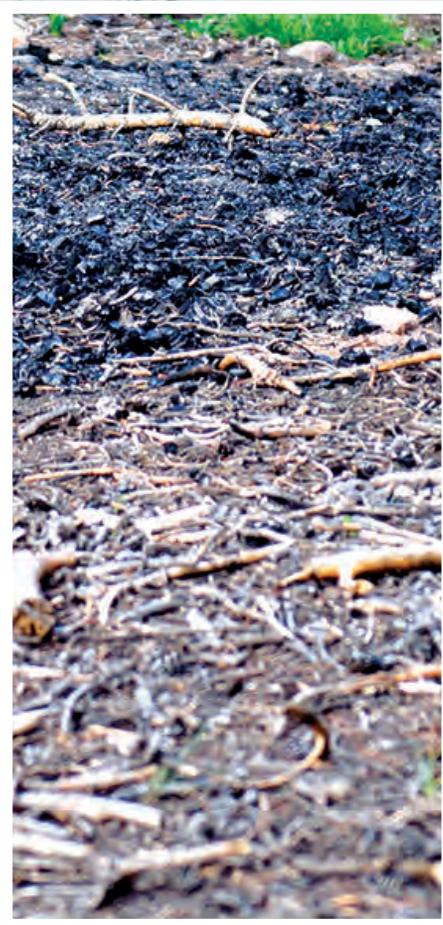


WATERSHED HEALTH IN NEW MEXICO

How watersheds affect you,
what's being done
to protect them, and
how you can help



For additional information,
please visit
www.nmda.nmsu.edu



WATER AND "THINGS"

by Dr. Doug Cram, Extension Fire Specialist for New Mexico State University

"Eventually, all things merge into one, and a river runs through it."
- Norman Maclean

The "things" Norman Maclean was writing about were watersheds. Of course, that type of jargon does not exactly flow off the tongue when writing in prose. We cannot be sure what familiarity Norman had with the concept of watersheds, but we can be sure their function was important to him because he loved fly fishing and muddy water is no friend of rod and reel. The same can generally be said for New Mexicans: we may not be hydrology experts, but we all value water and wish to better understand and manage our water resources (i.e., our watersheds).

So what are these "things" called watersheds? Watersheds are areas of land that catch rain and snow and then, thanks to gravity, release that water into streams, lakes, rivers, wetlands, and groundwater. Farms, ranches, forests, small towns, big cities and even your backyard can make up watersheds. Watersheds can cross county, state, and even international borders. Watersheds come in all shapes and sizes; it really just depends on what scale is of interest: acres or square miles. New Mexico is unique in that it has five water resource regions (think thousands of square miles) – more than any other state in the union (Figure 1). Within those five regions there are an additional 85 recognized subregions in New Mexico that can be considered watersheds. Each subregion can also be further divided in to smaller watersheds.

Why are these watershed "things" important? The value of water is self-evident (e.g., drinking, irrigation, industrial, ecological, and

recreational water), but what is less obvious is how watersheds affect water. Watersheds act like sponges, absorbing and releasing water. Norman referenced the latter when he wrote about how a river "runs" through it. A key principle in watershed management is slowing down the process – "no running allowed." **The health of a watershed can be measured by its capacity to capture and store water in all forms, including snow. Any management practice that promotes infiltration and storage across the watershed and then slowly releases that water is considered beneficial. The longer water spends in a watershed, the less potential it has for erosion.**

EROSION AND "THINGS"

Functionally, watersheds regulate water quality and quantity. However, following high-severity wildfires across hundreds of contiguous acres, instead of watersheds acting like a sponge and holding water, they tend to act like spillways channeling water down and out as fast as possible, leading to significant erosion events. And while post-fire erosion treatments can somewhat mitigate the impacts, the payoff pales in comparison to proactive watershed management treatments such as thinning and burning (see photos). Research indicates average sediment yield following high-severity fire in New Mexico ponderosa pine forests was 25 times greater than that of an unburned site (68 vs. 2.7 lbs per acre for every 1/25 inch of rain) (Johansen et al. 2001). Forest management treatments that reduce fire severity result in watersheds that are better able to capture and

store water as compared to watersheds that burn at high severity.

WHAT CAN I DO?

Because of the importance of water, especially here in the Southwest, watersheds and the functions they perform are critically important to all New Mexicans. Since we all live in a watershed, we all play a role in their management. Consider supporting forest and rangeland management efforts in your watershed, especially thinning and burning projects designed to reduce fire severity and promote forest resilience.

