region 8	95,690	6,040	360	102,090	89,700	8,010	520	98,230
Region 9	74,020	3,600	740	78,360	73,440	4,760	740	78,940
Region 10	636,610	35,690	20,815	693,115	636,840	57,570	24,100	718,510
Region 11	451,000	35,000	9,000	495,000	451,000	84,000	15,000	550,000
Region 12 MRG	281,930	118,560	51,370	451,860	228,510	278,430	71,080	578,020
Region 13 Estancia	54,880	2,230	64	57,174	54,880	6,800	100	61,780
Region 14	25,100	1,600	0	26,700	25,100	3,200	0	28,300
Region 15 Socorro Sierra	79,380	5,050	1,710	86,140	80,080	6,440	2,660	89,180
Region 16	132,660	17,480	26,275	176,415	275,850	27,100	57,620	360,570
Total New Mexico	2,766,853	308,851	202,633	3,278,337	3,054,847	646,056	277,397	3,978,300

Appendix I. Lease Versus Buy Decisions on Equipment

The usual decision making process for deciding on buy versus rent involves a comparison of the present value of the cost of the two alternatives.

The present value of a purchase is simply the purchase price less the present value of the salvage value of the units when these units are no longer used in cloud seeding projects.

The present value of a rental approach is the yearly rental cost discounted to present value.

Thus to make an economically correct decision one needs to know:

- The rental cost as related to the purchase price
- Years of expected usage
- Salvage value after usage is no longer required.
- The cost of capital i.e. the interest rate to be used to discount lease costs and salvage value to present value.
- Tax rate and depreciation policies if the entity involved pays taxes.

Because ground-based generators are said to cost 10% of the purchase price per month of use, a decision to buy versus rent would appear to be clear cut. Ground based generators are not an off the shelf item. Renting may result in the use of the least attractive units out there whereas purchase could mean the opportunity to have units manufactured that better meet the needs of particular projects.

For equipment other than ground-based generators the analysis will need to be made on a case by case basis. Some equipment may not be needed after a couple of years and might be able to be rented, especially if it is not likely that this equipment can be utilized elsewhere in New Mexico. There is no way to own and share in New Mexico. If there were an entity capable of performing that function this would provide additional flexibility.

Estancia Basin Water Planning Committee

P.O. Box 58
Estancia, NM 87016

August 16, 2024

Andrew Erdmann
Water Planning Program Manager
Interstate Stream Commission
P.O. Box 25102
Santa Fe, NM 87504-5102

Re: Water Planning Region Evaluation

Dear Mr. Erdmann,

I am writing on behalf of the Estancia Basin Water Planning Committee (EBWPC). We would like to provide feedback on New Mexico Water Security Planning Act Draft Rule and Guidelines.

Established in 1995, the EBWPC has provided local leadership for the past three rounds of regional water planning and anticipates an active role in the development of the next regional water security plan.

The Committee supports the refined basin boundaries based upon hydrological rather than political boundaries. We appreciate the efforts of the ISC to broaden and strengthen local networks and develop new opportunities for funding water management at the local level. However, we would like to propose that the Estancia Basin remain separated from other closed basins to our south, rather than becoming part of the Central Basin Council. While the proposed region groups closed basins that are all reliant on groundwater and lack surface water, there are no significant social ties between the Estancia Basin and the other closed basins. The Estancia Basin is also adjacent to major population centers and has been managed collaboratively for the last 30 years. Wrapping the Estancia Basin into the proposed Central Basin Council would be detrimental to the long-term regional water planning process that has already been established in the Estancia Basin.

The EBWPC has gained significant ground in co-managing the limited groundwater resources of the Estancia Basin over our 30-year history. We appreciate your consideration of our history and progress as you evaluate the draft rule.

Respectfully,

Krista Bonfantine

Krista Bonfantine, Ph.D.
Chair
Estancia Basin Water Planning Committee

February 21, 2025

New Mexico Interstate Stream Commission

EDF Comments on the Discussion Draft WSPA Rule

In January, 2025 the New Mexico Interstate Stream Commission (ISC) published its Discussion Draft Rule and Discussion Draft Guidelines, taking another step in its implementation of the Water Security Planning Act of 2023 (WSPA). This process represents a critical opportunity for New Mexico to rise to meet increasing water security challenges by enabling efficient and holistic water management at the regional level. Given the fundamental role regional planning stands to play in enabling future water security across the state, it is important to ensure the Rule and Guidelines set a strong framework for success. The Environmental Defense Fund thanks ISC for seeking public input and providing this opportunity to comment. We respectfully offer the following initial suggestions and comments relating to the Discussion Draft Rule and, in particular, Section 12 of the Discussion Draft Rule.

Comments on Discussion Draft Rule x.xx.xx.12 ADOPTION OF REGIONAL WATER SECURITY PLAN

Though we strongly support the intention that Regional Water Security Plans (Regional Plans) should be locally-driven by public input to the Regional Water Security Planning Councils (Regional Councils), establishing clear overarching goals and objectives for Regional Plans in the Rule is critical to ensuring that all Regional Plans are able to consistently make and measure progress toward defined water security benchmarks. The WSPA expressly requires ISC to provide statewide objectives for regional water security plan development, including compliance with interstate compacts, the federal Endangered Species Act of 1973 and Congressionally authorized tribal water settlement acts. There is nothing in the language of the RWSPA that prohibits ISC from providing statewide objectives beyond those listed.

At a minimum, we suggest that ISC set statewide objectives for Regional Plans that define water security and require Regional Plans to provide measurable and data-driven strategies for sustainable and proactive management and conservation of surface water and groundwater resources - including preparation for and response to drought conditions - so that sufficient water will be available to ensure public health, safety, and welfare; protect aquatic, riparian, and groundwater-dependent ecosystems; promote aquifer health; safeguard agricultural and natural resources; and balance the water uses and needs of future generations of New Mexicans. These statewide objectives should be included in Discussion Draft Rule Section 12.

Additionally, the rules should include specific considerations that Regional Councils must include in Regional Plans to achieve these water security goals and objectives that are required for plan approval. The Water Security Engagement Act public engagement process identified key considerations for characteristics and components to be included as criteria for the commission's approval (page 22 of the New Mexico Water Security Planning Act Observations and Considerations Report (November 2024)) that should form the basis of

Discussion Draft Rule Section 12.

Further, we recommend that the Rule should explicitly include improved groundwater management as a required outcome of Regional Plans. In New Mexico 92% of community water systems rely completely on groundwater to support our communities and economy. And as surface water supplies continue to dwindle, we are becoming increasingly reliant on groundwater. As a result, our demand for groundwater is increasing even as groundwater supply and recharge decrease due to climate change and overuse. New Mexico's widespread dependence on groundwater emphasizes the urgency to protect and sustain groundwater now and for the future via robust groundwater management, and this sense of urgency is apparent from the emphasis on groundwater that has come up in the public engagement process and noted in the New Mexico Water Security Planning Act Observations and Considerations Report.

To appropriately address the importance and urgency of groundwater management, we recommend that Discussion Draft Rule Section 12.G be amended to add an additional outcome, and we respectfully suggest language like the following:

> x.xx.xx.12(G)(9) address groundwater management considerations, including, but not limited to, mitigation of groundwater depletion; active groundwater monitoring for quantity and quality; and active groundwater management strategies, including consideration of any interconnection between surface water and groundwater.

Conclusion

The Water Security Planning Act provides an incredible opportunity to improve New Mexico's water resilience through bottom-up, locally-driven solutions that inform comprehensive regional planning. We look forward to engaging further with ISC throughout the rulemaking process to establish a strong foundation for success.

DISCUSSION DRAFT – New Mexico Acequia Association Comments

TITLE XX [title XX name]
CHAPTER XXX [chapter XXX name]
PART XXXX [part XXXX name]

x.xx.xx.1 ISSUING AGENCY: New Mexico Interstate Stream Commission, hereinafter the commission.
[x.xx.xx.1 NMAC – N, xx/xx/202x]

x.xx.xx.2 SCOPE: This rule governs the process for developing and maintaining regional water planning pursuant to the Water Security Planning Act.
[x.xx.xx.2 NMAC – N, xx/xx/202x]

x.xx.xx.3 STATUTORY AUTHORITY: Section 72-14A-1, et seq. NMSA 1978.
[x.xx.xx.3 NMAC – N, xx/xx/202x]

x.xx.xx.4 DURATION: Permanent.
[x.xx.xx.4 NMAC – N, xx/xx/202x]

x.xx.xx.5 EFFECTIVE DATE: xxxxxxxxxxxx xx, 2025, unless a later date is cited in the history note at the end of a section.
[x.xx.xx.5 NMAC – N, xx/xx/202x]

x.xx.xx.6 OBJECTIVE: To establish the criteria and procedures to develop, approve and maintain regional water plans, pursuant to the Water Security Planning Act, Section 72-14A-1et seq. NMSA 1978.
[x.xx.xx.6 NMAC – N, xx/xx/202x]

x.xx.xx.7 DEFINITIONS:

A. **"Commission"** means the New Mexico Interstate Stream Commission and its members, authorized under NMSA 1978 § 72-14-1, and the director and employees of the commission.

B. **"Planning Region"** or "Region" means an area of the state as described herein that defines the planning area for Regional Water Security Planning Councils.

C. **"Regional Water Security Planning Council"** or "Council" means individuals, representing groups or organizations as described herein, who make up the Council and lead the regional water security plan development and implementation process in their respective region.
[x.xx.xx.7 NMAC – N, xx/xx/202x]

x.xx.xx.8 WATER SECURITY TRIBAL ADVISORY COUNCIL

A. Subject to available funding and resources, the commission shall provide administrative support and facilitation, in consultation with the office of the state engineer and Indian affairs department, for the establishment and operation of a water security tribal advisory council ("WSTAC") comprising representatives of New Mexico pueblos, tribes and nations.

B. The purpose of the WSTAC is to provide a forum for input from New Mexico pueblos, tribes and nations to ensure that their sovereignty, water rights, water needs, and other viewpoints are considered and incorporated in the regional water planning process or other activities as determined by the commission.

C. The participating pueblos, tribes and nations shall determine their own procedures and operating principles.

x.xx.xx.9 ACEQUIA AND RURAL WATER SECURITY ADVISORY WORKING GROUP

A. Subject to available funding and resources, the commission shall provide administrative support and facilitation for the establishment and operation of the Acequia and Rural Water Security Advisory Working Group ("ARWSAWG") comprised of the appointed representatives of each Regional Water Security Planning Council that represents acequias, mutual domestics or community regional water systems, and land grant-mercedes in pursuant to section x.xx.xx.11 COMPOSITION OF REGIONAL WATER SECURITY PLANNING COUNCIL of this rule in addition to representatives from the New Mexico Acequia Commission, New Mexico Acequia Association, New Mexico Rural Water Association, and New Mexico Land Grant Council.

B. The purpose of the ARWSAWG is to provide a rural state-wide forum for input from New Mexico acequias, mutual domestics or community regional water systems, and land grant-mercedes to ensure that their water rights, water needs, and other viewpoints are considered and incorporated in the regional water planning process or other activities as determined by the commission.

C. The participating appointed representatives of acequias, mutual domestics or community

regional water systems, and land grant-mercedes of each Regional Water Security Planning Council shall determine their own procedures and operating principles.

~~x.xx.xx.9~~x.xx.xx.10 **PLANNING REGIONS**

A. The nine (9) Regional Water Security Planning Regions ("Planning Regions") are shown in Exhibit A (map).

~~x.xx.xx.10~~x.xx.xx.11 **COMPOSITION OF REGIONAL WATER SECURITY PLANNING COUNCIL**

A. The commission shall invite representatives, who reside within the planning region, from the following entities located within each Planning Region, except as otherwise provided for in sections C and D below, to establish the Regional Water Security Planning Council ("Council" or "Planning Council"). Each entity is entitled to have a representative serve on the council for any Planning Region that it is located within. The commission shall convene the representatives with the goal of establishing the members of a Council by consensus, or, if no

Commented [VG1]: The creation of the Acequia and Rural Water Security Advisory Working Group will meet the following requirements of the **Water Security Planning Act §72-14A-1 et seq., NMSA 1978,** ensure the plans are equitable, and ensure that no water rights are affected:

SECTION 4. WATER PLANNING FUNDING--REGIONAL WATER PLANNING--RULES--GUIDELINES.—Subsection C.:
"(5) provide engagement with acequia communities;
(6) provide for the engagement of rural communities;"

SECTION 5. REGIONAL WATER PLANNING ENTITIES.—Subsection C.:
"(4) assist in the funding, development and incorporation of plans for rural communities;"

SECTION 3. CONDEMNATION OF WATER RIGHTS.—
"Nothing in the Water Security Planning Act shall be construed as permitting the condemnation of water rights or as determining, abridging or affecting in any way the water rights of water right owners in the state."

Commented [VG2]: The current planning regions should track better with the administration that will be in charge of implementing the funding that will follow the completion of the plans. Either with the Councils of Governments, the Office of the State Engineer's Administrative District Offices, or other possible administrators of the funds.

agreement is reached, the commission shall determine the initial members of the Council. A Council can also self-organize provided the criteria below are met. Council membership will be based on the following:

(1) one representative appointed by the governing body of each municipality;

(2) one representative appointed by the governing body of each county;

(3) one representative appointed by the governing body of each irrigation or conservancy district;

(4) one representative appointed by the governing bodies of each Pueblo, Tribe, or Nation;

(5) one representative appointed by the governing body of each council of government;

(6) one representative appointed by the governing bodies of each soil and water conservation district;

(7) one representative of each regional acequia association in the planning region, or, if no regional association exists in a county or basin within the county, one acequia or community ditch representative who shall be a current or former commissioner or mayordomo of an acequia or community ditch established pursuant to Chapter 73, Articles 2 and 3 NMSA 1978; for each county located in whole or in part within the planning region, who shall be appointed by the governing body of the New Mexico Acequia Commission; and

(8) one representative for mutual domestic or community regional water systems for each county located in whole or in part within the planning region, who shall be appointed by [?].; and

(8)(9) one land grant-merced representative for each county located in whole or in part within the planning region, who shall be appointed by the governing body of the New Mexico Land Grant Council.

B. Each Council shall invite ten at-large members, located within the region, to represent the following stakeholders or stakeholder groups:

(1) agricultural producers;

(2) a public higher education institution;

(3) environmental or conservation organizations with water security concerns in the Planning Region;

(4) recreational interests;

(5) industrial water users; and

(5)(6) **two members of watershed restoration organizations; and**

(6)(7) five three additional at-large members.

C. Each council shall invite three non-voting representatives for entities outside the Planning Region. Representatives appointed pursuant to this shall not be required to reside within the borders of the planning region.

D. If a qualified or willing representative cannot be identified to serve as a representative for any entity or stakeholder described in sections 4.A or 4.B, the commission may select a replacement non-voting member who is knowledgeable about water resources in the Planning Region.

E. The council shall adopt written operating principles that describe the following, at a minimum, and shall provide their operating principles to the commission upon request:

(1) the roles and responsibilities of the council members;

(2) the duration of the term for representatives on the council; and

(3) the grounds and process for removing a representative from the council.

F. Subject to the commission director's determination of adequate funding and staffing, a commission staff member who resides within the region shall act as the commission's liaison to the council for the purpose of ensuring the proper coordination of commission information, policies, and resources.

G. The commission shall provide administrative support and facilitation for up to three four (43) meetings of the Council per calendar year.

x.xx.xx.11x.xx.xx.12 REGIONAL WATER SECURITY PLANNING COUNCIL MEETING REQUIREMENTS

A. Meetings shall be held at least three four (34) times per year during periods of plan development or update.

Commented [VG3]: This will provide for equitable acequia involvement and meent the following sections of the **Water Security Planning Act §72-14A-1 et seq., NMSA 1978**:

SECTION 4. WATER PLANNING FUNDING--REGIONAL WATER PLANNING--RULES--GUIDELINES.—Subsection C.:
"(5) provide engagement with acequia communities;
(6) provide for the engagement of rural communities;"

SECTION 5. REGIONAL WATER PLANNING ENTITIES.—Subsection C.:
"(4) assist in the funding, development and incorporation of plans for rural communities;"

SECTION 3. CONDEMNATION OF WATER RIGHTS.—
"Nothing in the Water Security Planning Act shall be construed as permitting the condemnation of water rights or as determining, abridging or affecting in any way the water rights of water right owners in the state."

Commented [VG4]: Land grant-mercedes are political subdivisions of the State (NMSA 1978, §§ 49-1-1 & 49-4-4,
NMSA 1978), with regulatory and protective authority over the common waters of the land
grant-merced (NMSA 1978, §§ 49-1-3H(H), 49-1-16, 49-4-5(H), 49-4-17). In addition, land
grant-mercedes have authority over land-use, comprehensive planning, zoning, and infrastructure
development within their common lands. The twenty-seven land grant-mercedes recognized as
political subdivisions of the State, collectively manage over 200,000 acres of land in the
watersheds of at least ten counties. Given their local government and land and water
management status they should be incorporated into the planning process. Adding representation
of land grant-mercedes, encompasses the spirit of the **Water Security Planning Act, §72-14A-1
et seq., NMSA 1978**, specifically sections:

SECTION 4. WATER PLANNING FUNDING--REGIONAL WATER PLANNING--RULES--GUIDELINES.—Subsection C.:
"(6) provide for the engagement of rural communities;"

SECTION 5. REGIONAL WATER PLANNING ENTITIES.—Subsection C:
"(4) assist in the funding, development and incorporati ... [1]

Commented [VG5]: There are many watershed restoration organizations in each region that have developed or are developing water plans and data. This will help to meet the following of the **Water Security Planning §72-14A-1 et seq., NMSA 1978**:

SECTION 5. REGIONAL WATER PLANNING ENTITIES.—Subsection C:
"(6) review existing water plans and data
sets of municipalities, counties and other entities within the water planning region and use them as appropriate."

B. Councils must provide reasonable notice of meetings or other activities to council members, the public, and the commission.

C. Subcommittee meetings may be held and may or may not be supported by commission staff and resources.

~~x.xx.xx.12~~x.xx.xx.13 **ADOPTION OF REGIONAL WATER SECURITY PLAN:** In order to be approved by the commission, regional plans must meet the following criteria:

A. Plans shall include a list of projects, programs and policies in order of priority.

B. Councils shall seek and document in the plan Water Security Tribal Advisory Council (WSTAC) and the Acequia and Rural Water Security Advisory Working Group (ARWSAWG) involvement, input and endorsements, as applicable.

C. Councils shall seek and document in the plan public input in the development, vetting and prioritization of regional water planning activities and proposals.

D. Councils shall seek and document and incorporate comments received from stakeholders consistent with the guidelines laid out by the commission.

E. Plans shall provide documentation of comments received from, and coordination with, state and federal agencies.

F. Councils shall review existing water plans and data sets of municipalities, counties, and other entities within or relevant to the Planning Region and use them as appropriate.

G. The outcomes sought by each Regional Water Security Plan shall:

(1) be established through broad public input;

(2) consider public welfare values, balancing water uses and the needs of future generations of New Mexicans;

(3) comply with state water law;

(4) be developed using the best available science;

(5) recognize and respect federally recognized or reserved tribal water rights;

~~(5)~~(6) **recognize and respect acequia, mutual domestic, and land grant-mercedes water rights and management authority;**

~~(6)~~(7) consider access to water for domestic use; ~~and~~

(8) comply with applicable federal water law;.

~~(7)~~(9) **meet the water needs of rural and agricultural communities; and**

~~(8)~~(10) consider the water needs of healthy fish and aquatic and riparian habitats.

H. Councils must report to the commission by June 30 of each year on the progress of Planning Activities and outcomes of Regional Water Security Plan implementation.

I. Plans shall be updated at least once every ten years and may be updated more frequently. The commission will maintain and publish all water security plans developed by Planning Councils.

~~x.xx.xx.13~~x.xx.xx.14 PROCEDURE FOR REGIONAL WATER SECURITY PLANNING COUNCILS TO DEVELOP AND PROVIDE NOTICE TO THE COMMISSION OF ISSUES AND CONCERNS RELATING TO THE PUBLIC WELFARE OF THE WATER PLANNING REGION

A. Identifying Public Welfare Issues and Concerns for Water Planning Region: Each Council shall establish a process for identifying the issues and concerns relating to the public welfare of the Council's water planning region. The process shall comply with the following requirements:

(1) All water rights holders or other interested parties who may be affected by a Council's determination shall be given a full and fair opportunity to participate in the process.

(2) Any member of the public or member of a Council may suggest a possible issue and concern related to public welfare for consideration by a Council.

(3) A Council shall not act on any suggestion until the requirements of notice and opportunity for participation under this rule have been met.

(4) In determining whether a particular issue or concern rises to the level of the public welfare of the water planning region, a Council is not required to reach unanimous consensus, but the Council shall include a clear description of the positions of any opponents when it transmits its determination to the Commission.

(5) Issues and concerns relating to the public welfare of a water planning region identified by a Council under the procedures outlined in this rule shall not be duplicative of the water rights evaluation factors set forth in the state engineer's authorizing statutes (i.e., impairment of existing water rights, contrary to conservation of water within the state, or detrimental to the public welfare of the state).

B. State engineer consideration of regional issues of public welfare in permitting decisions:

(1) The state engineer, in its permitting decisions, may consider issues of public welfare of a water planning region identified by a Council if the state engineer determines that such regional issues are related to

Commented [VG6]: The involvement, input, and endorsements of the Acequia and Rural Water Security Advisory Working Group will meet the requirements laid out in the **Water Security Planning Act §72-14A-1 et seq., NMSA 1978** and ensure that no water rights are affected:

SECTION 4. WATER PLANNING FUNDING--REGIONAL WATER PLANNING--RULES--GUIDELINES.—Subsection C.:
"(5) provide engagement with acequia communities;
(6) provide for the engagement of rural communities;"

SECTION 5. REGIONAL WATER PLANNING ENTITIES.—Subsection C.:
"(4) assist in the funding, development and incorporation of plans for rural communities;"

SECTION 3. CONDEMNATION OF WATER RIGHTS.—"Nothing in the Water Security Planning Act shall be construed as permitting the condemnation of water rights or as determining, abridging or affecting in any way the water rights of water right owners in the state."

Commented [VG7]: The incorporation of this language will meet the following requirements of the **Water Security Planning Act §72-14A-1 et seq., NMSA 1978**:

SECTION 3. CONDEMNATION OF WATER RIGHTS.—"Nothing in the Water Security Planning Act shall be construed as permitting the condemnation of water rights or as determining, abridging or affecting in any way the water rights of water right owners in the state."

Commented [VG8]: This sought outcome will meet the following requirement of the **Water Security Planning Act §72-14A-1 et seq., NMSA 1978** and ensure that the needs of rural communities are not left out:

SECTION 4. WATER PLANNING FUNDING--REGIONAL WATER PLANNING--RULES--GUIDELINES.—Subsection C.:
"(5) provide engagement with acequia communities;
(6) provide for the engagement of rural communities;"

SECTION 5. REGIONAL WATER PLANNING ENTITIES.—Subsection C.:
"(4) assist in the funding, development and incorporation of plans for rural communities;"

or may impact the public of the welfare of the state.

(2) The state engineer shall not be bound by any determination of a Council.

(3) In reviewing applications that implicate a given issue or concern identified by a Council as relating to the public welfare of a water planning region, the state engineer shall explain its reasoning related to such issue or concern if the state engineer determines that it is relevant to the public welfare of the state.

C. Notification of Council's Determination:

(1) When a Council has determined that an issue or concern relates to the public welfare of a water planning region, the Council shall notify the Commission;

(2) The notification shall include the information contained in Subsection A of this Section;

(3) The Commission's staff shall notify the relevant state engineer district office(s) of the Council's determination and shall provide all relevant documentation relating to the determination.

~~x.xx.xx.14~~x.xx.xx.15 PROCEDURE FOR A REGIONAL WATER PLANNING COUNCIL TO CONSIDER PUBLIC WELFARE VALUES AND THE NEEDS OF FUTURE GENERATIONS OF NEW MEXICANS

A. Regional Water Planning Council may consider public welfare values of the water planning region after such values have been determined pursuant to the procedures set forth in Section 12 of this rule.

B. Regional Water Planning Council shall consider the following public welfare values of the state in their regional water planning activities:

(1) The state's ability to meet its obligations under interstate compacts;

(2) The state's ability to comply with the Endangered Species Act, or otherwise prevent significant harm to the habitats of Federal- and State-endangered or -threatened species; ~~and~~

(3) The state's ability to meet the needs of future generations of New Mexicans;

(4) Regional water rights settlements, including tribal water rights settlements and alternative administration plans under the Active Water Resources Management program;~~.~~

(5) The water security of rural and agricultural communities including tribal, Pueblo, acequia, land grant-mercedes, colonias, and other rural communities; and

~~(3)~~(6) The health of watersheds, ecosystems, and hydrological systems that support the viability of both urban and rural communities.

C. Procedure for a Regional Water Planning Council to consider the needs of future generations of New Mexicans:

(1) The Regional Water Planning Council shall use the best science, data and models related to water resource planning and shall use them with scientific integrity and adherence to principles of honesty, objectivity, transparency and professionalism, as specified in NMSA 1978, Section 72-14A-4(C)(7);

(2) Regional Water Planning Council shall utilize such data and models to consider the needs of future generations of New Mexicans in their regional planning activities.

(3) The Regional Water Planning Council shall conduct surveys and collect data from the youth in each region to include their water concerns, needs, wishes, and future ways of life in the planning process.

~~(2)~~(4) The Regional Water Planning Council shall recognize the right of future generations to clean and ample water.

HISTORY OF x.xx.xx NMAC: [RESERVED]

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Commented [VG9]: This additional value is critical to meet the following requirements in the **Water Security Planning Act §72-14A-1 et seq., NMSA 1978** and ensure that the plans are equitable:

SECTION 4. WATER PLANNING FUNDING--REGIONAL WATER PLANNING--RULES--GUIDELINES.—
Subsection B:
"B. The commission shall establish a procedure, in consultation with the Indian affairs department, to establish an advisory council for taking into account in the regional water security program tribal sovereignty, tribal water rights and the water needs of tribal communities."

Subsection C.:
"(4) provide engagement with Indian nations, tribes and pueblos, including through the use of the State-Tribal Collaboration Act;
(5) provide engagement with acequia communities;
(6) provide for the engagement of rural communities;"

SECTION 5. REGIONAL WATER PLANNING ENTITIES.—Subsection C.:
"(4) assist in the funding, development and incorporation of plans for rural communities;"

Commented [VG10]: This additional procedure will provide each council with substantive data to evaluate the needs of future generations of New Mexicans and meet the following requirement of the **Water Security Planning Act §72-14A-1 et seq., NMSA 1978**:

SECTION 4. WATER PLANNING FUNDING--REGIONAL WATER PLANNING--RULES--GUIDELINES.—Subsection C:
"(e) the procedure for a regional water planning entity to consider public welfare values and the needs of future generations of New Mexicans;"

SECTION 5. REGIONAL WATER PLANNING ENTITIES.—Subsection B:
(2) consider public welfare values, ... [2]

Commented [VG11]: This additional procedure will provide each council with the need of future generations to have ample and clean water to prosper in New Mexicans and meet the following requirement of the **Water Security Planning Act §72-14A-1 et seq., NMSA 1978**:

SECTION 4. WATER PLANNING FUNDING--REGIONAL WATER PLANNING--RULES--GUIDELINES.—Subsection C:
"(e) the procedure for a regional water planning entity to consider public welfare values and the needs of future generations of New Mexicans;"

SECTION 5. REGIONAL WATER PLANNING ENTITIES.—Subsection B: ... [3]

Page 3: [1] Commented [VG4] **Vidal Gonzales** **2/14/2025 9:18:00 AM**

Land grant-mercedes are political subdivisions of the State (NMSA 1978, §§ 49-1-1 & 49-4-4, NMSA 1978), with regulatory and protective authority over the common waters of the land grant-merced (NMSA 1978, §§ 49-1-3H(H), 49-1-16, 49-4-5(H), 49-4-17). In addition, land grant-mercedes have authority over land-use, comprehensive planning, zoning, and infrastructure development within their common lands. The twenty-seven land grant-mercedes recognized as political subdivisions of the State, collectively manage over 200,000 acres of land in the watersheds of at least ten counties. Given their local government and land and water management status they should be incorporated into the planning process. Adding representation of land grant-mercedes, encompasses the spirit of the **Water Security Planning Act, §72-14A-1 et seq., NMSA 1978**, specifically sections:

SECTION 4. WATER PLANNING FUNDING--REGIONAL WATER PLANNING--RULES--GUIDELINES.—Subsection C.:
"(6) provide for the engagement of rural communities;"

SECTION 5. REGIONAL WATER PLANNING ENTITIES.—Subsection C:
"(4) assist in the funding, development and incorporation of plans for rural communities;"

Page 7: [2] Commented [VG10] **Vidal Gonzales** **2/14/2025 11:22:00 AM**

This additional procedure will provide each council with substantive data to evaluate the needs of future generations of New Mexicans and meet the following requirement of the **Water Security Planning Act §72-14A-1 et seq., NMSA 1978**:

SECTION 4. WATER PLANNING FUNDING--REGIONAL WATER PLANNING--RULES--GUIDELINES.—Subsection C:
"(e) the procedure for a regional water
planning entity to consider public welfare values and the needs of future generations of New Mexicans;"

SECTION 5. REGIONAL WATER PLANNING ENTITIES.—Subsection B:
(2) consider public welfare values,
balancing water uses and the needs of future generations of New Mexicans;

Page 7: [3] Commented [VG11] **Vidal Gonzales** **2/14/2025 11:29:00 AM**

This additional procedure will provide each council with the need of future generations to have ample and clean water to prosper in New Mexicans and meet the following requirement of the **Water Security Planning Act §72-14A-1 et seq., NMSA 1978**:

SECTION 4. WATER PLANNING FUNDING--REGIONAL WATER PLANNING--RULES--GUIDELINES.—Subsection C:
"(e) the procedure for a regional water
planning entity to consider public welfare values and the needs of future generations of New Mexicans;"

SECTION 5. REGIONAL WATER PLANNING ENTITIES.—Subsection B:
(2) consider public welfare values,
balancing water uses and the needs of future generations of New Mexicans;

AN ACT

RELATING TO WATER PLANNING; ENACTING THE WATER SECURITY PLANNING ACT; AUTHORIZING THE INTERSTATE STREAM COMMISSION TO MAKE LOANS AND GRANTS FOR REGIONAL WATER PLANNING; REQUIRING THE INTERSTATE STREAM COMMISSION TO MAKE RULES AND GUIDELINES FOR REGIONAL WATER PLANNING; PROVIDING DUTIES OF REGIONAL WATER PLANNING ENTITIES; PROTECTING PRIORITY ADMINISTRATION AND WATER RIGHTS OWNERS.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF NEW MEXICO:

SECTION 1. SHORT TITLE.--Sections 1 through 5 of this act may be cited as the "Water Security Planning Act".

SECTION 2. DEFINITION.--As used in the Water Security Planning Act, "commission" means the interstate stream commission.

SECTION 3. CONDEMNATION OF WATER RIGHTS.--Nothing in the Water Security Planning Act shall be construed as permitting the condemnation of water rights or as determining, abridging or affecting in any way the water rights of water right owners in the state.

SECTION 4. WATER PLANNING FUNDING--REGIONAL WATER PLANNING--RULES--GUIDELINES.--

A. Subject to available funding, the commission shall establish and conduct a regional water security program pursuant to the provisions of the Water Security Planning

Act. The commission may make grants or loans of funds for the purpose of regional water planning, as possible, using appropriations made for that purpose.

B. The commission shall establish a procedure, in consultation with the Indian affairs department, to establish an advisory council for taking into account in the regional water security program tribal sovereignty, tribal water rights and the water needs of tribal communities.

C. The commission shall:

(1) promulgate rules that, at a minimum, establish:

(a) the boundaries and number of water planning regions in the state;

(b) the criteria for commission approval of a regional water security plan with prioritized projects, programs and policies;

(c) the procedure for a regional water planning entity to develop and provide notice to the commission of issues and concerns relating to the public welfare of the water planning region;

(d) the composition of a regional water planning entity; and

(e) the procedure for a regional water planning entity to consider public welfare values and the needs of future generations of New Mexicans;

(2) adopt guidelines that, at a minimum, address:

(a) the identification of regional stakeholders and opportunities for stakeholder collaboration;

(b) the public input requirements for regional water planning;

(c) the requirements for a proposal for grants or loans for planning activities;

(d) the process for approval of grants or loans;

(e) the process for state agency collaboration;

(f) the metrics for reporting on regional water projects and, programs and policies;

(g) the procedures to support implementation of a regional water security plan; and

(h) the schedule for implementation of regional water planning, including integration with statewide objectives;

(3) emphasize engagement, communication and education in regional water planning activities statewide;

(4) provide engagement with Indian nations, tribes and pueblos, including through the use of the State-Tribal Collaboration Act;

(5) provide engagement with acequia

communities;

(6) provide for the engagement of rural communities;

(7) ensure, by using the integrated water data and information platform developed pursuant to the Water Data Act and collaborating with the bureau of geology and mineral resources of the New Mexico institute of mining and technology and the water resources research institute, that the best science, data and models relating to water resource planning are available to the regional water planning entities and are used with scientific integrity and adherence to principles of honesty, objectivity, transparency and professionalism in developing, vetting and prioritizing proposals;

(8) report, by October 31 of each year, to the appropriate legislative interim committee dealing with water and natural resources and, by October 31 of each year, distribute the report to the appropriate state agencies dealing with water and natural resources on regional water planning implementation that includes:

(a) approved regional water security plans with prioritized projects, programs and policies for state funding;

(b) outcomes of regional water security plan implementation; and

(c) the status of regional water planning expenditures; and

(9) support regional water planning entities by:

(a) providing technical and local capacity development support, including commission staff and funding;

(b) providing statewide objectives for regional water security plan development, including compliance with interstate compacts, the federal Endangered Species Act of 1973 and congressionally authorized tribal water settlement acts;

(c) supporting the development of a proposal for alternative administration through active water resources management, if prioritized by the region, that may be submitted to the state engineer and affected Indian nations, tribes and pueblos for approval; and

(d) identifying funding sources and supporting the acquisition of funds for implementation of approved regional water security plans.

SECTION 5. REGIONAL WATER PLANNING ENTITIES.--

A. An entity shall not be made a part of a proposal for planning funds under this section without that entity's consent.

B. The outcomes sought by each regional water

planning entity shall:

(1) be established through broad public input;

(2) consider public welfare values, balancing water uses and the needs of future generations of New Mexicans;

(3) be grounded in state water law;

(4) be developed using the best available science;

(5) recognize and respect federally recognized or reserved tribal water rights;

(6) consider access to water for domestic use; and

(7) comply with applicable federal water law.

C. Each regional water planning entity shall:

(1) be composed of regional stakeholders as identified in the entity's guidelines;

(2) ensure opportunities for participation by Indian nations, tribes or pueblos located within the water planning region;

(3) obtain public input in the development, vetting and prioritization of regional water planning activities and proposals;

(4) assist in the funding, development and

incorporation of plans for rural communities;

(5) report to the commission by June 30 of each year on the progress of planning activities and outcomes of regional water security plan implementation; and

(6) review existing water plans and data sets of municipalities, counties and other entities within the water planning region and use them as appropriate.

SECTION 6. Section 72-14-44 NMSA 1978 (being Laws 1987, Chapter 182, Section 2) is amended to read:

"72-14-44. INTERSTATE STREAM COMMISSION--GROUNDWATER APPROPRIATION--WATER RIGHTS PURCHASE.--

A. The interstate stream commission is authorized to appropriate groundwater or purchase water rights on behalf of any of the various regions of the state.

B. Nothing in this section shall be construed as permitting the condemnation of water rights or as determining, abridging or affecting in any way the water rights of Indian nations, tribes or pueblos".

General comment:

Both the draft rule and guidelines need to be revised to make it clear what elements are required in water plans, at a minimum, to help guide the planning councils and to ensure equity in planning across the state. While it is important that there is flexibility in the rule and guideline for regions to create plans that are specific to their communities and water balance, there are certain elements that will need to be standard across the state, none of which are clear from the draft documents. Additionally, it is not clear from either the rule or guidelines how plans will be evaluated by NMISC and determined to be acceptable for approval.

The combination of lack of structure and plan requirements combined with the list of council members almost guarantees the plans will not be completed in two years. It would be beneficial to look at how to engage as many voices as possible without giving all voices a formal vote in the council. For example, establishing subcommittees that can generate recommendations to the council would be an effective way to ensure voices are heard and that information is being considered.

To create the New Mexico's regional water security planning program as a powerful tool for solving water challenges, regional water security planning must be structured around the following core principles.

1. **Water Resource Planning Is a Tool for Solving Water Problems**

🔹 Water planning should be structured around identifying and solving water problems.

