

SUBMIT OPTION SUBMITTAL FORM BY:

1. EMAIL TO: COLORADORIVERBASINSTUDY@USBR.GOV

2. U.S. MAIL TO: BUREAU OF RECLAMATION, ATTENTION MS. PAM ADAMS, LC-2721, P.O. BOX 61470, BOULDER CITY, NV 89006-1470

3. FACSIMILE TO: 702-293-8418

Option Submittal Form

Contact Information (optional):

Keep my contact information private.

Contact Name: _____	Title: _____
Affiliation: _____	
Address: _____	
Telephone: _____	E-mail Address: _____

Date Option Submitted: 1/27/2012

Option Name:

Dust Mitigation Program

Description of Option:

In this proposal, The U.S. Department of the Interior – with input from the seven basin states, the stakeholder group described in Option #1, above, other federal agencies, and appropriate Tribal governments – would oversee a program to identify and mitigate significant sources of dust accumulating on snowpack in the headwaters of the Colorado Basin. A recent National Academy of Sciences study by Painter, et al. estimated that dust accumulation is lowering basin-wide annual water yields by 2% - 7%. Several lines of evidence trace the primary sources of this dust to areas of the Colorado Plateau in northeastern Arizona and northwestern New Mexico, where land management practices could be modified to reduce airborne dust, particularly in dry years.

Although the scale of dust mitigation measures would have to be large in order to have a meaningful impact on water supplies, the potential benefits – several hundred thousand acre feet of additional water yield – would be shared widely across the full range of Colorado River water users. Accordingly, a funding mechanism could be designed that imposes a relatively minor individual burden on the roughly 33 million users of Colorado Basin water, yet still yields sufficient revenue to support a program at a scale that can appreciably reduce dust migration increase water yields, and provide additional co-benefits such as improved rangeland management. We propose funding the dust program by amending federal law to dedicate a portion of hydropower revenue generated by federal projects in the basin to the program, at a level to be determined after consultation with the seven states, the Bureau, and the stakeholder group described in Option #1, above. Alternatively, those parties could recommend another equitable mechanism for sharing the costs of the program, such as a per-acre-foot assessment on water deliveries, or some other method.

Location: Describe location(s) where option could be implemented and other areas that the option would affect, if applicable. Attach a map, if applicable.

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This option would be implemented primarily on grazing lands on the Colorado Plateau in Arizona, New Mexico, Colorado, and Utah. The most prominent land ownership is likely by the Navajo Nation, the Bureau of Land Management, and private landowners.

This option would affect widespread high-elevation areas in the headwaters of the Colorado River Basin in Colorado, New Mexico, Utah, and Wyoming, where dust accumulation is altering the rate and timing of snowpack melting and evaporation.

Quantity and Timing: Roughly quantify the range of the potential amount of water that the option could provide over the next 50 years and in what timeframe that amount could be available. If option could be implemented in phases, include quantity estimates associated with each phase. If known, specify any important seasonal (e.g., more water could be available in winter) and/or frequency (e.g., more water could likely be available during above-average hydrologic years) considerations. If known, describe any key assumptions made in order to quantify the potential amount.

The NAS study suggests that the annual loss of water yield to the Colorado Basin from dust on snow ranges from 2% - 7% of total annual yield. That would be the theoretical upper limit on the amount of water this option could produce.

Research also suggests that if current climate and land use trends continue, increased dust accumulation could cause appreciable additional declines in annual water yield. This option could help to minimize or reverse those losses.

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Additional Information

Technical Feasibility: Describe the maturity and feasibility of the concept/technology being proposed, and what research and/or technological development might first be needed.

This project is feasible using existing technologies and methods. However, it would require the following research and development steps:

- Research to more precisely determine the primary source areas contributing to dust accumulation. This can be done via mineralogy, back-trajectory modeling, satellite observation, and analysis of particle size distribution.
- Determination of the most effective and feasible dust mitigation measures. Promising methods include the use of straw checkerboards of 1-2 square meters, supplemented by revegetation or by spraying of cyanobacteria. Improved grazing practices would likely play a role as well.

