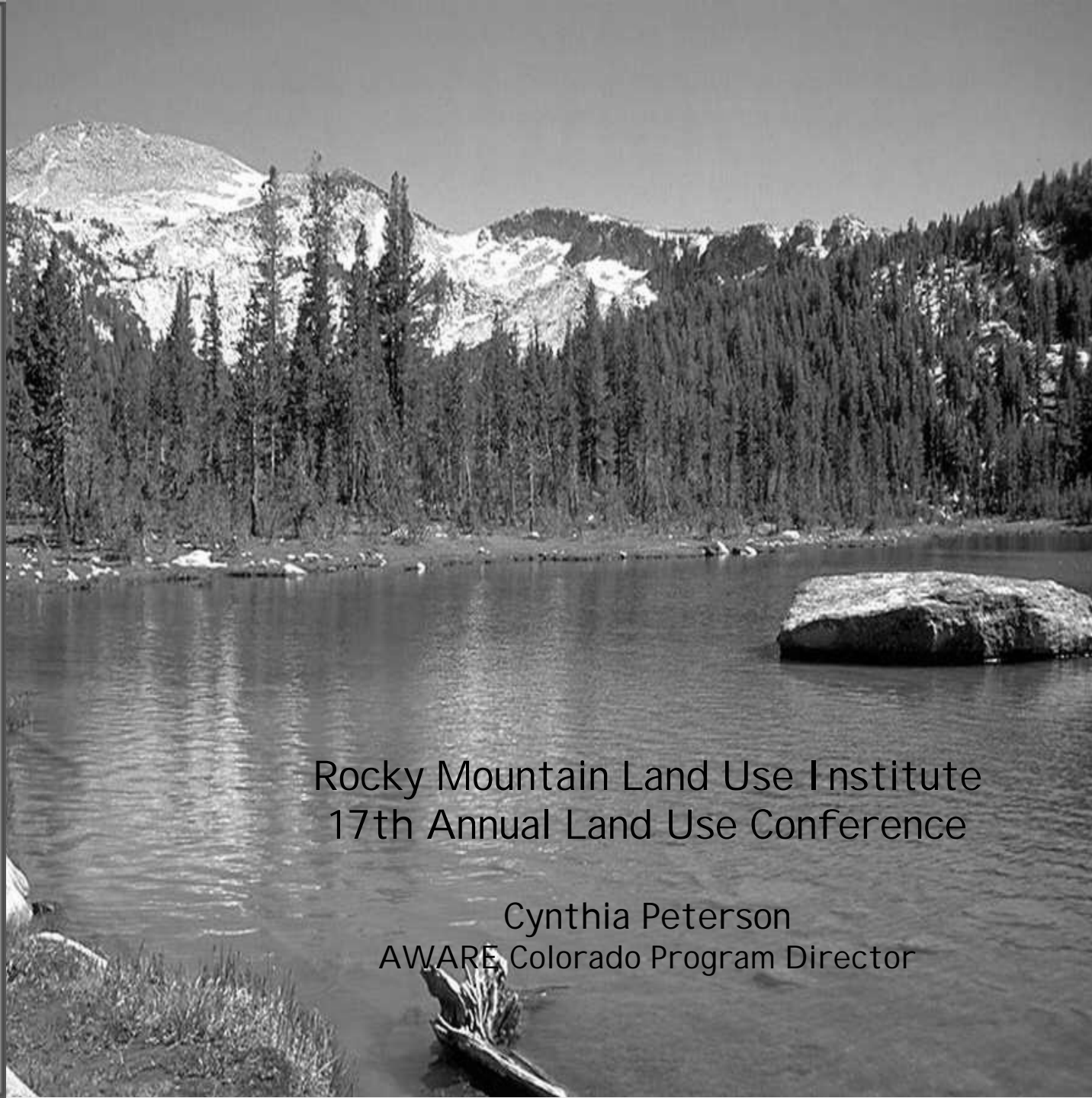


AWARE



COLORADO

Addressing
Water And
Natural
Resource
Education



Rocky Mountain Land Use Institute
17th Annual Land Use Conference

Cynthia Peterson
AWARE Colorado Program Director

ABOUT AWARE

**League of Women Voters of
Colorado Education Fund**



**Funded by: Colorado Department of Public Health
and Environment through a grant from the U.S.
Environmental Protection Agency**