✅ Clearly define the core water problems that regional planning must address—such as water overuse, climate-driven scarcity, aquifer depletion, and long-term sustainability.
✅ Require regional plans to develop, compare, and prioritize alternative solutions, rather than just listing projects.
✅ Emphasize adaptive decision-making that allows regions to revise strategies as water conditions change.

2. **Data-Driven Problem Definition Before Intensive Planning**

🔹 Water planning should not begin as an expensive, time-intensive process until the region's water problems are clearly defined using data.

✅ Require an initial problem-definition phase based on scientific, hydrologic, and economic data before launching full-scale planning efforts.
✅ Ensure that regional planning processes begin with a shared fact base, reducing confusion, inefficiency, and unproductive debates.
✅ Structure planning timelines to allow for early-stage data collection and assessment, so that stakeholders engage meaningfully once problems are well-defined.

3. **Water Planning Must Balance Legal Water Rights with Water Supply Protection**

🔹 Regional water security planning must explicitly balance the strong legal protections for the right to use water with the need to protect the water supply itself.

✅ Require explicit water balance evaluations that consider how water availability, climate change, and usage patterns affect long-term supply.
✅ Ensure that regional plans consider and evaluate the public welfare of the region, the needs of future generations of New Mexicans, equitable access to safe water, and the economic and environmental trade-offs of different water management choices.
✅ Enable regions to tailor solutions to their unique hydrologic, economic, and environmental conditions while ensuring that long-term sustainability is a core consideration.
✅ Require that regional plans include climate resilience measures that protect both the physical availability of water resources and users' rights.

4. **Water Planning Must Be Grounded in Science and Holistic Analysis**

🔹 Planning efforts must be based on the best available data while also supporting the development of new scientific and hydrologic information where data gaps exist.

✅ Require standardized scientific methodologies—such as water balance models, scenario planning, and risk assessments—to guide regional water security planning.

✅ Require that regional plans analyze the effects of continuing status quo water management and identify the specific actions needed to secure water for future generations of New Mexicans.
✅ Cumulative impacts of proposed projects should be evaluated holistically, ensuring that regional plans account for interconnected effects across communities and water use sectors.
✅ Ensure that data collection and analysis remain independent from political pressures, protecting the integrity of scientific assessments.
✅ Require that each proposed project, program, or policy is vetted for feasibility and that costs and projected water savings are developed for those that pass initial review, ensuring that scenario analysis is based on realistic options.

5. **Water Planning Must Be Efficient, Practical, and Actionable**

🔹 Regional planning should focus on producing clear, actionable solutions, rather than getting lost in bureaucratic complexity.

✅ Ensure that regional councils are structured efficiently, balancing broad representation with practical decision-making capacity.
✅ Ensure that each regional council has qualified leadership and the necessary resources to conduct and manage the water planning process effectively.
✅ Planning timelines must be realistic and structured, preventing unnecessary delays while allowing for thorough problem and solution analyses.

6. **Water Planning Must Engage Stakeholders Meaningfully, Not Just Formally**

🔹 Public participation should be structured to ensure that engagement is productive, inclusive, and directly informs decision-making.

✅ Equip regional councils with the resources and strategies needed to engage local communities effectively in the planning process.
✅ Ensure that public input is meaningfully incorporated into planning decisions, with clear mechanisms for responding to concerns and adapting plans based on stakeholder feedback.
✅ Adopt transparent and fair decision-making processes to balance competing water interests while maintaining accountability.

7. **Water Planning Must Be Well-Funded and Supported for Implementation**

🔹 The ISC's rulemaking and implementation approach should be proactive and well-funded, ensuring that planning efforts are not constrained by a lack of resources or political hesitation.

✅ Ensure dedicated funding streams for both planning and implementation, so that well-developed plans do not languish without action.
✅ Require regional councils and the ISC to establish clear pathways for implementation, including funding mechanisms, monitoring requirements, and accountability measures to track progress.
✅ Ensure that statewide objectives lead to solutions that comply with planning law and effectively support both statewide and regional water security needs.

Final Takeaway:

A successful regional water security planning process must go beyond bureaucratic compliance to serve as a problem-solving tool that applies the facts, the law, human creativity and community, and stakeholder input to ensure long-term water security. The NMISC Rules & Guidelines should be revised to explicitly incorporate these principles, ensuring that New Mexico's approach to water planning is efficient, actionable, and capable of addressing the state's most pressing water challenges.

ANDREW ERDMANN
WATER PLANNING PROGRAM MANAGER
INTERSTATE STREAM COMMISSION

RE: Discussion Draft of Rules & Guidelines to implement WSPA

Dear Andrew,

Thank you and your staff for all your hard work developing the draft Rules & Guidelines. You have done a good job setting the parameters and proposing "guard rails" for regional water planning which is sure to be a challenging and complex process.

I am responding as a (retired) professional mediator, and designer and facilitator of large multi-stakeholder collaboratives. I am no longer on New Mexico Water Advocates Board of Directors. I am now serving as an unofficial process observer for the Board and some of the committees.

The opportunity before us offers a once in a lifetime chance to make a significant contribution to the future well-being of NM. With a plan that supports the development of a resilient and sustainable water supply for each of the nine regions, New Mexico can move forward with addressing some of the other challenging resource management problems arising with and pursuant to emerging climate disruptions.

I write this letter to emphasize the critical importance of ISC supporting skillful dialogue decision making among all the regional stakeholders. A foundational element of success will be the development of trust and mutual respect among participants in all nine regions. At some point a list of prioritized potential water management projects will constitute one key element of an effective, comprehensive program. That said, the ability of any group to achieve such a milestone will be contingent on their ability to acknowledge mutual and competing interests, and seek the highest possible degree of alignment moving forward.

Because the Rules and Guidelines offer a high level /birds-eye view of the project it is not feasible/realistic at this time for me to dive into a detailed presentation on what an effective process might look. Which is OK -we're not there yet! That said, in a perfect world, regional stakeholders will be engaged in developing and committing to a *process for developing and implementing regional water management that works for them*. It is essential that they be provided with the professional support necessary to do so.

That said, because we are early in the process I offer just this comment: One of the hallmark manifestations of effective process – making decisions by consensus – appears several times in the Rules and Guidelines. By which I understand you mean full consensus or unanimous consensus. On the surface, yes indeed – reaching consensus is be a powerful arrow in the quiver of process tools.

However, there is not just one form of consensus. There are various forms of modified consensus, the parameters of which are determined by the participants. Many groups that practice consensus decision making do not use unanimity as their decision for reaching closure. Some use "unanimity minus one," others adopt 80% as an acceptable level of agreement. All

such groups see themselves as sincere practitioners of consensus decision making. Hallmarks include that no single member has personal veto power, but also that individual voices wield significant influence – enough to ensure that the group will engage in a genuine process of thinking and feeling together. This principle (restated) comes from the [Facilitator's Guide to Participatory Decision-Making, produced and published by **Community at Work 2014**].

In brief, I am suggesting that it might be helpful, at this time, to introduce people to the concept of modified consensus. As stakeholders in the regions become accustomed to this possibility, the form of consensus becomes a decision on the menu of choices that they will be empowered to make together.

I appreciate all the work you, Sara and your team have done in support of a better water future for New Mexico. I look forward to witnessing the evolution of this fundamentally game-changing project and hope I may be able to support ISC as it moves forward.

I hope you will accept the spirit in which these thoughts are offered.

Best regards,

Laurie McCann
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Claunch-Pinto
SOIL & WATER CONSERVATION DISTRICT
PO Box 129, Mountainair, NM 87036 Ph: 505-847-2372/505-847-2243

February 21, 2025

Andrew Erdmann
Water Planning Program Manager
Interstate Stream Commission
PO Box 25102
Santa Fe, NM 87504-5102

Re: Water Planning Region Evaluation

Dear Mr. Erdmann,

The Claunch-Pinto Soil and Water Conservation District (district) is writing on behalf of the Estancia Basin Water Planning Committee (EBWPC). We would like to provide feedback on the New Mexico Water Security Planning Act Draft Rule and Guidelines.

The EBWPC was established in 1995 to provide local leadership for regional water planning. Claunch-Pinto Soil and Water Conservation District has had a representative on this committee since its inception. The EBWPC has met on a regular basin since 1995 participating in three rounds of regional water planning efforts.

The district supports the refined basin boundaries based upon hydrological rather than political boundaries. We appreciate the efforts of the ISC to broaden and strengthen local networks and develop new opportunities for funding water management at the local level. The district is looking forward to participating in four of the new councils (Middle Rio Grande Council, Proposed Estancia Council, Central Basin Council and the Pecos Council) proposed by the ISC. The district supports the EBWPC's request that the Estancia Basin remain separated from other closed basins to our south, rather than becoming part of the Central Basin Council. Wrapping the Estancia Basin into the proposed Central Basin would be detrimental to the long-term regional water planning process that has already been established in the Estancia Basin for the past thirty years.

The EBWPC has gained significant ground in co-managing the limited groundwater resources of the Estancia Basin over our 30-year history. The district appreciates your consideration of the EBWPC history and progress as you evaluate the draft rule.

Respectfully,
Felipe Lovato
Felipe Lovato
Chairman
Claunch-Pinto Soil and Water Conservation District

Approaches to Planning Water Resources

Jay R. Lund, Dist.M.ASCE[1]

Abstract: Water resource problems and management are complex, confusing, and controversial for participants in technical, policy, and public water deliberations. A thoughtful planning approach can reduce confusion and structure controversies. This paper attempts to summarize and organize various technical approaches to water resources planning. This paper summarizes the basic approach of rational planning, followed by brief reviews of requirements-based, benefit-cost-based, multiobjective, conflict resolution, market-based, and muddling through approaches to planning. Each approach has particular advantages and disadvantages for specific situations. Each approach also has somewhat different policy expectations and analytical requirements. These approaches are discussed in terms of practical contributions to addressing water problems in contemporary contexts, particularly for messy long-term regional water issues. **DOI: 10.1061/(ASCE)WR.1943-5452.0001417.**

Introduction

There have been many sage observations on the nature of planning, "We plan, God laughs."–Old Yiddish Proverb (Hirsch 2009); "Everyone has a plan until they get punched in the mouth."–Mike Tyson (1996; Berardino 2012); and "Plans are nothing, but planning is everything."–Dwight Eisenhower (1950) (quoting Prussian general von Moltke 1871; Dupuy 1984).

Water resources planning is an ancient problem, dating back to flood control and water supply activities of the earliest civilizations. The success of most civilizations has rested, in part, on their ability to manage water (China, Indus, Europe, South and Central America) (Mithen 2012). The demise of several civilizations has been traced directly to failed regional water management (Peru, Mesopotamia) (Artzy and Hillel 1988; Ortloff et al. 1985). In the United States, water resource planning has evolved historically with changing economic and political circumstances (White 1969; Shad 1979; Kelley 1989; Lund et al. 2018; Pinter et al. 2019). Quantitative analysis and even economic thinking in water planning date at least to Roman times [Frontinus 97 AD (Frontinus 1973); Leveau 1993] and has been vital to successful water management in modern times, being more formalized by early 19th century French engineers (Ekelund and Hébert 1999; Morgan 1951). The lack of planning or poor planning often are blamed for continued controversies, expense, and inefficiencies in water management (Sheer 2010). The complexity and controversy of water problems should lead water planners and policy makers to seek fundamental principles and approaches for organizing the technical aspects of preparing solutions, even in unavoidably political contexts. This paper attempts to introduce, summarize, and organize a range of planning approaches often seen or advocated for water planning. Even in the common case where plans are not implemented, planning can inform, improve, and help frame longer-term policy and technical discussions of difficult and controversial water problems as they and their political context continue to evolve.

The paper begins with a review of rational planning, the fundamental process aspired to by most planning efforts. This is followed by a review of various technical approaches common or commonly discussed for water resources planning. Practical problems for effectively completing planning processes are then reviewed. In light of these practical problems of water management, some realistic and limited objectives are suggested for water resources plans. Finally, analytical and organizational aspects for each planning approach are compared, and conclusions are suggested for contemporary water problems.

Rational Planning

Rational planning is a systematic procedure for making near-term decisions for problems. Many have written about rational planning for water resource problems (Holmes and Wolman 2001; Yoe and Orth 1996; Orth and Yoe 1996; US WRC 1983; White 1966). Rational planning ideas have been employed in some of history's most innovative water projects (Morgan 1951). Thoughts on planning for water are closely related to work on urban, regional, landscape, and environmental planning problems (Meyerson and Banfield 1955; Briassoulis 1989) and more general rational or smart decision making (Simon 1947; Hammond et al. 1999). Although substantial differences exist in the methods and approaches suggested across authors, there is an essential procedural similarity. Rational approaches share a largely sequential rational planning thought process for both individual and group decision contexts.

All forms of rational planning take some variant of the rough series of steps summarized in Fig. 1. These steps are usually, but not always, sequential; steps often are revisited as a result of technical or stakeholder feedback, new information, or changing events. Nevertheless, the general direction and order of the planning effort remain the same. Steps 4, 5, and 7 have special importance. Statement of objectives, followed by identification of solution alternatives and evaluation of alternatives on stated objectives are the core of rational planning. This reduced set of steps parallels more formal and mathematical definitions of rationality and mathematical optimization (Von Neumann and Morgenstern 1944; Tribus 1969; Hillier and Lieberman 1995).

Limitations of rational planning are evident (Banfield 1959; Simon 1947; Braybrooke and Lindblom 1970). It is often difficult

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Figure 1: An Outline of Rational Planning (* = most fundamental steps)

Step 1. Statement of Problem: John Dewey said, "A problem well stated is a problem half solved." Early in rational planning, the problem should be firmly defined, stating people's concerns and plan motivation.

Step 2. Inventory/Background: What is known about the problem and the problem-setting? What has been learned already? How have earlier attempts to solve similar problems fared?

Step 3. Forecasting: The lifetime of most water problems and solutions is very long, far longer than the careers of individual policy-makers, engineers, and planners. Forecasts of demands and related conditions estimate how the problem and problem setting are likely to change over the life of proposed solutions. Uncertainty and inaccuracy in forecasts is unavoidable.

***Step 4. Statement of Performance Objectives**: What makes a proposed solution "good" or desirable? Performance objectives can be economic, financial, environmental, social, or the reliability of achieving technical standards. Planners and stakeholder representatives typically define performance objectives.

***Step 5. Identification of Alternative Solutions**: What actions are available to solve the problem (including doing nothing)? Alternatives should be mostly reasonable, represent a wide range of activities for solving the problem, and come from a variety of sources. Past experience with similar problems is helpful, as is more academic and creative thinking. Public participation and preliminary modeling often aid in identifying promising or politically important alternatives.

Step 6. Development of Alternatives: Time and resources prohibit examining "all possible alternatives." A limited number of promising alternatives are developed in sufficient detail for evaluation on performance objectives (the next step). Discussions with stakeholders and preliminary modeling often help screen, narrow, and refine alternatives.

***Step 7. Evaluation of Alternatives on Stated Objectives**: Each developed alternative is evaluated in terms of expected performance on each stated objective (e.g., economic, financial, environmental, social, risk, technical standards, etc.). This is typically the most analytical step and can include consideration of reliability and uncertainties. Interpretation and sensitivity analysis are desirable parts of the evaluation.

Step 8. Selection of a "Best" Alternative(s). The "best" alternative is selected based on evaluations from Step 7 and relevant stakeholder, policy, and public consultations or processes. "The plan" consists of the write-up of steps 1-8, with particular emphasis on presenting the selected alternative(s). Selection often involves multiple objectives and decision-makers, and can occur adaptively in stages over time.

Step 9. Implementation and Pragmatic Revisions of the Selected Alternative(s). Implementation often requires substantial modification and adaptation of a selected alternative. Practical considerations arise regarding political and institutional support, financial support, construction, operation, and ultimately closure or replacement over an alternative's lifespan.

Step 10. Periodic Re-Examination: For the next problem, did we learn anything from this experience? How could we have improved our work?

Fig. 1. An outline of rational planning.

or impossible for policy makers and stakeholders to clearly state their objectives in quantifiable ways, particularly for objectives involving reliability and risks. In its idealized form, the identification and comparison of all possible alternatives on all relevant objectives are clearly impossible in practice (such efforts usually serve those seeking to preserve the *status quo*). Only a limited number of alternatives can ever be identified, much less developed into a form that allows comparison of alternatives (even with computers). In analysis, evaluations contain uncertain assumptions and unavoidable simplifications. Ultimately, any analysis must serve an institutional or political framework that works, however slowly, to make decisions on the best solution.

The strengths of rational planning are its relative transparency, logic, and the considerable lack of other technical approaches for making better decisions. Many variations for implementing rational planning have arisen to help respond to specific circumstances. Often, planning's greatest contribution to problem-solving is the structure and systematic approach it imposes on information-gathering, deliberation, and decision making, especially for groups. Without such a structured approach, the complexity of water resource problems often leads to levels of confusion that contribute to controversy and policy paralysis. For application, both rational planning variations and nonrational alternatives to planning should be compared based on how well they might satisfy policy objectives.

Approaches to Water Planning

This section reviews six major approaches for water planning, most of which are variants of rational planning. Each approach addresses technical aspects of water problems within a decision making context. The political decision making context of a water problem can be more important than its technical aspects for determining the success of a particular planning approach. Indeed, as discussed later, political circumstances often greatly limit the practical potential of any planning effort. These six basic approaches are presented in a rough order of their historical formalization for modern applications:

1. Requirements-based planning,
2. Benefit-cost-based planning,
3. Multiobjective planning,
4. Conflict resolution planning,
5. Market-based planning, and
6. Muddling through.

For each approach to planning, the following aspects are discussed, (1) history, (2) methods, analysis, use of models, (3) data and computational requirements, (4) role of public participation, (5) how it helps decision makers, and (6) circumstances when it seems more likely to succeed or fail.

Requirements-Based Planning

Sometimes referred to as "project and provide," requirements-based planning is a traditional approach to formulating engineering problems. First, define functional specifications that the system must satisfy, often with appropriate factors of safety. Then, design (plan), build, and operate the system to meet these requirements (or loads) at the lowest cost or with the greatest reliability for a given budget (Suh 1990). An outstanding characteristic of requirements-based planning for water resources is that it typically assumes given and fixed demands and limits planning to "supply-side" options. This is reasonable when demands are outside the control of the planner or of such great importance that the costs of meeting demands are less than the costs of any water shortages or demand reductions.

The history, practicality, and method of requirements-based water resources planning are exemplified by the classical Rippl method (1883) for reservoir sizing. Here, future use of water is estimated from forecasting and is assumed fixed. The size of the supply is then determined by finding the reservoir size or combination of water sources that would always meet this demand with a repeat of the historical streamflow record. The sum of water supplies must always meet or exceed forecast use. This so-called "firm yield" approach to water planning has dominated water planning until recent decades when the costs of providing supply reliability often have grown to exceed the costs of reducing water use and the environmental costs of water supplies have become increasingly valued.

Requirements-based planning is very effective and appropriate for many water system components (e.g., pump stations, distribution lines, and local drainage). For these components, performance expectations are relatively fixed and standardized, and more detailed planning analysis might be too expensive relative to potential resulting improvements. However, for large strategic components and overall system planning, requirements-based approaches often result in controversial and overly expensive solutions and can neglect important external costs of water supplies and demand, such as environmental consequences.

Benefit-Cost-Based Planning

Benefit-cost analysis attempts to consolidate the many supply, demand, and other impacts of each alternative into monetary benefits and costs. The 1936 federal Flood Control Act neatly summarizes the germ of benefit-cost analysis, that a proposed project should have "benefits to whomsoever they may accrue . . . in excess of the estimated costs." Since this time, benefit-cost analysis has expanded steadily beyond flood control to include greater varieties of water uses and impacts (Griffin 1998; Russell et al. 1970; Howe 1971; James and Lee 1971; Jenkins and Lund 2000; US WRC 1983; Boardman et al. 1996). Flood control, navigation, water supply, hydropower, recreation, and even some environmental water uses are routinely included in benefit-cost analyses (Loomis 1987). The limitations of benefit-cost analysis are well known, including monetizing all effects of alternatives, selecting discount rates, incorporating social equity, and representing risk preferences. Nevertheless, its application has helped eliminate unworthy projects, justify worthy ones, and raise the quality of discussion for ambiguous cases. Benefit-cost analysis has strong technical aspects, including a broad and potentially rigorous integrating economic perspective with abilities to incorporate variability, reliability, and uncertainty, usually as averages or probability distributions of economic values.

Multiobjective Planning

In reaction to the narrow economic focus of benefit-cost evaluations, multiobjective approaches to planning attempt to display to decision makers the trade-offs inherent in selecting alternatives where all objectives cannot be measured in the same units (US WRC 1983; Cohon 1977; Cohon and Marks 1975). Such a trade-off display appears in Fig. 2, separating Pareto-optimal alternatives that represent efficient trade-offs from inferior alternatives. Tables are often used to help sort better from inferior alternatives where there are more than two objectives. Some authors attempt to go beyond the development and display of efficient trade-offs to propose rational bases for making decisions with these trade-offs identifying optimal solutions through multidimensional concepts of utility (Keeney and Howard 1976; Haimes and Warren 1974).

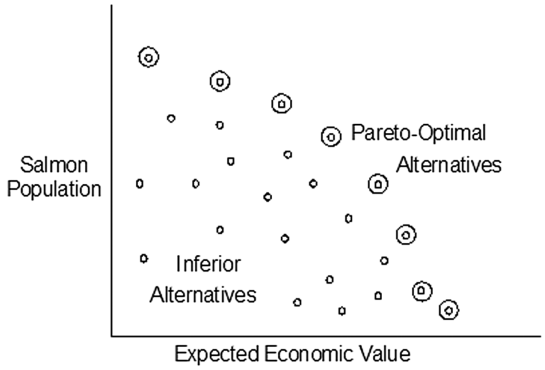

Fig. 2. Multiobjective trade-off plot.

While the analysis approach of multiobjective planning can eliminate technically "inferior" solutions efficiently, the approach typically lacks a formal way for balancing trade-offs to identify a most desirable alternative from many "Pareto-optimal" solutions (Fig. 2). Thus, in practice, for multiple stakeholder problems, multiobjective planning is limited to informing decision makers or stakeholders on the relevant trade-offs involved in their decisions or to helping identify promising alternatives that satisfy a range of likely objective weights (Brill et al. 1982). Difficulties visualizing or communicating trade-offs among more than a few objectives often hamper the practical value of multiobjective methods. Where the water resource problem involves fundamental political conflicts among objectives, multiobjective analysis cannot resolve those conflicts but can make them clearer and easier to discuss (Kasprzyk et al. 2012).

Planning to Resolve Conflicts

Conflicts among equals bring both awkwardness and opportunities, as in the anonymous saying, "Don't walk in front of me, I may not follow. Don't walk behind me, I may not lead. Walk beside me and be my friend." Planning to resolve conflicts differs fundamentally from other planning settings. The objective is to create a process where groups with conflicting objectives can discuss or negotiate a common plan or strategy, often in the context of permitting or permit negotiations. In most conflict settings, planning occurs in a political environment where parties have alternatives to participating in a formal planning process, posing a constant threat to such processes (Madani 2010). Several forms of conflict resolution-based planning have emerged to respond to the common difficulties of planning in many institutional and political situations (Viessman and Smerton 1990; Delli Priscoli 1990). These approaches typically emphasize the need of various parties or stakeholders to communicate, understand, negotiate, and ideally agree as necessary conditions for any solution to be accepted politically (Raiffa 1982). Considerable focus, effort, and time can be required to establish broad confidence and communication in both technical and policy-making processes in developing and implementing solutions.

Conflict resolution-based planning typically gages its success based on how well a consensus solution is achieved and may be less concerned with the Pareto-optimal rationality of a solution. Any plan agreed upon by the diverse stakeholders is generally considered a good plan. While consensus-based conflict-resolution processes appear to be useful, they have been far from universally successful, perhaps because such problems are tremendously messy and difficult (Walters 1997). Conflict resolution is often a long process and consensus is often difficult when numerous diverse and competing interests have a history of conflict and distrust within an unstable political context and changes in individual representation. Where decision making authority is highly decentralized, incentives or threats from outsiders are usually required, such as promises of federal or state funding or credible threats of regulatory or court action. Even where formally unsuccessful, such processes can serve an important long-term role in improving communications, information, and other conditions needed to work on solutions in the future.

Three broad categories of these still-developing planning approaches are summarized as follows.

Adaptive Management

Adaptive management is an old concept, "It is a bad plan that cannot be changed." Publilius Syrus, *Sententiae* (c. 43 BC) (Publilius, n.d.). Adaptive environmental management was first proposed in the late 1970s by a group of ecologists (Holling 1978; Walters and Holling 1990; Walters 1997; Walters and Green 1997; McLain and Lee 1996). The objective was to support ongoing environmental management with consideration of uncertainties and incorporating an ability to change management of a system as more was learned of the system's behavior and response to management. An original tenet of this school of thought is that computer modeling has a central role in synthesizing knowledge of environmental problems, integrating new knowledge of the problem, and developing updated promising management strategies. In adaptive management, the development of computer models is a collaborative exercise among different disciplines and stakeholders. The intent of modeling is to aid in developing and negotiating management alternatives, with both management and model-represented understanding adapting to new information over long periods of time, and to use modeling to design management experiments. The approach has had mixed success (Walters 1997; Lee 1999; Richards and Rago 1999).

Shared Vision Planning

A similar approach is commonly advocated by water resources engineers, often called "shared vision planning" (USACE 2007; Palmer, et al. 2013; Keyes and Palmer 1995; Werrick and Whipple 1994; Reitsma et al. 1996). This approach uses a group of stakeholders and technical experts to develop a computer model to represent a common understanding of the problem and develop, quantitatively compare, and negotiate potential solutions. Shared vision planning makes a greater effort at placing the modeling within a more traditional rational planning process with extensive facilitated public participation, merging aspects of rational planning and multiobjective analysis with aspects of facilitated conflict resolution processes (Imwiko et al. 2007; Sheer et al. 2013). The approach is a modern expression of ideas for planning large complex systems with public transparency and participation (Geddes 1915).

"Watershed" Planning

"Watershed planning" has been widely advocated by federal, state, and local agencies though with less formal guidance of how it should be done (Kenney 1999; Gelt 1998; Duram and Brown 1999). This concept differs fundamentally from long-standing ideas of relatively centralized planning for water at a watershed scale (White 1969; Goodman 1984). The most common tenets of current usage of "watershed planning" are that all stakeholders in the watershed should be involved in discussions of its management, all aspects of water quality and quantity in the watershed should be considered, and that the parties should have great flexibility in arriving at a consensus solution. The emphasis is on developing consensus-based water plans, involving all major stakeholders and agencies. As with adaptive management and shared vision planning, mutual education among parties and stakeholders is a major aspect of watershed planning, although documentation of understanding is less explicit and quantitatively integrated. Watershed planning seems to be more successful where there is a balance between expectations and resources/funding, effective leadership and management, interpersonal trust, committed participants, and a flexible and informal structure (Leach and Pelkey 2001). A relatively formalized and comprehensive application of watershed planning principles is the Texas water plan, with watershed plans for 16 regions of Texas, supported by an extensive technical and modeling program (TWDB 2002).

A common problem with all forms of consensus-based planning for conflict resolution, especially its adaptive management forms, is the need for extended studies, funding, and attention from parties involved. While the exchange of ideas in these processes can produce valuable results, the long time frame often causes many good efforts to lapse due to budgetary variability, management and personnel transitions, and short attention spans at funding, managerial, and political levels.

For controversial systems with de-centralized decision authority, conflict resolution approaches are sometimes the only approaches political authorities can support. Any positive results from a conflict resolution process are likely to be welcomed by an agency and political leaders seeking to make an improvement with minimal controversy. Without proper political conditions, consensus-based approaches are often less effective for ecosystem management than traditional agency-led approaches (Layzer 2012).

It is sometimes said, (1) If you want to go fast, go alone. (2) If you want to go far, go together. (3) If you want to go nowhere, #2 is your best excuse. Going forward is always messy. Going nowhere is easy, and change requires the right political conditions, which are often slow to develop. Sometimes floods, droughts, lawsuits, or other catalysts are needed to provide a political focus for change (Pinter et al. 2019).

Market-Based Planning

Markets provide an alternative to government planning: "The real question of government versus private enterprise is argued on too philosophical and abstract a basis. Theoretically, planning may be good. But nobody has ever figured out the cause of government stupidity—and until they do (and find the cure), all ideal plans will fall into quicksand." - Richard Feynman, 1963 letter to his wife Gweneth, written while attending a conference in Communist-era Warsaw in *What Do You Care What Other People Think* (pp. 90–91, 1988).

Markets are a decentralized form of planning, which can accomplish planning objectives very effectively in some circumstances (von Hayek 1945; Alchian 1950). Markets, negotiated contracts, and exchanges have long been important components of water planning, providing flexibility at local scales to adapt to short-term hydrologic, economic, and water demand variability. In recent decades, the use of water and infrastructure markets and negotiated exchanges has received increased interest and application to provide short and long-term flexibility in water planning, allocations, and operations (Lund and Israel 1995). Market-based planning often includes water contracts, markets for spot, dry-year, or

permanent water transfers, transferable discharge permits, or privatization of facilities or operations. Water markets can be exclusively among public agencies or districts or involve individual farmers and water users. In addition to facilitating efficient and flexible operations, markets also provide financial incentives to adapt management policies to hydrologic and economic conditions. In California, water markets have provided incentives for local agencies in diverse parts of the state to sponsor conjunctive use and water conservation programs that would not have occurred without the financial incentives of water markets (Pulido-Velázquez et al. 2004).

Voluntary agreements as a market framework can extend beyond water allocations to include compensations for other changes in operations that resolve conflicts (Coase 1960). Examples include downstream flood beneficiaries pay to replace any water supplies lost from lower flood season reservoir levels, as occurs with Folsom Reservoir in California, and the purchase of flooding easements on agricultural lands in flood bypasses.

There are obvious limits and disadvantages of market-based solutions to public resource problems. The assignment and accounting of rights and real water, third-party and externality effects, and other classical market imperfections all pose problems. Nevertheless, markets are often helpful and efficient components in water and environmental management (Anon 1995; Howe et al. 1986; Eheart and Lyon 1983).

"Muddling Through"

Sometimes being incrementally opportunistic is all that can be done, "You cannot control the winds . . . But when the favoring wind comes it is your own fault if you do not set your sails to meet it." A. B. Kendig (1876). Political and economic circumstances often do not support long-term plans that recommend major changes. When the political situation does not support long-term planning, it is often more effective for planning efforts to seek small short-term improvements in a desirable long-term direction. This approach is sometimes called disjoint incrementalism or "muddling through" (Lindblom 1959, 1979; Braybrooke and Lindblom 1970). Often, plans developed with the intent of following other planning approaches end up merely contributing to "muddling through." Numerous advantages have been ascribed to incremental actions and alternative evaluations in a pluralistic political environment (Braybrooke and Lindblom 1970), including improved responsiveness to perceived problems, ability to identify important consequences, and diffusion of decision and evaluation responsibilities. In this situation, a series of incremental decisions often can achieve more faster than more ideal formal plans (Connors 2005).

Comparison of Approaches

While exposition requires making distinctions among major approaches to planning, actual planning often reflects several approaches. Real planning situations often require an artful mix of approaches tailored to achieve practical political, technical, and legal objectives through practical political and technical means. Table 1 is a summary comparison of water planning approaches in terms of the three most fundamental steps of rational planning. Each approach reviewed employs rational planning core ideas in different ways. Requirements-based, benefit-cost, and multiobjective approaches apply rational planning methods most directly for settings with a more centralized and formal decision process. However, where centralized processes are unavailable politically, conflict resolution, market, and muddling through approaches each seek to accomplish similar rational planning objectives through different means.

Practical Problems

"Planning is an unnatural process; it is much more fun to do something. The nicest thing about not planning is that failure comes as a complete surprise, rather than being preceded by a period of worry and depression." - Sir John Harvey-Jones (1992). The problems of planning are not restricted to water resource systems but are common for urban and other infrastructure systems (Wildavsky 1973) as well as other problems, even robot control systems (Agre and Chapman 1990). The practical problems of planning often govern which approaches can or should be taken for a particular situation. Some major practical problems are discussed in the following sections.

Conflicting Water Uses and Objectives

Conflict among uses and users of water is common in water planning. Various agricultural and urban water supply, environmental uses, flood control, hydropower, recreation, and other uses all

Table 1. Rational aspects of common water planning approaches

Planning approach	Performance objectives	Alternative identification	Performance evaluation
1. Requirements-based	Cost and simple technical performance standards	Alternatives suggested by experts, stakeholders, or technical studies	Cost-effectiveness
2. Benefit-cost-based	Net economic or financial benefits for owner, region, or nation	Alternatives suggested by experts, stakeholders, or technical studies	Benefit-cost analysis, perhaps including uncertainty & variability
3. Multiobjective	Quantifiable objectives specified by decision makers or stakeholders	Alternatives suggested by experts, stakeholders, or technical studies	Reduce alternatives to the Pareto-optimal set
4a. Conflict resolution: Adaptive management	Mostly quantifiable objectives specified by decision makers or stakeholders	Alternatives suggested by experts, stakeholders, or technical studies	Empirical and model evaluations, with committee decisions and long-term efforts to adapt, monitor, and narrow uncertainties
4b. Conflict resolution: Shared vision	Mostly quantifiable objectives specified by stakeholders	Alternatives suggested by stakeholders and sometimes experts	Model evaluations and comparisons of alternatives with negotiated selections
4c. Conflict resolution: "Watershed Planning"	Objectives stated by decision makers or stakeholders	Alternatives suggested by stakeholders and sometimes by experts	Little or no formal evaluation
5. Market-based	Each party has its own objective(s), not necessarily revealed	Alternatives identified by parties to the market individually	Each party evaluates alternatives individually and privately; unsuitable alternatives rejected in market
6. Muddling through	Only limited objectives and expectations	Only easily implemented alternatives considered	Only simple and expedient evaluation of alternatives

Table 2. Planning approaches and conflict, authority, and integration

Planning approach	Conflicting uses, users, and objectives	Limited authority to implement plans	Integrating local, regional, & state plans
1. Requirements-based	Requirements must be established first	Requires consensus on "requirements"	Requires larger framework
2. Benefit-cost-based	Economic valuation mediates conflicts	Requires agreement on economic evaluation	Explicit in economic analysis
3. Multiobjective	Conflicts presented as trade-offs	Authority absent to select the final plan	Difficult, negotiated
4. Conflict resolution	Negotiation is the planning process	Negotiation among limited authorities	Difficult, negotiated
5. Market-based	Market mediates conflicts	Market forces overcome limited authorities	Implicit with market prices, relatively easy
6. Muddling through	Conflicts avoided whenever possible	Only plan within limited authorities	Usually not attempted explicitly

compete in economic, legal, and political forums over the management of water at local, regional, state, national, and international levels. Even within each common water use, individual users or user groups often disagree on allocations of water, financial costs, and environmental impacts. Table 2 compares how each planning approach addresses conflicts over water use objectives. Where conflicts are least intense, requirements-based, benefit-cost, and multiobjective approaches are suitable, as they allow for a very direct and technical analysis of more focused problems. With greater levels of conflict, conflict resolution, market, and incremental approaches are more likely to be successful.

Limited Authority to Implement Options

Regional water planners can rarely affect directly the vast majority of water management decisions because most water management decisions are made locally. The effectiveness of regional water plans is greater if integrated with local water management efforts and activities. In the past, state and national governments often intervened in water problems to facilitate regional solutions. In recent times, state and federal ability and willingness to fund regional options are now greatly reduced, particularly in the face of controversy. Each planning approach's treatment of limited authority is summarized in Table 2.

The need for centralized authority in water management has long been debated and is central to political theories of water management. Wittfogel (1957) argued that the historical origin of centralized government and political authority arose from the need for a central authority to develop and manage irrigation and flood control in early Mesopotamia (so-called "hydraulic civilizations"). More recent studies also point to the importance of centralized planning authority for water management (Kelley 1989; Worster 1985). However, others point to sometimes greater effectiveness and efficiency in highly decentralized water management systems, with studies of Puget Sound (Bish 1982) and Southern California groundwater management (Blomquist 1992). Decentralized management can better employ local knowledge, maintain local accountability and performance objectives, widen the range of options considered, and ensure widespread review and comment on intermediate and final policy and planning products. Effective decentralized management requires informal or formal coordinating mechanisms, such as coordinating committees, agreements and contracts, a regional agency of local agency members, regulations, markets, or the courts. A regional water plan with decentralized water management is likely to be more educational and define a framework or direction for common activity, and less likely to define a detailed plan of action.

Integrating Local, Regional, State, and National Plans and Policies

Most water management decisions, expertise, and resources are local. For every state, federal, or regional water planner, there are dozens of local water utility planners. And for each local water planner, there are thousands of agricultural, residential, commercial, and industrial water users, each making long and short-term water management decisions. Integrating these local and user decisions with regional and state water management decisions is both difficult and essential for effective regional management. Some summary thoughts on how each approach pursues this function appear in Table 2.