As the program progressed, it would gain considerable knowledge and experience regarding the most practical and effective mitigation methods. Due to the scale of the program, work would likely start at the pilot level and then proceed to scale.

Costs: Provide cost and funding information, if available, including capital, operations, maintenance, repair, replacement, and any other costs and sources of funds (e.g., public, private, or both public and private). Identify what is and is not included in the provided cost numbers and provide references used for cost justification. Methodologies for calculating unit costs (e.g., \$/acre-foot or \$/million gallons) vary widely; therefore, do not provide unit costs without also providing the assumed capital and annual costs for the option, and the methodology used to calculate unit costs.

Because it would cover a large area and involve labor-intensive methods, the cost of this program would be considerable. Because the program's benefits would be shared among millions of users at the basin scale, funds could be raised in a manner that imposes a relatively small cost on a large number of users yet still generates revenue on a scale commensurate with the problem. One such source would be a portion of revenue from federal hydropower projects.

Permitting: List the permits and/or approvals required and status of any permits and/or approvals received.

The program would be established pursuant to a cooperative agreement among the states, the federal government, and the Navajo Nation and perhaps other tribes.

Implementation measures would require approval/permission from landowners and/or land managers including the Bureau of Reclamation, the Navajo Nation, and private landowners. Implementation on federal public lands would be subject to the National Environmental Policy Act, the Federal Land Policy and Management Act, and other laws.

Any use of federal hydropower revenues for the program would have to be approved by

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Congress.

Legal / Public Policy Considerations: Describe legal/public policy considerations associated with the option. Describe any agreements necessary for implementation and any potential water rights issues, if known.

Implementation measures would require approval/permission from landowners and/or land managers including the Bureau of Reclamation, the Navajo Nation, and private landowners.

Implementation Risk / Uncertainty: Describe any aspects of the option that involves risk or uncertainty related to implementing the option.

Because of its scale and its physical and jurisdictional complexity, the implementation of this program would involve no small measure of uncertainty. However, the size of the benefits to be gained could easily be found to justify the risk that it would not succeed.

Reliability: Describe the anticipated reliability of the option and any known risks to supply or demand, such as: drought risk, water contamination risk, risk of infrastructure failure, etc.

Although the success of this program in improving water supplies cannot be known in advance, it poses no downside risks to water supply.

Water Quality: Identify key water quality implications (salinity and other constituents) associated with the option in all of the locations the option may affect.

N/A

Energy Needs: Describe, and quantify if known, the energy needs associated with the option. Include any energy required to obtain, treat, and deliver the water to the defined location at the defined quality.

Energy Required	Source(s) of Energy
N/A	

Hydroelectric Energy Generation: Describe, and quantify if known, any anticipated increases or decreases in hydroelectric energy generation as a result of the option.

Location of Generation	Impact to Generation
Basin-wide	To the extent this program increased annual basin water yields, it would have a positive effect on hydropower generation.

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Recreation: Describe any anticipated positive or negative effects on recreation.

Location(s)	Anticipate Benefits or Impacts
Basin-wide	To the extent this program increased annual basin water yields, it would have a positive effect on flows available to support recreation.

Environment: Describe any anticipated positive or negative effects on ecosystems within or outside of the Colorado River Basin.

Location(s)	Anticipated Benefits or Impacts
Basin-wide	To the extent this program increased annual basin water yields, it would have a positive effect on flows available to support ecosystems
Source areas of dust (Colorado Plateau)	This project could significantly improve the condition of grazing lands on widespread portions of the Colorado Plateau, with positive effects on ecosystems

Socioeconomics: Describe anticipated positive or negative socioeconomic (social and economic factors) effects.

Because of the labor-intensive nature of the mitigation technologies used, this program could employ substantial numbers of people in impoverished rural areas of the Colorado Plateau.

Other Information: Provide other information as appropriate, including potential secondary benefits or considerations. Attach supporting documentation or references, if applicable.

Painter, T. H., J. Deems, J. Belnap, A. Hamlet, C. C. Landry, and B. Udall (2010), Response of Colorado River runoff to dust radiative forcing in snow, <i>Proceedings of the National Academy of Sciences</i> , in press.