**Charter member of the
National NEMO Network**



AWARE advisory committee and project partners



PRESENTATION OVERVIEW

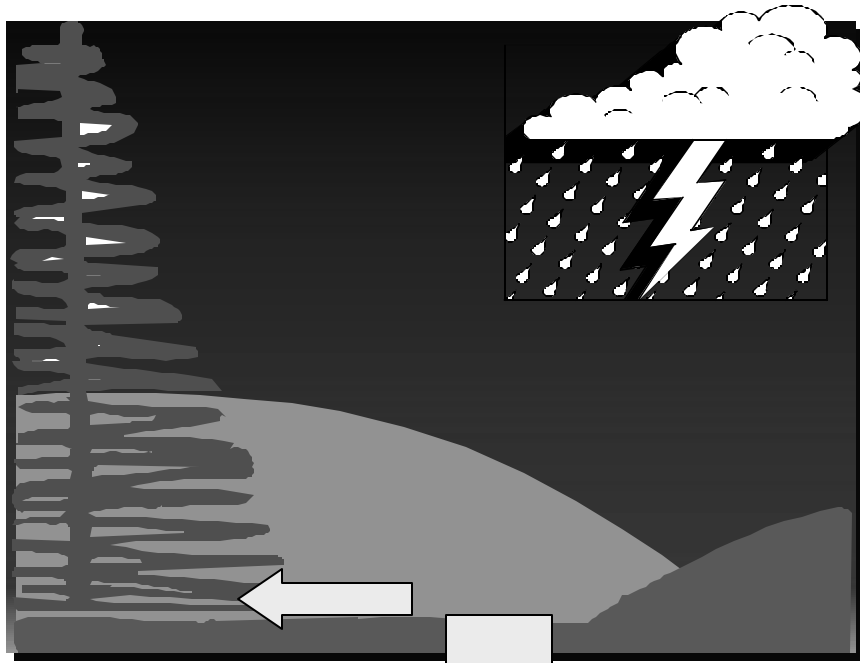
- How land use affects water quality
- What communities can do about it
- Helpful resources

WHY LAND USE?

Communities have a unique opportunity to prevent polluted runoff at the source and protect water resources through thoughtful community planning.