Water planning can rarely be undertaken with the precision, comprehensiveness, or focused authority of an industrial or military enterprise. More commonly, regional water planning must consider policies, plans, and regulations that already exist at local, regional, state, and federal scales. Thus, plans sometimes resemble the "exquisite corpse" of early 20th-century surrealist art circles, as illustrated by the following quote from an early housing study.

> The process by which a housing program for Chicago was formulated resembled somewhat the parlor game in which each player adds a word to a sentence which is passed around the circle of players: the player acts as if the words that are handed to him express some intention (i.e., as if the sentence that comes to him were planned) and he does his part to sustain the illusion. In playing this game the staff of the Authority was bound by the previous moves. The sentence was already largely formed when it was handed to it; Congress had written the first words, the Public Housing Administration had written the next several, and then the Illinois Legislature, the State Housing Board, the Mayor and City Council, and the CHA Board of Commissioners had each in turn written a few. It was up to the staff to finish the sentence in a way that would seem to be rational, but this may have been an impossibility. Meyerson and Banfield (1955, p. 269).

A larger framework is needed to integrate requirements-based plans, establishing compatible requirement specifications; this is difficult, though it is commonly done with water quality standards and diverse (and sometimes conflicting) permit requirements. Benefit-cost analysis provides a consistent economic criterion across all levels of decisions, although decision makers at different levels are unlikely to agree to such a common criterion, as recognized (albeit often futilely) in multiobjective approaches. Conflict resolution approaches provide a forum where conflicts among different decision makers and decision scales can be worked out by motivated participants. Whereas market and muddling-through approaches provide means to plan where explicit comprehensive collaboration is difficult or impossible.

Data, Time, and Resources for Analysis

Most analyses for planning are limited by the quantity and quality of data available, as well as the political circumstances of planning. Moreover, much important data, such as long-term water demands, environmental regulations, and climate change, become reliable

Table 3. Planning approaches and data, variability, and Aassessment

Planning approach	Data requirements	Variability and uncertainty	Assessing performance on each use objective
1. Requirements-based	Relatively small	Reliability standards	Simple. Costs and required specifications
2. Benefit-cost-based	Great	Can be explicit probabilities	Economic estimates often controversial or difficult
3. Multiobjective	Moderate to great	Difficult to present	Often difficult
4. Conflict resolution	Minimal to great	Difficult	Done by relevant stakeholders; may conflict
5. Market-based	Minimal	Implicit, left to buyers and sellers	Implicit. Performed by parties in the market
6. Muddling through	Modest	Usually not attempted	Only limited attempt made

only after their quantities are no longer relevant for planning. Large amounts of data do not necessarily contain useful information. Poorly or unsystematically collected or estimated data often contain less useful planning information than simple more transparent estimations. Data often must be digested and reconciled to be useful analytically or conceptually, with understood limitations.

Data problems are compounded when scientific controversy exists over how empirical data should be assembled or interpreted. This is common with biological problems with significant variability in field data and fundamental questions regarding how particular biological and ecological systems work. The lack of data, or useful data, tends to encourage some forms of planning relative to others, as summarized in Table 3. Small amounts of data tend to encourage market, muddling through, and requirements-based planning. Conflict resolution planning is the most flexible regarding data availability. The cost and time required for collection, digestion, and use of data always place technical limits on planning.

Few planners complain of having too much time, funding, or expertise. The lack of time is often imposed by statutory limitations or the attention span of governing political bodies and reduces the level of analysis undertaken, with implications for the approach taken to planning. Nevertheless, the time and resources allocated for plan or study completion often extend beyond the likely time of political attention or importance for a subject. Some such planning efforts are undertaken in part to defer controversial decisions to a later time. Plans likely have difficulty gaining attention from political leadership can still have long-term educational value for staff and stakeholders.

Variability and Uncertainty

Many aspects of real water problems are highly uncertain or variable, particularly over planning time frames. Many fundamental uncertainties exist regarding how water management affects specific environmental resources. Hydrologic uncertainties include "usual" variations between drought and flood, interactions of hydrologic components, and prospects for climate change; water demand uncertainty, from changes in population and wealth, changes in water use efficiency, and changes in weather; and changes in water quality and regulatory demands for water quality all are central to water planning and must be treated carefully in planning analysis (Hirsch 1978; Lund 1991). Unavoidable uncertainties exist for long-term prediction in most of these areas.

The formal understanding and analysis of uncertainties involve the use of probabilities. Probabilities are a powerful and rigorous analysis tool for such problems. However, the use and results of studies using probabilities are difficult to explain to decision makers, the public, and even most technical people. Various forms of sometimes extensive nonprobabilistic scenarios or contingency analyses sometimes are viewed as a substitute for probabilistic analysis (Brown et al. 2012; Herman et al. 2020). The treatment of variability and uncertainty for each planning approach is compared in Table 3. Some planning approaches seek to explicitly avoid variability and uncertainty (muddling through), while others (benefit-cost analysis) can rigorously incorporate probabilistic analyses. No approach handles variability and uncertainties without difficulty. All planning and plans should prepare for both anticipated events and surprises.

Limited Range of Alternatives

It is possible to develop, refine, and evaluate only a limited number of alternatives. Consider a water system with only 20 discrete nonexclusive water management options, including various water supply and demand actions to be combined into integrated alternatives for evaluation. Each combination of options is a possible alternative. Mathematically, if each option can either be included or excluded from an alternative, there are $2^{20} = 1{,}048{,}576$ possible alternatives. Real water management systems have thousands of possible decision options and many more possible alternatives. It is usually impossible to explicitly enumerate and evaluate all possible alternatives.

Practically, each new alternative, particularly creative or novel alternatives, requires considerable effort for the development and education of stakeholders. It is often difficult to develop promising alternatives in an atmosphere of controversy and political maneuvering. Some of these alternatives might be identified by optimization models that identify promising combinations of options (Jenkins et al. 2004). Stakeholders and agencies commonly reduce risks to their interests by limiting the range of alternatives to be considered, sometimes to the extent that alternatives are limited to small variations on the *status quo*.

Assessing Performance for each Objective

In planning, we would like to quantitatively evaluate proposed alternatives on each performance objective. Several difficulties commonly arise: (1) Stakeholders often find it difficult to specify their performance objectives, sometimes for political reasons, but also because it is often a difficult intellectual and technical task. (2) Given reasonable verbal statements of performance objectives, it is often difficult to develop quantitative mathematical representations. (3) Fundamental uncertainties commonly exist in knowing how a particular performance objective (such as salmon populations) will be affected by a specific combination of water management decisions.

Performance assessment is made more difficult by variability in hydrologic conditions and operations. How well can a particular water use tolerate or benefit from variability in flows? How should various probability distributions of water availability for specific uses be compared? Table 3 summarizes performance assessment problems for each planning approach. Much of the selection of a planning approach should be driven by the types of evaluation results that the political planning process can absorb. Thus, more fragmented planning processes are most likely to absorb market or muddling-through types of analysis. More organized or centralized political planning approaches can employ other approaches.

Transparency: Can We Understand and Communicate It All?

Understanding amid conflict adds difficulties, "It is difficult to get a man to understand something, when his salary depends upon his not understanding it!" Upton Sinclair (1934). Regional water systems are complex, so reasonable transparent representations also will be complex. Even among experienced water managers, few individuals have both broad and detailed knowledge of any large regional water system. One career usually cannot encompass complete and up-to-date detailed knowledge of a system and deep thinking about how to improve the system over the long term. No one can understand it all. This problem is compounded by employment transience at technical, managerial, and political levels; in any planning meeting, many people must be "brought up to speed."

With the diverse audiences and objectives of water planning, can we ever make our thinking and analysis understood? Given the real limitations and realistic expectations of planning, a simplified analysis that more clearly communicates water management guidance might more effectively improve a region's water management than the presentation of sophisticated methods and results (Geoffrion 1976). However, more sophisticated and detailed analyses are likely to be needed to develop and detail a plan. A plan or analysis that cannot be understood is unlikely to attract the confidence or readership needed for implementation. Clear and organized communication is central to plan development and effectiveness.

Planning for the Status Quo

We tend to think of planning as actively preparing changes and actions in response to current and expected problems. Alas, planning processes sometimes serve to defer, distract, or contain controversies and perpetuate the *status quo* (Lach et al. 2005). If those seeking actions can be diverted into a prolonged and elaborate planning or permitting process, attention to a problem can wane (following a flood or drought, for example). Such planning processes can also displace other agencies or interests from sponsoring more substantive planning processes. Such "dynamic inaction" can help protect a controversy-averse sponsoring agency from other potentially competing authorities (at least for a time) while satisfying stakeholders interested in perpetuating current conditions. Planning for the *status quo* is usually fairly successful when change is difficult and is especially successful if the planning process is prolonged, confusing, and time-consuming.

Some Realistic Objectives for Regional Water Planning

We all have ideas of what a water plan should accomplish. Popularly, water plans lead directly to actions that solve water problems. Alas, this is often not the case. In reality, water plans are steps in long conversations about difficult problems, serving a variety of related and important functions, and only some of which lead directly to resolving water problems. Many plan functions are useful informational steps for long-term water management.

Education

Water planning and plans educate the public, political leadership, stakeholders, and water agency professional staff and leadership about water problems and options. Water plans can be a regularly updated practical and authoritative overview of a region's water problems, with some directions for solutions. Each individual party concerned with a region's water problems will have a narrower view of the subject and so can rarely attempt the integrated perspective of a regional problem. The public education role of the plan is rarely direct; few people read plans. However, an authoritative water plan document can provide a reasoned, informed, and readable perspective on water problems for diverse water wonks, the media, staff, and "opinion leaders" to improve policy decisions and the accuracy of public perceptions.

The political leadership of general and water-related governments is tremendously distracted by many issues and their own political dynamics. Even the best political leaders can devote little time to technical aspects of decisions. Political leaders must rely on advice from others and authoritative accounts of the problem. Water plans can inform decision makers and their advisers on relevant aspects of water problems and provide some assurance to statewide, regional, and local stakeholders and water managers that their problems and alternative solutions have been fairly presented for consideration.

New water professionals or leaders often use local, regional, and statewide water plans to orient themselves in the practice and context of their work. For these people, regional and local plans provide a relatively comprehensive view of the context of their activities as well as perspectives on the overall direction of water management activities and examples of accepted planning methods and options.

Reference Document

Water plans and analyses are central reference documents for local, regional, and statewide water management and planning activities and decisions. In one location, a plan provides authoritative estimates of water demands and forecasts (disaggregated by use type); information on storage, conveyance, and water supply availability; an inventory of water distribution systems and their organization; an authoritative inventory of water problems; and a wealth of other information, including where additional information can be found. Plan estimates, data, and discussions have everyday uses for local, regional, statewide, and private water management and user activities. An organized authoritative source of such information provides a common benefit and focus for discussion.

Leadership in Water Management

Although most regional water plans are done by entities with very limited financial and jurisdictional powers for water management, such plans can provide significant leadership for a region's many local water management decisions. The options and objectives considered and the methods used in a plan set an example for other local and regional planning efforts. At regional and statewide scales and for federal agencies, planning practices set precedence and expectations for other levels of government that are more active and have more resources and jurisdiction to implement water management options. This leadership in content and method has great potential to help integrate and improve planning efforts by lower units of government, increasing the number of promising alternatives examined and solidifying their evaluations of alternatives. Such leadership must be responsible. Its leadership rests on neither lagging too far behind the advanced state of practice, nor being so far ahead of advanced practice as to risk being misunderstood or ignored.

Planning Fosters Discussion and Negotiations

While plans might or might not lead directly to the solution of water problems, any planning process provides long-term opportunities to discuss and negotiate water problems as well as opportunities for public input, feedback, and support. These opportunities can help the long-term development of solutions and understandings

of diverse and changing stakeholder and agency concerns, even when plan recommendations are ignored.

Specific Recommended Actions and Their Implementation

We normally think of water plans as recommending particular thought-through actions for improving a region's water management. However, practically, this is often not the functional case. The specifics of a water plan usually are most relevant at local levels where agencies tend to have more financial resources and independent implementation authority. For higher regional authorities, including state authority, the financial, jurisdictional, and political wherewithal to implement plan specifics often diminishes. Historically, state and federal agencies have dominated water development only for short periods. In California, for example, federal water projects dominated regional water development from the 1940s until 1982, and state projects occurred from 1967 to 1982. This occurred despite federal and state planning studies dating from 1873 (Pisani 1984). Before and since these periods, almost all major water supply projects in California have been instigated, financed, owned, and operated locally or sometimes regionally. Now and for the foreseeable future, regional water plans are likely to be effective only where they help integrate activities across local jurisdictions and users. In this difficult long-term process, planning can be very useful.

Following the Law

Planning processes often exist to meet relevant state or federal legislation, such as the federal National Environmental Policy Act (NEPA) or various state requirements. Such legislation requires various procedures for involving different units of government and the public, specification of objectives, and identification and evaluation of alternatives. Such legislation helps standardize planning across many types of planning problems. For example, NEPA requires that federal agencies develop and consider alternative courses of action and evaluate them in terms of environmental impacts. Implementing regulations for NEPA further specifies how these and other planning activities are to be accomplished. In addition, more specific legislation exists for particular water problems, such as the federal Clean Water Act or Endangered Species Act and their state variants. Any water management or development proposal or project will be expected to comply with relevant legal requirements. These legal requirements often explicitly or implicitly require a planning process.

Given the increasingly public nature of planning and the decentralized nature of water management, the educational, leadership, and procedural roles of plans and planning processes can be very significant, even where their short-term impacts are small. Local, regional, and national water problems are usually eternal and changing, with very long-term issues, controversies, and difficult conversations evolving over history. Water plans and planning provide essential opportunities to focus and improve the course and productivity of public and policy conversations on evolving water management problems.

In terms of rational decision making, the purpose of a plan is to convince a broad audience of decision makers and the public that:

1. the problem is relatively well considered, including implications of uncertainties,
2. a wide range of potentially promising alternatives has been identified with reasonable thoroughness,
3. unreasonable alternatives have been reasonably eliminated,
4. remaining alternatives have been developed to estimate desirable performance, with trade-offs considered, and
5. the final plan was judged the "best" of better-performing alternatives.

For long-term water problems, plan contributions to any of these aspects can be valuable.

Technical Analysis in Planning

Water planning is a complex business involving moving and storing millions of tons of liquid every day with substantial economic and environmental impacts and financial costs. So most regional water planning and management activities have heavily technical components. Lund and Palmer (1997) present a more detailed overview of the roles of computer modeling in planning and conflict resolution in water resources.

The role of technical planning expertise can vary greatly among planning approaches. For requirements and benefit-cost-based approaches, engineers and planners are largely isolated technicians, toiling in response to a problem defined by others and offering specific recommendations. Multiobjective planning requires engineers to interact more with stakeholders or their representatives to define and clarify plan objectives and communicate performance estimates and trade-offs to decision makers. Conflict resolution and muddling through forms of planning place engineers and planners in far more demanding (and interesting) roles nearer the center of explicitly political decision making. Here, technical study management must interact directly and interactively with opposing stakeholders, often for prolonged periods. As technical mediators and staff, engineers and planners sometimes work with professional facilitators overseeing the conflict resolution discourse and must become familiar with stakeholder objectives to better represent them, as well as to identify potential consensus solutions. In market-based planning, the engineer often retires somewhat from the public fray but still must understand market actors and conditions so as to advise in negotiating purchases, sales, and exchanges, as well as related legal and regulatory activities.

The purpose of analysis is usually not numbers, but insights (Geoffrion 1976). Under practical conditions and political limitations, it is often difficult to develop policy analysis from technical studies. Strategic analytical insights sometimes are more readily developed from more independent work led by internal agency "skunk works," universities, or others with less direct political accountability.

When to Plan How

Considerable public and professional controversy exist regarding how water planning should be done. Each planning approach presented has been successfully applied in some situations and has failed in others. No planning approach succeeds in all circumstances. In developing regional and statewide plans, it will often be necessary to integrate plans developed from different planning philosophies.

For discussion, three broad sets of planning circumstances are used to illustrate the likely suitability of different planning approaches. In the first circumstance, only rapid and inexpensive studies are possible. There may be few resources for the study, the pace of political events may limit the time available for planning, or the problem might not merit much attention. The second case is where planning resources are greater and a single formal decision making process exists to adopt and implement a plan. Planning details for most engineered water facilities traditionally fall into these first two categories and represent most day-to-day engineering planning. The third set of circumstances, multiparty decision making can occur in

Table 4. Hypothetically good conditions for different planning approaches

Planning approach	Only rapid and inexpensive studies possible	Single formal decision making process	Controversial multiparty decision making
1. Requirements-based	Especially effective for non-controversial and small problems	May overly limit alternatives and evaluation	Usually unsuccessful
2. Benefit-cost-based	Only limited analysis possible	Good, but usually requires interpretation	Informative, but politically insufficient
3. Multiobjective	Only limited analysis possible	Good, but requires interpretation and final judgment	Informative, but politically insufficient
4. Conflict resolution	Usually inadequate time or resources	Not needed	Promising, but often politically futile
5. Market-based	Potentially good, if properly arranged	Sometimes good	Promising, if properly arranged
6. Muddling through	Often best for large problems	Probably not good, unless the process breaks down	Often only possible approach; success limited and incremental

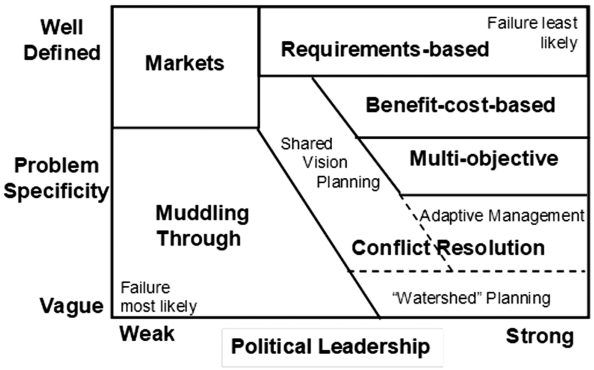

Fig. 3. Approaches to planning in political and problem contexts.

the midst of considerable controversy and conflict. Table 4 summarizes some ideas on the suitability of each approach for each of these cases.

In an era when federal and state governments lack the funding and will to impose or persuade formal planning outcomes on stakeholders, conflict resolution, marketing, and muddling through approaches are all that remain for stakeholders wishing to solve complex regional water problems. However, even within this less formalized and more pluralistic setting, requirements-based, benefit-cost-based, and multiobjective planning and techniques can be informative and useful.

Fig. 3 attempts to place the planning approaches discussed along two commonly relevant dimensions, the problem's specificity and the political leadership available to implement a plan. Other dimensions could be used, the world is a complex place, and the placements of each approach are inexact, but the figure serves to illustrate how muddling through, doubtless a common approach to planning in practice, can often result from a collapse of conditions suitable for more formal planning methods. Even in the worst cases, attempts at more formal planning can generate insights, alternatives, coalitions, and information useful for muddling through more effectively if these opportunities are used strategically (Connors 2005).

The rational selection of a planning approach should be based on the likely success of alternative approaches in achieving practical objectives for a planning effort. This selection process itself illustrates many practical problems in water resources planning.

Conclusions

Water problems are often complex, controversial, and occur over long historical periods, involving protracted and difficult public, private, and policy conversations. Confusion, controversy, expense, and delay can be magnified and prolonged if the approach to planning for these problems is unclear or ineffective. A clearly structured approach to planning for water resources problems is often necessary, or at least valuable.

A variety of planning approaches are available for different types and contexts of planning problems. While the general concepts of rational planning reflect fundamentals of rational decision making and are of broad utility, no specific planning approach is suitable for every planning problem and context. Planning problems vary greatly, with each one being arguably unique. A selected planning approach and its implementation should attempt to reflect the current and likely future problem and context and attempt to make the difficult water management conversations of the time more productive.

Local and intraagency water plans with well-defined problems and significant political and financial wherewithal are most likely to apply traditional planning notions. Larger-scale regional water plans usually have more tenuous political support and less well-defined problems, usually will require more complex forms of planning, and are less likely to lead directly to implemented solutions. Regional water plans typically serve longer-term educational functions for regional water management. For planning to fulfill most educational, leadership, policy, and project development roles, it must be transparent and comprehensible, rational, and not require unavailable time and financial resources.

The selection of an appropriate planning approach or mixture of approaches should reflect the objectives of addressing the particular planning problem in its context and the difficult discussions of the time. Without deeper thinking about planning, planning processes can easily become ineffective themselves and for problem-solving and discredit the sponsoring agencies, disadvantaging future planning efforts.

Data Availability Statement

No numerical data were used or abused for this paper, so all data used are immediately available without request.

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DISCUSSION DRAFT – New Mexico Land Grant Council Comments

TITLE XX [title XX name]
CHAPTER XXX [chapter XXX name]
PART XXXX [part XXXX name]

x.xx.xx.1 ISSUING AGENCY: New Mexico Interstate Stream Commission, hereinafter the commission.
[x.xx.xx.1 NMAC – N, xx/xx/202x]

x.xx.xx.2 SCOPE: This rule governs the process for developing and maintaining regional water planning pursuant to the Water Security Planning Act.
[x.xx.xx.2 NMAC – N, xx/xx/202x]

x.xx.xx.3 STATUTORY AUTHORITY: Section 72-14A-1, et seq. NMSA 1978.
[x.xx.xx.3 NMAC – N, xx/xx/202x]

x.xx.xx.4 DURATION: Permanent.
[x.xx.xx.4 NMAC – N, xx/xx/202x]

x.xx.xx.5 EFFECTIVE DATE: xxxxxxxxxxxx xx, 2025, unless a later date is cited in the history note at the end of a section.
[x.xx.xx.5 NMAC – N, xx/xx/202x]

x.xx.xx.6 OBJECTIVE: To establish the criteria and procedures to develop, approve and maintain regional water plans, pursuant to the Water Security Planning Act, Section 72-14A-1et seq. NMSA 1978.
[x.xx.xx.6 NMAC – N, xx/xx/202x]

x.xx.xx.7 DEFINITIONS:

A. **"Commission"** means the New Mexico Interstate Stream Commission and its members, authorized under NMSA 1978 § 72-14-1, and the director and employees of the commission.

B. **"Planning Region"** or "Region" means an area of the state as described herein that defines the planning area for Regional Water Security Planning Councils.

C. **"Regional Water Security Planning Council"** or "Council" means individuals, representing groups or organizations as described herein, who make up the Council and lead the regional water security plan development and implementation process in their respective region.
[x.xx.xx.7 NMAC – N, xx/xx/202x]

x.xx.xx.8 WATER SECURITY TRIBAL ADVISORY COUNCIL

A. Subject to available funding and resources, the commission shall provide administrative support and facilitation, in consultation with the office of the state engineer and Indian affairs department, for the establishment and operation of a water security tribal advisory council ("WSTAC") comprising representatives of New Mexico pueblos, tribes and nations.

B. The purpose of the WSTAC is to provide a forum for input from New Mexico pueblos, tribes and nations to ensure that their sovereignty, water rights, water needs, and other viewpoints are considered and incorporated in the regional water planning process or other activities as determined by the commission.

C. The participating pueblos, tribes and nations shall determine their own procedures and operating principles.

x.xx.xx.9 ACEQUIA AND RURAL WATER SECURITY ADVISORY WORKING GROUP

A. Subject to available funding and resources, the commission shall provide administrative support and facilitation for the establishment and operation of the Acequia and Rural Water Security Advisory Working Group ("ARWSAWG") comprised of the appointed representatives of each Regional Water Security Planning Council that represents acequias, mutual domestics or community regional water systems, and land grant-mercedes in pursuant to section x.xx.xx.11 COMPOSITION OF REGIONAL WATER SECURITY PLANNING COUNCIL of this rule in addition to representatives from the New Mexico Acequia Commission, New Mexico Acequia Association, New Mexico Rural Water Association, and New Mexico Land Grant Council.

B. The purpose of the ARWSAWG is to provide a rural state-wide forum for input from New Mexico acequias, mutual domestics or community regional water systems, and land grant-mercedes to ensure that their water rights, water needs, and other viewpoints are considered and incorporated in the regional water planning process or other activities as determined by the commission.

C. The participating appointed representatives of acequias, mutual domestics or community

regional water systems, and land grant-mercedes of each Regional Water Security Planning Council shall determine their own procedures and operating principles.

~~x.xx.xx.9~~x.xx.xx.10 **PLANNING REGIONS**

A. The nine (9) Regional Water Security Planning Regions ("Planning Regions") are shown in Exhibit A (map).

~~x.xx.xx.10~~x.xx.xx.11 **COMPOSITION OF REGIONAL WATER SECURITY PLANNING COUNCIL**

A. The commission shall invite representatives, who reside within the planning region, from the following entities located within each Planning Region, except as otherwise provided for in sections C and D below, to establish the Regional Water Security Planning Council ("Council" or "Planning Council"). Each entity is entitled to have a representative serve on the council for any Planning Region that it is located within. The commission shall convene the representatives with the goal of establishing the members of a Council by consensus, or, if no

Commented [VG1]: The creation of the Acequia and Rural Water Security Advisory Working Group will meet the following requirements of the **Water Security Planning Act §72-14A-1 et seq., NMSA 1978,** ensure the plans are equitable, and ensure that no water rights are affected:

SECTION 4. WATER PLANNING FUNDING--REGIONAL WATER PLANNING--RULES--GUIDELINES.—Subsection C.:
"(5) provide engagement with acequia communities;
(6) provide for the engagement of rural communities;"

SECTION 5. REGIONAL WATER PLANNING ENTITIES.—Subsection C.:
"(4) assist in the funding, development and incorporation of plans for rural communities;"

SECTION 3. CONDEMNATION OF WATER RIGHTS.—
"Nothing in the Water Security Planning Act shall be construed as permitting the condemnation of water rights or as determining, abridging or affecting in any way the water rights of water right owners in the state."

Commented [VG2]: The current planning regions should track better with the administration that will be in charge of implementing the funding that will follow the completion of the plans. Either with the Councils of Governments, the Office of the State Engineer's Administrative District Offices, or other possible administrators of the funds.

agreement is reached, the commission shall determine the initial members of the Council. A Council can also self-organize provided the criteria below are met. Council membership will be based on the following:

(1) one representative appointed by the governing body of each municipality;

(2) one representative appointed by the governing body of each county;

(3) one representative appointed by the governing body of each irrigation or conservancy district;

(4) one representative appointed by the governing bodies of each Pueblo, Tribe, or Nation;

(5) one representative appointed by the governing body of each council of government;

(6) one representative appointed by the governing bodies of each soil and water conservation district;

(7) one representative of each regional acequia association in the planning region, or, if no regional association exists in a county or basin within the county, one acequia or community ditch representative who shall be a commissioner or mayordomo of an acequia or community ditch established pursuant to Chapter 73, Articles 2 and 3 NMSA 1978; for each county located in whole or in part within the planning region, who shall be appointed by the governing body of the New Mexico Acequia Commission; and

(8) one representative for mutual domestic or community regional water systems for each county located in whole or in part within the planning region, who shall be appointed by [?].; and

(8)(9) one land grant-merced representative for each county located in whole or in part within the planning region, who shall be appointed by the governing body of the New Mexico Land Grant Council.

B. Each Council shall invite ten at-large members, located within the region, to represent the following stakeholders or stakeholder groups:

(1) agricultural producers;

(2) a public higher education institution;

(3) environmental or conservation organizations with water security concerns in the Planning Region;

(4) recreational interests;

(5) industrial water users; and

(5)(6) **two members of watershed restoration organizations; and**

(6)(7) five three additional at-large members.

C. Each council shall invite three non-voting representatives for entities outside the Planning Region. Representatives appointed pursuant to this shall not be required to reside within the borders of the planning region.

D. If a qualified or willing representative cannot be identified to serve as a representative for any entity or stakeholder described in sections 4.A or 4.B, the commission may select a replacement non-voting member who is knowledgeable about water resources in the Planning Region.

E. The council shall adopt written operating principles that describe the following, at a minimum, and shall provide their operating principles to the commission upon request:

(1) the roles and responsibilities of the council members;

(2) the duration of the term for representatives on the council; and

(3) the grounds and process for removing a representative from the council.

F. Subject to the commission director's determination of adequate funding and staffing, a commission staff member who resides within the region shall act as the commission's liaison to the council for the purpose of ensuring the proper coordination of commission information, policies, and resources.

G. The commission shall provide administrative support and facilitation for up to three four (43) meetings of the Council per calendar year.

x.xx.xx.11x.xx.xx.12 REGIONAL WATER SECURITY PLANNING COUNCIL MEETING REQUIREMENTS

A. Meetings shall be held at least three four (34) times per year during periods of plan development or update.

Commented [VG3]: This will provide for equitable acequia involvement and meent the following sections of the **Water Security Planning Act §72-14A-1 et seq., NMSA 1978**:

SECTION 4. WATER PLANNING FUNDING--REGIONAL WATER PLANNING--RULES--GUIDELINES.—Subsection C.:
"(5) provide engagement with acequia communities;
(6) provide for the engagement of rural communities;"

SECTION 5. REGIONAL WATER PLANNING ENTITIES.—Subsection C.:
"(4) assist in the funding, development and incorporation of plans for rural communities;"

SECTION 3. CONDEMNATION OF WATER RIGHTS.—
"Nothing in the Water Security Planning Act shall be construed as permitting the condemnation of water rights or as determining, abridging or affecting in any way the water rights of water right owners in the state."

Commented [VG4]: Land grant-mercedes are political subdivisions of the State (NMSA 1978, §§ 49-1-1 & 49-4-4,
NMSA 1978), with regulatory and protective authority over the common waters of the land
grant-merced (NMSA 1978, §§ 49-1-3H(H), 49-1-16, 49-4-5(H), 49-4-17). In addition, land
grant-mercedes have authority over land-use, comprehensive planning, zoning, and infrastructure
development within their common lands. The twenty-seven land grant-mercedes recognized as
political subdivisions of the State, collectively manage over 200,000 acres of land in the
watersheds of at least ten counties. Given their local government and land and water
management status they should be incorporated into the planning process. Adding representation
of land grant-mercedes, encompasses the spirit of the **Water Security Planning Act, §72-14A-1
et seq., NMSA 1978**, specifically sections:

SECTION 4. WATER PLANNING FUNDING--REGIONAL WATER PLANNING--RULES--GUIDELINES.—Subsection C.:
"(6) provide for the engagement of rural communities;"

SECTION 5. REGIONAL WATER PLANNING ENTITIES.—Subsection C:
"(4) assist in the funding, development and incorporati ... [1]

Commented [VG5]: There are many watershed restoration organizations in each region that have developed or are developing water plans and data. This will help to meet the following of the **Water Security Planning §72-14A-1 et seq., NMSA 1978**:

SECTION 5. REGIONAL WATER PLANNING ENTITIES.—Subsection C:
"(6) review existing water plans and data
sets of municipalities, counties and other entities within the water planning region and use them as appropriate."

B. Councils must provide reasonable notice of meetings or other activities to council members, the public, and the commission.

C. Subcommittee meetings may be held and may or may not be supported by commission staff and resources.

~~x.xx.xx.12~~x.xx.xx.13 **ADOPTION OF REGIONAL WATER SECURITY PLAN:** In order to be approved by the commission, regional plans must meet the following criteria:

A. Plans shall include a list of projects, programs and policies in order of priority.

B. Councils shall seek and document in the plan Water Security Tribal Advisory Council (WSTAC) and the Acequia and Rural Water Security Advisory Working Group (ARWSAWG) involvement, input and endorsements, as applicable.

C. Councils shall seek and document in the plan public input in the development, vetting and prioritization of regional water planning activities and proposals.

D. Councils shall seek and document and incorporate comments received from stakeholders consistent with the guidelines laid out by the commission.

E. Plans shall provide documentation of comments received from, and coordination with, state and federal agencies.

F. Councils shall review existing water plans and data sets of municipalities, counties, and other entities within or relevant to the Planning Region and use them as appropriate.

G. The outcomes sought by each Regional Water Security Plan shall:

(1) be established through broad public input;

(2) consider public welfare values, balancing water uses and the needs of future generations of New Mexicans;

(3) comply with state water law;

(4) be developed using the best available science;

(5) recognize and respect federally recognized or reserved tribal water rights;

~~(5)~~(6) **recognize and respect acequia, mutual domestic, and land grant-mercedes water rights and management authority;**

~~(6)~~(7) consider access to water for domestic use; ~~and~~

(8) comply with applicable federal water law;.

~~(7)~~(9) **meet the water needs of rural and agricultural communities; and**

~~(8)~~(10) consider the water needs of healthy fish and aquatic and riparian habitats.

H. Councils must report to the commission by June 30 of each year on the progress of Planning Activities and outcomes of Regional Water Security Plan implementation.

I. Plans shall be updated at least once every ten years and may be updated more frequently. The commission will maintain and publish all water security plans developed by Planning Councils.

~~x.xx.xx.13~~x.xx.xx.14 PROCEDURE FOR REGIONAL WATER SECURITY PLANNING COUNCILS TO DEVELOP AND PROVIDE NOTICE TO THE COMMISSION OF ISSUES AND CONCERNS RELATING TO THE PUBLIC WELFARE OF THE WATER PLANNING REGION

A. Identifying Public Welfare Issues and Concerns for Water Planning Region: Each Council shall establish a process for identifying the issues and concerns relating to the public welfare of the Council's water planning region. The process shall comply with the following requirements:

(1) All water rights holders or other interested parties who may be affected by a Council's determination shall be given a full and fair opportunity to participate in the process.

(2) Any member of the public or member of a Council may suggest a possible issue and concern related to public welfare for consideration by a Council.

(3) A Council shall not act on any suggestion until the requirements of notice and opportunity for participation under this rule have been met.

(4) In determining whether a particular issue or concern rises to the level of the public welfare of the water planning region, a Council is not required to reach unanimous consensus, but the Council shall include a clear description of the positions of any opponents when it transmits its determination to the Commission.

(5) Issues and concerns relating to the public welfare of a water planning region identified by a Council under the procedures outlined in this rule shall not be duplicative of the water rights evaluation factors set forth in the state engineer's authorizing statutes (i.e., impairment of existing water rights, contrary to conservation of water within the state, or detrimental to the public welfare of the state).

B. State engineer consideration of regional issues of public welfare in permitting decisions:

(1) The state engineer, in its permitting decisions, may consider issues of public welfare of a water planning region identified by a Council if the state engineer determines that such regional issues are related to

Commented [VG6]: The involvement, input, and endorsements of the Acequia and Rural Water Security Advisory Working Group will meet the requirements laid out in the **Water Security Planning Act §72-14A-1 et seq., NMSA 1978** and ensure that no water rights are affected:

SECTION 4. WATER PLANNING FUNDING--REGIONAL WATER PLANNING--RULES--GUIDELINES.—Subsection C.:
"(5) provide engagement with acequia communities;
(6) provide for the engagement of rural communities;"

SECTION 5. REGIONAL WATER PLANNING ENTITIES.—Subsection C.:
"(4) assist in the funding, development and incorporation of plans for rural communities;"

SECTION 3. CONDEMNATION OF WATER RIGHTS.—"Nothing in the Water Security Planning Act shall be construed as permitting the condemnation of water rights or as determining, abridging or affecting in any way the water rights of water right owners in the state."

Commented [VG7]: The incorporation of this language will meet the following requirements of the **Water Security Planning Act §72-14A-1 et seq., NMSA 1978**:

SECTION 3. CONDEMNATION OF WATER RIGHTS.—"Nothing in the Water Security Planning Act shall be construed as permitting the condemnation of water rights or as determining, abridging or affecting in any way the water rights of water right owners in the state."

Commented [VG8]: This sought outcome will meet the following requirement of the **Water Security Planning Act §72-14A-1 et seq., NMSA 1978** and ensure that the needs of rural communities are not left out:

SECTION 4. WATER PLANNING FUNDING--REGIONAL WATER PLANNING--RULES--GUIDELINES.—Subsection C.:
"(5) provide engagement with acequia communities;
(6) provide for the engagement of rural communities;"

SECTION 5. REGIONAL WATER PLANNING ENTITIES.—Subsection C.:
"(4) assist in the funding, development and incorporation of plans for rural communities;"

or may impact the public of the welfare of the state.

(2) The state engineer shall not be bound by any determination of a Council.

(3) In reviewing applications that implicate a given issue or concern identified by a Council as relating to the public welfare of a water planning region, the state engineer shall explain its reasoning related to such issue or concern if the state engineer determines that it is relevant to the public welfare of the state.

C. Notification of Council's Determination:

(1) When a Council has determined that an issue or concern relates to the public welfare of a water planning region, the Council shall notify the Commission;

(2) The notification shall include the information contained in Subsection A of this Section;

(3) The Commission's staff shall notify the relevant state engineer district office(s) of the Council's determination and shall provide all relevant documentation relating to the determination.