Below are some resources that may be useful in learning more about New Mexico watersheds:

- ◆ Contact your local **Soil and Water Conservation District** and become involved in the management of your watershed.
- ◆ **New Mexico Forest and Watershed Restoration Institute at New Mexico Highlands University**
- ◆ **New Mexico Water Resources Research Institute**
- ◆ **AllAboutWatersheds.org**
- ◆ **The Conservation Technology Information Center - Know Your Watershed**
- ◆ **New Mexico Surface Water Quality Bureau, especially the Watershed Protection Program**

Literature cited: Johansen, M., Hakonson, T., and Breshears, D. 2001. Post-fire runoff and erosion from rainfall simulation: contrasting forests with shrublands and grasslands. Hydrological Processes 15(15):2953–2965.

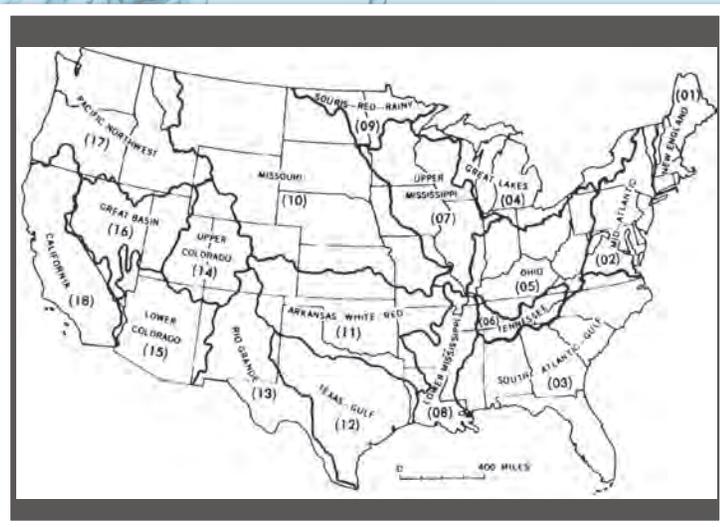


Figure 1. Water resources regions in the U.S.



(Left) A ponderosa pine forest that was thinned and burned prior to wildfire. (Right) An adjacent ponderosa pine forest that was not treated prior to wildfire. Both photos were taken after the 2002 Borrego Fire.

HEALTHY WATERSHEDS AND HARMFUL WILDFIRES

by Micaela Hester, New Mexico State Forestry Division

Albuquerque is banked along the Rio Grande. Silver City neighbors the Gila River. The Pecos runs through Carlsbad. The places where we live are intertwined with watersheds. These lands gather and carry water, a precious resource in our dry state. Our communities are only as strong as our watersheds. This is why watershed health is so important, and why damage from wildfire impacts us all.

Healthy watersheds produce multiple benefits for New Mexicans. They provide clean and abundant water, improved air quality, recreational opportunities, and forest products. Our critters also depend on watersheds as places for both wildlife habitat and livestock forage. But due to prolonged drought conditions, the conditions of our state's forested watersheds aren't great. Weakened and overgrown, they are prone to insects, diseases, and wildfires.

Large-scale, severe fires in upper headwaters—the watersheds in higher elevations that collect snow—can have negative effects that reach far beyond the burned area. Fire damage can cause soil loss, downstream flooding, debris flows, and degraded water quality. An aggressive wildfire can produce excess stormwater runoff, which causes flooding downstream—where several of our communities are found. A scorched watershed's soil turns hydrophobic, meaning rain can't be filtered through the ground's natural processes. Too much unfiltered, debris-carrying water can be harmful to a watershed's physical, biological, and even chemical qualities. Since we rely on our water from these places, the fire's damage impacts us as well.

To tackle this problem, foresters conduct treatment projects throughout the year. Doing so helps prepare vulnerable areas for the wildfire season. These big, landscape-scale initiatives

restore critical watersheds by thinning unhealthy tree stands and clearing debris. It protects the area against wildfire's spread and reduces damage. A fire that has fewer dense fuels to consume can't move as rapidly or unpredictably as it otherwise would. Carefully planned treatments can stall a fire or contain it to a fixed area. Not only is this helpful to impaired watersheds, but it also protects firefighters and nearby communities.

It's not just foresters and firefighters who work to keep watersheds safe and healthy; many groups in New Mexico provide support. Several communities have watershed alliances or create public fire-prevention projects. Whether a person wants to do research as a citizen scientist, help organize a clean-up event, or be part of a wildfire-prevention planning team, there are many ways to support watersheds. The very areas that we depend on to thrive now depend on us to survive.