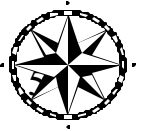
How Development Impacts the Water Cycle



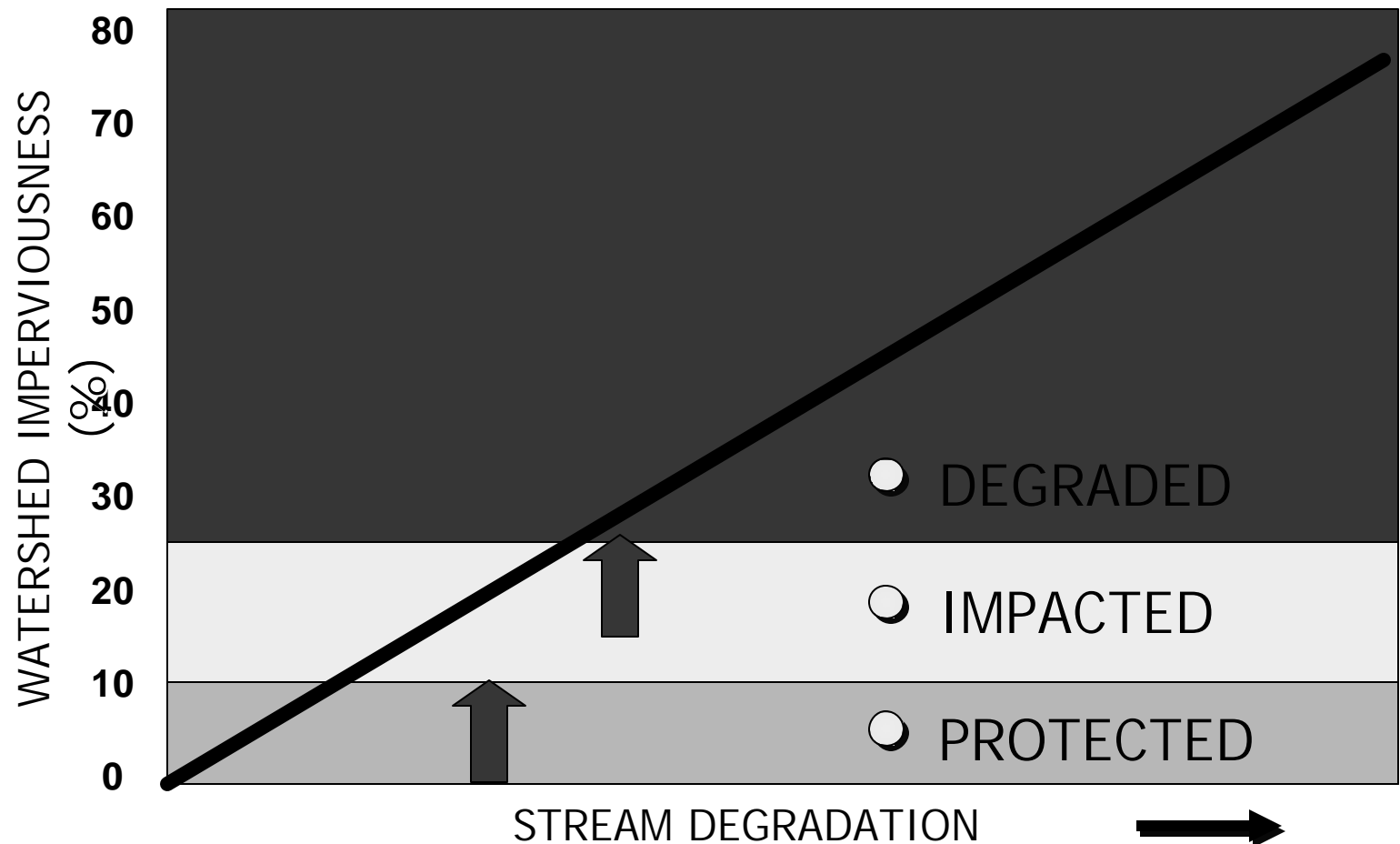
More
Infiltration



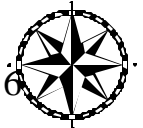
More Runoff



WATERWAY HEALTH AND IMPERVIOUSNESS



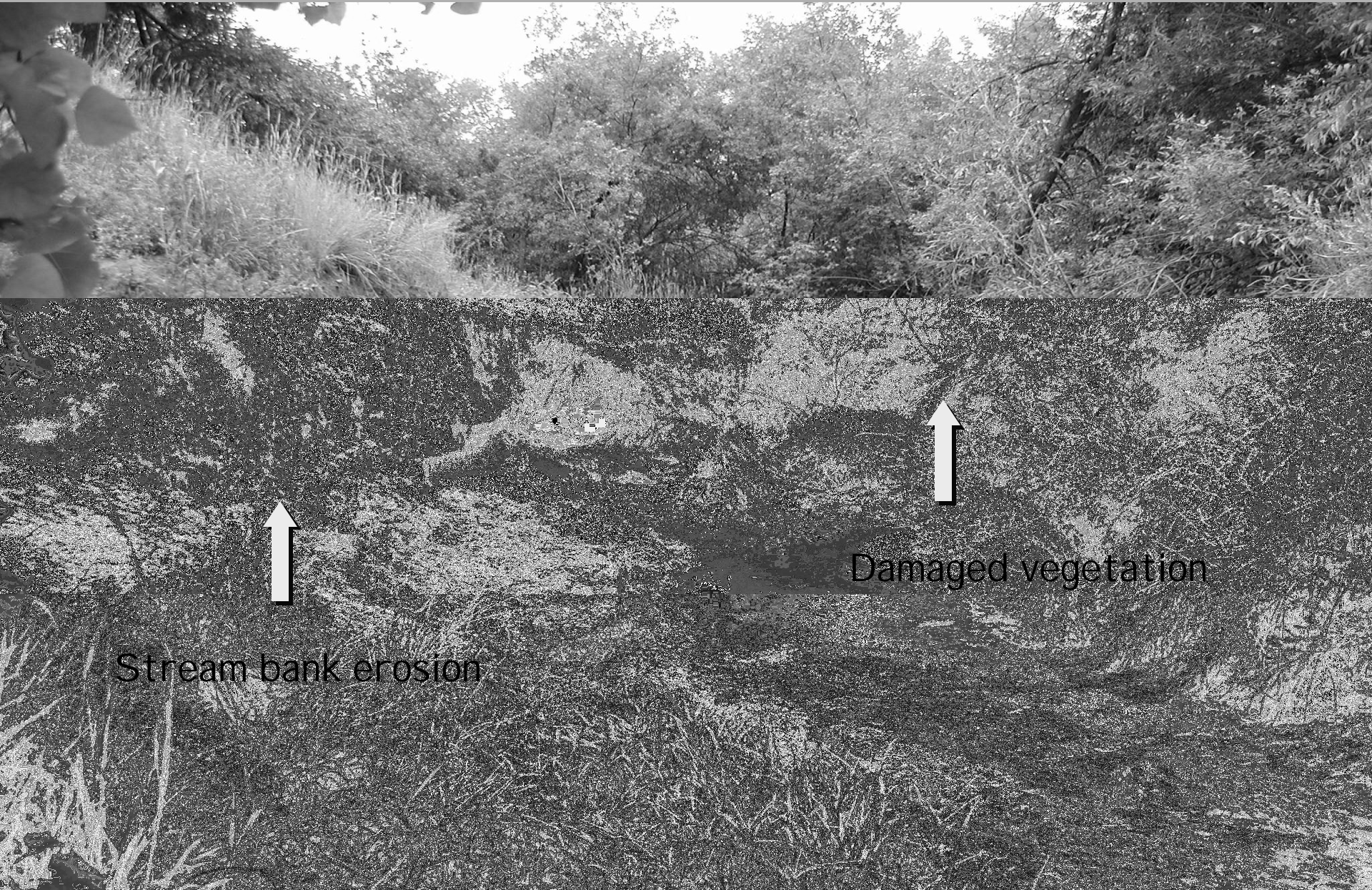
ADAPTED FROM SCHUELER, ET. AL., 1992



REDUCED GROUNDWATER INFILTRATION

- Less filtration of pollutants and contaminants
- Reduced stream flows in dry weather
- Water leaves the watershed

Increased runoff volume and velocity
cause stream degradation.