~~x.xx.xx.14~~x.xx.xx.15 PROCEDURE FOR A REGIONAL WATER PLANNING COUNCIL TO CONSIDER PUBLIC WELFARE VALUES AND THE NEEDS OF FUTURE GENERATIONS OF NEW MEXICANS

A. Regional Water Planning Council may consider public welfare values of the water planning region after such values have been determined pursuant to the procedures set forth in Section 12 of this rule.

B. Regional Water Planning Council shall consider the following public welfare values of the state in their regional water planning activities:

(1) The state's ability to meet its obligations under interstate compacts;

(2) The state's ability to comply with the Endangered Species Act, or otherwise prevent significant harm to the habitats of Federal- and State-endangered or -threatened species; ~~and~~

(3) The state's ability to meet the needs of future generations of New Mexicans;

(4) Regional water rights settlements, including tribal water rights settlements and alternative administration plans under the Active Water Resources Management program;~~.~~

(5) The water security of rural and agricultural communities including tribal, Pueblo, acequia, land grant-mercedes, colonias, and other rural communities; and

~~(3)~~(6) The health of watersheds, ecosystems, and hydrological systems that support the viability of both urban and rural communities.

C. Procedure for a Regional Water Planning Council to consider the needs of future generations of New Mexicans:

(1) The Regional Water Planning Council shall use the best science, data and models related to water resource planning and shall use them with scientific integrity and adherence to principles of honesty, objectivity, transparency and professionalism, as specified in NMSA 1978, Section 72-14A-4(C)(7);

(2) Regional Water Planning Council shall utilize such data and models to consider the needs of future generations of New Mexicans in their regional planning activities.

(3) The Regional Water Planning Council shall conduct surveys and collect data from the youth in each region to include their water concerns, needs, wishes, and future ways of life in the planning process.

~~(2)~~(4) The Regional Water Planning Council shall recognize the right of future generations to clean and ample water.

HISTORY OF x.xx.xx NMAC: [RESERVED]

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Commented [VG9]: This additional value is critical to meet the following requirements in the **Water Security Planning Act §72-14A-1 et seq., NMSA 1978** and ensure that the plans are equitable:

SECTION 4. WATER PLANNING FUNDING--REGIONAL WATER PLANNING--RULES--GUIDELINES.—
Subsection B:
"B. The commission shall establish a procedure, in consultation with the Indian affairs department, to establish an advisory council for taking into account in the regional water security program tribal sovereignty, tribal water rights and the water needs of tribal communities."

Subsection C.:
"(4) provide engagement with Indian nations, tribes and pueblos, including through the use of the State-Tribal Collaboration Act;
(5) provide engagement with acequia communities;
(6) provide for the engagement of rural communities;"

SECTION 5. REGIONAL WATER PLANNING ENTITIES.—Subsection C.:
"(4) assist in the funding, development and incorporation of plans for rural communities;"

Commented [VG10]: This additional procedure will provide each council with substantive data to evaluate the needs of future generations of New Mexicans and meet the following requirement of the **Water Security Planning Act §72-14A-1 et seq., NMSA 1978**:

SECTION 4. WATER PLANNING FUNDING--REGIONAL WATER PLANNING--RULES--GUIDELINES.—Subsection C:
"(e) the procedure for a regional water planning entity to consider public welfare values and the needs of future generations of New Mexicans;"

SECTION 5. REGIONAL WATER PLANNING ENTITIES.—Subsection B:
(2) consider public welfare values, ... [2]

Commented [VG11]: This additional procedure will provide each council with the need of future generations to have ample and clean water to prosper in New Mexicans and meet the following requirement of the **Water Security Planning Act §72-14A-1 et seq., NMSA 1978**:

SECTION 4. WATER PLANNING FUNDING--REGIONAL WATER PLANNING--RULES--GUIDELINES.—Subsection C:
"(e) the procedure for a regional water planning entity to consider public welfare values and the needs of future generations of New Mexicans;"

SECTION 5. REGIONAL WATER PLANNING ENTITIES.—Subsection B: ... [3]

Page 3: [1] Commented [VG4] **Vidal Gonzales** **2/14/2025 9:18:00 AM**

Land grant-mercedes are political subdivisions of the State (NMSA 1978, §§ 49-1-1 & 49-4-4, NMSA 1978), with regulatory and protective authority over the common waters of the land grant-merced (NMSA 1978, §§ 49-1-3H(H), 49-1-16, 49-4-5(H), 49-4-17). In addition, land grant-mercedes have authority over land-use, comprehensive planning, zoning, and infrastructure development within their common lands. The twenty-seven land grant-mercedes recognized as political subdivisions of the State, collectively manage over 200,000 acres of land in the watersheds of at least ten counties. Given their local government and land and water management status they should be incorporated into the planning process. Adding representation of land grant-mercedes, encompasses the spirit of the **Water Security Planning Act, §72-14A-1 et seq., NMSA 1978**, specifically sections:

SECTION 4. WATER PLANNING FUNDING--REGIONAL WATER PLANNING--RULES--GUIDELINES.—Subsection C.:
"(6) provide for the engagement of rural communities;"

SECTION 5. REGIONAL WATER PLANNING ENTITIES.—Subsection C:
"(4) assist in the funding, development and incorporation of plans for rural communities;"

Page 7: [2] Commented [VG10] **Vidal Gonzales** **2/14/2025 11:22:00 AM**

This additional procedure will provide each council with substantive data to evaluate the needs of future generations of New Mexicans and meet the following requirement of the **Water Security Planning Act §72-14A-1 et seq., NMSA 1978**:

SECTION 4. WATER PLANNING FUNDING--REGIONAL WATER PLANNING--RULES--GUIDELINES.—Subsection C:
"(e) the procedure for a regional water
planning entity to consider public welfare values and the needs of future generations of New Mexicans;"

SECTION 5. REGIONAL WATER PLANNING ENTITIES.—Subsection B:
(2) consider public welfare values,
balancing water uses and the needs of future generations of New Mexicans;

Page 7: [3] Commented [VG11] **Vidal Gonzales** **2/14/2025 11:29:00 AM**

This additional procedure will provide each council with the need of future generations to have ample and clean water to prosper in New Mexicans and meet the following requirement of the **Water Security Planning Act §72-14A-1 et seq., NMSA 1978**:

SECTION 4. WATER PLANNING FUNDING--REGIONAL WATER PLANNING--RULES--GUIDELINES.—Subsection C:
"(e) the procedure for a regional water
planning entity to consider public welfare values and the needs of future generations of New Mexicans;"

SECTION 5. REGIONAL WATER PLANNING ENTITIES.—Subsection B:
(2) consider public welfare values,
balancing water uses and the needs of future generations of New Mexicans;

Additional comments on NM WSPA Discussion Draft Rule and Guidelines

Patrick McCarthy, Senior Water Policy Officer, Thornburg Foundation

February 21, 2025

Overarching comments

- The draft rule and guidelines provide a good foundation that can be refined and enhanced with community input to create final guidance that is both rigorous and adaptable. Ideally, this framework will support the development of community-led plans that serve as practical, multi-year roadmaps for policy reforms, new projects and programs, and funding decisions. **These plans must address the urgent challenge of building climate-resilient water systems in an era of rapid social and ecological change**. The framework will not meet this moment if it simply encourages or endorses business-as-usual water governance and management. As water scarcity and insecurity grow, **the Water Security Planning Act must play a pivotal role in reshaping how we understand and manage New Mexico's invaluable water resources**. It should drive conservation and adaptation across all water-use sectors, ensuring that both New Mexicans and the ecosystems that sustain us can continue to thrive.
- The proposed planning councils have **too many members** (20- 50 for each region, by my estimate) to get much done in the allotted time frame.
- The **content and organization** of the regional water plans are not specified, other than the requirements that the plan include "a list of programs, projects, and policies in order of priority." This could result in long lists of projects at different scales; different levels of feasibility, need, urgency, and cost; and different levels of contribution toward the goal of achieving water security and resilience.
- The rules and guidelines **do not clearly define water security nor the intended purpose of the regional water plans** (though section 14C in the draft rules call for the Regional Water Planning Councils to "consider [certain] public welfare values of the state in their regional water planning activities."
- There are **no clear criteria or other guidelines for setting priorities** among projects, nor are there provisions for ensuring there is a balance among conventional concrete-and-steel water projects and those involving nature-based solutions or that are designed to achieve multiple benefits for people and nature.
- The rules and guidelines fail to specify whether and how each regional planning entity will be provided with **baseline scientific information** about water supply, demand, and quality, as well as hydrologic projections based on defensible climate change models. (This is partially addressed in section 6.2.)
- The guidelines specifically address interstate compacts and other requirements for equitable surface water allocation, but there is little direction as to whether and how **groundwater sustainability** should be addressed in the plans.
- Rather than providing grants via the proposed Regional Planning Grant Program, consider providing **direct block grants** to each Water Planning Council for technical assistance, foundational scientific information, facilitation, meeting space, and other essential functions. This could make the process more equitable among water planning councils.
- The rules and guidelines do not specify **how the prioritized PPP lists will be considered for state funding** through the Water Trust Board, capital outlay, or other state funding mechanisms, nor do the rules require that the WTB, ISC, or other authorities heed the

priorities set by the regional planning entities or *vice versa*. Consider specifying more clearly in the rules and guidelines how planning councils will ensure that their priorities are aligned with the state's priorities, and that PPP funding mechanisms are feasible, vetted, and aligned with state funding programs such as the Water Trust Fund, Strategic Water Reserve, and SRF.

Comments on Draft Rules & Guidelines (copied from the online survey)

COMPOSITION OF REGIONAL WATER SECURITY PLANNING COUNCIL

The regional planning council membership, as outlined, may number as high as several dozen -- far too large to serve as an effective planning team. I suggest limiting the number of members to 15, dropping the requirement to include representative from each county of municipalities, acequias, mutual domestic associations, etc. Also drop representatives of institutions of higher education -- a better role is for them to serve as technical advisors -- and drop the requirement that conservation organizations have "water security concerns in the Planning Region." (For no other group is this a requirement, inexplicably.)

REGIONAL WATER SECURITY PLANNING COUNCIL MEETING REQUIREMENTS

That the council will meet a minimum of three times is too infrequent. I suggest at least quarterly.

ADOPTION OF REGIONAL WATER SECURITY PLAN

The criteria for acceptance of regional water plans need clarification and rigor. Earlier efforts at NM regional water planning are widely understood to have underperformed, and this rubric does not address the structural causes of the plans' shortfalls, including: insufficient integration with the state water plan; insufficient attention to, and documentation of, practical and sustainable funding for each PPP, including plans that specify funding sources, amounts, and sequencing; little documentation of explicit linkages between PPPs and state funding vehicles such as the Water Trust Fund and capital outlay, and few to no criteria for project selection; lack of attention to the principles and practices of integrated water resources management (i.e., collaborative management of all water resources—surface water, groundwater, wastewater, and stormwater—to maximize economic, social, and environmental benefits, and coordination across different sectors and jurisdictions to address water challenges holistically); and few requirements, or state technical or financial support, for development of a rigorous and consistent scientific and technical foundation for each regional plan that meets statewide standards.

PROCEDURE FOR A REGIONAL WATER PLANNING COUNCIL TO CONSIDER PUBLIC WELFARE VALUES AND THE NEEDS OF FUTURE GENERATIONS OF NEW MEXICANS

Add to Section B: (4) The state's ability to plan for climate change and the other threats to our water supplies and take action to secure water resources for the communities, economies, and the ecosystems they support. Areas of concern are:

- Water supply, including both surface storage and groundwater aquifers;
- Generation of hydroelectric power and other forms of energy;
- River flows to maintain ecosystems and water quality;
- Recreational use of lakes and rivers; and
- Protection from extreme events, including floods, wildfire, and persistent drought.

(Adapted from the federal SECURE Water Act of 2010.)

4.0 GRANTS OR LOANS FOR PLANNING ACTIVITIES

A grant program that requires proposals, presumably under a competitive process, could favor planning regions with readily available technical resources, notably the Middle Rio Grande, Upper Rio Grande, and Lower Rio Grande, where NM's population and financial and technical resources are concentrated. Consider instead allocating Commission funds directly to each region commensurate with their need for such resources. Distribution of the funds would be contingent on agreement by councils to (a) develop a foundation of baseline scientific and technical information that meets Commission-established criteria for scientific rigor and (b) coordinate the development of this hydrologic/economic/ecological baseline with state agencies and higher education institutions (notably NM Tech and the Bureau of Geology). I am concerned that planning councils would develop information resources -- for example, assessments of current and future supply and demand -- that are widely variable in quality.

6.0 METRICS FOR REPORTING ON REGIONAL WATER PROJECTS, PROGRAMS AND POLICIES and WATER SECURITY PLAN IMPLEMENTATION

Section 6.2 lacks clarity and detail. Consider this guidance: "Analyses to support…investments in water resources should utilize the best available science, data, analytical techniques, procedures, models, and tools in hydrology, engineering, economics, biology, ecology, risk and uncertainty, and other fields to the extent that sufficient funding is available. To the extent feasible, it is appropriate to quantify the effects of water resources projects. The level of detail required to support…investments in water resources may vary but should not be greater than needed to inform the decision-making process efficiently and effectively. The level of detail, scope, and complexity of analyses should be commensurate with the scale, impacts, costs, scientific complexities, uncertainties, risks, and other sensitivities (e.g., public concerns) involved in potential decisions." (See https://obamawhitehouse.archives.gov/sites/default/files/final_principles_and_requirements_march_2013.pdf.)

8.0 SCHEDULE FOR IMPLEMENTATION OF REGIONAL WATER PLANNING, INCLUDING INTEGRATION WITH STATEWIDE OBJECTIVES

8.3 needs clarification and detail. What statewide objectives? 50-year water plan? State water plan? Other documents? Consider guidance not only for regional water planning, but for FUNDING, IMPLEMENTATION, and MONITORING of regional water plans once they are completed and approved. The rules and guidelines do not provide much, if any information about when, how, and by whom the plans will be implemented, nor about the role of the planning councils in supporting and coordinating plan implementation, including (a) development and implementation of sustainable financing (i.e., public and/or private funds) plans for PPPs and other plan elements, (b) PPP implementation, and (c) monitoring, evaluation, and learning about PPP implementation and impacts. This is a ***critical gap*** in the rules and guidelines and thus presents a potential pitfall -- one that the previous regional water plans clearly fell into. See, for example, the 2024 LFC evaluation of state-funded water projects.

9.0 COMMISSION APPROVAL OF REGIONAL WATER SECURITY PLANS

My comments in the previous section pertain also to section 9.1. Consider adding a requirement that each project, program, and policy have a sustainable funding plan that identifies funding sources, amounts and names a single organization or individual that has committed to serving as a funding lead. Moreover, consider requiring that the funding programs named in the PPP list (e.g.,

Water Trust Board) have reviewed the PPPs and have determined that they meet the minimum agency/program eligibility requirements. This would increase both the rigor of the PPP lists and their integration with agency funding programs.

Regional Water Planning Comments

Elaine Hebard - February 21, 2025

Thank you for the opportunity to comment on the NM Water Security Planning Act Discussion Draft regarding the Regional Boundaries and the Guidelines For The Development Of Regional Water Security Plans (RWSP). I hope that the planning staff will take into consideration these and others, publishing another draft for comments.

While I agree with the proposed Boundary map, there needs to be support for sub-basins (ex, it is a long way from Moriarty to the Salt Basin!) as well.

With regards to the Draft Guidelines to develop the RWSPs, I am dismayed.

First of all, there is no statement about why we need to plan. There is no statement about the dire situation we find ourselves water-wise, Rather, the document reads like this is being done because it's required.

Why was the Objective[1] so limited?

From §72-14A-4:

> 3. (7) ensure, by using the integrated water data and information platform developed pursuant to the Water Data Act [72-4B-1 to 72-4B-4 NMSA 1978] and collaborating with the bureau of geology and mineral resources of the New Mexico institute of mining and technology and the water resources research institute, that the best science, data and models relating to water resource planning are available to the regional water planning entities and are used with scientific integrity and adherence to principles of honesty, objectivity, transparency and professionalism in developing, vetting and prioritizing proposals;

There is no inclusion as to how this water data and information platform gets integrated into the regional process.

Moreover, where is the planning process itself? When do such undertakings such as identification of the problem, goals and objectives, and the clarifying the consequences for not meeting goals occur? Sometime after 2029? Another goal making process?

I have included the Template from the 2004 Regional Water Planning Handbook because it set out the process and information necessary to include in the plan, and how to evaluate it. I have also included the Table of Contents from the 2004 Water Plan for Region 12 (Middle Rio Grande) to show how the Handbook was tracked. In particular, the alternatives were analyzed for Management, Water conservation, Water development. Infrastructure development and Water quality management.

Several alternatives were proposed and run through a water model to see if water demand was reduced and/or water supply was increased. From there, a preferred scenario was developed and then finally, a project, program or policy list was created, to implement the scenario.

[1] "To establish the criteria and procedures to develop, approve and maintain regional water plans, pursuant to the Water Security Planning Act, Section 72-14A-1et seq. NMSA 1978."

My biggest concern is about the time lapse. The MRG is in trouble. Included below are my comments to the ISC last month. Once again, the MRG over-consumed its allotment under the Compact. That is not news. From the 2004 Plan:

> **10.1.2 Urgent Shortfall Reality**
>
> " The Key Fact About Our Water - Demand Exceeds Supply" (**OSE/ISC 2002)**
>
> The initial implementation schedule for the Preferred Scenario may leave a Rio Grande Compact delivery shortfall for ten to twenty years. We need to accelerate implementation of the water planning actions. We need to eliminate the predicted short-term deficits in our compliance with the Rio Grande Compact until the other measures in this plan have had time to take effect. All users must share in the substantial contributions to the effort. The state and the region should work openly and cooperatively to address this issue. Specific urgent actions should be identified, studied, evaluated, and implemented that are focused on avoiding defaulting on the Rio Grande Compact. These actions will have urban and rural economic impacts, but such impacts should be temporary. Unless there is a priority call, water-rights holders must be fairly compensated for the temporary loss of use rights when water is reallocated to meet compact delivery requirements.
>
> All necessary actions should be taken to ensure that water necessary to meet the shortfall is acquired. In doing so, the acquisition of water should not be limited to any one primary source or sector. Considerations in achieving a balanced plan of action should include accelerated Bosque and riparian restoration, a method for performing priority administration in advance of adjudication, a residential conservation program, a municipal and industrial conservation program, a agricultural conservation program, reduction in urban pumping, state leasing of urban water, state leasing of agricultural water, increase in upstream instead of downstream storage of water, and a moratorium on new authorizations of consumptive use.

Rather than reducing consumption, it has stayed the same or increased. Groundwater and surface water remains over appropriated, and it will take a serious effort by all concerned, starting with a water model accepted by all, to reduce consumption.

After the public forums last year, I had hoped to write a more positive review of the Guidelines. Rather than take up more time and space, I'll endorse many of the comments by the Water Advocates (I am not a member), particularly:

> A successful regional water security planning process must go beyond bureaucratic compliance to serve as a problem-solving tool that applies the facts, the law, human creativity and community, and stakeholder input to ensure long-term water security. The NMISC Rules & Guidelines should be revised to explicitly incorporate these principles, ensuring that New Mexico's approach to water planning is efficient, actionable, and capable of addressing the state's most pressing water challenges.

Thank you,

Elaine Hebard
1513 Escalante SW
Albuquerque, NM

Attachments

a. Template from the 2004 Regional Water Planning Handbook (pages 3-7)
b. Table of Contents from the 2004 Water Plan for Region 12 (Middle Rio Grande) (pages 7-16)
c. 2004 Water Plan for Region 12 10 Recommendations (pages 8-19)
d. ISC Meeting of January 21, 2025 - Public Comment -- Elaine Hebard (pages 19-22)

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a. Template from the 2004 Regional Water Planning Handbook

https://www.ose.state.nm.us/Planning/RWP/Handbook/1994%2520Regional%2520Water%2520Planning%2520Handbook.pdf

1994 Regional Water Planning Handbook
New Mexico Interstate Stream Commission December, 1994

IV. REGIONAL WATER PLANNING TEMPLATE

The template for a regional water plan was designed to provide uniformity in developing regional planning documents. The Commission expects to use the plans to ensure an adequate supply of water for each region of the state. This objective will be enhanced if plans are based on the same format and assumptions and are comparable to one another. The template contains a listing of the topic headings for consideration and, where applicable, addressed by every regional planning entity.

Also, a Regional Water Planning Checklist is available for planners upon request to the Interstate Stream Commission. The checklist is organized to correspond with the Regional Water Planning Template. The checklist is not intended as a list of requirements. Rather, it is intended as a tool to help planners ensure that all pertinent considerations are addressed.

Executive Summary

The Executive Summary is likely to be the part of the plan which will be most widely read and disseminated publicly. The summary should therefore be a brief, clearly presented short version of the findings and recommendations of the plan, which could be read and understood separately from the fully documented version. It should contain a statement on public participation efforts and results, statements on water supply and water demand and the plan's final recommendation to reconcile the two.

□□Description of planning process
□□Findings
□□Water supply
□□Water demand
□□Water plan alternatives
□□Recommended water plan for the region

Introduction

The introduction should provide the reader with the following:

□□Individuals involved in water plan development
~~~~~~~~~~~~~~~~~

□□Previous water planning in the region
□□the water plan's contents

Documentation of Public Involvement in Planning Process
□□Interstate Stream Commission-sponsored water workshop
□□Background summary of region prepared for public dissemination
□□List of stakeholders and participants

Strategy chosen to maximize public involvement
□□Use of the media
□□Press releases
□□Outreach effort tailored to specific communities
□□Project time table
□□Public meetings

Background Information
□□Description of the region
□□Location, boundaries
□□Geography, landscape
□□Climate
□□Natural resources
□□Major surface and groundwater sources
□□Demographics
□□Economic picture
□□Land ownership & land use
□□Historical overview of water use in region

Legal Issues
□□Water laws relevant to region
□□state
□□federal
□□tribal

□□Federal legal issues
□□Federal reservations
□□Indian reservations or pueblos
□□Other federal enclaves
□□Federal environmental law issues
□□Treaties
□□Federal water projects

□□Water quality standards
□□Federal
□□State
□□Municipal
□□Tribal or pueblo

□□Relevant lawsuits

□□Court decrees
□□Pending adjudications

□□Water rights administration policies specific to the region
□□Duty and consumptive use figures
□□Ground water basin criteria
□□Compact obligations

□□Special districts
□□Legal issues needing resolution
□□Local conflicts

Water Resources Assessment for the Planning Region
□□Water supply
□□Surface water
□□Precipitation data
□□Drainage basins and watersheds
□□Streamflow data
□□Evaporation data
□□Surface water yields
□□Storage reservoirs and conveyance canals □□capacity
□□evaporation
□□useful life

□□Ground water
□□Geologic data
□□Hydro geology data by aquifer
□□Well field data
□□Ground water yields by aquifer
□□Sustainable yields
□□Drawdowns by level of development

□□Water quality issues
□□Assess quality of water sources
□□Identify sources of contamination
□□Assess feasibility of water quality management plans
□□Improving water and land-use practices
□□Water treatment alternatives
□□Wastewater treatment
□□Summary of water supply considering legal limitations

Water Demand
□□Present uses
□□Type, location and ownership of water rights
□□Water rights by category of use
□□Water diversions by category of use
□□Water depletions by category of use
□□Public water supply systems data

□□Irrigation practices
□□Conveyance losses
□□Return flows
□□Lake evaporation
□□Riparian uses/in stream flows

□□Future water uses by 40 year planning horizon
□□Projected future demographics
□□Population
□□Future land use
□□Economic growth and jobs

□□Projected water demands by category of use
□□Future sources of water supply
□□Projected changes in water supplies in region
□□Management alternatives to increase supply
□□Changes to existing works
□□Replacement of existing facilities
□□Water banking

□□Emergency contingency plans
□□Drought considerations
□□Flood considerations

□□Water conservation
□□Conservation measures
□□Suitability of each measure assessed for region
□□Amounts and timing of water saved
□□Effect on return flows
□□Difficulty (including costs) and timing of implementation

□□Summary of present and future water demand

Water Plan Alternatives

□□Each proposed alternative should include a description of specific and practical means by which the supply of the region may be reconciled with the present and future demands of the region, as analyzed above. Alternatives should contain:
□□Management component
□□Water conservation component
□□Water development component
□□Infrastructure development component
□□Water quality management plan

□□Each alternative should be analyzed on the following bases:
□□Social issues and evaluation (public welfare)
□□Political issues and evaluation
□□Institutional evaluation

Evaluations

□□Each proposed alternative must be evaluated in accordance with the standards below:
□□Technical feasibility
□□Political feasibility
□□Social and cultural impacts
□□Financial feasibility
□□Implementation schedule
□□Physical, hydrological and environmental impacts

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b. Table of Contents from the 2004 Water Plan for Region 12 (Middle Rio Grande)

Table of Contents
Summaries (also available bound separately)
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C-2 Mcada and Barroll 2002 (ES)
C-3 Bartolino and Cole 2002 (ES)
C-4 FWUP 2001 (ES)
C-5 IPP 2000 (WA sum)
C-6 Papadopulos 2000 (ES)
C-7 Nims et al. (Shomaker) 2000 (ES)
C-8 OSE/ISC Framework for Public Input (ES)
C-9 Niemi and McGuckin 1997 - WWPRC (ES)
C-10 Scurlock 1998 (TOC)
C-11 Daniel B Stephens 2003 (full water qual rpt)
D Glossary
E Water Projects
F Public Comments

Supporting Documents
Supporting documents appear on the accompanying CD available on request from the Mid-Region Council
of Governments.
A-1 WA Certificate of incorporation
A-2 WA Bylaws
A-3 WRB Bylaws
A-4 WA IRS certificate
A-5 MOU – WA/MRCOG
A-6 Blewett letter
A-7 MOU – subregions
A-8 Roles and Responsibilities letter
B Plan schedule
C-1 Pamphlets
C-2 Slide Shows
C-3 Road Shows
C-4 Water Picture Show
C-5 Regional Forum Summaries (mailers for 4-6)
C-6 Chronicles 1999-2002
C-7 Media Kit
D Public Comment database
E-1 Candidate Alts book
E-2 Presentation of Alts by Kryder
E-3 Long Alternatives Tracking Matrix
E-4 Alts Public preferences
E-5 Alts Evaluation Handbook
E-6 Alts Feasibility Handbook (a draft version??)
E-7 Tracking the Alts (short version)
F Maps
G1-4 DBS Fact Sheets (econ, legal, soc/cul/ and technical feasibility)
H Full 3rd party docs
H-1 OSE/ISC Planning Handbook 1994
H-2 FWUP 2001
H-2 FWUP Appendices 2001

H-3 Papadopulos 2000
H-4 Nims et al (Shomaker) 2000
H-5 Legal Issues 2003
H-6 Legal Overview 2003
H-7 IPP 2000
H-8 Jojola report
H-9 Rio Grande Compact
H-10 Treaty of Guadalupe Hidalgo
I WBE
J Fact sheets for 19 Alts
K-1 Information given to SDCs
K-2 Converged Scenario
K-3 Preferred Scenario
K-4 Water for Future Scenario
K-5 SDC Scenarios
L ISC Plan Acceptance Criteria
M Main model (SNL summary)
N Mini model (assumptions, Powersim files)
O Analysis Team Regional Data
P Chapter 9 endnotes
Q Plan Development Database
R Tohajiilee Water Supply Project
S Placitas Water Demand Study
T What Is a Partnership?

Historical Archives
Historical archives appear on the accompanying CD available on request from the Mid-Region Council of Governments.
A1-2 ISC SOWs
B Two letters to pueblos (2002, 2003)
C Contributors to WA and water planning
D-1 AC members/agendas (1997-2003)
D-2 ExCom agendas (2000-2003)
D-3 WRB members/minutes (1999-2003)
E Monthly meeting schedule
F Working Team reports (inconsistent representation)
G-1 Water Assemblies (nothing for #3)
G-2 Regional Forums 1 and 6 (nothing for 2-5)
G-3 Community Conversations
G-4 Special meetings (workshops, retreats, joint sessions, coordination sessions)
H Changes to March 2004 Version

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~~~~~~~~~~~~~~~

c. 2004 Water Plan for Region 12

https://www.ose.state.nm.us/Planning/RWP/Regions/12_MRG/History/HI-CH10-Suppl.pdf

10 Recommendations

These quotes from the Office of the State Engineer and Interstate Stream Commission's strategic plan articulate key constraints to this plan's recommendations.

> The flows of New Mexico's two major rivers—the Rio Grande and the Pecos River— are barely adequate to meet both New Mexico's existing needs and its interstate stream compact delivery obligations. The state's continuing ability to meet those compact obligations is a delicate balance. (OSE/ISC 2003)
>
> Management - New Mexico must efficiently and effectively manage its rivers and groundwater to maximize the use of the state's water supply to meet existing water rights, to meet any required environmental demands, and to meet its interstate stream compact obligations. (OSE/ISC 2001)

In accordance with the mission of the Middle Rio Grande Region's (MRG Region) water plan to balance use with renewable supply, and keeping in mind the state's role and mission as well, this chapter contains the recommendations that follow from the Preferred Scenario. The following sections are included:

□□Introduction—Presents some basic assumptions relating to the detailed recommendations.

□□Detailed Recommendations—The recommendations are generally grouped to match the sequence of topics addressed in the Preferred Scenario description of Section 9.3. The reader should not infer any indication of priority, urgency, or importance from the sequence that the items are listed in this section. In addition, a few recommendations appear that are needed to meet the mission and goals (see Appendix A) but are not directly implied by the Preferred Scenario.

□□List of Water Projects

□□Statement of Public Welfare for the Region

A table of the benefits and costs with projected timing for all of the recommendations discussed in Section 10.2 will be developed during updates of the plan during 2004. More information relevant to these recommendations can be found in the Fact Sheets prepared by Daniel B. Stephens and Associates and the analysis of 19 alternatives that the Alternatives Working Team prepared (see Supporting Documents Series G and Supporting Document J). For definition of terms, see the glossary in Section 1.8.

10.1 Introduction

The Preferred Scenario of Section 9.3, the alternative actions, the original suggestions that led to the alternative actions, the analysis reports by D. B. Stephens and Associates, and the analyses that are embedded in the Sandia National Laboratory's Middle Rio Grande model (MRG model) of the region and of the alternative actions were used as source data for the recommendations.

10.1.1 Vision and Assumptions

Regional Inflows and Rainfall

Assumptions concerning the inflows and precipitation for the planning period are described more extensively in Section 9.3.1. In summary, two predictions are considered: The "recent historical prediction" is based upon the average inflows and precipitation for the last half of the twentieth century. The "tree ring prediction" average is about 94% of the "recent historical prediction" average. For drought planning, a ten-year period was used with inflows about 89% of the above two prediction levels.

Population Projections

Assumptions concerning population growth for the planning period are described more extensively in Section 9.3.1. In summary, population growth was modeled to match the estimates from the UNM Bureau of Business and Economic Research (BBER 2002).

Imported San Juan-Chama Project Water

Assumptions concerning the use of the imported San Juan–Chama Project water are discussed more extensively in Section 9.3.1. In summary, it was assumed that the entire contracted amounts (after transit losses) will be available, will come into the region, and will be diverted to the contractors starting in 2006. It is understood that even though the plan assumes the full San Juan–Chama Project allotment, there is a possibility that it will not be received every year.

10.1.2 Urgent Shortfall Reality

" The Key Fact About Our Water - Demand Exceeds Supply" (**OSE/ISC 2002)**

The initial implementation schedule for the Preferred Scenario may leave a Rio Grande Compact delivery shortfall for ten to twenty years. We need to accelerate implementation of the water planning actions. We need to eliminate the predicted short-term deficits in our compliance with the Rio Grande Compact until the other measures in this plan have had time to take effect. All users must share in the substantial contributions to the effort. The state and the region should work openly and cooperatively to address this issue. Specific urgent actions should be identified, studied, evaluated, and implemented that are focused on avoiding defaulting on the Rio Grande Compact. These actions will have urban and rural economic impacts, but such impacts should be temporary. Unless there is a priority call, water-rights holders must be fairly compensated for the temporary loss of use rights when water is reallocated to meet compact delivery requirements.

All necessary actions should be taken to ensure that water necessary to meet the shortfall is acquired. In doing so, the acquisition of water should not be limited to any one primary source or sector. Considerations in achieving a balanced plan of action should include accelerated Bosque and riparian restoration, a method for performing priority administration in advance of adjudication, a residential conservation program, a municipal and industrial conservation program, a agricultural conservation program, reduction in urban pumping, state leasing of urban water, state leasing of agricultural water, increase in upstream instead of downstream storage of water, and a moratorium on new authorizations of consumptive use.

10.1.3 Need for Balanced Decisions During Water Shortages

With the advent of ground-water pumping, consumptive uses have been temporarily insulated from the effects of water shortage. We now know that surface and ground water are linked, each affecting the other. No one usage should be insulated from water shortages. In balancing decisions during water shortages, additional considerations should include senior rights priorities, and the ability of each individual to absorb additional conservation while recognizing historic uses and community values.

10.2 Detailed Recommendations

The increase in demand for water is an ongoing phenomenon. This section recommends specific actions to meet the region' s future demands. Local governments, water management agencies and water users should implement these in order to align with this plan' s goals and objectives. Table 10-1 identifies how each recommendation supports the mission and goals of the plan. Table 10-2 lists the numeric performance targets that appear explicitly in the Preferred Scenario of Section 9.3.

These recommendations were derived from Chapter 8' s individual alternative actions, Chapter 9' s Preferred Scenario and can be traced back to suggestions from the public as well as experts in their respective fields. The implications of this section have been taken from technical analysis, modeling and the judgment of various participants in the process.

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ISC Meeting of January 21, 2025
Public Comment -- Elaine Hebard

Last November, the Office of the State Engineer issued the New Mexico Water Use by Categories for 2020. I'd like to share some observations I gleaned after reviewing it and the 2015 Report, which came out in 2019.

First of all, while I realize that a lot of work goes into the WUR, is there some way for the State to release water use numbers earlier? It is much more difficult to seek changes for water uses and users when the most recent data is already 5 years old.

And changes are needed.

Water usage among the six Compact Counties of the Middle Ro Grande varied greatly.[2] As I explain in the footnote, I tried to create a Compact Report, but there are sure to be minor errors. Nevertheless, the message is clear -- groundwater withdrawals exceeded our Compact allotment.

[2] * I removed Irrigated Ag acres which appeared to be outside the Compact boundaries. Specifically, I removed San Augustin Plains (Socorro.); all but Above EBID (Sierra) and Santa Fe and Vicinity (SF), for a total of 13,583 af WSW and 27,333 af WGW. Some public water supplies may likewise be out of MRG Compact Basin but not removed. For 2015. for Irrigated Ag, I removed: the same areas for a total of af 11,711 WSW and 37,418 af WGW. Some public water supplies may likewise be out of MRG Compact Basin but not removed. If the proposed, Preferred Hydro-Administrative Boundaries, outlined in the Discussion Draft being introduced today are confirmed,, hopefully, the 2025 WUR will be also broken down into Compact boundaries.
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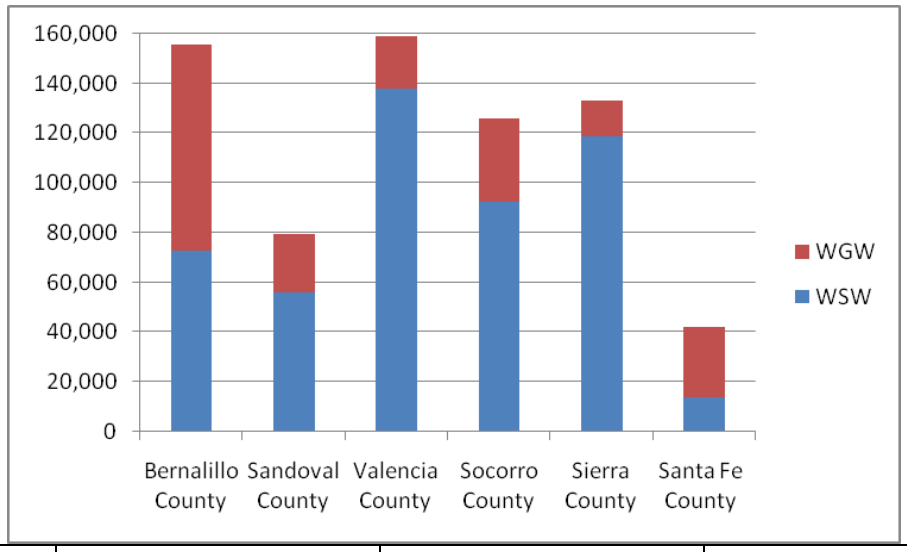
2020 Groundwater and Surface Water Withdrawals*



	WSW		WGW		TW	
Bernalillo County	72,852	11.15%	82,685	12.65%	155,537	23.80%
Sandoval County	55,988	8.57%	23,300	3.57%	79,288	12.13%
Valencia County	137,937	21.11%	20,829	3.19%	158,766	24.29%
Socorro County	92,436	14.14%	32,374	4.95%	124,810	19.10%
Sierra County	110,864	16.96%	4,016	0.61%	114,881	17.58%
Santa Fe County	8,721	1.33%	11,573	1.77%	20,295	3.11%
	478,798	73.26%	**174,777**	26.74%	**653,577**	100.00%

And sure enough, in 2020, there was a Compact deficit in 2020.

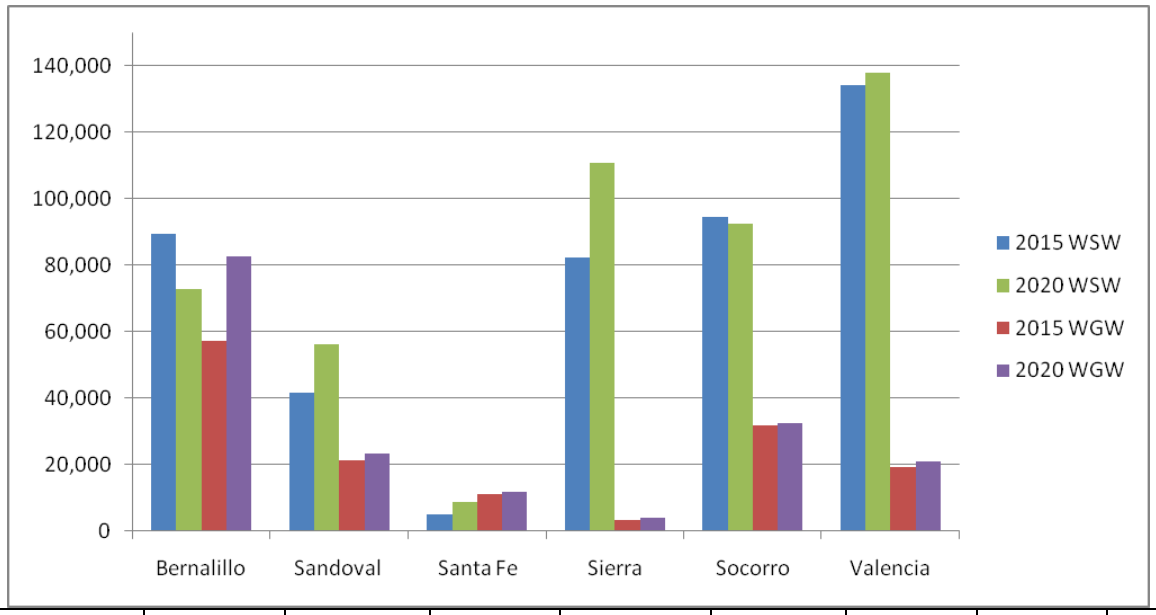
RIO GRANDE COMPACT - DELIVERIES BY NEW MEXICO AT ELEPHANT BUTTE
YEAR 2020 (RECONCILED IN 2023)

Quantities in thousands of acre feet to nearest hundred

SUMMARY OF DEBITS AND CREDITS				
	ITEM	DEBIT	CREDIT	BALANCE
NM1	Balance at Beginning of Year	----------	----------	Dr. 93.0
NM2	Scheduled Delivery at Elephant Butte	774.9	----------	Dr. 867.9
NM3	Actual Elephant Butte Effective Supply	----------	745.7	Dr. 122.2
NM4	Reduction of Debits a/c Evaporation		0.7	Dr. 121.5
NM5	Reduction of Credits a/c Evaporation and Spill	----------	----------	
NM6				
NM7				
NM8	Balance at End of Year	----------	----------	Dr. 121.5

While it may be good news that only 1,300 af was added to the debt last year, it still means that surface water users are restricted under Article 7.

Water usage rose by roughly 10% from 2015 to 2020. Overall pumping rose by 22% while surface water diversions rose by 7%. Pumping increased substantially in Bernalillo County, while surface water withdrawals declined. Surface water use increased in Sandoval County, as in Sierra County, the latter mostly as evaporative loss from Elephant Butte Reservoir.



	Bernalillo	Sandoval	Santa Fe	Sierra	Socorro	Valencia	Tot dif	Total 2015	Total 2020
2015 WGW	57,096	21,350	10,929	3,159	31,714	19,061		143,309	
2020 WGW	82,685	23,300	11,573	4,016	32,374	20,829			174,777
2015 WSW	89,371	41,486	4,861	82,343	94,419	134,084		446,564	
2020 WSW	72,852	55,988	8,721	110,864	92,436	137,937			477,269
				EBR evap				589,873	652,046
dif wgw	25,589	1,950	644	857	660	1,768	31,468		
dif wsw	-16,519	14,502	3,860	28,521	-1,983	3,853	30,705		
Dif total	9,070	16,452	4,504	29,378	-1,323	5,621	62,173		62,173

WSW=withdrawal, surface water; WGW=withdrawal, ground water

The State has said that the Rio Grande in the MRG was fully if not over appropriated by 1907. A substantial portion of the groundwater use, whether allowed under various permits such as "vested" ones, is still junior to those earlier uses. The depletions caused by the pumping, from a myriad of uses and users (such as vested uses, ESA requirements, MRCD's reclaimed lands usage, and the thousands of domestic well users), are not fully offset.

Rather than continue to require surface water users to bear the brunt of the Compact deficit, the ISC should require all users to reduce their use. A letter similar to the one sent by former SE Hamman to the MRGCD regarding the need for depletions reductions is needed to be sent to all major water users in the basin. Why not establish a depletions water model?

The ISC should also request that the State Engineer review the various permits issued already. What would it mean to river flows if the vested permits, for instance, had to be offset?

And like is being done in the Lower Rio Grande, a Water Alliance should be created here with the goal to rein in depletions. The tasks laid out in the Settlement with Wildearth Guardians for the new Biological

Opinion provide a useful framework, with would be able to mesh with the Regional Plan when that effort gets underway. [3]

Meanwhile, the MRG cannot wait.

Thank you,

Elaine Hebard
1513 Escalante SW
Albuquerque, NM

[3] From today's agenda packet - Tasks: (1) development of enforceable conservation measures; (2) analysis of climate change; (3) analysis of river management impacts; (4) analysis of river drying on listed species; (5) analysis of water rights administration impacts and water diversions on listed species; (6) analysis of habitat suitability and fish passage in the Angostura and Cochiti Reach; and (7) analysis of impacts of use of a 30,000 to 50,000 acre-foot conservation pool.

DATE: February 21, 2025

TO: Interstate Stream Commission Planning Program

FROM: Western Resource Advocates, NM Wild, Amigos Bravos, Theodore Roosevelt Conservation Partnership, American Rivers Action Fund, and Audubon Southwest

RE: Comments on Discussion Drafts of Water Security Planning Act Rule and Guidelines

Dear Mr. Erdmann and Ms. Fox,

Thank you for the opportunity to submit comments on the draft rules and guidelines of the Water Security Planning Act. These documents will provide the scaffolding for successful regional water planning for many years to come and we appreciate the time and effort that went into these initial drafts.

Below you will find comments and specific language suggestions that we believe will strengthen the rules and guidelines. These comments were developed and approved by Western Resource Advocates, New Mexico Wild, the Theodore Roosevelt Conservation Partnership, Amigos Bravos, American Rivers Action Fund, and Audubon Southwest, who collectively represent more than ten thousand members and supporters across the state of New Mexico with an interest in supporting the unique ecosystems, communities, and economies of our state.

We would also like to make the following general comments that came up throughout our review of both the rules and guidelines, and that we feel are particularly critical to success:

1) Our organizations strongly believe in a consensus driven approach to planning. Focusing on building consensus should be a goal of any planning process, and we firmly believe that consensus-driven planning results in stronger and more defensible plans.
2) The Water Security Planning Act includes requirements for councils to consider both public welfare, and the needs of future generations of New Mexicans. These are two separate concepts. Currently the rule and guidelines set out some minimum standards for how to consider public welfare, but largely leaves the needs of future generations undefined. We believe this risks not meeting the requirements of the statute and a critical consideration that is required in the planning process - the long-term benefits and impacts of proposed projects.
3) From reading both the rules and guidelines we understand there is some reluctance to commit to certain actions that will require future funding. However, including language that subjects whole sections of rule to the availability of funding is not regularly seen in administrative rulemaking. All agency work is subject to the annual appropriations process of the legislature and we don't believe it is appropriate to single out only some

actions as subject to funding. Doing so risks implying that those sections of rule are not a priority.

4) While we disagree with ISC's position on the limited scope of what can be included in rule, at the very least the guidelines should be more robust and provide more detailed direction to councils than what currently exists. Members of the public may be confused about the difference between rules and guidelines, and it needs to be more clear up front what the purpose of the guidelines are, and how they will be implemented together with the rules by the ISC. Without this clarity, there is a risk that councils might not pay adequate attention to the critical information provided in guidelines.
5) We are concerned that the draft rule and guidelines do not adequately require planning entities - or give them the necessary guidance - to make hard decisions about the steps that need to be taken to meet each region's water needs. We suggest including requirements by rule that planning entities prioritize projects based on specific criteria. In addition, we suggest including requirements that planning entities document how each project will meet these criteria and outline basic implementation steps such as funding needs, permitting requirements, and implementation timeline estimates.

Comments on Draft Rules

We make the following specific comments on the discussion **draft rules** of the Water Security Planning Act:

Section 10

B. Each Council shall invite ten at-large members, to be reviewed and confirmed by the commission, located within the region, to represent the following stakeholders or stakeholder groups:

(1) agricultural producers;
(2) ~~a public higher education institution;~~
(3) environmental or conservation organizations ~~with water security concerns in the Planning Region;~~
(4) recreational interests;
(5) industrial water users; ~~and~~
(6) domestic well users;
(7) water quality monitoring or protection interests;
(8) a social or environmental justice organization; and
(9) two ~~five~~ additional at-large members.

- 10.b - We understand the interest in representing broad water perspectives on the council, and delegating appointments to the local level makes sense. However, we believe that the commission has a responsibility to ensure that the invitations sent by these appointed members are consistent with the requirements in the rule. Therefore we included a requirement that at-large members are confirmed by the commission.
- 10.b - It is also unclear why the "environmental or conservation organization" representative has qualification language included when no other at-large member is required to prove that they have direct concerns in the region other than residing there. We request that this language is removed, or alternatively similarly required for all at-large members

- 10.b - We respectfully question the inclusion of higher education institutions as a named at-large member. While they may represent major interests and water users in some regions, this is not the case in all regions. We believe higher education is better placed as a non-voting technical expert or an open at-large seat when applicable.
- 10.b - We also see that agricultural and industrial users will likely be represented both in the appointed positions and at-large positions. To maintain a more balanced council, we suggest some additional named at-large positions while reducing the number of un-named positions, keeping the net number of positions the same.

C. A member may be appointed to represent more than one entity or interest, however in such cases that member will only retain one vote or similar decision making power as any single member.

D. Each council shall invite three non-voting representatives for entities outside the Planning Region. Representatives appointed pursuant to this shall not be required to reside within the borders of the planning region.

- 10.c [NEW] We understand from presentations from ISC staff that there is the possibility that individuals may represent more than one interest as an appointed member - for example multiple acequias or tribes might elect to be represented by a single person. We would like clarity on what the decision-making implications of that be - i.e does that individual then have 1 vote or do they have the number of votes of the entities they represent? We included language to clarify that.

E. If a qualified or willing representative cannot be identified by the council or commission to serve as a representative for any entity or stakeholder described in sections 104.A or 104.B, the commission may select a replacement non-voting member who is knowledgeable about water resources in the Planning Region.

- 10.e - We understand the pressure between the desire for local expertise and control, and the reality that each region will have widely different capacity to fill each position. We believe that adding commission review and approval of non-voting members adds another layer of certainty that sufficient effort will be made to find voting representation for each position, and that non-voting members will be as close as reasonable to local experts.

F. The council shall adopt written operating principles that describe the following, at a minimum, and shall provide their operating principles to the commission upon request:

(1) the roles and responsibilities of the council members, including non-voting members;

(2) the duration of the term for representatives on the council; ~~and~~

(3) the grounds and process for removing a representative from the council, and

(4) Process by which the Council will achieve consensus on actions and priorities;

(5) Process by which each Council members was selected;

G. The Council's adopted written operating principles must, at a minimum, include

i Each voting member of the Council shall be entitled to one and only one vote, and;

ii The Council will seek consensus in decision making and document dissenting opinions when consensus cannot be reached.

- 10.f - This section gives broad agency to each council to organize as they see fit, which reflects the feedback ISC received that councils needed to be able to adapt to each region's needs. However, we believe that requiring some minimum standards is reasonable to ensure consistency across regions and equity within each council.
- 10.f - In particular, we strongly support a consensus based decision making model, as the best way to ensure that diverse voices are given a real seat at the table, that the rule makes clear that each individual is entitled to one vote, and that councils define the roles that non-voting members have in the planning process.

H. ~~Subject to the commission director's determination of adequate funding and staffing,~~ A commission staff member who resides within the region shall act as the commission's liaison to the council for the purpose of ensuring the proper coordination of commission information, policies, and resources. If a staff member does not reside within the region, then the director shall work with the council to support staffing from one of the members listed in 10.A. or through other means.

I. The commission shall provide administrative support and facilitation for up to three (3) meetings of the Council per calendar year.

J. The commission shall provide councils with technical support and resources to ensure councils have access to the best available data and science, including previously developed local water planning plans and processes.

(1) The commission shall provide councils with administrative support to ensure councils have support identifying funding sources to implement projects identified by the councils.

- 10.h - We support ISC's commitment to providing local support to each planning group, and recommend adding a requirement that the ISC work with the appointing bodies described in 10.A, or other contracting mechanisms, to ensure that each council has sufficient support and connection to commission staff.
- 10.J - Access to best available science will be critical to the success of each council, and we recommend ISC staff be directed in rule to assist in making sure existing data and tools are made available.

Section 11

x.xx.xx.11 REGIONAL WATER SECURITY PLANNING COUNCIL MEETING REQUIREMENTS

A. Meetings shall be held at least three (3) times per year during periods of plan development or update.

B. Councils must provide reasonable notice of meetings or other activities to council members, the public, stakeholders, and the commission in a manner consistent with the guidelines laid out by the commision and the Open Meetings Act.. ~~Councils must provide reasonable notice of meetings or other activities to council members, the public, and the commission.~~

C. Subcommittee meetings may be held and may or may not be supported by commission staff and resources.

- 11.b - If regional water planning is to have the impact we hope on the organization and prioritization of water projects throughout the state, we believe strongly that openness and transparency are critical. Without such protections, plans risk being seen as

politicized and biased. We recommend including requirements that councils conform to the rules of the Open Meetings Act.

Section 12

x.xx.xx.12 ADOPTION OF REGIONAL WATER SECURITY PLAN: In order to be approved by the commission, regional plans must meet the following criteria:

A. Plans shall include a list of projects, programs and policies in order of priority and each project, program, or policy shall:.

(1) Document how it will support water security in the region and improve public welfare, balance of water uses, and the needs of future generations of New Mexicans;

(2) Provide an estimate of readiness including when possible a path to implementation, necessary funding, and required permits,

(3) and address potential social justice issues and environmental impacts related to implementation of the PPP.

B. Councils shall seek and document in the plan Water Security Tribal Advisory Council (WSTAC) involvement, input and endorsements, as applicable.

C. Councils shall seek and document in the plan public input in the development, vetting and prioritization of regional water planning activities and proposals in a manner consistent with the guidelines laid out by the commission.

D. Councils shall seek and document and incorporate comments received from stakeholders in a manner consistent with the guidelines laid out by the commission.

E. Plans shall provide documentation of comments received from, and coordination with, state and federal agencies.

F. Councils shall review existing water plans and data sets of municipalities, counties, and other entities within or relevant to the Planning Region and use them as appropriate to, at minimum, summarize regional water sources, uses, and needs.

- This section gives broad agency to each council to organize and plan as they see fit, which reflects the feedback ISC received that councils needed to be able to adapt to each region's needs. However, we believe that some minimum standards are reasonable to require to ensure consistency across regions and equity of opinion within each plan.
- Without some minimum standards, plans could easily avoid difficult questions of feasibility and sustainability, and fail to meet the requirements in statute that they consider the public welfare, and needs of future generations.

G. The outcomes sought by each Regional Water Security Plan shall:

(1) be established through broad public input;

(2) consider public welfare values, balancing all water uses including consumptive and nonconsumptive water use and the needs of future generations of New Mexicans;

(3) comply with state water law;

(4) be developed using the best available science;

(5) recognize and respect federally recognized or reserved tribal water rights;

(6) consider access to water for domestic use; ~~and~~

(7) comply with applicable federal water law; and

(8) consider the water needs of healthy aquatic and riparian life and ecosystems ~~fish and aquatic and riparian habitats~~.

- 12.g.2 - While the attorney general has clearly indicated that in-stream/nonconsumptive water rights can be counted as beneficially used, there is still confusion by the public on this fact. We recommend clarifying that balancing water use includes all beneficial uses, consumptive and nonconsumptive.
- 12.g.8 - We recommend language changes in this section to represent a more holistic understanding of the diversity of species and ecosystems that depend on our river and groundwater resources.

Section 13

x.xx.xx.13 PROCEDURE FOR REGIONAL WATER SECURITY PLANNING COUNCILS TO DEVELOP AND PROVIDE NOTICE TO THE COMMISSION OF ISSUES AND CONCERNS RELATING TO THE PUBLIC WELFARE OF THE WATER PLANNING REGION

A. Identifying Public Welfare Issues and Concerns for Water Planning Region: Each Council shall establish a process for identifying the water-specific issues and concerns relating to the public welfare of the Council's water planning region. The process shall comply with the following requirements:

- 13.a - We are generally supportive of this section, especially the discussion of consensus requirements. We recommend including "water-specific" to clarify that this public welfare discussion is limited to water-related topics. This would avoid potential straying into important but ultimately not relevant topics that impact life and welfare.

Section 14

x.xx.xx.14 PROCEDURE FOR A REGIONAL WATER PLANNING COUNCIL TO CONSIDER PUBLIC WELFARE VALUES AND THE NEEDS OF FUTURE GENERATIONS OF NEW MEXICANS

A. Regional Water Planning Council may consider public welfare values of the water planning region after such values have been determined pursuant to the procedures set forth in Section 12 of this rule.

B. Regional Water Planning Council shall consider the following public welfare values of the state in their regional water planning activities:

(1) The state's ability to meet its obligations under interstate compacts;

(2) The state's ability to comply with the Endangered Species Act, to avoid additional listings of species, or otherwise prevent additional degradation to habitats and ecosystems ~~significant harm to the habitats of Federal- and State-endangered or -threatened species~~; and

(3) Regional water rights settlements, including tribal water rights settlements and alternative administration plans under the Active Water Resources Management program.

C. Regional Water Planning Council shall consider needs of future generations of New Mexicans in their regional water planning activities. Procedure for a Regional Water Planning Council to consider the needs of future generations of New Mexicans:

(1) The Regional Water Planning Council shall use the best science, data and models related to water resource planning and shall use them with scientific integrity and adherence to principles of honesty, objectivity, transparency and professionalism, as specified in NMSA 1978, Section 72-14A-4(C)(7);

(2) Regional Water Planning Council shall use and document the use of ~~utilize~~ such data and models to consider the needs of future generations of New Mexicans in their regional planning activities.

(3) Using the information developed from the above methods, The Regional Water Planning Council shall document the long-term sustainability and impacts of any proposed projects, including an estimate of how long any benefits achieved from a project are expected to remain.

- 14.b - We strongly support the inclusion of Endangered Species Act compliance, and recommend mirroring ISC's goals in the Strategic Water Reserve - to prevent the listing of future species. We also recommend a broader definition of habitats beyond just federal and state listed species.
- 14.c - The Water Security Planning Act requires that the rules define a procedure for the council to consider the needs of future generations. We believe that Section 14 needs to provide a minimum standard for what this consideration is. The use of best available science, while critical to planning in general, does not address or describe the needs of future generations by default. We recommend these changes to ensure that future generations are meaningfully considered in the planning and prioritization process.

Comments on Draft Guidelines

We make the following specific comments on the discussion draft guidelines of the Water Security Planning Act:

Section 2

2.0 IDENTIFICATION OF REGIONAL STAKEHOLDERS AND OPPORTUNITIES FOR STAKEHOLDER COLLABORATION

2.1 Stakeholders shall be consulted in the development of any RWSP. Stakeholders shall have a voice in the planning process but do not have final say in the decisions regarding water planning in a region.

2.2 Planning Councils must establish a method for Stakeholders to enter into and engage in the planning process. At a minimum, the identification of Stakeholders shall include:

a. documentation that the Stakeholder lives within the region or has provided a statement of interest.

b. a point of contact for the Planning Council.

c. what group the stakeholder represents.

- 2.2 - In this section, it is somewhat unclear whether meeting the listed minimum requirements is the responsibility of the stakeholder or the council. We are taking it to mean the minimum required information that the council must gather about stakeholders, but this could be clarified.
- 2.2.b - For this requirement in particular, it is unclear if this is a point of contact in the stakeholder organization, or among Council members.
- 2.2.c - We support the requirements for documentation of the stakeholder engagement process, and as a part of that, we recommend an additional point requiring documentation of what interest or group the stakeholder represents. This may be self-identified.

2.3 Planning Councils shall conduct adequate notice and maintain a distribution list for Stakeholders. Stakeholders may elect to receive information by email, USPS First Class mail, or other methods approved by the Planning Council. Members of the Stakeholder list should be given, at minimum, sixty days notice ~~notified~~ of the following opportunities:

~~a. to support/endorse council members.~~

a. to provide comments on proposed plan language.

b. to provide notice of dissent to the NMISC at the time of plan submission for consideration.

And thirty days notice of the following opportunities:

a. to support/endorse council members

b. notice of Planning Council meetings and in-person or remote attendance options.

- 2.3 - We feel that the intent of this section is extremely important to ensure adequate public and stakeholder engagement. Because these are guidelines, we feel it is an appropriate place to provide specific minimum notice times. We recommend splitting this section into two groups, such that "members of the Stakeholder list should be given, at minimum, sixty days notice" of opportunities under 2.3.b and 2.3.c, and "thirty days notice" of opportunities under 2.3.a and 2.3.d.

Section 3

3.1 RWSPs shall ~~must~~ include ample opportunities for the public to be involved in the development of the plan and the development of the prioritization of PPPs. During the development of any RWSP ~~regional water security plan~~, the Planning Council must, at a minimum:

a. Inform Stakeholder list and distribute information regionally about the development of the plan, including opportunities for input, at regular intervals.

b. Host two public meetings, with support for both in-person and virtual opportunities for participation.

c. Provide a minimum of sixty days for the public to comment in person, via email, or through a web site on ~~a~~ draft or final versions of water security plan.

d. Provide an opportunity for public comments to be reviewed ahead of finalization of a water security plan.

- 3.1 - For consistency and formality, we recommend changing "~~must~~" to "shall".
- 3.1 - We value the inclusion of both the minimum number of Council meetings and minimum number of public meetings per year, because we feel a working Council meeting (while potentially being open to the public) has a very different purpose than a public education and update meeting. As it stands, this section does not clarify if there is a difference between these meeting types, or define what a public versus council meeting is. We recommend establishing a minimum of two public meetings in addition to the three Council meetings required in rule.

3.2 ISC will support ~~a~~ Additional opportunities for input, which may include, but are not limited to:

a. Providing materials in languages in common use within the region (e.g., sign, Spanish, Tewa, Navajo).

b. Hosting additional meetings, focus groups, listening sessions, open house events, etc.

- 3.2 - We feel that the opportunities for input in 3.2 are very important for fair and equitable engagement. We suggest that the ISC commit to supporting these items.

3.3 WSPA emphasizes engaging rural communities, therefore the Planning Council may consider a range of participation options that eliminate barriers such as access to a stable internet connection or lengthy travel. This could include, for example:

a. providing engagement resources (e.g., presentations, paper surveys) to local community partners with existing connections in rural areas.

b. multiple in-person opportunities distributed throughout larger regions, and expanded strategies for community engagement, e.g. through local radio broadcasts to alert communities about engagement opportunities.

c. meeting spaces or computer access for remote participation.

- 3.3 – We recommend distributing relevant meeting opportunity information through a wide range of communication channels to ensure awareness and participation in remote areas of the state. For example, some communities that lack reliable internet access may rely more heavily on local radio broadcasts or other communications channels that are more accessible in these regions. We encourage the ISC to take full advantage of these alternate communication outlets.