INNOVATIVE FUND DESIGNED TO SECURE OUR WATER, WAY OF LIFE

by Tracey Stone, The Nature Conservancy

New Mexico's Rio Grande and its tributaries supply water to Albuquerque, Santa Fe, several Pueblos and other communities—water for more than half of New Mexico's population. Quite simply, the river is an essential ingredient for our state's economic growth.

But in recent years we have seen that frequent, high-severity wildfires and subsequent post-fire flooding increasingly threaten the Rio Grande's water security and cause extensive soil erosion and debris flows that degrade water quality for communities downstream.

The Las Conchas Fire illustrated the problem when post-fire flooding sent ash and sediment flowing into the Rio Grande. Water managers halted withdrawals from the river for several

weeks in Albuquerque and Santa Fe because ash-laden water was not worth treating. Meanwhile, the flooding deposited tons of debris in Cochiti Lake, closing the area to recreation and dumping excessive sediment in the reservoir.

The Rio Grande Water Fund is a groundbreaking project that provides a proactive solution to this challenge by engaging private and public partners to protect vital watersheds in northern New Mexico.

The Rio Grande Water Fund will generate sustainable funding for a 20-year program of large-scale forest and watershed restoration treatments—including thinning overgrown forests, restoring streams and rehabilitating areas that flood after wildfires.

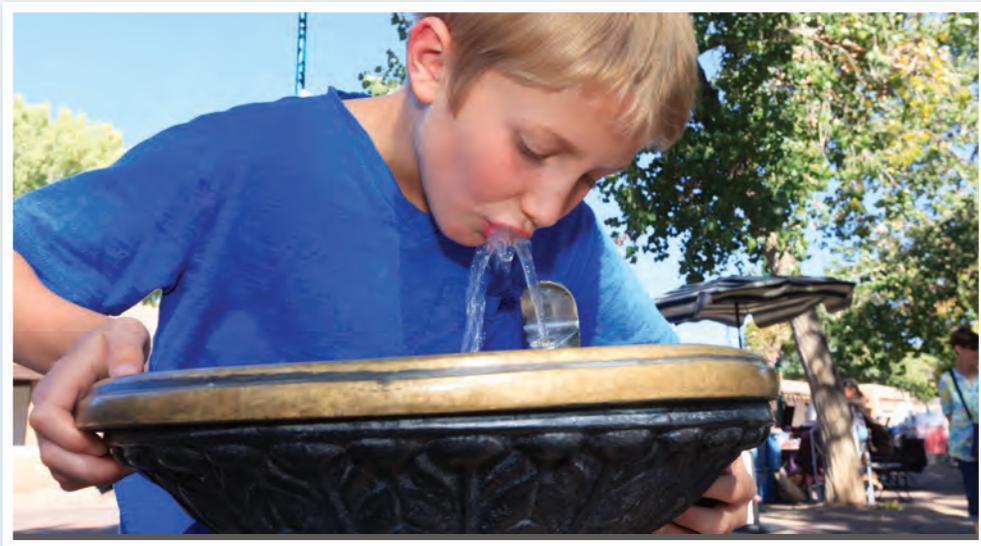
Forests store and filter a majority of New Mexico's water supply. When forests can't provide clean, reliable water, our health and our economy are jeopardized. Restoring overgrown forests is a proven solution to make forests safer and healthier.

The Rio Grande Water Fund also supports economic growth. An estimated 300-600 forest worker jobs will become available each year, depending on the work on the ground and the kind of wood-products manufacturing that is established. In addition, healthy rivers, forests and mountains attract recreationists and visitors, supporting the state's tourism industry.

The Nature Conservancy is leading this effort along with 47 signatory organizations to the Rio Grande Water Fund charter, a diverse set of groups and agencies who are working together toward a common goal. The Conservancy, with its strong foundation in science and problem-solving, provides guidance, planning and research to ensure Water Fund resources are directed toward places and activities that will have the most significant impact and the best return on investment.

The Water Fund will also leverage new and existing federal funds, so every dollar invested is maximized to treat additional lands and waters to secure our water supply for communities, business, industry and nature.

To learn more, visit nature.org/riogrande.



EVERYTHING IS CONNE

The network of arroyos, streams, and rivers, and the water and
We all live in a watershed. The choices we make

WHERE IT ALL BEGINS

Water enters the watershed as rain or snowmelt in the highlands. Some gathers in ponds and creeks that feed larger streams and rivers. Some soaks into the soil, which filters the water as it travels downward to be stored in underground aquifers. A healthy watershed acts like a sponge – absorbing, storing, and slowly releasing water.