Stream bank erosion

Damaged vegetation

INCREASED POLLUTANT LOAD

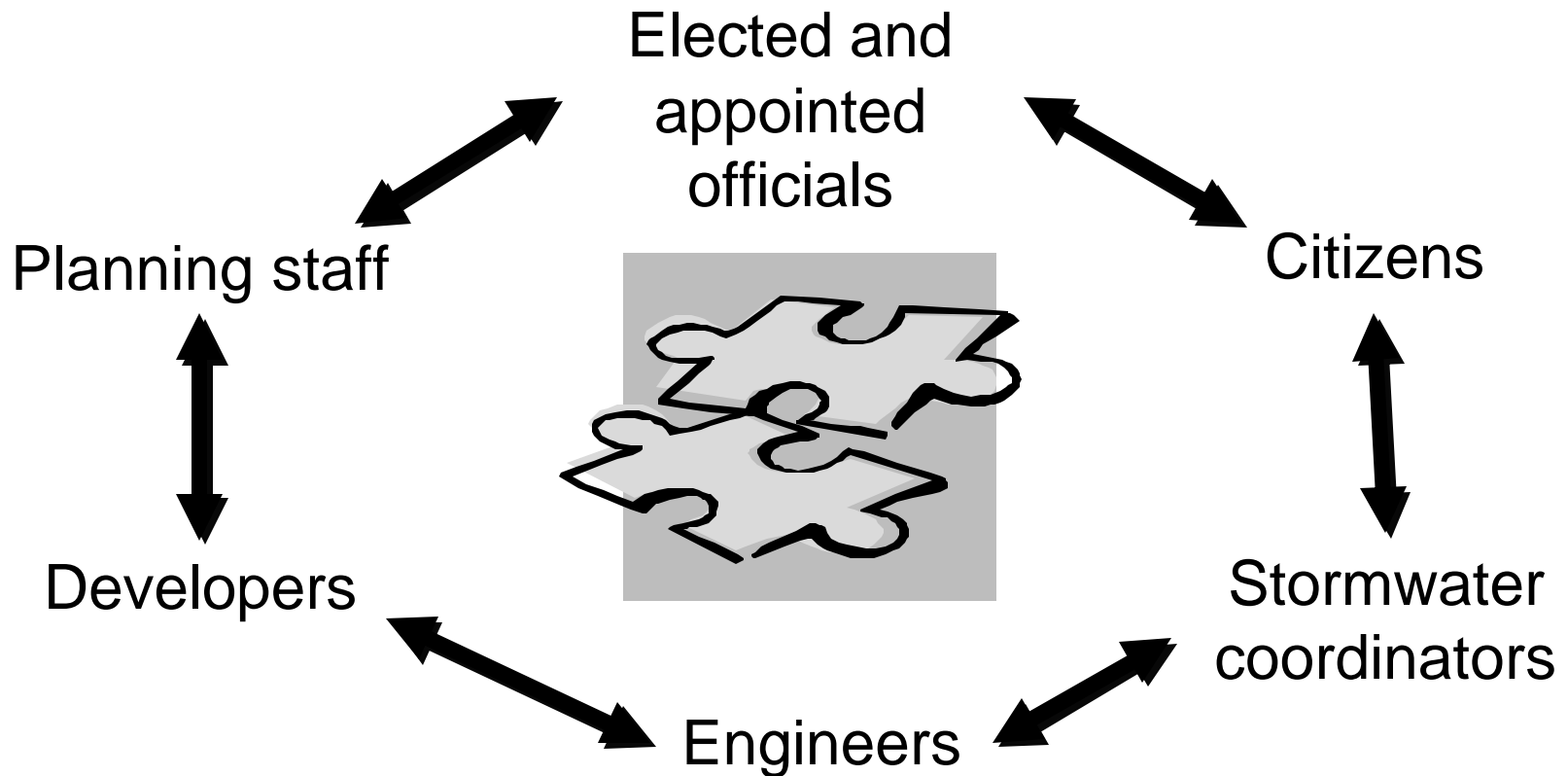
- Sediment and nutrients
- Metals and other toxic chemicals
- Bacteria, viruses and other pathogens



WHAT CAN YOUR COMMUNITY DO?

