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: February 1, 2012

Option Name:

Securing water supply resources by reducing risk of catastrophic wildfire through risk analysis and forest management strategies

Description of Option:

This option secures water resources and provides a reduction of significant growing risk to water suppliers. This solution is already being adopted in many places around the west.

This solution involves analysis of forest health and future disaster scenarios accounting for climate change projections. In particular focus will be on identification of habitats likely to be at greater risk of catastrophic wildfire, with associated sedimentation into downstream water supplies, loss of snow retention ability, and catastrophic debris flows. The solution responds to these challenges by adopting forest management strategies to reduce the potential for catastrophic wildfire, prioritizing those places where there is both a climate-driven risk and social vulnerability due to water supply. This solution will reduce ash and mudflow to reservoirs and rivers, and also potentially protect important water supply infrastructure, like pipes.

In the Santa Fe Watershed, this solution includes forest restoration activities that include non-commercial mechanical thinning of small-diameter trees, controlled burns to reintroduce the low-severity ground fires that historically maintained forest health, and comprehensive ecological monitoring to determine effects of these treatments on forest and stream habitats, plants, animals, habitats and soils. (other examples given at the end of this form)

Water supply impacts from catastrophic fire have been seen in a number of western places in the past, and this solution identifies forest management actions to reduce the threat to city water in places where managers want to avoid risks.
For example: A decade ago, the Cerro Grande Fire served as a wake-up call for much of the West. The fire burned for two weeks, sustained by 100 years of built-up fuel, leaving behind a wasteland of destroyed homes, dead trees and ash. After the blaze was contained and the charred earth began to cool, another disaster was set in motion. The damage from the fire was so intense that the deeply rooted trees could not hold the soil. Debris and ash poured down the mountains clogging streams, rivers and lakes—wreaking havoc on the Los Alamos water supply and causing over $9 million in damage.
Another example: Last summer Albuquerque was forced to close water intake from streams full of ash and sediment following the nearby catastrophic fire.

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

Locations where key water supply resources like reservoirs, rivers and municipal infrastructure (pipes) are surrounded by forests at risk of catastrophic wildfire. The Nature Conservancy and partners such as Stanford University's Natural Capital project are developing tools that will be able to provide geographic specificity as to the risk of future climate extremes and the potential for sedimentation in the wake of those extremes.

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.

Not applicable

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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 is a mature strategy, being employed in a number of places.

Research for each site consists of

- Analysis of future risk scenarios of catastrophic wildfire to forests around key water resources
- Identification of sedimentation risk based on future extremes of precipitation and topography
- Identification of appropriate forest management practices to reduce risk, with Forest Service or other partners

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.

Funding for these types of strategies is coming from different places, depending on context and location (specific examples in case studies at end of this form)

- Partnership and funding from Forest Service, where Forest Service manages the lands around water resources
- Grant money – federal allocation for forest thinning
- Municipal Water supplier
- Regional Water Authority
- Water user fees
- Bonds

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

Permits required will vary depending on land ownership, state regulations and management actions envisioned.

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.

- Awareness of the public, in some places, is important
- In Santa Fe – polls have shown that public is willing to pay considerably more in fees than the implementation requires.

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

Paraphrase of risk analysis by municipal water manager in Santa Fe:

- Risk of waiting until later, and the associated costs, are getting greater because of climate change
- We used to think we could just stop the forest fires – now we can't
- Fires are too big, too hot, too frequent, too costly to fight

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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.

This solution involves identification of risk and actions, as described above.

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

This solution is directed as securing water quality – and reducing the significant risk of disasters that cause great water quality problems – from ash during a fire, and sedimentation and mudflow in the rainy seasons following the fires.

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
Not applicable.	

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

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

Location(s)	Anticipate Benefits or Impacts

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

Location(s)	Anticipated Benefits or Impacts
	This solution has considerable co-benefits to healthy ecosystems. See examples below.