WATER ON THE MOVE

Water moves from the "watershed divide" at the highest elevations to the body of water at the lowest point in a watershed. It can travel overland as surface water, or flow underground as ground water. As the water moves from the top to the bottom of the watershed, it passes through communities, forests, grassland, farmland, wetlands, and floodplains. Along its way, it nourishes the land and all the living things that inhabit the watershed.

A NEVER-ENDING CYCLE

Water can remain in a watershed for hours, days, or thousands of years. But eventually it evaporates from the surface of the earth or water body or is transpired by a plant. Someday, somehow, every drop of water that entered as precipitation returns to the atmosphere as water vapor, and starts the journey all over again.



KNOW YOUR WATERSHED – IT'S W

ECTED IN A WATERSHED

l nutrients they carry, support the web of life in the watershed.
directly impact the watershed...your watershed.



CONSERVE

Most people in the arid Southwest know that it makes good sense to conserve water. But how about conserving energy? It takes water to generate electricity and to produce oil and gas. It takes energy to pump, treat, and deliver water to our homes and businesses. So when we conserve energy, we are conserving water and vice-versa.

PROTECT

We need clean water, and we want enough of it to support our communities and nourish our environment. What good is it to have lots of water if it's polluted? There are ways to clean up contaminated water, but they can be difficult and expensive. The simplest action any of us can take to protect our water quality and water supplies in our watershed is not to pollute in the first place.

ENHANCE

The plants and soil, and the microbes that live in them, do much of the work in a watershed. In forests and floodplains, farms and prairies, arroyos and wetlands, they work behind the scenes to filter, store, and produce clean water. Taking care of the soil and vegetation enhances their ability to do those jobs.

*Image and information courtesy of
AllAboutWatersheds.org*

WHERE YOUR WATER COMES FROM!

RESTORE NEW MEXICO:

Where Partnerships and the Landscape Approach are Keys to Success

by Donna Hummel, Bureau of Land Management

The Bureau of Land Management (BLM) administers more public land – over 245 million surface acres – than any other federal agency in the United States. Most of this land is located in the 12 Western states. Here in New Mexico, the BLM manages over 13 million acres of the public's lands for multiple uses. These lands contain significant natural, cultural, and historical resources for the public to enjoy. But there are also complex environmental challenges that impact these lands like wildfire, invasive species, and the long-term effects of human use of the land.

The BLM has implemented landscape-scale restoration programs to better address these challenges and to improve the health of public lands. To achieve broad-scale restoration, BLM New Mexico developed the Restore New Mexico (Restore NM) program.

Initiated in 2005, Restore NM is a collaborative effort to restore New Mexico's grasslands, woodlands, and riparian areas to a healthy and productive condition. The pilot program focused on abandoned oil field reclamation efforts, management of invasive species, and riparian