3.5 Planning Regions or sub-regions are encouraged to coordinate and share information or resources with other Planning Regions or sub-regions, especially those upstream or downstream of each planning region.

- 3.5 - The public indicated the importance of hydrology in the geographic organization of the planning process. Most regions have the potential to be strongly impacted by the activities in upstream and downstream regions, and collaboration between these hydrologically neighboring regions will be of great value.

Section 4

4.1 Subject to appropriations from the legislature, the Commission will develop a Regional Planning Grant Program with proposal requirements for grants or loans for Planning Activities and an approval process. The receipt or administration of Regional Planning Grants or Loans shall not entitle a governing entity to greater say in Planning Activities beyond that of their voting representatives.

- 4.1 - Due to New Mexico's anti-donation clause, any funds directed to the ISC to provide councils with grants or loans will need to be awarded to and administered by one of the local governing entities represented in the council. We recommend including language that ensures that the award of a grant or loan to an entity is not taken to indicate that that entity has greater say in the planning process.

Section 5

5.1 Councils are encouraged to collaborate with State agencies, who may ~~can~~:

a. provide comments on draft RWSPs to the NMISC and the Planning Council developing the RWSP, including:

i. highlighting permit requirements should a given project be funded.

ii. highlighting areas of conflict between proposed projects and state of NM goals.

iii. estimating time commitment for State Agency staffing.

iv. identifying opportunities for leveraging or accessing funding and expertise.

v. Identifying any other issue the State Agency finds relevant to a region's proposed plan.

b. Identifying a person or group to act as the liaison for their agency and provide NMISC with up-to-date contact information for the person or group.

- 5.1 - We appreciate and strongly agree with the inclusion and input of state agency experts in the regional planning process, However, because state agencies are limited by capacity and funding across the board, we recommend clarifying that Councils need to be active partners in seeking agency guidance and expertise.

5.3 NMISC Planning Program will:

a. serve as an informational resource for topics associated with planning, such as various state and federal funding sources, the best available scientific tools/models, previously developed related water planning documents, or opportunities to connect projects that may have multiple benefits.

b. act as a liaison between agencies and Councils.

c. provide agency comments to the Councils.

d. endeavor to maintain a list of agency partners for regional consultation.

e. provide a forum for state agencies and planning entities to meet and collaborate.

i. at the request of an agency or Planning Council.

ii. at an annual coordination meeting.

iii. or as needed.

- 5.3 – There are a wide variety of existing local, regional, and statewide water planning documents. While some of these plans may be focused on specific topic areas, such as drinking water supply or fire resilience through headwater restoration, we encourage the ISC to support councils in using existing plans to inform newly developed regional water plans. Utilizing previously developed plans may help streamline planning processes,

ensure that regional water plans incorporate multiple perspectives and multiple benefits, and identify already vetted and robustly supported water projects.

Section 6

- 6.2 - We agree that understanding and reporting on regional water balance is a critical yet complex component of effective regional planning, and that councils will require support, especially technical hydrological expertise, to adequately meet this need. However, we are concerned with the lack of clarity and definitions in this section, especially given the inherent complexity and challenge of accurate and scientifically sound water balance analysis. We feel that it will raise several questions that must be addressed in the guidelines.
    - Who are the supporting "groups" besides the Planning Program? We feel that this may make reporting of the water budget vulnerable to being skewed or otherwise misrepresented, hindering adherence to the "best available data and science".
    - What kind of tools and support are envisioned? Support tools and data should have some kind of vetting process and be cited clearly in reports to ensure adherence to the "best available data and science".
    - What is included and how in-depth is this water balance? We suggest that the ISC specifically recommend minimum components and require any deviation from the recommended water-balance reporting be explained by the council.
    - Is this reporting to be included in or in addition to the approved plan? We suggest that water balance reporting be a required part of the approved plan and it be referenced in this WSPA-required reporting process, so that planning is clearly based on and informed by the water balance.
- 6.2.a - We appreciate that there may be important intent behind this point, but feel it is confusing as worded, because the physical reality of the water balance either does or does not align with statewide objectives, regardless of reporting.
- 6.2.a - We feel that establishing statewide objectives as part of the guidance for Regional Water Planning is extremely important, but if those objectives have been defined somewhere, we are not aware of it. Statewide objectives need to be clearly defined and consistently referenced.

Section 7

- 7.1 - We suggest that this section and overall outcomes of the regional water planning process would greatly benefit from better clarification on the role and responsibilities of the council in the implementation of PPPs. As written, we feel that this section suggests that the council has no responsibilities beyond reporting, and if that is the intention, that this is inadequate. We are concerned that this lack of responsibility will result in a disconnect between planning and implementation to the detriment of both components of this process.
- 7.1.a.iii - We agree that regularly updating the list of prioritized PPPs is of great importance and that this requirement belongs in rule, rather than guidelines. We suggest

that this requirement may be enforced by making councils with out-of-date PPP lists ineligible for programmatic grants and loans.

- 7.1.b - We understand the intent of this is to ensure that no PPP is proposed without someone dedicated to its implementation, but putting all of the responsibility for implementation on a single sponsor will, by design, prioritize projects coming from sponsors with broad capacity or authority, which are are also the projects most likely to get funded outside of the regional planning process. We suggest that guidance be given for more distributed responsibilities beyond a single sponsoring entity or grant-recipient.
- 7.2.f - While we understand the importance of clarifying that these activities fall outside of the responsibility of the ISC, we suggest that guidance is needed on whom these responsibilities do fall. If it is a sponsor, we suggest a new section of the guidelines be devoted to defining who a PPP sponsor is and what their responsibilities are.

Section 8

- 8.1 - We recognize that this section may be intended to outline the planning timeline statewide, but clarification is also needed at the regional level. In particular, the statement "This phase will last for six years" raises the need for clarification on when implementation of PPPs can start, because six years is too long a delay for many regions' more pressing water needs.
- 8.3 - Again, we feel it critical that "statewide objectives" be clearly defined, as this term is used in several locations and seems to carry considerable weight. We recommend this includes adherence to the Endangered Species Act, interstate compact compliance, not infringing on existing water rights, and improving public welfare.

Section 9

To be presented for Commission approval, RWSPs must contain the following elements, in addition to meeting the requirements set forth in the Rule:

9.1 Prioritized list of PPP requests from the region. This list includes multiple, sub-lists organized based on readiness with project types and sponsor noted for each individual PPP.

a. Each of these readiness-based sub lists is independently prioritized, ranking each PPP at an individual level relative to all other PPPs on that list (region-wide).

b. Project readiness includes 3 categories:

i. ready to implement/proceed (like shovel ready). ii.

needs planning (one step away from shovel ready).

iii. needs scoping (one step away from being planned).

c. Each proposed PPP must list the sponsor(s) that intends to obtain and administer the funding for and implement the PPP.

- 9.1.c - To ensure that sponsors follow through on administration of any grant funding they receive, we recommend an addition to this point so that it reads "Each proposed

PPP must list the sponsor(s) that intends to obtain and administer the funding for and implement the PPP."

d. PPP types include, but are not limited to:

i. watershed health

ii. river and riparian corridor and habitat restoration

iii. drinking water

iv. storm water iv. dam maintenance

v. water conservation resulting in reduction of total water use vi. education

vii. efficiency

viii. water reuse

ix. aquifer storage and recovery

x. aquifer recharge

- 9.1.d - We appreciate that this point clarifies that PPPs are not limited to the types listed. However, because of the considerable need and potential funding pathways for environmental restoration in our waterways, we suggest that "river and riparian corridor restoration" be added to the list of PPP project types.

e. Additional information for each PPP that would strengthen its case for prioritization includes:

i. Documentation/Proof of existing funding match commitments for identified PPP's on the prioritized list if that exists.

ii. Documentation that the PPP will have multiple benefits and/or meet multiple state objectives

iii. Documentation indicating that the PPP will minimize harm and maximize benefit to public welfare and the needs of future generations of new mexicans

iv. Documentation of substantial support from diverse stakeholder groups

v. Documentation that PPP will have long-lasting and sustainable benefits

vi. Other items that may strengthen the case for specific PPP.

vii. Other items that may strengthen the case for specific PPP.

- 9.1.e - We agree that guidelines should provide councils with a basis for what kinds of documentation and factors may strengthen a PPP's case for prioritization, in part because this will inform members of the public regarding their support or dissent of

plans, as well as the legislative budget process. However, we feel this section, as written, is too incomplete to provide these benefits. We suggest that a broader menu of factors be presented to councils.

- 9.2 - We feel that this point, as written, substantially undermines the intent of the WSPA. We don't agree that the statute requires that public welfare and needs of future generations be defined together as a statement, but rather that councils evaluate projects against their impact on future generations (i.e sustainability, long-term impacts, etc) separately from impacts on current public welfare, especially because public welfare definitions may vary from region to region. We strongly recommend that, at the very least, the guidelines define a minimum standard for what review of the needs of future generations entails. For example, both the governor's water plan and leading statewide science on future water supplies focus on a 50-year timespan. We suggest that the minimum standard include, but not be limited to addressing PPPs' 50-year impacts on water quality, ecosystem services, water availability, and access to water for cultural and economic activities.

> 9.5 Acknowledgement and discussion of regional water balance including reductions in projected water availability and impacts of climate change, including ~~decision-making practices adapted for~~ increasing aridity and uncertainty, as discussed in the report "Climate Change in New Mexico Over the Next 50 Years: Impacts on Water Resources".

- 9.5 - We strongly support the requirement that councils consider the impacts of an uncertain and variable water future. We recommend being more direct about the causes of such uncertainty and specifically direct councils to refer to the state's most comprehensive resources on the impacts of climate change on our water systems.

SIMPLIFY

You have probably covered most to every contingency. However, it's so long, so detailed and so convoluted, that no group or regional planning council can EVER match every requirement/suggestion in this draft.

How about a simple list of the suggestions and a separate list of the requirements?

You can add which section of the plan relates to each suggestion or requirement.

Form the council, using good common sense and including as many relevant entities as possible.

However, the size of that group in most regions will be way too unwieldy and may never reach a reasonable decision.

Consensus is not enough for something this important. The planning and the ultimate plan for each large region needs to be if not unanimous, then without major conflict.

Also make a simple list of all portions that require ISC inclusion or approval, not scattering them throughout the document.

In other words, you need a summary of the major roles of whomever/whatever on each page of the document.

I know you have to gird yourself from lawsuits, so this document should be available, but you need a simpler shorter version for those who will participate in the creating of their plans.

NMWA's Markup of the ISC's Discussion Draft Rules and Guidelines for the Water Security Planning Act

Submitted February 21, 2025

Introduction

The fifteen-member Board of the Water Advocates is submitting herein a mark-up of the ISC's Discussion Draft Rules and Guidelines for WSPA. The marked-up rules contain a suggested approach to establish and conduct a robust regional water security program pursuant to the provisions of the Water security Planning Act 72-14A NMSA 1978.

We understand that ISC prefers that our comments fit within the structure of the Discussion Draft. Accordingly, we have mapped our recommended rule set into the structure of the ISC's Discussion Draft with Microsoft Word's tracked changes. Besides the marked-up draft below, we have also placed our rationale comments in the paragraph-by-paragraph boxes of the website form. Because of the 1000-character limitation on the website boxes, those paragraph-by-paragraph comments make frequent references to the mark-up that starts on page 4 of this file.

Our rule set, from which we've drawn rule text for the mark-up, was drafted, edited, re-edited, and refined multiple times over the course of twenty-two months. The development of our source text for the markup of the discussion draft Water Security Planning Act Rule Set was shaped by the collective expertise of eleven New Mexico Water Advocates participants and collaborators, each bringing decades of experience in water policy, resource management, engineering, conservation, hydrology, and community planning. They represent a broad spectrum of knowledge and leadership in ensuring sustainable water solutions for New Mexico. Their combined insight reflects a deep commitment to safeguarding the state's water future through science-based, community-driven, and policy-informed approaches.

By strengthening these rules, New Mexico has a remarkable opportunity to create real solutions for our water future. We urge the ISC to ensure that the WSPA's full potential is realized—giving every region the tools and structure needed to address its water challenges effectively.

Key Points in the Marked-Up Draft:

We wish to call the ISC Review Team's attention to several key attributes of the marked-up set of rules:

- The Objectives paragraph x.xx.xx.6 should be more robust than a mere implementation of the statute.
- A larger set of Definitions in x.xx.xx.7 should include rules, guidelines, projects, policies, and programs.
- The plan Approval Criteria in x.xx.xx.12 serve as an enforceability mechanism of the detailed rules by using two groups of approval criteria: satisfactory planning process and satisfactory plan content.
- The Public Welfare statement for the region in x.xx.xx.14 reflects its goals and values and can serve as a reference for evaluating the effectiveness of alternative programs containing projects and policies.
- Rules should include commitments by the ISC. Requirements beyond the five statute-specified rules that apply to the ISC appear in x.xx.xx.15.
- Additional requirements that apply to each planning Council appear in x.xx.xx.16.
- The core processes for Councils to conduct regional planning appear in x.xx.xx.16.F.
- We believe Guidelines (recommendations) should be drafted after the rules are in place.

NEW MEXICO INTERSTATE STREAM COMMISSION

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MEMORANDUM

DATE: January 10, 2025

TO: New Mexico Interstate Stream Commission

THROUGH: Hannah Riseley-White, NMISC Director

FROM: Andrew Erdmann, Water Planning Program Manager
Sara Fox, Senior Water Planner

RE: Presentation by staff on a discussion draft of rules and guidelines to implement the Water Security Planning Act, process for continued stakeholder engagement, and preparation for rule promulgation

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Background
The NMISC Water Planning Program has been working to implement the Water Security Planning Act (WSPA) since the Act's unanimous passage in the 2023 legislative session. As part of that process, the Water Planning Program hosted a series of in-person open house events in the Spring/Summer of 2024 throughout New Mexico, as well as an online version of the open house. Additional opportunities to comment were provided in June through August of 2024. The purpose of these efforts was to gain input on the future of regional water planning in New Mexico under the Act. These engagement efforts wrapped up in August 2024.

Discussion
The Water Planning Program has been working with contractors on synthesizing the input gathered from the 2024 engagement campaign. This synthesis is informing the development of the rule and guidelines called for by the WSPA (WSPA Rule and Guidelines). The Water Planning Program and contractors have developed three reports related to the engagement effort. All three reports are now available on MainStreamNM.org, and are summarized below:

1) Engagement Report – provides detailed information related to the questions presented and responses received, both in-person and online. In addition, there is a data dashboard online that is helpful for further exploring the responses.

2) Observations and Considerations Report – provides an overview of contractor recommendations related to drafting the WSPA Rule and Guidelines based on the input received; and
3) Summary Report – provides a summary of the engagement effort and key feedback received.

These three documents synthesize and report on what was asked and heard from the participants through the engagement effort in 2024 to support NMISC and others in the next phase of developing the WSPA Rule and Guidelines. Using these reports, NMISC staff have worked internally to develop a Discussion Draft of the WSPA Rule and Guidelines, including new proposed boundaries for regional water planning. The Discussion Draft WSPA Rule and Guidelines will be used to solicit additional public engagement. Once that feedback is received, NMISC staff will propose additional revisions to the draft before initiating formal rule promulgation later this year.

Request
None at this time, informational presentation only.

Packet Material
- Discussion Draft Water Security Planning Act Rule
- Proposed Discussion Draft Hydro-Administrative Boundaries
- Discussion Draft Water Security Planning Act Guidelines
- New Mexico Regional Water Planning Summary Report
- New Mexico Water Security Planning Act: Observations and Considerations Report
- Main Stream Magazine

TITLE XX [title XX name]
CHAPTER XXX [chapter XXX name]
PART XXXX [part XXXX name]

x.xx.xx.1 ISSUING AGENCY: New Mexico Interstate Stream Commission, hereinafter the commission.
[x.xx.xx.1 NMAC – N, xx/xx/202x]

x.xx.xx.2 SCOPE: This rule governs the process for developing and maintaining regional water planning pursuant to the Water Security Planning Act.
[x.xx.xx.2 NMAC – N, xx/xx/202x]

x.xx.xx.3 STATUTORY AUTHORITY: Section 72-14A-1, et seq. NMSA 1978.
[x.xx.xx.3 NMAC – N, xx/xx/202x]

x.xx.xx.4 DURATION: Permanent.
[x.xx.xx.4 NMAC – N, xx/xx/202x]

x.xx.xx.5 EFFECTIVE DATE: xxxxxxxxxxxxx xx, 2025, unless a later date is cited in the history note at the end of a section.
[x.xx.xx.5 NMAC – N, xx/xx/202x]

x.xx.xx.6 OBJECTIVE: To establish the criteria and procedures to develop, approve and maintain regional water plans, pursuant to the Water Security Planning Act, Section 72-14A-1et seq. NMSA 1978.

A. , , and establish the administrative law requirements applicable to the commission and regional councils to implement a program of regional water security planning across New Mexico. The overall purpose of the Water Security Planning Act is to develop regional water plans whose implementation will provide long term water resilience for the region. The purpose of these rules is to empower diverse regions of the state and their constituent communities to solve or mitigate bona fide water problems within the region. This will entail a broad public and tribal process to develop and then maintain a preferred alternative program of policies and projects that together:take full cognizance of the hydrologic reality of the region

B. have been fully vetted with scientific integrity, evaluated and prioritized

C. are consistent with statewide objectives, including adequate water for current and future generations' economic well-being, resilience of aquifer systems, as well as compliance with interstate compacts, the endangered species act, and congressionally authorized tribal water settlement acts

x.xx.xx.7 DEFINITIONS:

A. **"Commission"** means the New Mexico Interstate Stream Commission and its members, authorized under NMSA 1978 § 72-14-1, and the director and employees of the commission.

B. **"Communities"** include self-organized local groups, governmental entities, or non-governmental institutions focused on water security planning.

C. **"Fairness"** means giving due consideration of the benefits and impacts to diverse, disadvantaged, and cultural communities in the distribution of water.

D. **"Guidelines"** are agency-created statements that are recommendations on how the rules might be implemented.

E. **"Hydrologic reality"** means the conclusions of science regarding how much physical water exists and how it flows.

F. An **"Interim Plan Element"** is a program, policy, or project selected by a regional council with a formal recommendation for implementation consideration by the ISC prior to the completion and ISC approval of that council's regional plan.

G. **"Planning Region"** or "Region" means an area of the state as described herein that defines the planning area for Regional Water Security Planning Councils.

H. A **"Policy"** is a set of rules, guidelines, plans, or agreements that address how water is

managed.

I. A **"Program"** is a collection of policies and projects that together are intended to achieve a goal.

J. **"Project"** is the design and construction of infrastructure.

K. **"Regional Water Security Planning Council"** or "Council" means individuals, representing groups or organizations as described herein, who make up the Council and lead the regional water security plan development and implementation process in their respective region

L. A **"Regional Plan"** is a document that describes the regional water planning process and presents a description and the justification and priorities of new water programs, policies, and infrastructure projects.

M. **"Resilience"** means the ability to anticipate, prepare for and adjust to changing conditions and withstand, respond to and recover rapidly from disruptions.

N. **"Rules"** are promulgated administrative law.

O. **"Scientific Integrity"** means the adherence to principles of honesty, objectivity, transparency, professionalism, and ethical behavior when conducting, managing, using the results of, and communicating about matters of science and facts, which must be of high quality and free from inappropriate influence.

P. **"Water Balance"** means quantitative tabulation of water resource inflows, demands, outflows and changes in storage within a specific time interval and three-dimensional boundary.

x.xx.xx.8 WATER SECURITY TRIBAL ADVISORY COUNCIL

A. The commission shall provide administrative support and facilitation, in consultation with the office of the state engineer and Indian affairs department, for the establishment and operation of a water security tribal advisory council ("WSTAC") comprising representatives of New Mexico pueblos, tribes and nations.

B. The purpose of the WSTAC is to provide a forum for input from New Mexico pueblos, tribes and nations to ensure that their sovereignty, water rights, water needs, and other viewpoints are considered and incorporated in the regional water planning process or other activities as determined by the commission.

C. The participating pueblos, tribes and nations shall determine their own procedures and operating principles.

D. The commission shall keep regional councils informed about WSTAC guidance.

E. Regional councils shall incorporate inputs from WSTAC into their planning processes.

x.xx.xx.9 PLANNING REGIONS

A. The nine (9) Regional Water Security Planning Regions ("Planning Regions") are shown in Exhibit A (map). *[[The Water Advocates recommend only that the north edge of the Pecos Council region be extended a little northward to encompass the headwaters of the Pecos River.]]*

x.xx.xx.10 COMPOSITION OF REGIONAL WATER SECURITY PLANNING COUNCIL: Membership of a regional council shall be determined within the region with support as needed from the commission, subject to the following:

A. **Membership Quantity:** A regional council shall be self-selected and composed of at least six individual members and not more than twenty individual members having needed expertise. Each member may designate an alternate with similar interests to serve in the member's absence

B. **Interest Balancing:** The set of members collectively must represent water interests in the region, balanced for the region, among residential, community, commercial, agricultural, natural, technical and institutional interests, including water right owners and groundwater permit holders who depend on the shared water supplies of the region.:

C. **Membership Conflict Resolution:** In the event of conflict about membership balance or quantity within a region, the commission shall mediate, or arbitrate if necessary, to resolve the controversy.

D. **Staff Support**: Regional councils may hire planning, technical and administrative staff\

x.xx.xx.11 REGIONAL WATER SECURITY PLANNING COUNCIL MEETING REQUIREMENTS

A. As the regional plans will be advising the ISC, local governments, and the general public on water policies and projects, council meetings shall not be subject to New Mexico's Open Meetings Act. .

x.xx.xx.12 APPROVAL FOR IMPLEMENTATION OF REGIONAL WATER SECURITY PLAN:

In order to be approved by the commission, a regional plan or interim plan element must demonstrate to the commission that:

A. there was an **Adequate Planning Process:** the regional council prepared its regional plan or interim plan element through a coherent planning process that demonstrated:

(1) fairly balanced participation: the regional council sought, documented, considered and acted upon stakeholder and public voices,

(2) transparency: the regional council regularly brought the water security planning program work and progress to the public and facilitated public participation and comments

(3) a scientific foundation: water security planning has taken full cognizance of the scientific foundation for planning provided by the commission and the regional plan demonstrates scientific integrity,

(4) formal evaluation: proposed policies and projects that have been will vetted and grouped into alternative programs, including a no action alternative, from which a preferred alternative program has been selected,

(5) public welfare: the regional council's planning developed and adhered to a statement of current and future public welfare as specified in x.xx..xx.13,

(6) tribal sovereignty: the regional council's planning took into account ongoing cognizance of tribal sovereignty and interests within the particular region, and,

(7) natural water uses: the regional planning identified groundwater/aquifer, riverine and riparian habitat impacts and addressed how those impacts would be limited and balanced under reduced water availability due to increasing temperatures and aridity.

B. there is **Adequate Planning Content**: implementation of the preferred alternative program in regional plan would:

(1) close the gap between overall regional water demand and regional water supply,

(2) address any significant intraregional gaps between supply locations and demand locations,

(3) increase the long-term viability of the water planning region's water supplies and the water adaptability for current and future generation users,

(4) provide for reliable domestic water supplies for at-risk communities within the region,

(5) protect riverine and riparian habitat and species values,

(6) include groundwater management plans,

(7) for regions containing perennial streams, include surface water management plans,

(8) for regions containing interstate perennial streams, assure ongoing compliance with interstate compacts,

(9) achieve long term water availability,

(10) achieve consistency with community, municipal and institutional water plans within the region, and,

(11) provide for the regional council to lead and manage regional plan implementation, monitor and report the outcomes, and prepare amendments and updates to the approved regional plan.

C. it is possible to **Adjust for Inadequacies:** Whenever the commission determines a submitted regional plan or interim plan element does not meet the minimum criteria stated in x.xx.xx.12.A and x.xx.xx.12.B, the commission and the regional council shall negotiate and assist with establishing a process, schedule and funding for changes to bring the submitted regional plan or interim plan element up to adequacy.

x.xx.xx.13 PROCEDURE FOR REGIONAL WATER SECURITY PLANNING COUNCILS TO DEVELOP AND PROVIDE NOTICE TO THE COMMISSION OF ISSUES; Regional councils shall promptly report in writing any issues they encounter that inhibit their ability to fulfill promises in the approved work plan.

A. Issue Types. The issues to be reported may include problems:

(1) needs for state level technical assistance or financial assistance,

(2) difficulties in supporting at risk communities within the region, .

(3) delays affecting timely work product deliveries, or,

(4) difficulties in coordination with internal or adjacent water planning agencies. .

B. Response. In response to reported issues, the commission shall promptly take necessary action to try to resolve the issue and get the regional council back on track. The actions may include: :

(1) negotiated revision of the approved work plan,

(2) supplemental funding,

(3) negotiation or mediation support, or, .

(4) provision of technical advice, data and modeling.

(5) .

x.xx.xx.14 PROCEDURE FOR A REGIONAL WATER PLANNING COUNCIL TO CONSIDER PUBLIC WELFARE VALUES AND THE NEEDS OF FUTURE GENERATIONS OF NEW MEXICANS: Through a broad public process, regional councils shall develop a statement defining the public welfare of the region. Regional councils shall ensure their planning processes and recommendations take careful cognizance of welfare needs that might not be specifically or sufficiently represented among the regional council's membership. At a minimum, aspects to be considered for possible inclusion shall include:

A. understanding the legal, hydrologic, and demand attributes of the region

B. avoiding or minimizing impacts to disadvantaged communities within the region, .

C. preserving non-renewable resources (aquifers) for future generations of New Mexicans, :

D. avoiding or minimizing impacts to habitats of threatened or endangered species,

E. avoiding or minimizing impacts to traditional communities' uses of water,

F. recognizing and respecting the property rights of water rights holders,

G. needs for economic growth and encouragement of new business opportunities,

H. ensuring consistency with internal and adjacent water planning processes, and,

I. avoiding or minimizing degradation of existing traditional and acequia water rights and uses.

x.xx.xx.15 COMMISSION REQUIREMENTS FOR REGIONAL AND COMMUNITY WATER SECURITY PLANNING: This paragraph and its subordinates establish the rules requiring the commission to conduct a robust statewide water security planning program, and that are not explicitly covered in paragraphs x.xx.xx.8 through x.xx.xx.14. The commission shall:

A. Overall: Assure that the goals and outcomes sought by any regional plans funded and approved pursuant to this rule:

(1) are established publicly through broad public input and shared values,

(2) consider attributes and values in the regionally defined public welfare of the region,

(3) provide for escalating reduction in water uses over the next 50 years to achieve balance with diminished and declining water resources,

(4) balance, protect and improve the health and resilience of watersheds and rivers, as well as effectively managing groundwater/aquifer recharge and withdrawals,

(5) develop regional and community capacity and broad participation in water security planning and implementation,

(6) close the gaps between regional water demand and the physically and legally available regional water supply,

(7) increase the resilience of New Mexico's water supplies for water users including future generations,

(8) provide for long-term use of the region's surface and groundwater resources,

(9) balance and protect riverine and riparian habitat water uses, threatened and endangered species, state species of concern and in-stream recreational needs,

(10) comply, or contribute to complying, with applicable interstate compact obligations,

(11) provide for reliable domestic water supplies for at-risk communities within each region, and,

(12) include long-term management plans for available use of ground water and surface water.

B. Establish Regional Councils: On a schedule subject to commission financial and personnel resources, convene, or financially support the regional self-convening of a broad public process, for each region defined in x.xx.xx.9, to establish the initial membership of the regional council consistent with the requirements of x.xx.xx.10,

C. Support Regional Councils: In response to proposals from regional councils, financially support the ongoing operations of regional councils,

D. Provide Regional Council Guidance: Establish guidelines for recommended practices, protocols or requirements for regional councils to conduct their regional water security planning that:

(1) is based on adequate, reliable science and data,

(2) incorporates and facilitates cooperation and collaboration,

(3) invites and provides for the effective participation of pueblos, tribes and nations in the regional water security planning early in the process,

(4) assures the accessible and balanced participation by all interests,

(5) evaluates and prioritizes all proposed projects and policies, considering efficacy, technical feasibility, implementation costs, water rights ownership, fairness, and the public welfare of the region as well as the current and future regional water balances,

(6) packages prioritized projects and policies into alternative programs whose collective effects meet statewide goals and outcomes in x.xx.xx.15.A, and,

(7) includes a library of common use templates that regional councils may choose to adapt or adopt.

E. Set Criteria for Funding Regional Proposals: Prior to accepting any regional work plan funding proposal, develop guideline criteria for evaluating such proposals. These criteria at a minimum shall provide for:

(1) identification of the water planning region requesting funds,

(2) reasonable proposed costs and timetables for completion of the planning process,

(3) provisions for the notice of, review of and comment on the regional water security planning proposal,

(4) planned use of a water security planning process, including:

(a) defining the public welfare of the region according to criteria in x.xx.xx.14

(b) consideration of the regional water security plan approval criteria in x.xx.xx.12,

(c) opportunities for participation by Indian nations, tribes or pueblos located within the water planning region,

(d) opportunities for self-defined communities within the region to effectively contribute to the regional water security plan,

(e) ensuring a firm scientific basis for planning by due consideration of existing data and remediation of any data gaps,

(f) consideration of potential conflict with laws relating to existing water rights,

(g) documenting the planning progress and the regional water security plan, and

(5) legal authorization for the established regional council to accept, manage and disburse funds,

F. Provide Technical Support: Create a technical support program with data and models to build capacity for regional water resources management planning and implementation, including for Tribal, acequia, and rural communities.

G. Support State Implementation Funding: Prioritize its support and recommendations for state-matching implementation funding of those water infrastructure improvement projects and policy changes that have been vetted and prioritized in approved regional plans.

H. Support Federal Implementation Funding: Seek and secure federal matching funding for water security planning and implementation,

I. Support Groundwater Studies and Data: Cooperate with federal and state agencies to jointly fund and conduct groundwater resources investigations and to make available reliable water data in regions where remaining available groundwater resources are uncertain or knowledge is insufficient to support water security planning,

J. Develop Commission Guidance: Adopt guidelines that at a minimum address:

(1) identification of the water planning region requesting funds,

(2) the process for approval of grants or loans,

(3) the process for state agency collaboration,

(4) the metrics for reporting on regional water projects,

(5) the processes for coordinating regional planning activities and decisions with other state agencies, including the Office of the State Engineer, the Bureau of Geology and Mineral Resources and the Energy, Minerals and Natural Resources Department,

(6) the procedures to support implementation of a regional plan, and,

(7) the schedule for implementation of regional water security planning.

K. Coordinate with Tribal Liaison Representatives: To the extent allowed, encourage, support and participate with the Water Security Tribal Advisory Council (WSTAC) comprising representatives of New Mexico Nations, Tribes and Pueblos as its activities relate to the regional water security planning program, keeping regional councils informed about WSTAC guidance.

L. Provide an Annual Report to the Legislature: Each year before August 1, prepare and deliver to the Interim Committee on Water and Natural Resources a regional water security planning report describing:

(1) actual funding compared to requests for the current fiscal year,

(2) progress achieved since the most recent annual report,

(3) plans for regional water security planning during the coming fiscal year, and,

(4) legislative funding requests/requirements to meet those plans.

x.xx.xx.16 REGIONAL COUNCIL REQUIREMENTS FOR REGIONAL AND COMMUNITY WATER SECURITY PLANNING: This paragraph and its subordinates establish the rules requiring each planning council to conduct a robust water security planning program, and that are not explicitly covered in paragraphs x.xx.xx.8 through x.xx.xx.14. Each regional council shall:

A. Organize Itself: Establish and update as needed its own operating rules or adaptation of commission-supplied templates for conducting water security planning including:

(1) terms and term limits of membership,

(2) methods for membership succession,

(3) mechanisms to assure membership balance consistent with x.xx.xx.10.B,

(4) meeting and operating rules for the regional council,

(5) identifying needs for planning, technical and administrative staff,

(6) procedures for administrative and financial management,

(7) criteria for making water planning decisions, and,

(8) obtaining means to accept, manage and disburse funds.

B. Conduct Interactions: Maintain cooperation and coordination with internal and external organizations including:

(1) political subdivisions of the state located partially or totally within the region,

(2) self-identified communities located partially or totally within the region,

(3) tribal entities located partially or totally within the region, including incorporation of inputs from the Water Security Tribal Advisory Council (WSTAC), and,

(4) negotiating of organizations' planning attributes to assure compliance with regional constraints including ongoing compact compliance and shared aquifer protection.

C. Propose Planning Work Effort: Prepare and deliver to the commission proposals for funding grants to conduct all or part of the necessary regional water security planning effort and develop a resultant plan of

action, in recognition of the commission's proposal evaluation criteria in x.xx.xx.15.E. Such proposals shall include:

(1) the regional council's work plans and plans for progress reporting,
(2) embedded communities' work plans,
(3) needs for planning, technical and support staff,
(4) schedule milestones, and,
(5) funding requirements.

D. Seek External Funds: Try to obtain regional water security planning funds from outside of the commission.

E. Enable Community Level Planning: Support and facilitate community level water security planning to include:

(1) public outreach and education to create and engage community planning groups,
(2) provide water security planning guidance,
(3) provide funds in response to well-organized requests,
(4) provide or obtain commission technical support as requested,
(5) monitor communities' financial and planning progress, and,
(6) incorporate communities' planning information into the regional plan.

F. Conduct Regional Planning: Conduct an ongoing process to enhance water security across the region. The process should include:

(1) establishing a quantitative understanding of the legal, hydrologic, and demand attributes of the region, yielding knowledge of its water situation and problems,
(2) extensive iterative interaction with the commission, public and communities by providing interim work products and ingesting inputs throughout the planning process,
(3) developing a coherent statement of public welfare of the region in accordance with x.xx.xx.14,
(4) ensuring scientific integrity in the planning through use of data and models,
(5) requesting technical support from the commission as needed,
(6) identifying potential infrastructure projects and administrative policies at regional and community levels to enhance regional water adaptability
(7) evaluating, such projects and policies for:
(a) technical feasibility,
(b) cost,
(c) compliance with the statement of public welfare of the region,
(d) recognition of scientific and hydrologic reality,
(e) social impacts and benefits,
(f) riverine and habitat impacts and benefits,
(g) impacts and benefits to the regional economy,
(h) contribution to closing gaps between regional demand and supply,
(i) contribution to closing gaps between intraregional demands and supplies,
(j) contribution to community water adaptability, and,
(k) adaptability for future generations.