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

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

Other examples of this solution:

The Santa Fe Waterfund

- The Santa Fe Water Source Protection Fund prepares city residents for climate change by managing wildfire risk, securing water supplies and conserving nature in an integrated fashion. Public grants support watershed restoration activities that reduce the risk of climate-driven catastrophic wildfire and subsequent disruption of the city's water-supply infrastructure, including reservoirs, water treatment plants, and conveyances. See short Case Study below
  For more information, please contact: Laura McCarthy, lmccarthy@tnc.org

The Nature Conservancy, Independence Lake

- Protecting water quality in one of the system's headwater lakes to benefit both biodiversity and people by increasing the resiliency of the freshwater system in the face of regional climate change projections. To date this includes protection and management of over 2,200 acres of forest surrounding Independence Lake.

  Independence Lake has unique ecological values, including one of only two lacustrine populations of the endangered Lahontan cutthroat trout, and TNC's efforts to protect those ecological values has garnered support and funding from state and federal agencies. The lake also provides the most upstream storage of municipal water for the Reno/Sparks area. For this reason, the Truckee Meadows Water Authority has provided partial funding for TNC's efforts to manage the forest surrounding the lake to reduce the likelihood of catastrophic wildfire and the resulting impacts to water quality from post-fire runoff. With both the threat of decreased water supply and increases in wildfires, protection of this resource should prove increasingly important.
  For more information, please contact: Mickey Hazelwood, mhazelwood@tnc.org

Denver Water

- *Forests to Faucets Partnership* that is being employed by a large western city.
  http://www.denverwater.org/SupplyPlanning/WaterSupply/PartnershipUSFS/

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Fire for Water: Forest restoration strategies to reduce risk from drought and wildfire and protect water resources for a mid-size city in the Southwest US, Santa Fe, NM

The Santa Fe Water Source Protection Fund prepares city residents for climate change by managing wildfire risk, securing water supplies and conserving nature in an integrated fashion. Public grants support watershed restoration activities that reduce the risk of climate-driven catastrophic wildfire and subsequent disruption of the city's water-supply infrastructure, including reservoirs, water treatment plants, and conveyances. Now larger municipalities like Denver are developing similar programs as a way to protect their water supplies.

A decade ago, the Cerro Grande Fire served as a wake-up call for much of the West. The fire burned for two weeks, sustained by 100 years of built-up fuel, leaving behind a wasteland of destroyed homes, dead trees and ash. After the blaze was contained and the charred earth began to cool, another disaster was set in motion. The damage from the fire was so intense that the deeply rooted trees could not hold the soil. Debris and ash poured down the mountains clogging streams, rivers and lakes—wreaking havoc on the Los Alamos water supply and causing over $9 million in damage.

In the Four Corners states of the southwestern United States – Arizona, Colorado, New Mexico and Utah – climate change is already changing ecosystems and affecting people in ways that are measurable and readily apparent. In fact, this arid region has been identified as a bellwether of climate change in North America due to recent ecological changes – uncharacteristically large and severe fires, widespread insect outbreaks, forest dieback, and other signs of ecological degradation – that are associated with changing temperature, precipitation and stream flow regimes. This suite of ecological changes threatens ecosystem services such as water supply and flood control and natural resource-based industries including farming, ranching, nature tourism and outdoor recreation, resulting in estimated annual losses of billions of dollars per year

This solution includes forest restoration activities that include non-commercial mechanical thinning of small-diameter trees, controlled burns to reintroduce the low-severity ground fires that historically maintained forest health, and comprehensive ecological monitoring to determine effects of these treatments on forest and stream habitats, plants, animals, habitats and soils.

This project to secure water for city users is supported by a strong local science-management partnership and based on extensive ecological research. The Southwest Climate Change Initiative, led by The Nature Conservancy, is a public-private partnership developed in 2009 with the University of Arizona Climate Assessment for the Southwest, Wildlife Conservation Society, National Center for Atmospheric Research, and Western Water Assessment. The initiative's goal is to provide information and tools to build resilience in ecosystems and communities of the southwestern U.S.

For more information, please contact: Laura McCarthy, lmccarthy@tnc.org