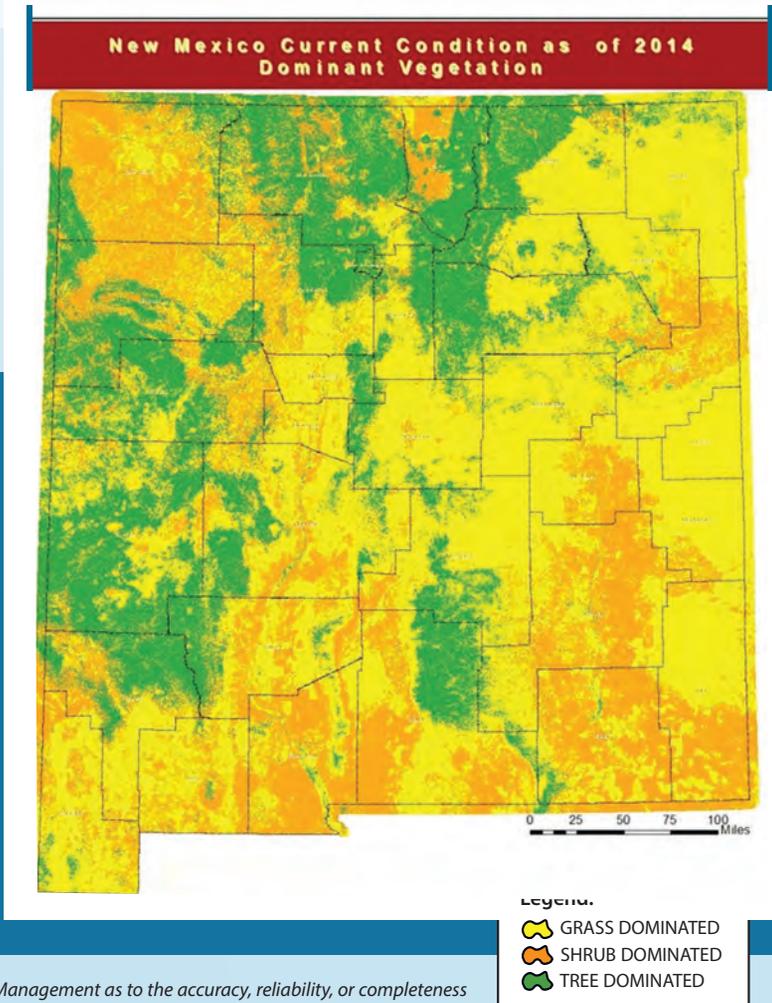
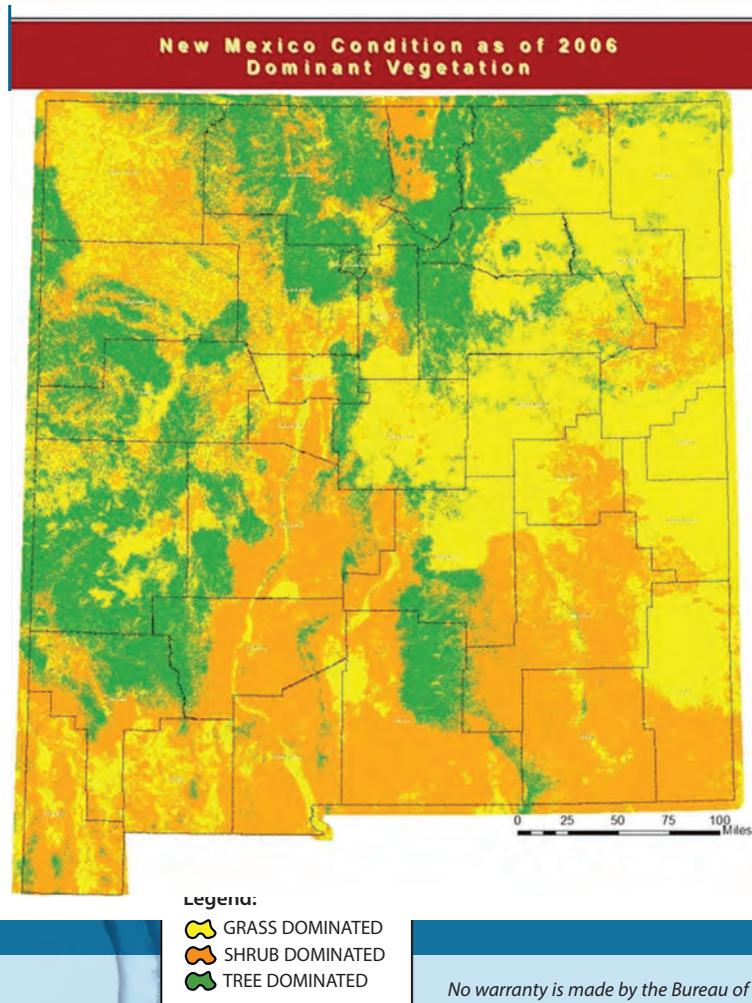
restoration. Restore NM has now broadened its portfolio to include forest thinning, brush management, wildlife habitat enhancement, fuels (vegetation) reduction and rangeland improvements.

Successful partnerships have resulted in land health improvements across the landscape regardless of ownership. Previously degraded lands have been restored and natural ecosystems are getting a boost. **Over the past 10 years, the BLM and its partners have restored more than 3 million acres of BLM, other federal lands, state, tribal, and private lands in New Mexico through treatments such as forest thinning, vegetation management and prescribed fire.** In southern and eastern New Mexico, for example, Restore New Mexico's multiple partners have worked together to restore native grass and shrub lands, non-native Salt cedar has been removed from streams, and hazardous fuels are being reduced to minimize the threat of wildfire. The benefits are evident; native cottonwood-willow bosques are thriving and wildlife habitat is improving for a wide variety of species including the Lesser Prairie Chicken and other at-risk species.

These shared accomplishments would not have been possible without collaborative partnerships. Restore New Mexico's "charter partners" include the New Mexico Association of Conservation Districts, the Natural Resource Conservation Service, Soil and Water Conservation Districts, the New Mexico Department of Game and Fish, private landowners, and academic partners including New Mexico State University's Jornada Experimental Range and the USGS Cooperative Research Unit. Valuable new partners have joined the effort, including the New Mexico State Forestry Division, the New Mexico Forest Industries Association, the National Wild Turkey Federation, the New Mexico Forest and Watershed Restoration Institute, and New Mexico's Land Grant and Native American communities, to name a few.