(8) prioritizing such projects and policies in accordance with their evaluations,
(9) packaging groups of prioritized projects and policies into various alternative programs,
(10) modeling or otherwise evaluating the various alternative to programs to verify that, if implemented, they would meet the statewide goals and outcomes in x.xx.xx.15.A,
(11) selecting a preferred alternative program that best meets the declared public welfare of the region, and,
(12) creating a detailed plan for implementation of the preferred alternative program.

G. Promote Interim Plan Elements: Only if the regional council determines that implementation of a duly evaluated high-priority project or policy is sufficiently urgent, the regional council may pursue an interim plan element for that project or policy to be acted upon sooner than completion and implementation of the full regional plan. The interim plan element shall:

(1) contain the urgency and priority justifications for being treated in advance of the full regional plan,

(2) contain a description of the project or policy,

(3) contain a summary of the project or policy evaluations, and,

(4) be submitted to the commission for approval, and if needed be subject to negotiated changes to obtain commission approval for implementation.

H. Prepare Regional Plan: Develop a regional plan in recognition of the commission's approval criteria stated in x.xx.xx.12 including:

(1) the region's hydrological situation,

(2) the statement of public welfare of the region,

(3) description of the planning process that led to the regional plan,

(4) a description of each recommended policy and project,

(5) a summary of the project and policy evaluations,

(6) a prioritized list of recommended infrastructure projects for the region,

(7) a prioritized list of recommended administrative policies for the region,

(8) the preferred alternative program for the region, and,

(9) the implementation plan for the preferred alternative program.

I. Seek Approval of the Regional Plan: Submit the regional plan to the commission for approval, and if needed negotiate changes to obtain commission approval for implementation.

J. Conduct Ongoing Planning: After approval of the initial water security plan, perform a continued publicly interactive planning process to include:

(1) proposing work plans and funding requirements to the commission,
monitoring of project and policy implementation progress, **Guiding Principles for Water Planning:**

(2) monitoring of water supply and demand changes,

(3) addressing newly recognized issues at community and regional levels, and,

(4) developing and submitting updates to the regional plan.

K. Report to Commission: Throughout the planning processes, provide semi-annual summary reports to the commission reflecting:

(1) use of funds,

(2) progress to date,

(3) any difficulties encountered,

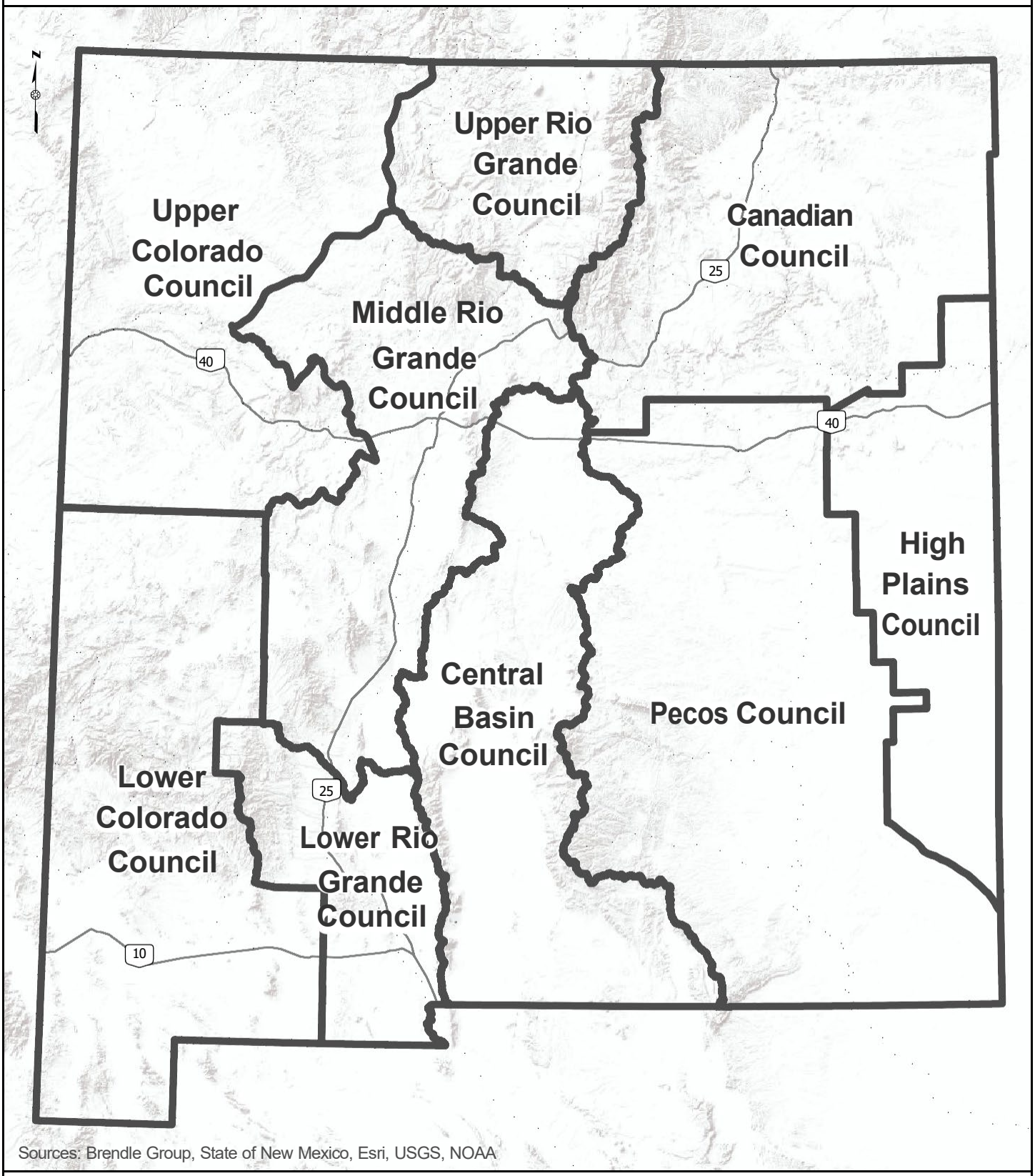
(4) cost or progress deviations from the proposed processes,

(5) cost to complete, and,

(6) near term plans.

HISTORY OF x.xx.xx NMAC: [RESERVED]

New Mexico Preferred Hydro-Administrative Boundaries



Rivers

Highways

Preferred Hydro-Administrative Boundaries

0 25 50 100 Miles

[[New Mexico Water Advocates Comment: We believe:

- Guidelines should provide “how-to” recommendations for interpreting the Rules. Rules are the place for presenting requirements. The Guidelines should not be imposing requirements.

- The Rules should specify a process for planning and developing plans, within which Guidelines provide recommendations on how the rules might be implemented.

- The requirement content of many of the Guidelines should be migrated and merged into in the Rules. Until we see how that migration plays out, further comment on the Guidelines would not be productive. We believe we have accomplished much, if not all, of that migration in our markup of the Rules.

Accordingly, we have marked all of the Discussion Draft Guidelines, below, as deleted.]]

New Mexico has needed to develop a better water management mechanism for many years and it has been lacking from the state to the community level for a long time. The extended drought cycles have forced us to look more closely at the possibly finite status of our water supplies. This has finally triggered an effort towards a more in depth and potentially restrictive management process for the future. While I find a wonderful set of rules and guidelines in the proposed plan, I also have reservations regarding the potential constraints on water use that will be triggered in the future. Obviously, there needs to be a means to manage and optimize water use to assure we have adequate supplies for the future, specifically to support the needs of the human residents of our state, but we also need to look further and immediately at limiting the growth of the populace. To endanger the livelihood of our existing ranching and agricultural users, and even the industrial applications, by allowing unrestrained residential growth and recreational use threatens the customs and culture of our state. This plan must look to the root causes of the limits of our supplies with an equal or greater regard to their impacts as opposed to restricting the traditional uses of this precious element of our existence.

Additionally, there needs to be as much visibility in the development process as well as the application of this plan as possible. I am actively involved in community planning (Lincoln County Land and Natural Resources Committee) and in the water industry but only now, on April 29, 2025, became aware of this proposed plan. This deeply concerns me and will encourage me to be more attentive going forward, but there are too many means to notify the public that have gone unaddressed. Social media and print publications might well have reached me. Instead, this notification landed in my promotional email folder and fortunately I happened to see it, belatedly for certain.

Cathie R Eisen
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Nogal, NM
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575-937-6321

ESTABLISH A MINIMUM CONSERVATION POOL TO PROTECT THE ECOSYSTEM AT ELEPHANT BUTTE LAKE

Elephant Butte Lake Dam was constructed in 1916, without the intent or capacity to maintain a minimum conservation pool needed to sustain the fishery, other aquatic organisms, wildlife, vegetation, and habitat. Due to acute factors, including climate-related conditions, the Rio Grande Compact, an international treaty with Mexico, the original dam design and intent at the time, and reduced or irregular water storage at Elephant Butte Reservoir, the region could experience an ecological disaster within the reservoir. To prevent this disaster, the reservoir should maintain at least a minimum conservation pool of 113,196-acre feet (af) or 5.7% of the reservoir's capacity.

INDUSTRY STANDARD MINIMUM STORAGE CAPACITY

Maintaining a minimum pool or dead storage level is standard in the industry; most dam dead storage levels are engineered well above 5.7%. Storing a minimum of 5.7% of capacity maintains the lake's water level at 4300 feet, which is the lowest possible level needed to sustain Dam Site Marina at its optimal location.

LOCATION AND ORGINAL PURPOSE

Elephant Butte Dam (originally called Engle Dam) is on the Rio Grande River, located immediately east of Elephant Butte, New Mexico, 145 miles south of Albuquerque, New Mexico, and 125 miles north of El Paso, Texas. When constructed, the reservoir was designed to store about 2,210,298 af of water for irrigation and flood control but has since reduced to 1,985,900 af according to information released by the Bureau of Reclamation (BOR). As a result of ongoing sediment accumulation, the true capacity of the reservoir is much less. It is a concrete gravity dam, 301 feet high, and 1,674 feet long, including the spillway. Dam construction started in 1911 and was completed in 1916.

The reservoir quickly became a premier recreational destination in the southwest with 1.5 million to 2.5 million visitors annually. In 1940, a Telsa-designed dynamo hydroelectric generation plant with a capacity of 24,300 kilowatts was installed at the dam. The power system encompasses 490 miles of transmission line and eleven (11) substations totaling 81,750 kilovolt-amperes, which was developed and operated by the Rio Grande Project until 1977.

HISTORY

At the time of completion, the dam created the largest reservoir in the world and was the first civil engineering water project associated with international allocation of water. The reservoir is currently the 84th largest man-made lake in the United States and the largest in New Mexico by total surface area and peak volume. It is impounded by Elephant Butte Dam, a section of the largest state park in New Mexico, Elephant Butte Lake State Park. Elephant Butte Lake is one of the most

important fishing destinations for Largemouth Bass anglers in the Southwest, and largest outdoor recreational mecca in New Mexico.

WATER CONFLICTS AND THE COMPACT

Historically, the region has fought over Rio Grande water. These conflicts resulted in a federal embargo against Colorado, an international treaty with Mexico, extraordinary and ongoing litigation, and an interstate compact. Since 1938, Elephant Butte Lake has been governed by the Rio Grande Compact. The Rio Grande Compact is an interstate compact between Colorado, New Mexico, and Texas, to apportion the waters of the Rio Grande Basin equitably. Water from the lake supplies irrigation water as well as a portion of El Paso's drinking water supply, when available. The reservoir is part of the Rio Grande Project, which provides for irrigation, flood risk reduction and hydroelectric power to south-central New Mexico and western Texas. In 1906, an international treaty was signed guaranteeing Mexico 10% or about 60,000 af of Rio Grande water per annum.

On multiple occasions key regional stakeholders had quasi-coordinated dialogues discussing a minimum pool, but these conversations abruptly ended when reasonable volumes of water were released into the lake from upstream authorities. Past efforts were unproductive and shortsighted. Thus far, the lake's ecosystem exposures remain unmitigated, and sufficient safeguards have not been enacted to protect the ecosystem from serious water level fluctuations. Without proper management, experts believe the lake will die within 73 years. Seventy-three (73) years may seem like a long time, in reality, it is three generations of farmers, residents, nature lovers, and outdoor enthusiasts.

THE WATER HAD DROPPED BELOW DEAD POOL LEVEL NINE TIMES

In 1974, the community initiated an effort to create a minimum pool. US Representative Runnels championed the effort and secured 50,000 af of additional water. Unfortunately, little thought of preserving a minimal water level went into the legislation, and in 1994, the water level breached the spillway, officially nullifying the appropriation. This effort, as well intended as it was, failed to provide a sustainable resolution to the problem. Since the nullification of Representative Runnels appropriation in 1994, the lake has dropped to or below 5.7% of capacity on nine (9) occasions for a total of 740 days. Each of these nine events likely harmed the lake's ecosystem.

Since completion of the dam, the reservoir has experienced 4,011 days at or below 5.7% of water capacity. The worst period was August 3rd-8th, 1954, when the lake dropped to 0.1%. August 6th was the worst day ever recorded with only 2,395 af of water in the lake. Locals tell stories of the lake, once having a capacity to store over two (2) million af of water, recessing to a narrow river channel in 1954, where they caught fish by hand and net. The ecosystem suffered incalculable harm from these infinitesimal water levels. People do not typically contemplate the harm the next significant water fluctuation or minimal water level will cause to the fishery, other aquatic organisms, wildlife, and their habitats; the reservoir dropped to 5.7% or below on twenty-one (21) occasions in the past and it will occur again without intervention.

The BOR conducted an Environmental Impact Statement (EIS) for Elephant Butte and Caballo Reservoirs Resource Management Plan, dated 1999. The following is a summary of goals identified in the EIS: create and maintain wildlife habitat areas, protect riparian and wetland plant communities, protect and enhance the quality of the fishery, control erosion, manage vegetation, manage and protect cultural resources, provide a balance of water uses, ***manage fluctuation of water surface levels, and provide for drought contingency***. If implemented, these goals would

address many concerns, but many key stakeholders must be involved to establish and maintain a minimum conservation pool. The BOR does not have the sole authority or responsibility to address many of the goals identified in their plan nor to create a minimum pool.

IRRIGATION SEASON IMPACTS

It has long been suspected that the large water-level fluctuations experienced at Elephant Butte Lake were harmful to the fishery and ecosystem. During irrigation session, it is common for water levels to recede by 20,000 af or more per week and over six (6) inches per day. As annual spring flows diminish, the water cycle of the reservoir suffers fluctuations detrimental to the nest-building strategies of fish, other aquatic organisms, and some wildlife. These fluctuations increase disease and adversely affect their morality, particularly in bass and bluegill spawns. They kill aquatic vegetation, disconnect shoreline habitat from water, interrupt native natural vegetation propagation, kill existing riparian vegetation, increase erosion and sedimentation, and increase turbidity during water drawdowns.

LARGEMOUTH BASS AFFECTED

Alexander Vaisvil, PhD conducted research on the effects of water level fluctuations to young-of-year Largemouth Bass in Elephant Butte Lake. He concluded that water level fluctuations directly impact hatchings and growth rates of Largemouth Bass. Hatches were reduced when reservoir water levels receded. The resulting water fluctuations reduced the quality and quantity of littoral fish habitat (Daugherty et al. 2015). Water released from the dam during hatching periods significantly reduces the number of fish hatching and results in lower growth rates of hatchlings. Vaisvil's abstract (*Water-Level Fluctuations and Water Temperature Effects on Young-of-Year Largemouth Bass in a Southwest Irrigation Reservoir*) published in the Journal of Fish and Wildlife Management (2022) 13 (2): 534-543.

Vaisvil cited other research indicating strong year classes of Largemouth Bass were associated with water levels at or above full capacity of southeastern reservoirs, (Maceina and Bettoli 1998; Sammons and Bettoli 2000). A correlation between strong year classes of Largemouth Bass and high-water years was observed and reported by Kohler et al. (1993). Elevated but stable water levels inundated vegetation in littoral areas that provided young-of-year Largemouth Bass with increased cover from predation as well as increased availability of prey (Parkos et al. 2011). An important finding in this research suggests reasonable and stable water levels are healthy for the ecosystem, and support improved fish spawning, nursey habitat and other aquatic organisms.

CONSEQUENCES FOR AQUATIC LIFE

Low water levels at Elephant Butte Lake have numerous consequences for fish and other aquatic organisms, and their habitat. Anoxia, a combination of warm water temperatures and low water levels, has historically caused large numbers of fish mortality in Elephant Butte Lake and many other lakes across the state. In summer months, thermal layers develop in a lake. Water near the surface is too hot for fish, while cooler water at the bottom has too little oxygen. Lakes with critically low water and elevated temperatures have decreased oxygen available for life, thus triggering large-scale fish die-offs.

2018 LOW LEVELS CAUSE FISH DIE-OFFS

In a press release dated August 10, 2018, the New Mexico Department of Game and Fish indicated several lakes including Elephant Butte Lake were experiencing fish die-offs. The die-offs affected multiple species of fish and were attributed to low oxygen levels caused by recent weather patterns

across the state, including drought and hot temperatures. At the time, Elephant Butte Lake's water level was at or below the recommended minimum pool level of 5.7% for 162 days straight. A related press release dated August 14, 2018, the Gila National Forest Service said the water levels at several New Mexico lakes, including Elephant Butte Lake had significantly declined, leaving critically low dissolved oxygen levels for fish and other aquatic organisms. The situation resulted in a large-scale fish die-off.

SEDIMENTATION ACCUMULATION

Water fluctuation also causes sedimentation problems. According to Bureau of Reclamation Technical Report No. ENV-20200-019 Titled, "*Elephant Butte Reservoir 2017 and 2019 Sedimentation Survey*", since 1915, the reservoir lost 624,000 af or (24%) of its storage capacity due to sedimentation. The survey also indicated that due to sediment accumulation, the reservoir pool below the invert of the penstock valve has been reduced to 33 percent of the original penstock storage volume, a loss of 67%. The sedimentation level at the dam is 4,236 feet (project vertical datum), which is about four (4) feet below the invert of the outlet works valve. If sediment raises four (4) feet at the dam, the dam will have no ability to release water for any purpose, including the compact.

Based on the level accumulation of sediment, sediment management is critical at the reservoir. Sediment management activities at Elephant Butte Reservoir historically consisted of using the sluice gates to remove sediment from the face of the dam. The sluice gate air vents are undersized at this dam; hence, sediment sluicing can only occur when the reservoir head is not too great. There are no other active sediment management efforts taking place in the reservoir (*B. Kalminson, personal communication, December 16, 2019*). For over 100 years, sediment has made its way to the dam. This lack of addressing sediment management over 100 years has harmed the lakes ecosystem and dam infrastructure. On the current path, if measures are not taken, sedimentation will render the dam inoperable in about 70 years. Ironically, Elephant Butte Reservoir is not the only dam in New Mexico in serious need of maintenance and upkeep, Caballo, El Vado and Ft. Sumner dams also need attention.

GOVERNOR'S 50 YEAR WATER PLAN

The Governor's 50-year Water Action Plan, released in 2024 acknowledges surface water resources are degrading due to extreme weather and other threats. Her report identifies several important water resource management strategies; however, the plan does not go far enough to protect Elephant Butte Lake's ecosystem. Action item (A4) in the Governor's plan states, "Prioritize water management infrastructure improvements (e.g., dams and reservoirs) and operational efficiencies to meet future demands by developing agreements for flexible management options, … and addressing critically important dam safety improvements, while ensuring that environmental flows and compliance will be part of our solutions." This plan should include strategies to protect and maintain the lake's ecosystem.

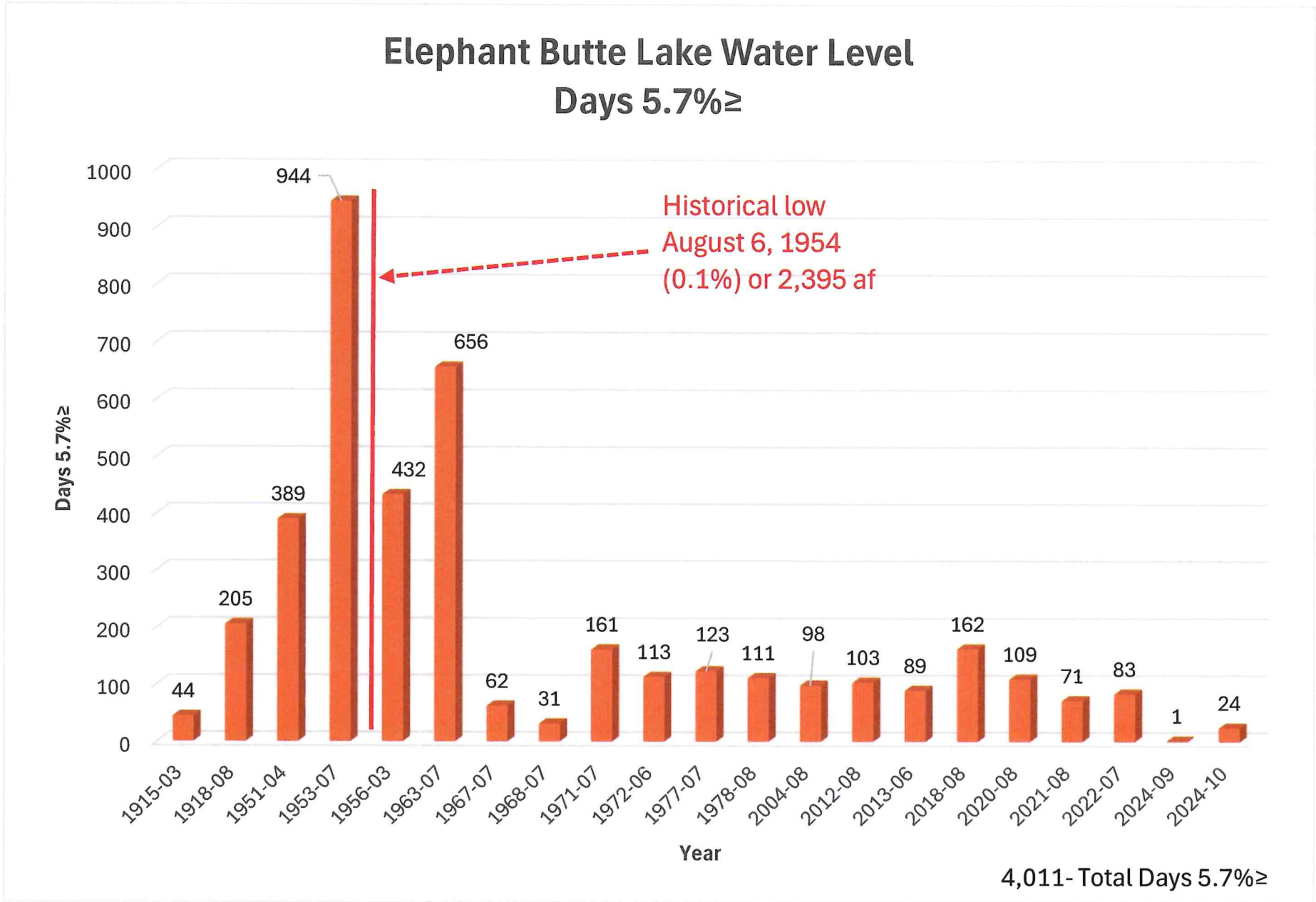
COMPLICATED TIMING AND APPROPRIATION

Unquestionably, the timing and appropriation of Rio Grande water is complicated, which is likely why no one has made a serious attempt to establish a reasonable minimum conservation pool. The undertaking is challenging, but not insurmountable. New Mexico must develop a long-term plan and vision to protect the ecosystem of the state's largest lake. Key stakeholders must be assembled to protect the lake's ecosystem and to establish a conservation pool, including representatives from the governor's office, the region's state legislative and federal congressional delegations, NMOSE,

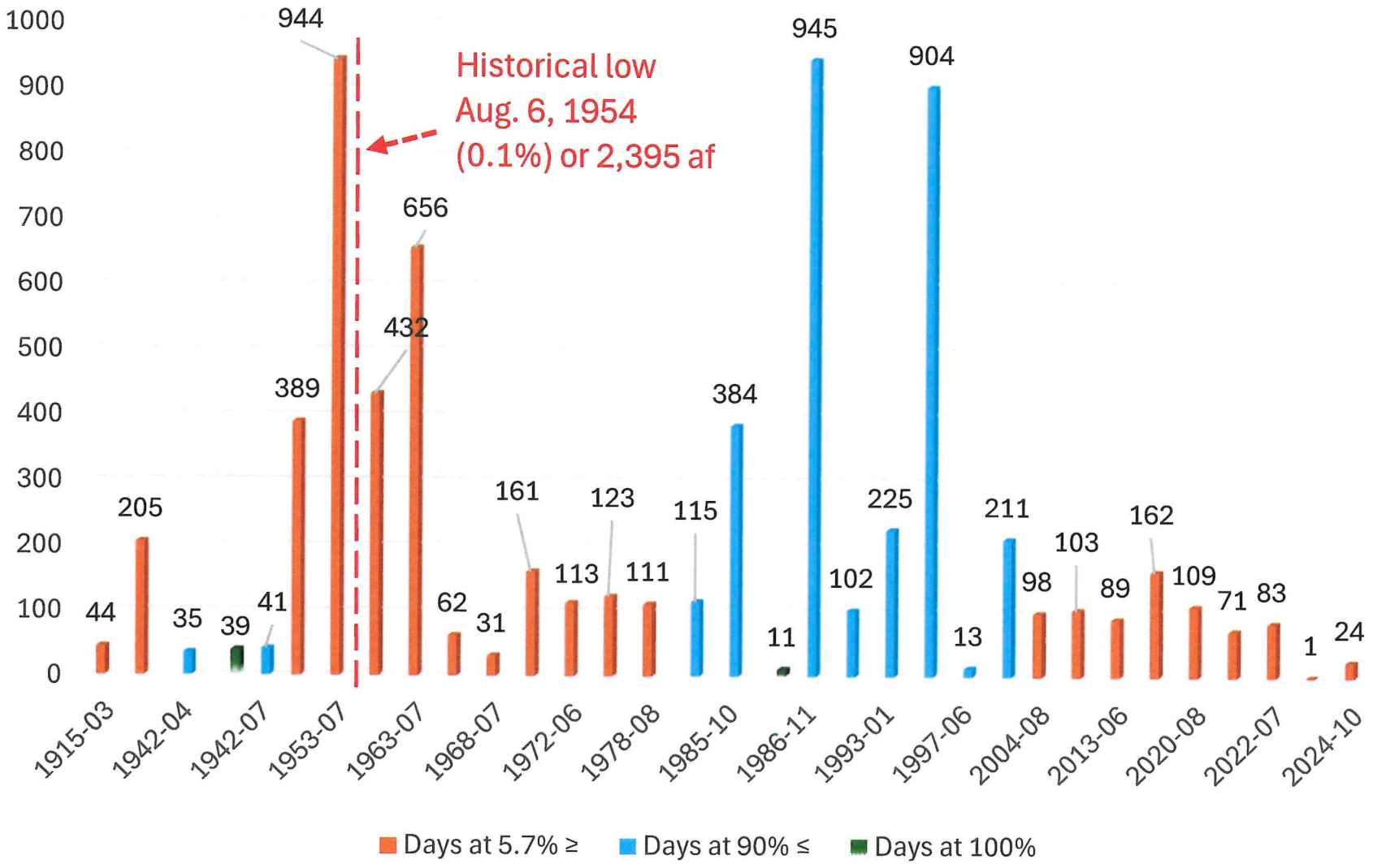
NMISC, NMDFG, BOR, USGS, Elephant Butte Irrigation District, El Paso County Water Improvement District 1, and other local organizations.

The bottom line is that numerous organizations and communities support securing water to sustain the lake's ecosystem, preventing an ecological disaster at the lake, and creating a strategic water reserve to protect New Mexico's future.

402 Butte Blvd, PO Box 1355, Elephant Butte, NM 87935-1355 Phone: 575-952--0912
Email: ebnmchamber@gmail.com Website: www.ebnmchamber.org Facebook: Elephant Butte Chamber of Commerce


Elephant Butte Lake Water Level
Days 5.7%≥
Historical low
August 6, 1954
(0.1%) or 2,395 af
Days 5.7%≥
Year
1000
900
800
700
600
500
400
300
200
100
0
44
205
389
944
432
656
62
31
161
113
123
111
98
103
89
162
109
71
83
1
24
1915-03
1918-08
1951-04
1953-07
1956-03
1963-07
1967-07
1968-07
1971-07
1972-06
1977-07
1978-08
2004-08
2012-08
2013-06
2018-08
2020-08
2021-08
2022-07
2024-09
2024-10
4,011- Total Days 5.7%≥

ELEPHANT BUTTE LAKE WATER LEVELS AT 5.7%≥ & 90%≤

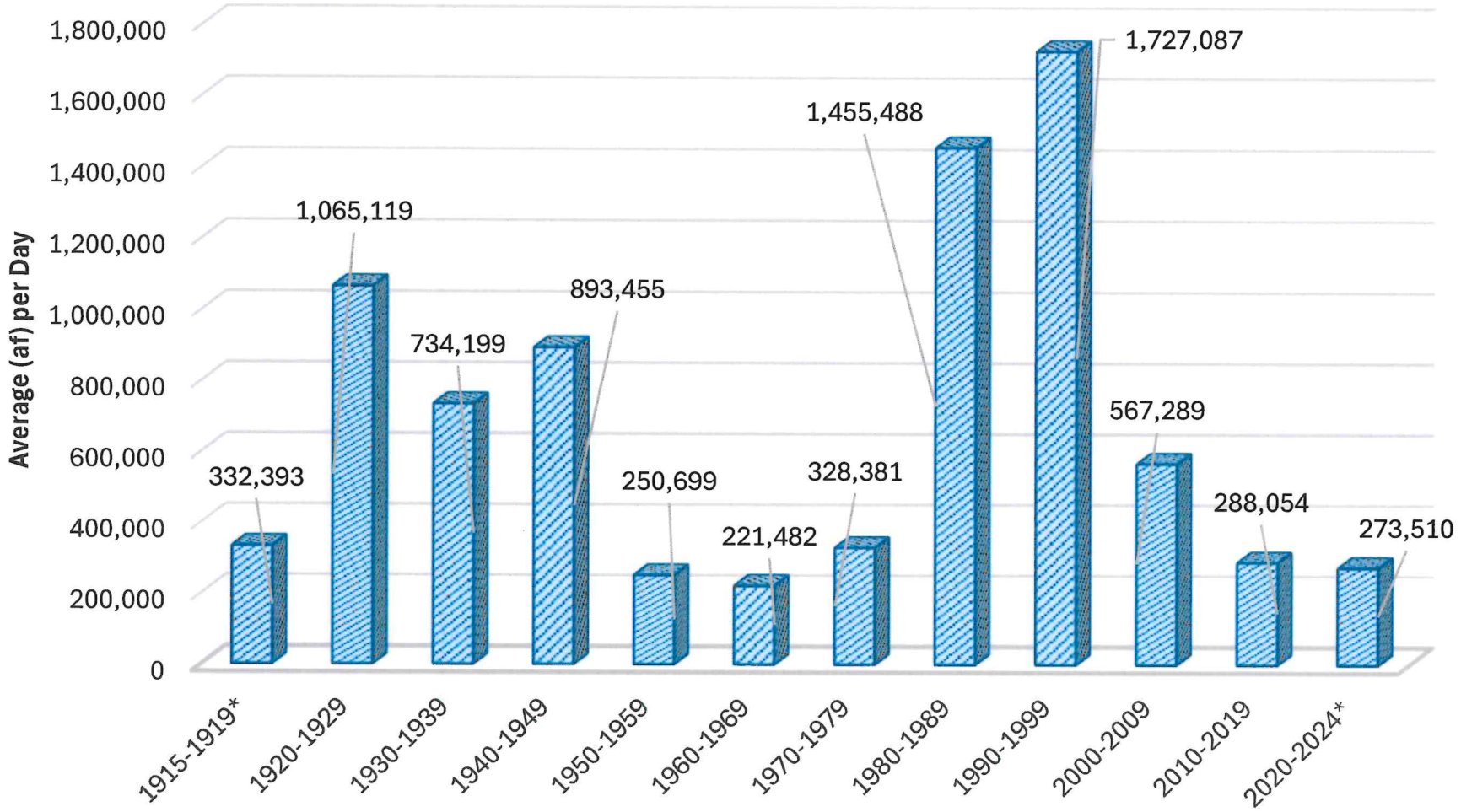


ELEPHANT BUTTE RESERVOIR WATER LEVELS

Date	Water Level	# of Days at Level
03/21/1915-05/03/1915	5.7% ≥	44
08/28/1918-03/27/1919	5.7% ≥	205
04/22/1942-05/26/1942	90% ≤	35
5/27/1942-07/04/1942	100% Full	39
07/05/1942-08/14/1942	90% ≤	41
04/28/1951-05/21/1952	5.7% ≥	389
07/08/1953-02/07/1956	5.7% ≥	944
08/03-08/1954	0.1% historical low	
03/28/1956-06/03/1957	5.7% ≥	432
07/18/1963-05/04/1965	5.7% ≥	656
07/11/1967-09/11/1967	5.7% ≥	62
07/12/1968-08/12/1968	5.7% ≥	31
07/04/1971-12/12/1971	5.7% ≥	161
06/29/1972-10/20/1972	5.7% ≥	113
07/25/1977-11/25/1977	5.7% ≥	123
08/16/1978-12/05/1978	5.7% ≥	111
05/07/1985-08/29/1985	90% ≤	115
10/24/1985-11/11/1986	90% ≤	384
11/12/1986-11/22/1986	100% Full	11
11/23/1986-06/24/1989	90% ≤	945
05/02/1992-08/11/1992	90% ≤	102
01/02/1993-08/14/1993	90% ≤	225
12/09/1993-05/31/1996	90% ≤	904
06/20/1997-07/02/1997	90% ≤	13
11/29/1997-06/27/1998	90% ≤	211
08/15/2004-11/21/2004	5.7% ≥	98
08/22/2012-12/03/2012	5.7% ≥	103
06/20/2013-09/17/2013	5.7% ≥	89
08/04/2018-01/13/2019	5.7% ≥	162
08/30/2020-12/17/2020	5.7% ≥	109
08/07/2021-10/17/2021	5.7% ≥	71
07/17/2022-10/08/2022	5.7% ≥	83
9/27/2024	5.7% ≥	1
10/01/2024-10/24/2024	5.7% ≥	24

Total Days at 5.7% ≥	**4,011**
Total Days at 90% ≤	3,025
Total Days at 100% Full	50

ELEPHANT BUTTE LAKE
WATER LEVEL BY DECADE



SOUTH VALLEY REGIONAL ASSOCIATION OF ACEQUIAS (SVRAA)

Statement of Objections by South Valley Acequia Association on the NM WSPA- Discussion Draft Rules and Guidelines Survey

4/29/2025

The South Valley Regional Association of Acequia, in representation of the signatories listed below, is presenting the objections below to the request made by the Interstate Stream Commission (ISC) to the Regional Water Plan that is underway now.

Objection 1: Acequia representation

> We object to the minimal space provided for Acequia participation on the proposed regional councils. While Acequia numbers may vary by region, it is incumbent that the Interstate Stream Commission give space equal to that provided to municipalities, agribusiness, industrialists, developers, and Pueblos. Where the presence of Acequias is evident, their participation should be recognized, encouraged, and supported by the ISC.

Objection 2: Commodity or common resources

> The proposed rules and guidelines ignore the planning process and the common resources and focus only on the outcome. It is a recurrent problem that policy makers such as the Office of the State Engineer and the Interstate Stream Commission give preferential treatment to interests that consider water a commodity rather than a common resource. Policy makers neglect to fully consider water a resource bestowed upon us by the natural laws of creation for the common good of all life. While the Indigenous, traditional, and environmental stewards make every effort to consider the spiritual tenets of water, our worldviews are relegated to a footnote; nothing is further from the truth. The sacred common resource must be given paramount attention as a special gift for all life.

Objection 3: Public Welfare and Conservation

> The rules and guidelines are contradictory in that the State Engineer has a role in the development of the Regional Public Welfare Statement and can then ignore it. Acequia welfare and conservation continues to be skewed to the detriment of Indigenous and traditional communities. Despite our putting forth every effort to consider the well-being of our communities and our lands, we keep getting challenged and forced to do more. The horrendous Compact “debit” makes it obvious that monied interests are permitted to reap great profits at the expense of our common well-being. The State cannot be allowed to continue to ignore the extraordinary sacrifices our communities have already made to comply. The same sense of stewardship must be demanded and imposed upon the unchecked water usage of municipalities and developers, industrialists, and agribusiness. The Public Welfare Statement must provide the same protection for Acequia as for endangered species. We cannot allow policy makers to continue ignoring and neglecting the priceless and sacred role that our acequias have for our survival.

James “Santiago” Maestas, President
South Valley Regional Association of Acequias

Andrea Lopez, Commissioner
Arenal Acequia

Rip Anderson, Commissioner
Arenal Acequia

Brad Lagorio, Mayordomo
Arenal Acequia

Katrina Gallegos, Commissioner
Armijo Acequia/Ranchos de Atrisco

Nate Smith, Commissioner
Armijo Acequia/Ranchos de Atrisco

Eddie Jaskolski, Commissioner
Armijo Acequia/Ranchos de Atrisco

Eddie Baca, Commissioner
Armijo Acequia/Ranchos de Atrisco

Diana Pino, Commissioner
Atrisco Acequia

Liz Montoya, Commissioner
Atrisco Acequia

Albert Sanchez, Commissioner
Atrisco Acequia

Daniel Hutchison, Localogy

Carlos Matutes, Green Latinos

Julie Stephens, Stephens & Associates

Patrick Jaremillo, American Friends Service Committee

William Zamora, Vice President
South Valley Regional Association of Acequias

Rick Leydig, Commissioner
Los Padillas Acequia

John Lopez, Commissioner
Los Padillas Acequia

Patricia Dan, Commissioner
Los Padillas Acequia

Luke Esquibel, Mayordomo
Los Padillas Acequia

Thomas Powell, Commissioner
Pajarito Acequia

Louie Tapia, Commissioner
Pajarito Acequia

Herman Trujillo, Commissioner
Pajarito Acequia

Jorge Garcia, Executive Director
Center for Social Sustainable Systems

Marcia Fernandez, Board of Directors
Center for Social Sustainable Systems

Chaz Rose, Jemez, Enterprises

Albino Garcia, Jr., La Plazita Institute

Genie Stevens, The Global Warming Express

Enrique LaMadrid, La Acequia de los Gallegos

Lauro Silva, Mountain View Community

Genie Stevens, Sierra Club

Concepts for New Mexico's Regional Water Planning Program

The rules (and guidelines) for a robust regional water planning program, as required by the Water Security Planning Act, should at a minimum meet the following criteria:

- Regional water planning must deliver tangible results
  - Actionable guidance, not shelf reports
  - Viable solutions to current and future water shortfalls
  - Ongoing provision for communication and collaboration
  - Transparent timelines, deliverables, and accountability for implementation
  - Clear connection to available funding streams (state, federal, private)

- The regional planning process is voluntary – so it must be perceived to have value:
  - To the participants
  - To the legislature
  - To the agency (ISC)
  - To local communities and future generations

- Core values include:
  - Equitable representation of the region's diverse interests
  - Face-to-face interaction and dialogue
  - Clear understanding of challenges and solutions to regional water problems
  - Mechanisms to mitigate the water problems; be resilient
  - Vetted/prioritized infrastructure projects
  - Statewide objectives to support regional economic health and compact compliance
  - Preservation of local water traditions and cultural practices
  - Use of credible, science-based hydrologic data integrated with community knowledge

We suggest a close approximation of the four paragraphs x.xx.xx.6, .10, .12, and .16. on the following pages are necessary in order to make the full set of rules meet the above criteria.

We recognize that the x.xx.xx.16 paragraph has rather elaborate requirements to lay out the regional planning processes. Should the ISC perceive those requirements to be too elaborate for inclusion in the rules, we believe the portions that are NOT highlighted in yellow, while important for meeting the criteria, could be demoted to be included within the guidelines.

NEW MEXICO
WATER ADVOCATES

The rules should lay out an overall purpose for conducting regional water planning. The following x.xx.xx.6 OBJECTIVE constitutes a first approximation of how such a purpose could be stated.

x.xx.xx.6 **OBJECTIVE:** To establish the criteria and procedures to develop, approve and maintain regional water plans, pursuant to the Water Security Planning Act, Section 72-14A-1et seq. NMSA 1978, and establish the administrative law requirements applicable to the commission and regional councils to implement a program of regional water security planning across New Mexico. The overall purpose of the Water Security Planning Act is to develop regional water plans whose implementation will provide long term water resilience for the region. The purpose of these rules is to empower diverse regions of the state and their constituent communities to solve or mitigate bona fide water problems within the region. This will entail a broad public and tribal process to develop and then maintain a preferred alternative program of policies and projects that together

A. take full cognizance of the hydrologic reality of the region

B. have been fully vetted with scientific integrity, evaluated, and prioritized

C. are consistent with statewide objectives, including adequate water for current and future generations' economic well-being, resilience of aquifer systems, as well as compliance with interstate compacts, the endangered species act, and congressionally authorized tribal water settlement acts

The rules should provide the constraints within which each region needs to establish the membership of its water planning Council. The following x.xx.xx.10 COMPOSITION… constitutes a first approximation of how constraints upon such membership establishment could be stated.

These words address how big the Council should be, how it should achieve interest balancing, and how to deal with perceptions of non-representation.

x.xx.xx.10 COMPOSITION OF REGIONAL WATER SECURITY PLANNING COUNCIL: Membership of a regional council shall be determined within the region with support as needed from the commission, subject to the following:

A. Membership Quantity: A regional council shall be self-selected and composed of at least six individual members and not more than twenty individual members having needed expertise. Each member may designate an alternate with similar interests to serve in the member's absence

B. Interest Balancing: The set of members collectively must represent water interests in the region, balanced for the region, among residential, community, commercial, agricultural, natural, technical, and institutional interests, including water right owners and groundwater permit holders who depend on the shared water supplies of the region.:

C. Membership Conflict Resolution: In the event of conflict about membership balance or quantity within a region, the commission shall mediate, or arbitrate, if necessary, to resolve the controversy.

D. Staff Support: Regional councils may hire planning, technical and administrative staff

The rules should provide a mechanism to enforce the requirements that are placed upon regional planning Councils. The following x.xx.xx.12 APPROVAL… constitutes a first approximation of how such an enforcement mechanism could be stated.

These words present criteria to confirm that resulting regional water plans were developed following an adequate planning process and that the resulting regional water plans' content achieve the goals of the overall regional planning program.

x.xx.xx.12 APPROVAL FOR IMPLEMENTATION OF REGIONAL WATER SECURITY PLAN: In order to be approved by the commission, a regional plan or interim plan element must demonstrate to the commission that:

A. there was an **Adequate Planning Process:** the regional council prepared its regional plan or interim plan element through a coherent planning process that demonstrated:

(1) fairly balanced participation: the regional council sought, documented, considered, and acted upon stakeholder and public voices,

(2) transparency: the regional council regularly brought the water security planning program work and progress to the public and facilitated public participation and comments

(3) a scientific foundation: water security planning has taken full cognizance of the scientific foundation for planning provided by the commission and the regional plan demonstrates scientific integrity,

(4) formal evaluation: proposed policies and projects that have been well vetted and grouped into alternative programs, including a no action alternative, from which a preferred alternative program has been selected,

(5) public welfare: the regional council's planning developed and adhered to a statement of current and future public welfare as specified in x.xx.xx.13,

(6) tribal sovereignty: the regional council's planning took into account ongoing cognizance of tribal sovereignty and interests within the particular region, and,

(7) natural water uses: the regional planning identified groundwater/aquifer, riverine and riparian habitat impacts and addressed how those impacts would be limited and balanced under reduced water availability due to increasing temperatures and aridity.

B. there is **Adequate Planning Content**: implementation of the preferred alternative program in regional plan would:

(1) close the gap between overall regional water demand and regional water supply,

(2) address any significant intraregional gaps between supply locations and demand locations,

(3) increase the long-term viability of the water planning region's water supplies and the water adaptability for current and future generation users,

(4) provide for reliable domestic water supplies for at-risk communities within the region,

(5) protect riverine and riparian habitat and species values,

(6) include groundwater management plans,

(7) for regions containing perennial streams, include surface water management plans,

(8) for regions containing interstate perennial streams, assure ongoing compliance with interstate compacts,

(9) achieve long term water availability,

(10) achieve consistency with community, municipal and institutional water plans within the region, and,

(11) provide for the regional council to lead and manage regional plan implementation, monitor and report the outcomes, and prepare amendments and updates to the approved regional plan.

C. it is possible to **Adjust for Inadequacies:** Whenever the commission determines a submitted regional plan or interim plan element does not meet the minimum criteria stated in x.xx.xx.12.A and x.xx.xx.12.B, the commission and the regional council shall negotiate and assist with establishing a process, schedule, and funding for changes to bring the submitted regional plan or interim plan element up to adequacy.

The rules should lay out a set of guardrails or constraints within which the regional Councils must conduct their planning mission. The following x.xx.xx.16 REGIONAL COUNCIL REQUIREMENTS… constitute a first approximation of how bounds for the Councils' planning processes could be stated.

These words present boundaries or guardrails for how the Council's planning work should take place. They address criteria for self-organization of the Council, need for coordination, need to apply for funding, the necessity to engage communities within the region, the conduct of the planning process, dealing with urgent issues, developing a documented plan, reporting to the agency, and needed post-plan monitoring and updates.

x.xx.xx.16 REGIONAL COUNCIL REQUIREMENTS FOR REGIONAL AND COMMUNITY WATER SECURITY PLANNING: This paragraph and its subordinates establish the rules requiring each planning council to conduct a robust water security planning program, and that are not explicitly covered in paragraphs x.xx.xx.8 through x.xx.xx.14. Each regional council shall:

A. Organize Itself: Establish and update as needed its own operating rules or adaptation of commission-supplied templates for conducting water security planning including:

(1) terms and term limits of membership,
(2) methods for membership succession,
(3) mechanisms to assure membership balance consistent with x.xx.xx.10.B,
(4) meeting and operating rules for the regional council,
(5) identifying needs for planning, technical and administrative staff,
(6) procedures for administrative and financial management,
(7) criteria for making water planning decisions, and,
(8) obtaining means to accept, manage and disburse funds.

B. Conduct Interactions: Maintain cooperation and coordination with internal and external organizations including:

(1) political subdivisions of the state located partially or totally within the region,
(2) self-identified communities located partially or totally within the region,
(3) tribal entities located partially or totally within the region, including incorporation of inputs from the Water Security Tribal Advisory Council (WSTAC), and,
(4) negotiating of organizations' planning attributes to assure compliance with regional constraints including ongoing compact compliance and shared aquifer protection.

C. Propose Planning Work Effort: Prepare and deliver to the commission proposals for funding grants to conduct all or part of the necessary regional water security planning effort and develop a resultant plan of action, in recognition of the commission's proposal evaluation criteria in x.xx.xx.15.E. Such proposals shall include:

(1) the regional council's work plans and plans for progress reporting,
(2) embedded communities' work plans,
(3) needs for planning, technical and support staff,
(4) schedule milestones, and,
(5) funding requirements.

D. Seek External Funds: Try to obtain regional water security planning funds from outside of the commission.

E. Enable Community Level Planning: Support and facilitate community level water security

planning to include:

(1) public outreach and education to create and engage community planning groups,

(2) provide water security planning guidance,

(3) provide funds in response to well-organized requests,

(4) provide or obtain commission technical support as requested,

(5) monitor communities' financial and planning progress, and,

(6) incorporate communities' planning information into the regional plan.

F. Conduct Regional Planning: Conduct an ongoing process to enhance water security across the region. The process should include:

(1) establishing a quantitative understanding of the legal, hydrologic, and demand attributes of the region, yielding knowledge of its water situation and problems,

(2) extensive iterative interaction with the commission, public and communities by providing interim work products and ingesting inputs throughout the planning process,

(3) developing a coherent statement of public welfare of the region in accordance with x.xx.xx.14,

(4) ensuring scientific integrity in the planning through use of data and models,

(5) requesting technical support from the commission as needed,

(6) identifying potential infrastructure projects and administrative policies at regional and community levels to enhance regional water adaptability

(7) evaluating, such projects and policies for:

(a) technical feasibility,

(b) cost,

(c) compliance with the statement of public welfare of the region,

(d) recognition of scientific and hydrologic reality,

(e) social impacts and benefits,

(f) riverine and habitat impacts and benefits,

(g) impacts and benefits to the regional economy,

(h) contribution to closing gaps between regional demand and supply,

(i) contribution to closing gaps between intraregional demands and supplies,

(j) contribution to community water adaptability, and,

(k) adaptability for future generations.

(8) prioritizing such projects and policies in accordance with their evaluations,

(9) packaging groups of prioritized projects and policies into various alternative programs,

(10) modeling or otherwise evaluating the various alternative to programs to verify that, if implemented, they would meet the statewide goals and outcomes in x.xx.xx.15.A,

(11) selecting a preferred alternative program that best meets the declared public welfare of the region, and,

(12) creating a detailed plan for implementation of the preferred alternative program.

G. Promote Interim Plan Elements: Only if the regional council determines that implementation of a duly evaluated high-priority project or policy is sufficiently urgent, the regional council may pursue an interim plan element for that project or policy to be acted upon sooner than completion and implementation of the full regional plan. The interim plan element shall:

(1) contain the urgency and priority justifications for being treated in advance of the full regional plan,

(2) contain a description of the project or policy,

(3) contain a summary of the project or policy evaluations, and,

(4) be submitted to the commission for approval, and if needed be subject to negotiated changes to obtain commission approval for implementation.

H. Prepare Regional Plan: Develop a regional plan in recognition of the commission's approval criteria stated in x.xx.xx.12 including:

(1) the region's hydrological situation,
(2) the statement of public welfare of the region,
(3) description of the planning process that led to the regional plan,
(4) a description of each recommended policy and project,
(5) a summary of the project and policy evaluations,
(6) a prioritized list of recommended infrastructure projects for the region,
(7) a prioritized list of recommended administrative policies for the region,
(8) the preferred alternative program for the region, and,
(9) the implementation plan for the preferred alternative program.

I. Seek Approval of the Regional Plan: Submit the regional plan to the commission for approval, and if needed negotiate changes to obtain commission approval for implementation.

J. Conduct Ongoing Planning: After approval of the initial water security plan, perform a continued publicly interactive planning process to include:

(1) proposing work plans and funding requirements to the commission,
(2) monitoring of project and policy implementation progress,
(3) monitoring of water supply and demand changes,
(4) addressing newly recognized issues at community and regional levels, and,
(5) developing and submitting updates to the regional plan.

K. Report to Commission: Throughout the planning processes, provide semi-annual summary reports to the commission reflecting:

(1) use of funds,
(2) progress to date,
(3) any difficulties encountered,
(4) cost or progress deviations from the proposed processes,
(5) cost to complete, and,
(6) near term plans.

San Juan Water Commission's ("SJWC") Comments on Discussion Draft of Regional Water Planning Rule

General Comment

The scope and contents of the ISC's rule governing the process for establishing and conducting a regional water security program are established by the Water Security Planning Act, sections 72-14A-1, *et seq.* NMSA 1978. The ISC's rule must not exceed the scope of its authority under that Act.

Specific Comments

SJWC's proposed modifications to draft rule language are set forth below in redline and ~~strikeout~~ format.

"**x.xx.xx.2 SCOPE:** This rule governs the process for developing and maintaining regional water planning pursuant to the Water Security Planning Act, Section 72-14A-1, et seq. NMSA 1978."

x.xx.xx.7 DEFINITIONS:

[Note: All terms used in the rule should be defined in this section, rather than in the guidelines. Definitions for "Planning Activities," "Regional Water Security Plan," and "Stakeholder" should therefore be moved here. Further, all terms defined in the rule need not be re-defined in the guidelines.]

x.xx.xx.8 WATER SECURITY TRIBAL ADVISORY COUNCIL

"**B.** The purpose of the WSTAC is to provide a forum for input from New Mexico pueblos, tribes and nations to ensure that their sovereignty, water rights, and water needs~~, and other viewpoints~~ are considered and incorporated in the regional water planning process or other activities as determined by the commission."