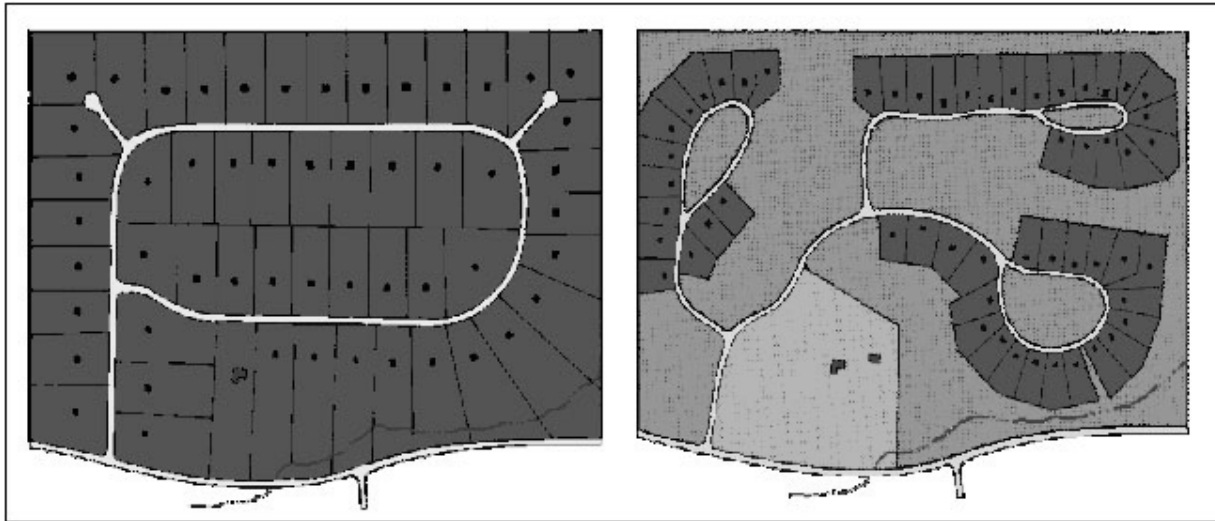


MANY STAKEHOLDERS...



COMMUNITY TOOLS

- Cluster development
- Buffers
- Overlay zoning
- Planned unit development
- Annexation agreements