Restore New Mexico is working – working to restore natural landscapes throughout the state. A continuation of these strong partnerships will allow us to continue to restore our state's ecosystems for the benefit of current and future generations.

To learn more about Restore New Mexico, please visit www.blm.gov/nm/restore.



No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources and may be updated without notification.

THINNING FOR ECOSYSTEM RESTORATION

by Dr. Kent Reid, New Mexico Forest and Watershed Restoration Institute, New Mexico Highlands University

The New Mexico Forest and Watershed Restoration Institute (FWRI), housed at New Mexico Highlands University, was organized about 10 years ago to promote practices that reduce the risk of catastrophic fire and improve ecosystem function. This need arose because **fire was excluded from lands of the Southwest for more than a century, resulting in an explosion of trees on the landscape. Our native plant communities can't function like they are supposed to with these dense stands. Thus, a big part of FWRI's work has to do with thinning, or deciding which tree to cut and which to leave.**

We know more about restoration thinning in ponderosa pine than in any other plant community, and we work with agencies and natural resource professionals on how to do it properly. Several general sets of recommendations are out there, and they tend to have these traits in common:

- ◆ Take as many trees as you can - Going from densities of 1,000 trees per acre, which we have grown used to, to the fewer than 100 trees per acre that are more appropriate, may be emotionally difficult.

- ◆ Leave groups and openings – Thin so the residual stand is very open and the trees are in fairly tight groups that vary in size.
- ◆ Take mostly small-diameter trees – The smallest trees likely would not have survived if fire were still present.
- ◆ Leave some trees of all diameters – Leave the smallest and the largest trees, as well mid-sized ones.
- ◆ Try to leave trees of the same diameter within any one group – If you can leave a group with a diameter range of only five or six inches, do it.
- ◆ Leave some openings to regenerate – These are areas where new, vigorous groups will establish and grow.
- ◆ Pay attention to the quality of the trees that are left – Leave the best trees to be parents of the next generation.
- ◆ Leave dead trees for wildlife – To the extent that it is safe for woods workers, let the snags stand.
- ◆ Burn it – If we don't reintroduce fire, we will be right back at this same point 25 years from now.

Again, this description is for ponderosa pine. Mixed-conifer restoration is similar to this, but mixed conifer can be a thought of as a continuous forest with openings of various sizes inside it, and it can be significantly denser both before and after thinning. Restoring piñon-juniper (PJ) is too complicated to go into here, but almost always, the PJ plant community will benefit from regular, low-intensity fire.

Thinning is expensive, and we effectively have only firewood as a market for the small-diameter material that is produced in restoration thinning. Still, we have a choice of thinning to a point that the forest can withstand a low-intensity fire, or not thinning and running a high risk of everything burning up.

Finally, this article can only serve as an introduction. Agencies and consulting foresters throughout New Mexico are familiar with these ideas, and will be well-versed in local needs, conditions, and constraints. Contact them with questions.

DROUGHT TOOLKIT ALSO IMPROVES WATERSHED HEALTH

by Kelly Hamilton, Southwest Border Food Protection and Emergency Preparedness Center

If you need proof that watershed health be improved by communities coming together and planning for drought, you need look no further than a 2015 pilot project in Socorro County, New Mexico.

The Extension Disaster Education Network (EDEN) Community Capacity Building Program for Drought Toolkit was used in 2015 as part of a collaborative effort between Socorro County Emergency Management; New Mexico State University's College of Agricultural, Consumer and Environmental Sciences (NMSU/ACES); and the New Mexico Department of Agriculture. After several community meetings and the formulation of a "drought resistance plan," a partial list of mitigation factors was developed, including:

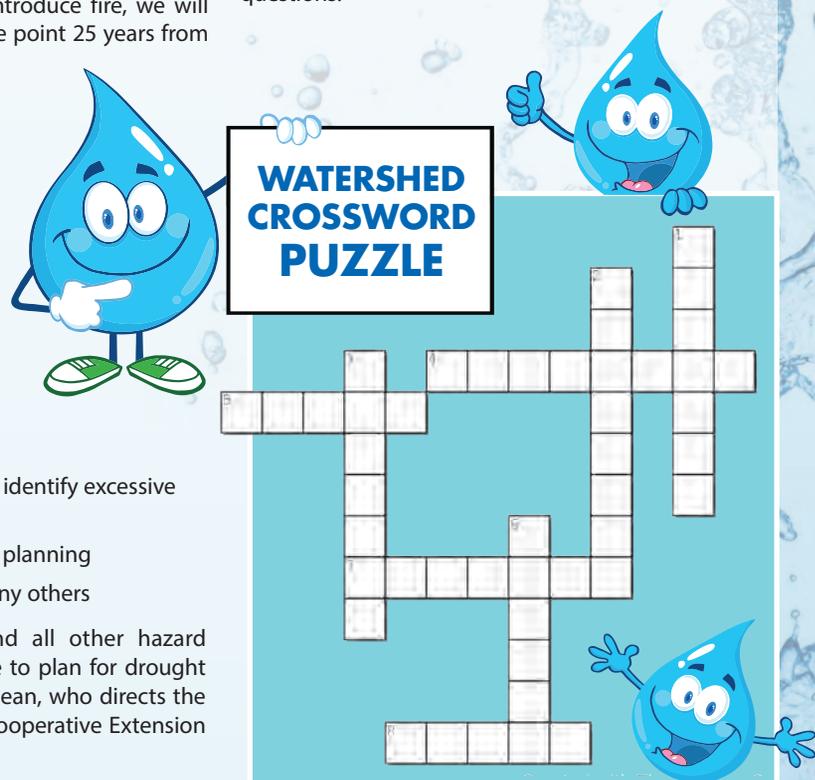
- ◆ Monitoring aquifers for water quality and volume
- ◆ Identifying necessary resources, depending on the severity of drought
- ◆ Public education

- ◆ Voluntary home audits to identify excessive water usage
- ◆ Community conservation planning
- ◆ Greywater usage; and many others

"We plan for wildfires and all other hazard events; it only makes sense to plan for drought in New Mexico," said Tom Dean, who directs the Southwest District of the Cooperative Extension Services for NMSU/ACES.

Not only is the toolkit useful for identifying mitigation factors for watershed health and drought, but the information gathered by using the toolkit is also useful for communities in writing grant applications and other mitigation plans such as the Threat and Hazard Identification and Risk Assessment (THIRA).

The toolkit and coordination assistance is available from the Southwest Border Food Protection and Emergency Preparedness Center. Contact Tom Dean at tdean@nmsu.edu or Kelly Hamilton at khamilton@nmda.nmsu.edu if your community is interested in using this toolkit.



DOWN

1. Healthy watersheds act like these
2. To use wisely, not too much
3. A mix of dead leaves, food scraps, etc. used to fertilize soil
6. Type of plants best-adapted to the local climate

ACROSS

4. What forest managers use to improve forest health
5. Another name for evaporated water
7. Water that is not underground
8. In the watershed as rain or snowmelt

WE ALL LIVE IN A WATERSHED

What can I do to help take care of my watershed?

Information excerpted from AllAboutWatersheds.org

Since watersheds are simply areas of land, you take care of your watershed by being a good land steward. Here are some actions you can take on your own land. You can also help by supporting projects that restore watersheds in your community.

CONSERVE ENERGY, CONSERVE WATER

Because it takes water to produce electricity and to secure other energy sources like oil and gas, conserving energy also conserves water supplies. Here are some conservation tips:

- ◆ Turn off lights and fans and adjust thermostats in unoccupied rooms.
- ◆ Unplug energy "vampires", like phone and computer chargers, when not in use.
- ◆ Sign up for renewable energy option if your electric company offers one.
- ◆ Reduce your fuel consumption for transportation. Take mass transit, or follow fuel efficiency tips on websites like www.fueleconomy.gov.
- ◆ See the water conservation tips on this poster for the parts of the watershed where you live and work.

ON THE FARM OR RANCH

Good agricultural practices like contour planting and integrated pest management conserve water and protect water quality.

- ◆ Plant along contours so irrigation water soaks into the ground and does not run off.
- ◆ Build healthy soil with compost or other organic material.
- ◆ Use fertilizers or pesticides sparingly. Use only according to the directions on the label.
- ◆ Compost or other organic matter makes soil better

able to catch, store, and release water. Microbes that live in moist healthy soils help plants grow and filter our pollutants.

- ◆ In areas where wind erosion is a problem, plant windbreaks. Use trees and shrubs that will protect fields and soil by slowing down the wind.
- ◆ Select plants suitable to the site. Native plants take less care and can survive better. Native plants also provide the best food and shelter for wildlife.

AT HOME AND IN YOUR YARD SAVE WATER INDOORS

- ◆ Take shorter showers.
- ◆ Fix leaky faucets.
- ◆ Test toilets for leaks, and repair leaks if found.
- ◆ Don't run water down the drain while waiting for it to warm up or cool off. Catch it to use later.