[Note: Section 72-14A-4(B) of the Water Security Planning Act does not refer to "other viewpoints" and expressly states the advisory council should take into account "tribal sovereignty, tribal water rights and the water needs of tribal communities."]

x.xx.xx.10 COMPOSITION OF REGIONAL WATER SECURITY PLANNING COUNCIL

"**A.** . . . to establish the Regional Water Security Planning Council ~~("Council" or "Planning Council")~~. Each entity is entitled to have a representative on the ~~c~~Council for any Planning Region that it is located within. The commission shall convene the representatives with the goal of establishing the members of a Council by consensus, or, if no agreement is reached, the commission shall determine the initial members of the Council. A Council can also self-organize provided the criteria below are met. Council membership will be based on the following:

. . . .

(5) ~~one representative appointed by the governing body of each council of government,~~

. . . .

(9) one representative from each additional political subdivision located in whole or in part within the planning region not falling within the previous membership categories."

[Note: "Council" is referenced in the definition of Regional Water Security Planning Council and thus is not needed here. The term "Planning Council" is not used elsewhere in the rule and should therefore not be included. "Council of government" is undefined and confusing. All political subdivisions not falling within the other listed categories of representatives should be included, such as SJWC.]

. . . .

x.xx.xx.11 REGIONAL WATER SECURITY PLANNING COUNCIL MEETING REQUIREMENTS

. . . .

"**B.** Councils must provide reasonable notice of meetings or other activities to council members, the public, and the commission."

[Note: Subsection B should be revised to specify what constitutes "reasonable notice" of meetings or other activities. Otherwise, members of the public or disgruntled Council members may have a legal basis to challenge any regional plan adopted by the Council.]

"**C.** Subcommittee meetings may be held and may ~~or may not~~ be supported by commission staff and resources."

[Note: "May" does not require the support of commission staff and resources.]

x.xx.xx.12 ADOPTION OF REGIONAL WATER SECURITY PLAN: "In order to be approved by the commission, regional plans must meet the following criteria:

. . . .

G. The outcomes sought by each Regional Water Security Plan shall:

(1) be established through broad public input;

(2) consider public welfare values, balancing water uses and the needs of future generations of New Mexicans;

(3) comply with state water law;

(4) be developed using the best available science;

(5) recognize and respect federally recognized or reserved tribal water rights;

(6) consider access to water for domestic use; and

(7) comply with applicable federal water law.

~~**(8)** consider the water needs of healthy fish and aquatic and riparian habitats.~~"

[Note: Subsections G(1)-(7) are taken, almost verbatim, from the Water Security Planning Act, Section 72-14A-5(B)(1)-(7). Subsection G(8) is not found in the Act and therefore is beyond the scope of the ISC's authority to mandate. Further, such environmental issues arguably may be addressed through the other mandates, such as compliance with state and federal water law.]

x.xx.xx.13 PROCEDURE FOR REGIONAL WATER SECURITY PLANNING COUNCILS TO DEVELOP AND PROVIDE NOTICE TO THE COMMISSION OF ISSUES AND CONCERNS RELATING TO THE PUBLIC WELFARE OF THE WATER PLANNING REGION

. . . .

"~~**B.** State engineer consideration of regional issues of public welfare in permitting decisions:~~

~~**(1)** The state engineer, in its permitting decisions, may consider issues of public welfare of a water planning region identified by a Council if the state engineer determines that such regional issues are related to or may impact the public of the *[sic]* welfare of the state.~~

~~**(2)** The state engineer shall not be bound by any determination of a Council.~~

~~**(3)** In reviewing applications that implicate a given issue or concern identified by a Council as relating to the public welfare of a water planning region, the state engineer shall explain its reasoning related to such issue or concern if the state engineer determines that it is relevant to the public welfare of the state.~~

. . . .

(C) Notification of Council's Determination:

. . . .

~~**(3)** The Commission's staff shall notify the relevant state engineer district office(s) of the Council's determination and shall provide all relevant documentation relating to the determination.~~"

[Note: Under state law, the ISC has no authority over the State Engineer's permitting decisions. Further, the Water Security Planning Act, Section 72-14A-4, establishes the scope of the ISC's authority under the Act. The Act does not address the State Engineer's consideration of regional public welfare issues in permitting decisions. In fact, Section 72-14A-3 of the Act states that nothing in the Act shall be construed "as determining, abridging or affecting in any way *the water rights of water right owners in the state." (Emphasis added.)* It *therefore is improper to adopt a rule indicating what information the State Engineer "may" consider when making a permitting decision and requiring the State Engineer to explain the reasoning concerning public welfare considerations. Subsection B should therefore be deleted in its entirety. For the same reasons, subsection C(3) should be deleted.]*

x.xx.xx.14 PROCEDURE FOR A REGIONAL WATER PLANNING COUNCIL TO CONSIDER PUBLIC WELFARE VALUES AND THE NEEDS OF FUTURE GENERATIONS OF NEW MEXICANS

. . . .

"**B.** Regional Water Planning Councils shall consider the following public welfare values of the state in their regional water planning activities:

(1) The state's ability to meet its obligations under interstate compacts;

(2) The state's ability to comply with the Endangered Species Act~~, or otherwise prevent significant harm to the habitats of Federal- and State-endangered or -threatened species~~; and

(3) The state's ability to comply with congressionally authorized tribal water settlement acts."

~~**(3)** Regional water rights settlements, including tribal water rights settlements and alternative administration plans under the Active Water Resources Management Program."~~

[Note: The proposed changes more closely track the language of Section 72-14A-4(C)(9), which does not refer to preventing "significant harm" to endangered species and specifically refers to "congressionally authorized tribal water settlement acts." Further, Section 72-14A-4(C)(9)(c) does not require that regional water planning entities consider alternative administration; rather, it requires the ISC to "support" planning entities in the "development of a proposal for alternative administration through active water resources management, if prioritized by the region . . . ." (Emphasis added.)]

San Juan Water Commission's ("SJWC") Comments on Discussion Draft of Regional Water Planning Guidelines

SJWC's proposed modifications to draft Guidelines language are set forth below in redline and ~~strikeout~~ format.

1.0 DEFINITIONS

All terms used herein that are defined in the Rule shall have the definition provided in the Rule. The following terms, which are not defined in the Rule, are defined as follows:

[Note: Many of the terms defined in the Guidelines are either already defined in the Rule or used in the Rule. Definitions for those terms should be found only in the Rule. "Commission," "Planning Region" and "Regional Water Security Planning Council" already are defined in the Rule so should not be included here.

The following terms, which are used in the Rule, should be defined there: "Planning Activities," "Regional Water Security Plan," and "WSPA."

The only remaining terms to be defined in the Guidelines are: "Planning Program," "PPP," "Regional Planning Grant Program," "Stakeholder," and "State agency."

SJWC's proposed changes to the terms not already defined in the draft Rule, whether or not proposed to be defined only in the Rule, are below.

SJWC also proposes the addition of a definition of "public" because of the distinction between a "stakeholder" and the "public" that is evidenced by the language the Act. For example, Sections 72-14A-4(C)(2)(a-b) distinguish between "regional stakeholders"/"stakeholder collaboration" and "public input requirements."]

1.X "Public" means a person or entity that resides in a Planning Region or has a direct interest in a Planning Region's water security.

1.9 "Stakeholder" means ~~someone who resides in, or has direct interest in the region's water security.~~ a person or entity described in sections 10(A) or 10(B) of the Rule.

1.10 "State agency" means any department or agency of the State or ~~of~~ a political subdivision of the State.

2.0 IDENTIFICATION OF REGIONAL STAKEHOLDERS AND OPPORTUNITIES FOR STAKEHOLDER COLLABORATION

2.1 Planning Councils shall consult Stakeholders ~~shall be consulted~~ in the development of any RWSP. Councils shall have final decision making authority ~~Stakeholders shall have a voice in the planning process but do not have final say in the decisions~~ regarding water planning in a region.

2.2 Planning Councils must establish a method to provide notice to ~~for~~ Stakeholders of the opportunity to enter into and engage in ~~the planning process~~ Planning Activities. At a minimum, ~~the identification of Stakeholders shall include:~~ notice shall comply with the Rule.

~~a. documentation that the Stakeholder lives within the region or has provided a statement of interest.~~

~~b. a point of contact for the Planning Council.~~

[Note: SJWC has proposed that minimum notice requirements be set forth in the Rule. Also, SJWC's proposed definitions of "stakeholder" and "public" eliminate the need for a statement of interest or proof of residency here.]

2.3 Planning Councils shall ~~conduct adequate notice and~~ maintain a distribution list ~~for~~ of Stakeholders that have requested an opportunity to monitor or participate in Planning Activities. Stakeholders may elect to receive information by email, USPS First Class mail, or other methods approved by the Planning Council. Members of the Stakeholder list should be notified of the following opportunities:

a. to support/endorse council members~~.~~;

b. to provide comments on proposed plan language~~.~~;

c. to provide notice of dissent to the NMISC at the time of plan submission for consideration~~.~~; and

d. to participate in ~~notice of~~ Planning Council meetings, including ~~and~~ in-person ~~or~~ and remote attendance options.

2.4 Additional opportunities for Stakeholders to participate in Planning Activities ~~can~~ may be developed at the discretion of the Planning Council.

3.0 PUBLIC INPUT REQUIREMENTS FOR REGIONAL WATER PLANNING

3.1 RWSPs must be established through broad public input, includ~~e~~ing ~~ample~~ opportunities for the public to be involved in ~~the development of the plan and the development of~~ the prioritization of PPPs. During the development of any ~~regional water security plan~~ RWSP, the Planning Council must, at a minimum:

a. ~~Inform Stakeholder list and d~~Distribute information regionally about the development of the plan, including opportunities for public input, at regular intervals.

[Note: because of the distinction between Stakeholders and the public provided in the Rule, and as proposed by SJWC in the definitions, Section 2.0 applies to Stakeholders and Section 3.0 applies to the public in general.]

b. Host two public meetings, with support for both in-person and virtual opportunities for participation.

c. Provide a minimum of sixty days for the public to comment in person, via email, or through a web site on a draft water security plan.

d. Provide an opportunity for public comments to be reviewed by the Planning Council ahead of finalization of a water security plan.

3.2 Additional opportunities for input may include, but are not limited to:

a. Providing materials in languages in common use within the region (e.g., sign, Spanish, Tewa, Navajo).

b. Hosting additional meetings, focus groups, listening sessions, open houses, or other similar events. ~~events, etc.~~

3.3 WSPA emphasizes engaging rural communities, therefore the Planning Council may consider a range of participation options that eliminate barriers such as lack of access to a stable internet connection or lengthy travel. This could include, for example:

a. ~~p~~Providing engagement resources (e.g., presentations, paper surveys) to local community partners with existing connections in rural areas.

b. Providing multiple in-person opportunities distributed throughout larger regions.

c. Providing meeting spaces or computer access for remote participation.

3.4 Planning Councils may create working groups to increase opportunities for participation or to address water security planning topics of concern that are particular to a geographic sub-region, Stakeholders, or other sector. Regardless of the number of working groups within a Planning Region, a prioritized list of projects, programs and policies ("PPPs") must be consolidated into a single list for the Regional Water Security Plan.

3.5 Planning Regions or sub-regions are encouraged to coordinate and share information or resources with other Planning Regions or sub-regions.

4.0 GRANTS OR LOANS FOR PLANNING ACTIVITIES

4.1 Subject to appropriations from the legislature, the Commission will develop a Regional Planning Grant Program with proposal requirements for grants or loans for Planning Activities and an approval process.

5.0 PROCESS FOR STATE AGENCY COLLABORATION

5.1 State agencies ~~can~~ may:

a. provide comments on draft RWSPs to the NMISC and the Planning Council developing the RWSP, including:

i. ~~h~~Highlighting permit requirements should a given project be funded.

ii. ~~h~~Highlighting areas of conflict between proposed projects and state ~~of NM~~ goals.

iii. ~~e~~Estimating the time commitment for ~~State~~ ~~A~~agency staffing.

iv. ~~i~~Identifying opportunities for leveraging or accessing funding and expertise.

v. Identifying any other issue the ~~State~~ ~~A~~agency finds relevant to a region's proposed plan.

b. Identify~~ing~~ a person or group to act as the liaison for their agency and provide NMISC with up-to-date contact information for the person or group.

5.2 Regional Water Security Planning Councils will:

a. ~~c~~Consider all agency comments and input to ensure compliance with regulations.

b. ~~d~~Document all agency comments and their resolution in an Appendix in the region's water security plan.

5.3 NMISC Planning Program will:

a. serve as an informational resource for topics associated with planning, such as various state and federal funding sources, the best available scientific tools/models, or opportunities to connect projects that may have multiple benefits.

b. ~~a~~Act as a liaison between agencies and Councils.

c. ~~p~~Provide agency comments to the Councils.

d. ~~endeavor to m~~Maintain a list of agency partners for regional consultation.

e. ~~p~~Provide a forum for state agencies and planning entities to meet and collaborate~~.~~:

i. at the request of an agency or Planning Council~~.~~;

ii. at an annual coordination meeting~~.~~; or

iii. ~~or~~ as otherwise needed.

6.0 METRICS FOR REPORTING ON REGIONAL WATER PROJECTS, PROGRAMS AND POLICIES and WATER SECURITY PLAN IMPLEMENTATION

6.1 The Planning Program will develop a template for Planning Councils to use for their required reporting to the Commission by June 30 each year. The template will include metrics and measures for reporting on implementation of projects, programs, or policies.

6.2 Planning Councils shall utilize tools and support provided by groups, including the Planning Program, to evaluate and report on regional water balance. Water balance reporting shall:

a. utilize the best available science with NMISC support~~,~~; and

b. not conflict with statewide objectives.

7.0 PROCEDURES TO SUPPORT IMPLEMENTATION OF A REGIONAL WATER SECURITY PLAN

7.1 Responsibilities of Planning Councils:

a. With the support of NMISC:

i. Develop a water security plan with the support of the NMISC planning team per the schedule in section 8.

ii. Update a Regional Water Security Plan at least every 10 years.

iii. Update the prioritized PPP lists at least once every 5 years.

b. The PPP's identified sponsor is responsible for implementing PPPs from the prioritized lists.

7.2 Responsibilities of the Planning Program:

a. Subject to appropriation of funding by the legislature, administer the RPGP.

b. ~~s~~ Support Planning Councils in developing an initial RWSP per the timeline and process in section ~~9~~8.

c. Help connect Planning Councils to other resources by:

i. ~~s~~Serving as a liaison between Planning Councils and ~~potentially~~ other ~~partner~~ state and/or federal agencies.

ii. ~~i~~Identifying knowledgeable local resources.

iii. ~~i~~Informing Planning Councils about other funding opportunities.

iv. ~~s~~Supporting development and utilization of up-to-date science/data/models.

d. ~~i~~Informing Planning Councils about statewide objectives.

e. ~~p~~Providing support identified elsewhere within these Guidelines.

f. Planning Program or NMISC responsibilities do not include:

i. ~~a~~Acting as a fiscal agent~~,~~.

ii. Managing any grant or loan~~,~~; or

iii. ~~p~~Project management.

8.0 SCHEDULE FOR IMPLEMENTATION OF REGIONAL WATER PLANNING, INCLUDING INTEGRATION WITH STATEWIDE OBJECTIVES

8.1 Initial plan development phase. The goal of the initial drafting phase is to develop water security plans for each region in the state. This phase will last for six (6) years, and the Planning Regions will be addressed three (3)-at-a-time, with a two (2)-year time period for each. NMISC will ensure that initial plans for all regions are completed before a subsequent planning cycle is initiated for any region.

8.2 Subsequent phases. After the initial drafting phase, NMISC will support each Planning Council during the updating of its ~~each~~ regional water security plan. NMISC will undertake no more than three (3) plan updates at time, for two (2) years at a time.

8.3 Integrating with statewide objectives. Statewide objectives will need to be reviewed and adhered to.

[Note: ISC should propose a timeline for this process.]

9.0 COMMISSION APPROVAL OF REGIONAL WATER SECURITY PLANS

To be presented for Commission approval, RWSPs must contain the following elements, in addition to meeting the requirements set forth in the Rule:

9.1 Prioritized list of PPP requests from the region. This list may include~~s multiple, sub-lists~~ sublists organized based on readiness, with project types and sponsor noted for each individual PPP.

a. Each of these readiness-based ~~sub-lists~~ sublists ~~is~~ shall be independently prioritized, ranking each PPP at an individual level relative to all other PPPs on that list (region-wide).

b. Project readiness ~~includes~~ shall be identified as ~~3 categories~~:

i. ready to implement/proceed (like shovel ready)~~.~~;

ii. needs planning (one step away from shovel ready)~~.~~; or

iii. needs scoping (one step away from being planned).

c. Each proposed PPP must list the sponsor(s) that intends to obtain the funding for and implement the PPP.

d. PPP types include, but are not limited to:

i. watershed health;

ii. drinking water;

iii. storm water;

iv. dam maintenance;

v. water conservation resulting in reduction of total water use;

vi. education;

vii. efficiency;

viii. water reuse;

ix. aquifer storage and recovery; or

x. aquifer recharge.

e. Additional information for each PPP that would strengthen its case for prioritization, including, if available, ~~includes:~~

~~i.~~ ~~D~~documentation/~~P~~proof of existing funding match commitments. ~~for identified PPP's on the prioritized list, if that exists~~.

~~ii. Other items that may strengthen the case for specific PPP.~~

[Note: the proposed change incorporates (i) and (ii) in subparagraph (e).]

f. Planning councils may elect to repeat PPP list items in subsequent iterations of RWSP's.

9.2 A statement of public welfare values and the needs of future generations of New Mexicans.

9.3 Documentation of working groups within a Planning Region.

9.4 Any additional requirements for the composition of the Planning Council beyond those specified in the Rule.

9.5 Acknowledgement and discussion of regional water balance including reductions in projected water availability and decision-making practices adapted for increasing uncertainty.

9.6 Documentation of outreach conducted to encourage participation in regional planning. This could be a website, newsletter, presentations, or articles.

County Commissioner Eric Olivas
415 Silver Ave. SW, 8th Floor
Albuquerque, New Mexico 87102
Office: 505-468-7212
District5@bernco.gov
www.bernco.gov

February 27th, 2025

New Mexico Interstate Stream Commission
c/o Director Riseley-White
Hannah.Riseley-White@ose.nm.gov

Re: Public Comment on 1/21/25 Discussion Draft Rules & Guidelines

Dear Director Riseley-White and Commissioners,

New Mexico's long-term water security depends on getting the regional water planning process right. The current Discussion Draft Rules & Guidelines lack the necessary structure to ensure effective planning. Without key improvements, the state risks jeopardizing this critical opportunity to determine what the status quo will bring and what we can do better, considering the needs of future generations and our economies. I urge the ISC to refine and strengthen these rules before they are finalized.

Regional Water Security Planning Must Succeed. New Mexico's regional water security planning must succeed. With a changing climate, increasing demands on water resources, and evolving hydrologic realities, we have a narrow window of opportunity. The ISC must provide a clear and effective framework in its rules to ensure that regional planning leads to meaningful and lasting water security solutions.

The Rules Must Articulate Clear Objectives. The rules should clearly define water security as the ability of a region to sustainably provide water for current and future generations while balancing ecological, economic, and social needs. Without a clear definition, planning efforts may be inconsistent and lack measurable goals.

Water Security Planning Must Go Beyond Prioritization of Projects. A meaningful regional water security plan must include more than just a prioritized list of projects, programs, and policies. While communities may propose much-needed water and wastewater infrastructure, these projects alone will not provide true regional water security. The rules must ensure that regional plans focus on determining what it will take to secure long-term water security.

The Rules Must Require Consensus and Collaboration. The Rules do not address consensus-building or the collaboration required to reach consensus. They should contain requirements for successful collaborative process design so that regional water planning councils function efficiently and productively.

A Data-Driven Approach Should Guide Decision-Making. Water planning must be grounded in the best available data and follow a logical approach to ensure that regional plans are built on a strong factual foundation. Hundreds of proposed projects in each region will require screening, vetting, and cost estimates before prioritization. The Rules should address that process in detail to assure that it is valid.

The Planning Program Must Be Attractive to Those Whose Participation is Required. Regional water security planning is voluntary at both the regional and community scales. The ISC must ensure that the process is structured to encourage meaningful participation by clearly outlining incentives, benefits, and expected outcomes for participants. Without this, key stakeholders may disengage, undermining the effectiveness of the planning effort.

Shared Authority and Responsibility Between the ISC and Councils. The rules unnecessarily insert ISC control over local governance decisions, such as appointing all local government council members. Each governing body must be free to choose its own representatives. The Rules must distinguish the Commission's roles from its staff's.

Unwieldy Council Size Without Process or WaternExpertise Requirements. The proposed structure of the Middle Rio Grande Council, with over 60 members, poses a significant governance challenge. Without a clear decision-making framework and process guidelines, councils risk inefficiency, delays, and disengagement from key stakeholders.

Conclusion

I urge the ISC to revise these rules to establish a structured, transparent, and science-driven framework for regional water security planning. Without clear expectations, strong collaboration, and a data-driven foundation, New Mexico risks another cycle of ineffective water planning. The ISC must engage in an open, structured dialogue with stakeholders to ensure these rules create a planning framework that is actionable, science-based, and capable of delivering real water security.

Thank you for your time and consideration.

Sincerely,

Eric C. Olivas
Chair, Bernalillo County Board of Commissioners

NEW MEXICO
WATER ADVOCATES

March 16, 2025

via email to Hannah.Riseley-White@ose.nm.gov & ISC.Commission@ose.nm.gov

Chairman Mark Sanchez
Vice Chair Stacy Timmons
Secretary Elizabeth K. Anderson, P.E.
Commissioners Aron Balok, Greg Carrasco, Aaron Chavez, Paula Garcia,
Peter Russell, Phoebe Suina

New Mexico Interstate Stream Commission
407 Galisteo Street
Santa Fe, NM 87501

Attention: Director Hannah Riseley-White

Dear Chairman Sanchez, Vice Chair Timmons, Secretary Anderson, and Members of the Commission:

Thank you for extending the public comment period on the draft Water Security Planning Act (WSPA) rules and guidelines, as well as hearing your staff summarize these comments at your March 20, 2025, public meeting. On behalf of the New Mexico Water Advocates, I write to reaffirm our commitment to shaping a robust statewide water security planning program—one that empowers New Mexico's communities and regions to understand their available water supplies and trends, account for public welfare and future generations, and adapt effectively to ensure improved water security. Many on our team have observed both successes and setbacks in prior water planning, and we want upcoming WSPA planning to emerge as an unqualified success.

The WSPA charges you, as the Interstate Stream Commission, with creating and conducting a dynamic statewide water security planning program. Because water is an essential, limited public resource subject to more rights than can be sustainably met, any water resources planning effort must address multiple competing or evolving objectives. Despite the complexities, the law's goals are clear:

- Empower each voluntary regional council to develop data-driven, practicable water conservation plans that bolster community water security and bring water demands into better balance with diminishing supplies.
- Prioritize state funding assistance for locally prioritized community and regional water and wastewater **infrastructure**—and water **conservation** projects, programs, and policies.

To that end, the Rules should articulate a thoughtful, well-structured framework, guided by best practices (or equally rigorous methods), that can be tailored locally yet remains consistent with statewide objectives. Such a framework is crucial for systematically identifying, evaluating, and prioritizing solutions to regional and community water security challenges and infrastructure needs, especially as evidence of overuse grows and supplies continue to decline.

Equally vital is a formal, well-defined vision of what the WSPA program should accomplish. As Stephen R. Covey advised, "beginning with the end in mind" clarifies why each step matters and ensures purposeful rules and guidelines. We strongly encourage the ISC to publish and share such a vision now, uniting the program's participants and partners under common goals.

Shortly after the 2023 WSPA (Section 72-14A NMSA 1978) became law, a committee from the Water Advocates began refining a vision and drafting potential rules—drawing on decades of firsthand experience with water planning to discern which elements succeed and which fall short.

We submitted two versions of these draft rules to ISC staff—an initial informal version in November 2024, and a formal redline submission included with the Water Advocates' official public comments on the ISC's February 21 deadline. A cover letter highlights issues for the Commission's consideration, as suggested by Vice Chair Timmons in response to my request for advice. We posted several directly related articles.

In our view, the ISC's January 2025 "Discussion Draft" Rules don't realize the ISC's responsibility to implement the 2023 Act by creating a rigorous, outcome-focused water security planning program that will deliver value to the participants, the regions, communities, and the State.

Over the next few weeks and months, as the Commission and staff refine these rules, we respectfully urge you to:

1. **Release all narrative comments the ISC has received to date**, fostering transparency and open dialogue among all interested parties.
2. **Develop and publish a clear vision and set of objectives for the WSPA program**, to guide the rules drafting and promulgation and everything else.
3. **Define the ISC's rulemaking process**, including specific opportunities for groups like the Water Advocates to participate.
4. **Sponsor stakeholder events or roundtables** that allow commenters to exchange observations and discuss relevant best practices.
5. **Clarify how the OSE/ISC will address areas with severe water imbalances**—such as the Middle Rio Grande—explicitly outlining where urgent state intervention is needed to avoid further legal conflict, and where there is significant local interest in planning.
6. **Commit to greater transparency**, increased public comment opportunities, publicly accessible meeting recordings, and open deliberations that considers public input for the Commission's critical rulemaking and other decisions.

Thank you for the opportunity to share our perspectives and for your continued efforts to refine these rules. The Water Advocates remain eager to cooperate with the Commission, ISC staff, and stakeholders across New Mexico in ensuring that the WSPA fulfills its promise of locally driven, yet statewide-aligned, water security solutions.

Sincerely,

Norm Gaume, P.E. (ret.)
On behalf of the New Mexico Water Advocates
505 690-7768
NMwateradvocates.org; info@NMwateradvocates.org

Michelle Lujan Grisham
Governor of New Mexico

Mary Trujillo Mascareñas
Chair Person

Judy Torres
Vice Chair Person

New Mexico Acequia Commission
www.newmexicoacequiacommission.com

March 28, 2025

Andrew Erdmann
NM Interstate Stream Commission
P.O. Box 25102
Santa Fe, NM
87504-5102

Dear Mr. Erdmann,

Thank you for the opportunity to review and provide feedback on the Regional Water Plan. Attached you'll find a slightly revised version of the Regional Water Plan document. The New Mexico Acequia Commission agrees with the edits the New Mexico Acequia Association has provided with only minor edits from the Commission. Please review and let us know of any additional questions.

Sincerely,

Mary Mascarenas

Mary T. Mascareñas, Chairwoman
NM Acequia Commission

Judy Torres

cc: Judy Torres, Vice-Chair - NMAC

NEW MEXICO
WATER ADVOCATES

March 16, 2025

via email to Hannah.Riseley-White@ose.nm.gov & ISC.Commission@ose.nm.gov

Chairman Mark Sanchez
Vice Chair Stacy Timmons
Secretary Elizabeth K. Anderson, P.E.
Commissioners Aron Balok, Greg Carrasco, Aaron Chavez, Paula Garcia,
Peter Russell, Phoebe Suina

New Mexico Interstate Stream Commission
407 Galisteo Street
Santa Fe, NM 87501

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To that end, the Rules should articulate a thoughtful, well-structured framework, guided by best practices (or equally rigorous methods), that can be tailored locally yet remains consistent with statewide objectives. Such a framework is crucial for systematically identifying, evaluating, and prioritizing solutions to regional and community water security challenges and infrastructure needs, especially as evidence of overuse grows and supplies continue to decline.

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We submitted two versions of these draft rules to ISC staff—an initial informal version in November 2024, and a formal redline submission included with the Water Advocates' official public comments on the ISC's February 21 deadline. A cover letter highlights issues for the Commission's consideration, as suggested by Vice Chair Timmons in response to my request for advice. We posted several directly related articles.

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1. **Release all narrative comments the ISC has received to date**, fostering transparency and open dialogue among all interested parties.
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Sincerely,

Norm Gaume, P.E. (ret.)
On behalf of the New Mexico Water Advocates
505 690-7768
NMwateradvocates.org; info@NMwateradvocates.org

Raton Water Works

Water Department
P.O. Box 99 / Raton, New Mexico 87740 / (575) 445-3861

April 25, 2025

Hannah Riseley-White, Director
New Mexico Interstate Stream Commission
407 Galisteo Street, Suite 101
Santa Fe, NM 87501
Hannah.Riseley-White@ose.nm.gov

Re: Comments on the Water Security Planning Act Rules and Guidelines

Dear Director Riseley-White,

On behalf of the City of Raton and Raton Water Works, I would like to thank you for the opportunity to review and comment on the proposed rules and guidelines associated with the Water Security Planning Act. We appreciate the level of detail, effort, and outreach the Commission is dedicating to the planning process.

The City of Raton supports the principle of regional planning and project prioritization, if paired with meaningful funding opportunities that will enable communities across New Mexico to meet their current and future water needs.

We concur that the proposed Canadian Council planning region is configured geographically to facilitate cooperation and planning in our part of New Mexico. As the council representation is organized, we would like to emphasize the importance of water right owner representation on the council. Our priority is to ensure that any planning or implementation efforts will respect and protect existing property rights and water rights to protect generations of investment and cultivation of our municipal water supply. These rights are foundational to our community, and all communities, and must be honored throughout all phases of the planning and funding process.

For example, section 13.A.1 reads: *"All water rights holders or other interested parties who may be affected by a Council's determination shall be given a full and fair opportunity to participate in the process."* The word "participate" is vague, and we would like this language to be strengthened. Water rights holders should have the primary say in their own water resources and not be threatened by others in the region who might have differing interests.

We also recognize that many details remain to be determined regarding how regional water councils will function—including governance structures, decision-making processes, and funding mechanisms. We understand that these questions will require thoughtful dialogue and continued input from local stakeholders, and we are committed to engaging in that conversation.

The City of Raton and Raton Water Works look forward to working with the Interstate Stream Commission and other water rights owners to support the successful implementation of regional water planning. We appreciate the opportunity to contribute to effort.

Sincerely,

Mark Morris
Board Chairman
Raton Water Works

Lloyd Wakefield
General Manager
Raton Water Works

Lori Chatterley
Mayor Pro-tem
City of Raton

Copy: Andrew Erdman: Andrew.Erdmann@ose.nm.gov
Sara Fox: Sara.Goldstein@ose.nm.gov

April 30, 2025
Regional Water Planning Program
Interstate Stream Commission

Re: Draft Rules and Guidelines to Implement Water Security Planning Act

Thank you for another opportunity to review the draft Rules and Guidelines. I am once again struck by the failure of these two documents to address the task.

The 1994 Regional Water Planning Handbook stated that the "Commission expects to use the plans to ensure an adequate supply of water for each region of the state." What is the purpose of the draft Rule and Guidelines? To implement projects, programs, or policies, or PPPs? Which are to be developed how? To what end?

PPPs are an end product of the planning process. Before they can be developed, the regions will have to go through a planning process. The plan must contain statements on water supply and water demand and recommendations to reconcile the two. When do such undertakings such as identification of the problem and goals, and understanding the consequences for not meeting goals occur?

The draft Rules and Guidelines must provide a template of the process. The template, incorporating water planning principles, should begin with the region creating a vision.

When the 2004 MRG Plan was being developed, the 1997 MRG Water Budget provided the rational for planning and the slogan -- *Balance Use With Renewable Supply*. Working together on developing the data and the water budget enabled the group to agree upon the urgency of our situation (which still exists), and then to discuss alternatives and scenarios.

The 1994 template contained topic headings for consideration and, where applicable, to be addressed by every regional planning entity. Each region was required to analyze alternatives for management, water conservation, water development, infrastructure development and water quality management. Now, the "plan" is to be a list of PPPs, with subsequent reporting to be on implementation of them. There is nothing in the Rules or Guidelines about how those PPPs were developed, or how they will help alleviate the undefined problem so that success can be declared.

The only guidance as to how to develop PPPs is the vague statement that "[t]he Regional Water Planning Council shall use the best science, data and models related to water resource planning and shall use them with scientific integrity and adherence to principles of honesty, objectivity, transparency and professionalism, as specified in NMSA 1978, Section 72-14A-4(C)(7)." [1]

[1] This statutory section does not give guidance as to how this action is to be done.
§72-14A-4(C)(7) C. The commission shall ensure, by using the integrated water data and information platform developed pursuant to the Water Data Act [72-4B-1 to 72-4B-4] and collaborating with the bureau of geology and mineral resources of the New Mexico institute of mining and technology and the water resources research institute, that the best science, data and models relating to water resource planning are available to the regional water planning entities and are used with scientific integrity and adherence to principles of honesty, objectivity, transparency and professionalism in developing, vetting and prioritizing proposals.

Without setting forth much more guidance to the regions, the end result will be a mish mash of PPP lists but with no plan to accompany them.

Here are some specific comments and questions about the draft rules and guidelines:

> Rule §. Identifying Public Welfare Issues and Concerns
>
> (1) All water rights holders or other interested parties who may be affected by a Council's determination shall be given a full and fair opportunity to participate in the process.

What does *participate* mean? Vote? Veto?

> (5) Issues and concerns relating to the public welfare of a water planning region identified by a Council under the procedures outlined in this rule **shall not be** duplicative of the water rights evaluation factors set forth in the state engineer's authorizing statutes (i.e., impairment of existing water rights, contrary to conservation of water within the state, or detrimental to the public welfare of the state).

What then is the purpose of a regional public welfare statement? The regional public welfare may well include a statement about non-impairment, etc., which may be deemed contradictory. Is that a problem, since under the next section the SE gets a chance to weigh in on the regional public welfare statement itself?

> B. State engineer consideration of regional issues of public welfare in permitting decisions:
> (1) The state engineer, in its permitting decisions, may consider issues of public welfare of a water planning region identified by a Council if the state engineer determines that such regional issues are related to or may impact the public of the welfare of the state.
> (2) The state engineer shall not be bound by any determination of a Council.
> (3) In reviewing applications that implicate a given issue or concern identified by a Council as relating to the public welfare of a water planning region, the state engineer shall explain its reasoning related to such issue or concern if the state engineer determines that it is relevant to the public welfare of the state.

The SE can comment during the planning process on the regional public welfare, especially as to whether that interferes with the state's authorizing statutes. So why is the SE *not bound* by the accepted regional public welfare statement?

> B. Regional Water Planning Council shall consider the following public welfare values of the state in their regional water planning activities:
> **(1)** The state's ability to meet its obligations under interstate compacts;
> **(2)** The state's ability to comply with the Endangered Species Act, or otherwise prevent significant harm to the habitats of Federal- and State-endangered or -threatened species; and
> **(3)** Regional water rights settlements, including tribal water rights settlements and alternative administration plans under the Active Water Resources Management program.

The Regional Water Planning Council shall consider regional water rights settlements! But this seems to go further in suggesting that it is in the State's interests for the region to consider

alternative administration plans. Why not also include in the public welfare statement that it is in the State's as well as the regions' interests for current laws to be administered.

> **(1)** The Regional Water Planning Council shall use the best science, data and models related to water resource planning and shall use them with scientific integrity and adherence to principles of honesty, objectivity, transparency and professionalism, as specified in NMSA 1978, Section 72-14A-4(C)(7);

This is frankly about the only place where there is any reference to what might be in the basis of the plans, but there is still nothing about process. Nor is there any mention as to how these models, etc. will be acquired and used.

> **(2)** Regional Water Planning Council shall utilize such data and models to consider the needs of future generations of New Mexicans in their regional planning activities.

Using what criteria, etc.?

> **Guidelines: 6.0** Metrics For Reporting On Regional Water Projects, Programs And Policies And Water Security Plan Implementation
>
> 6.1 The Planning Program will develop a template for Planning Councils to use for their required reporting to the Commission by June 30 each year. The template will include metrics and measures for reporting on implementation of projects, programs, or policies.

The Template is simply how to report implementation of projects, programs, or policies. What about all the steps before that?

> 6.2 Planning Councils shall utilize tools and support provided by groups including the Planning Program to evaluate and report on regional water balance. Water balance reporting shall: a. utilize the best available science with NMISC support, and b. not conflict with statewide objectives.

The Planning Program provided the data in 2016 and it bombed. No one had any confidence in it. I think it more likely that the data being developed in the Basin Study will be used in the Regional Plans. Either way, thus far, there is no spatial component.

Thank you again for this opportunity,

Elaine Hebard
1513 Escalante SW
Albuquerque, NM 87104