COMMUNITY TOOLS

Transportation infrastructure



A BETTER APPROACH



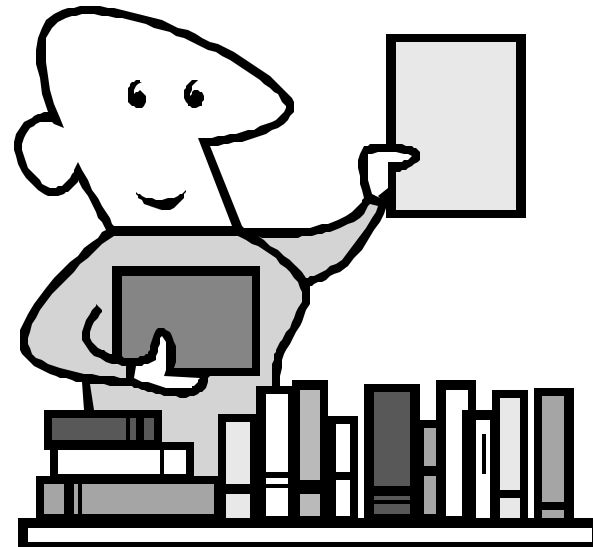
COMMUNITY TOOLS

Landscaping

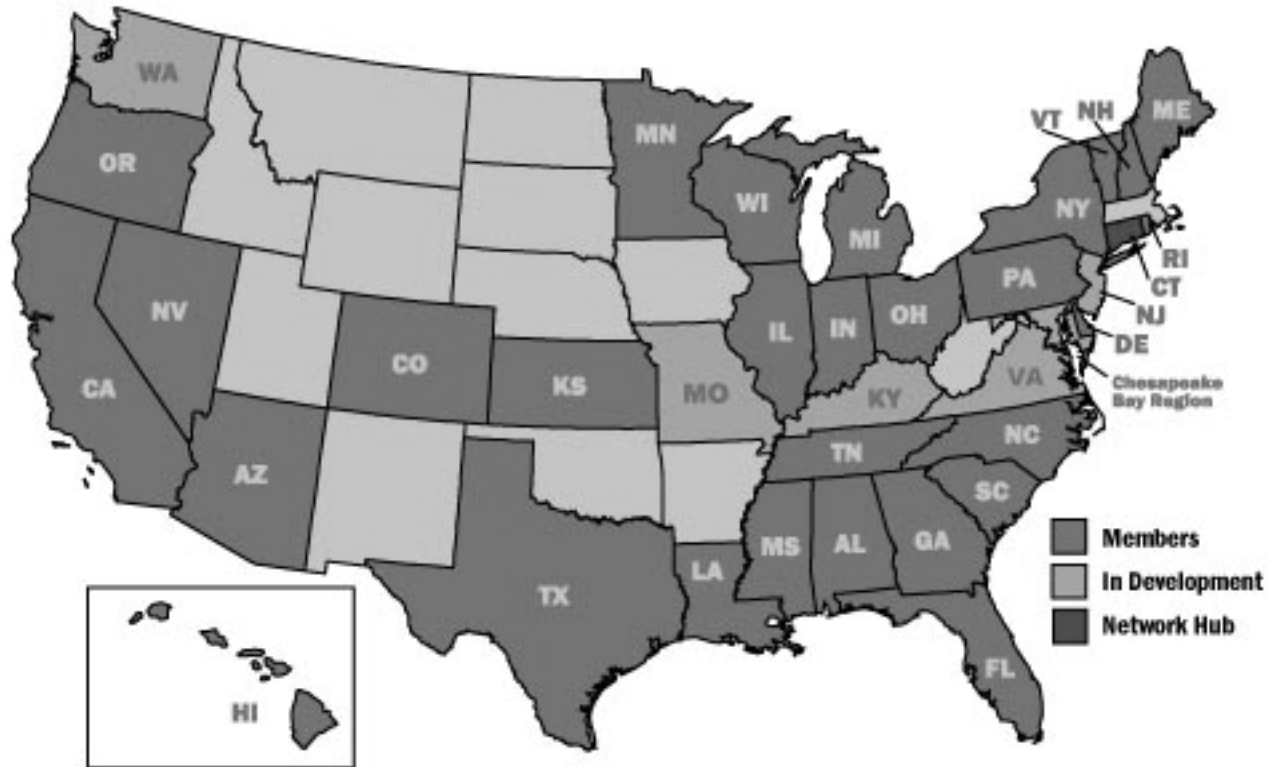


RESOURCES

- NEMO Network
- Other resources and Colorado counterparts
- Information about specific strategies
- Handouts



NEMO NETWORK PARTNER PROGRAMS



NEMO NETWORK PARTNER PROGRAMS



AWARE Colorado

- Community Presentations
- AWARE Colorado Web site
- Water Protection Toolkit for Local Officials
www.awarecolorado.org/toolkit.html
- AWARE Updates e-newsletter

NEMO NETWORK PARTNER PROGRAMS

NEMO Nevada



- Workshops on various topics
- Seminars
- Web site
www.unce.unr.edu/programs/sites/nemo
- Publications

NEMO NETWORK PARTNER PROGRAMS



"Protecting water quality through community planning"

Report Division to Municipal Officials

Nonpoint Source Water Pollution

By Susan Donahue, Water Quality Education Specialist, and Valery Hughes, NEMO Nevada Program Staff, University of Nevada Cooperative Extension


Nonpoint source pollution is a fuzzy term for polluted runoff. Water washing over the land, whether from rain, car washing or the watering of crops or lawns, picks up an array of contaminants. These contaminants include oil and sediment from roadways, agricultural chemicals from farmland, and nutrients and toxic materials from urban and suburban areas. This runoff finds its way into our watersheds, either directly or through storm drain collection systems.

The term nonpoint is used to distinguish this type of pollution from point source pollution. Point source pollution comes from specific sources, such as sewage treatment plants or industrial facilities. Scientists' evidence shows that although huge strides have been made in cleaning up major point sources, our precious water resources are still threatened by the effects of polluted runoff. In fact, the United States Environmental Protection Agency has estimated that nonpoint source pollution is now the single largest cause of the deterioration of our nation's water quality.

Whatever they call it, why should I care about it? Polluted runoff does not just affect your neighborhood ditch or down your neighborhood drain or down your retention pond. Water pollution in your town, and perhaps in your own backyard, can result in contaminated drinking water. An additional impact of nonpoint source pollution or polluted runoff is economic. It affects our public beaches. When polluted runoff enters surface waters, water recreation facilities have to work longer and harder to process the water adequately drinking water. This increases

"The bottom line is that both polluted runoff and its management are likely to increasingly affect you and your community in the near future."

COOPERATIVE EXTENSION
Bringing the University to You



"Protecting water quality through community planning"

Report Division to Municipal Officials

The Effects of Urbanization on the Water Cycle

By Susan Donahue, Water Quality Education Specialist, University of Nevada Cooperative Extension

As our communities grow, we create many visible changes, including housing developments, road networks, expansion of services, and more. These changes impact our precious water resources, with pollution of water resources being one potential impact. To understand how our water supplies can become polluted, it is important to understand the related subterranean "recycling" system the water cycle, also called the hydrologic cycle.

The hydrologic cycle transports water between earth's land, atmosphere, and oceans. The major processes moving water are evaporation, transpiration, condensation, and precipitation. Evaporation occurs when the sun's energy turns liquid water on the earth's surface into water vapor which enters the atmosphere. Water vapor leaves plants in a process called transpiration. Collectively, these two processes are called evapotranspiration.