PROTECT WATER OUTDOORS

- ◆ Collect rainwater from your roof in rain barrels or cisterns. Use it to water trees and landscape plants.
- ◆ Shape the ground to direct runoff from buildings and driveways to plantings.
- ◆ Choose the landscape plants that are adapted to the local environment. They use less water and fertilizer.
- ◆ Use mulch to keep moisture in the soil. A 2-3" layer allows rain to soak in, reduces evaporation, and moderates soil temperature for plant roots. Mulch can also protect your soil from wind and water erosion.
- ◆ Properly maintain septic systems. Avoid sending harmful materials down the drain. Have your septic tank inspected by a professional and pumped as necessary.

BUY "GREEN" TO CONSERVE WATER AND PROTECT WATER QUALITY

- ◆ Choose locally produced food and products.
- ◆ Use non-toxic alternatives to chemical cleansers.
- ◆ Install low-flow showerheads and toilets.
- ◆ Choose high-efficiency models when replacing old appliances.

IN THE CITY

- ◆ Plant trees wisely. Well-located trees can cool streets and buildings in the summer and still allow winter sun to warm them.
- ◆ Protect water quality. Don't dump anything into storm drains. Pick up after your pets!
- ◆ Design landscaping to gather runoff for use by plants instead of sending it down the drain.
- ◆ Support projects that preserve or improve open space, especially the buffer zones along waterways and between developed areas and wildlands.
- ◆ Encourage local officials to install "green infrastructure" to conserve and protect your water supplies.

OUTDOORS

- ◆ Follow "Leave No Trace" principles, which you can learn about online.
- ◆ Stay on trails when hiking, bicycling or horseback riding. Keep ATVs to designated routes.
- ◆ Camp away from the banks of waterways.
- ◆ Use only weed-free hay for backcountry travel with horses or other livestock.
- ◆ Inspect and wash watercraft to avoid introducing exotic pests into rivers and lakes.

NEW MEXICO'S SOIL AND WATER CONSERVATION DISTRICTS (SWCDs) AND WATERSHED HEALTH

by Katie Goetz, New Mexico Department of Agriculture

It's easy enough to tell from the name that a soil and water conservation district (SWCD) deals with, well, matters to conserve the state's soil and water resources. But what does that mean, exactly?

First, a bit of background: There are 47 soil and water conservation districts in New Mexico and each SWCD is its own governmental subdivision. In the way that each school district is governed by a school board, each SWCD is governed by its own locally elected board of supervisors. Boards of supervisors consist of local landowners with an interest or background in natural resource conservation and/or agriculture.

The purpose of SWCDs is much like the purpose of the 1953 legislation (the Soil and Water Conservation District Act) that created them in New Mexico: to conserve and develop the natural resources of the state, provide for flood control, preserve wildlife, protect the tax base and promote the health, safety and general welfare of the people of New Mexico. SWCDs are unique in their statutory authority to work on local, state,

federal, tribal, and private lands in New Mexico. This allows SWCDs to work across landownership types to accomplish conservation activities within their authority.

Those authorities include:

- ◆ developing comprehensive natural resource plans
- ◆ working with both private and public (state and federal) landowners on engineering, cultivation, and land use projects
- ◆ helping both private and public landowners secure financial aid and items (ranging in size from seeds to heavy equipment) for projects that curb erosion and potential flood damage, as well as watershed restoration projects
- ◆ working with the appropriate government agencies to conduct and publish research on treating soil erosion and floodwater/sediment damage, as well water conservation and development projects

Real-life examples help illustrate how these authorities play out on the ground. For instance, the Claunch-Pinto Soil and Water Conservation District (located in Mountainair) was the first in the nation

to sign an agreement with the U.S. Forest Service and state conservation agencies to implement projects to reduce fuels, remove invasive species (like tamarisk, also known as salt cedar), and reintroduce native species (like cottonwoods). Like many other SWCDs, Claunch-Pinto offers cost-sharing to private landholders to encourage them to reduce fuels and restore the ecology of their private lands.

The state's 47 SWCDs are stitched together under the New Mexico Soil and Water Conservation Commission, which provides assistance and oversight for SWCD activities as necessary. The New Mexico Department of Agriculture also provides administrative support to the SWCDs.

Soil and water conservation districts exist to help landowners – whether private or public – within district boundaries prevent and resolve collective soil and water challenges. To locate the SWCD in which your land resides, you'll find a link to a map of the state's 47 SWCDs at www.nmda.nmsu.edu/apr/soil-and-water-conservation-districts/.