The water vapor in the atmosphere cools to form clouds (condensation). Through precipitation in the form of rain or snow the water returns to earth. These accumulations in the mountains, providing storage in the form of a snow pack that will slowly melt and release water in the spring and summer. Some of the rain runs off the land, into rivers or lakes. While it is hard to believe, rain carries only about 0.001 percent and fresh water lakes only about 0.009 percent of all water on earth!

Rain also soaks into the ground, or infiltrates, and replenishes the water stored in the soil. The soil and subsoil water supply in the ground come below the water table groundwater. It can include flow to rivers and oceans. Aquifers are geological formations containing groundwater in sufficient quantities to provide water to extraction wells.

Groundwater accounts for about 0.61 percent of the earth's water. In highly sensitive streams, degradation can begin when as little as 5 percent to 10 percent of the watershed area has impervious cover.

What You and Your Community Can Do


Prevention is an unavoidable fact of nature. We, the citizens, are all many options available to municipalities interested in reducing the water quality impacts of existing or future development. Strategies can be organized into a three-tiered approach, which can be summarized as: plan, minimize and mitigate.

PLAN DEVELOPMENT BASED ON YOUR COMMUNITY'S NATURAL RESOURCES

Remember preventing pollution by wise planning is by far the best expense and most effective way to protect your town's watersheds. A working knowledge of your community's natural resources is a critical step in guiding appropriate development. Begin with a natural resources inventory identifying important natural resources and

"Natural resource planning, site design and use of best management practices provide an effective three-tiered approach to coping with polluted runoff."

COOPERATIVE EXTENSION
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Report Division to Municipal Officials

Impacts of Development on Waterways

By Susan Donahue, Water Quality Education Specialist, and Valery Hughes, NEMO Nevada Program Staff, University of Nevada Cooperative Extension

Traditional land development techniques can drastically alter watersheds. Increased storm water runoff associated with development often begins a chain of events that includes flooding, erosion, stream channel alteration and ecological damage. Combined with an increase in man-made pollutants, these changes in watershed form, function, and chemistry can result in degraded systems no longer capable of providing good drainage, healthy habitat or natural pollution processing. Local officials interested in protecting area waters must go beyond standard flood and erosion control practices and address the issue of polluted runoff through a multi-tiered strategy of planning, site design and storm water best management practices.

Disruption of the Water Cycle

When development occurs, the resultant alteration to the land can lead to dramatic changes to the hydrology, or the way water is transported and stored. Impervious man-made surfaces (asphalt, concrete, rooftops) and compacted earth associated with development create a barrier to the infiltration of rainfall into the soil. This increases surface runoff and decreases groundwater recharge (Figure 1, page 2). This disruption of the natural water cycle leads to a number of changes, including:

- Increased volume and velocity of surface runoff.
- Increased frequency and severity of flooding.
- Peak storm flows many times greater than in natural basins.
- Loss of natural runoff storage capacity in vegetation, wetlands and soil.
- Decrease in water quality in tributary streams, which can result in reduced dilution of incoming waters.
- Reduced groundwater recharge and
- Decreased base flow to the groundwater contribution to stream flow. This can result in streams flowing only intermittently or going dry. It can also affect water temperature and thermal pollution.

Impacts on Stream Form and Function

Impacts associated with development typically go well beyond flooding. The greater volume and intensity of runoff leads to increased erosion from construction sites, development areas, and stream banks. Because a stream's channel evolves over time in response to the water and sediment loads that it receives, development-generated runoff and sediment cause significant changes in stream form. To become increased flow streams in urbanized areas tend to become

"Local officials interested in protecting area waters must go beyond standard flood and erosion control practices..."

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Report Division to Municipal Officials

Strategies for Coping with Polluted Runoff

By Susan Donahue, Water Quality Education Specialist, and Valery Hughes, NEMO Nevada Program Staff, University of Nevada Cooperative Extension

As the intensity of development increases, so does the generation of nonpoint source water pollution or polluted runoff. A good indicator of the intensity of development in a given area is the amount of impervious surfaces, such as roads, driveways, parking lots and roofs. Studies have shown that the greater the impervious surface coverage in a watershed, the greater the potential for degradation of that watershed's water systems. Thus, local officials can do much to protect their water resources by considering the location, extent, drainage patterns and maintenance of impervious surfaces on a stream and watershed basis, as well as on individual sites. Future resource planning, site design and use of best management practices provide an effective three-tiered approach to coping with polluted runoff.

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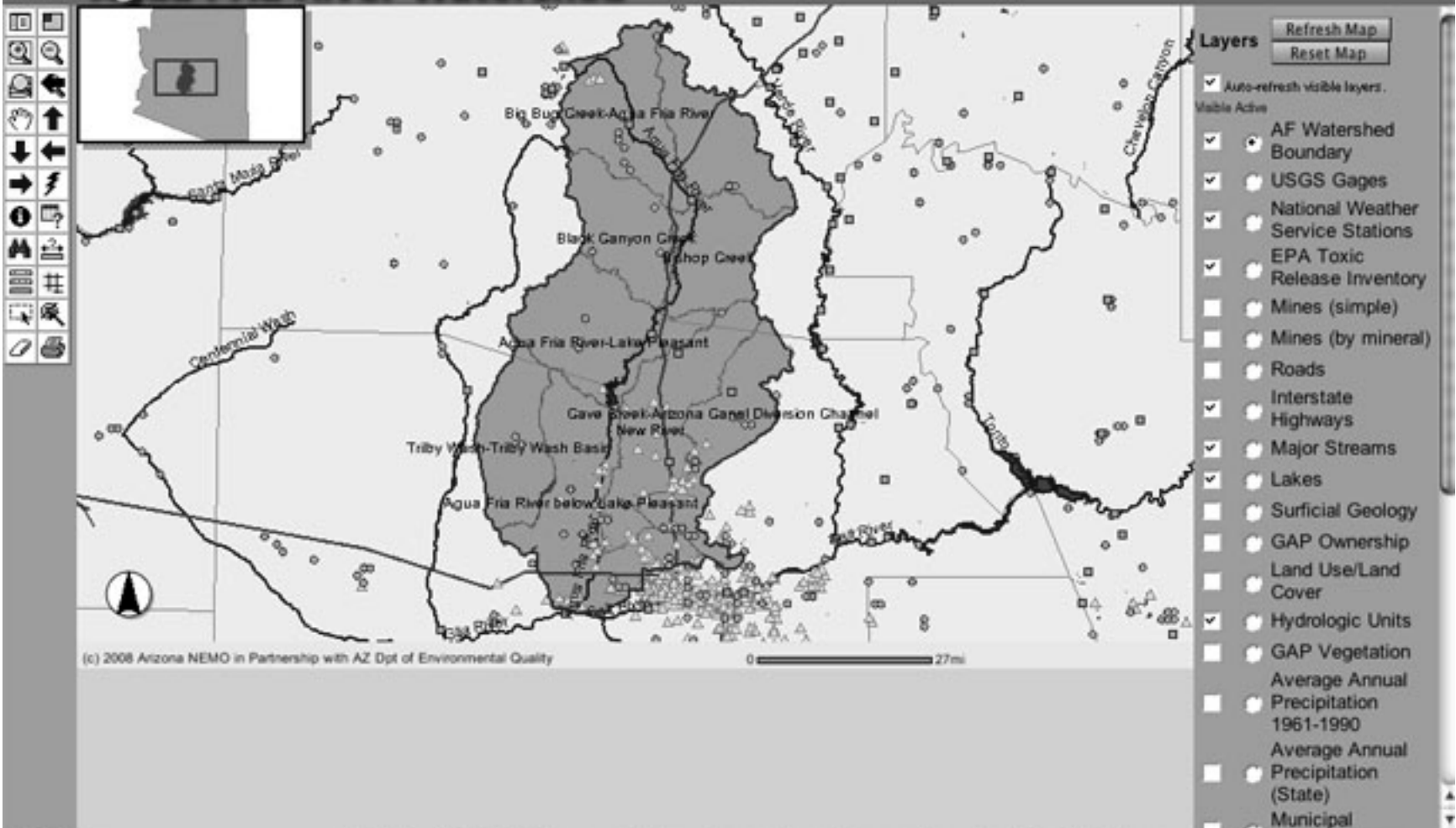
NEMO NETWORK PARTNER PROGRAMS

Arizona NEMO



- Outreach, analysis and research
- Seminars
- Watershed plans and GIS resources
- Web site
www.srn timer.arizona.edu/nemo
- Publications

Agua Fria River Watershed



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Zoom In

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Help

Suggestions/Comments

Technical Problems

Arizona NEMO Home

STATE RESOURCES



- Nonpoint Source Program
- Source Water Protection Program
- Cooperative Extension Programs
- Office of Smart Growth

OTHER RESOURCES

- Urban Drainage and Flood Control

District

- Colorado Association of Stormwater and Floodplain Managers

- Colorado Stormwater Council

- Watershed groups and associations

- Clear Creek Watershed Foundation

- Fountain Creek Visioning Task Force



SPECIFIC STRATEGIES

•Trade associations

- Colorado Asphalt Pavement Assoc.
- Interlocking Concrete Pavement Institute
- National Ready Mixed Concrete Assoc.

•Nonprofit organizations

- Colorado Riparian Assoc.
- American Forests
- Land Trust Alliance



CONCLUSION

- ✓ Land use affects water quality
- ✓ Communities (in the broad sense) play a key role in protecting water quality
- ✓ Helpful resources



FOR ADDITIONAL INFORMATION AND UPDATES

www.awarecolorado.org

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Some of this material was adapted with permission from
University of Connecticut Cooperative Extension System.

Photos and graphics provided by:
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