



ARIZONA ASSOCIATION OF CONSERVATION DISTRICTS

"Conserving Natural Resources and Agriculture Since 1944"

Healthy Watersheds

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The hydrologic cycle is precipitation, evaporation, interception, infiltration, percolation, transpiration, runoff. All water in Arizona comes from precipitation on the watersheds (except that in the Colorado River). It is the source of all stream flow, springs, and ground water (some of the latter accumulated over many thousands of years). The main focus of watershed management is to capture and safely release water from precipitation. Capture means to store the water in the soil where it falls to the extent possible. Safe release means to let the excess moisture flow into streams or percolate into ground water slowly so that it does not cause excessive flooding and erosion and has time to percolate into the ground water.

The main determinants of the amount of runoff and erosion are climate (amount, timing, and intensity of precipitation), topography (slope and aspect), soils (depth, texture, aggregation, rock content), and vegetation cover (basal and canopy cover, including litter). Of these, vegetation cover is the only one we can manage. We do this by controlled grazing, reducing excess shrub and tree cover to improve ground cover and reduce fuel accumulation, reducing the number and improving the design of roads, and, in some cases, reseeding or using check dams or other physical structures.

Anything which reduces the amount or distribution of effective plant and litter cover will increase the rate and amount of runoff and result in increased soil erosion and flooding. Factors which can cause decreased cover include excessive grazing by livestock and wildlife, intense wildfires, drought, and encroachment of woody plants which reduces grass cover.

What is the problem? Much of the range and forest land in Arizona has experienced increased density of shrubs and/or trees in areas that historically supported more open, parklike stands, or invasion of shrubs and trees into areas that historically were grasslands. This has resulted in lower ground cover, increased flood runoff, soil erosion, less forage for livestock and wildlife, impaired water quality, and increased risk of catastrophic wildfire, depending on the vegetation type and precipitation zone.

What caused the problem? The causes vary from place to place, but in general the main causes are considered to be mainly due to lack of natural fire regimes as a result of grazing and fire protection over the past 100+ years. Severe drought conditions, climate change, and invasion of exotic plant species are other possible factors interacting with these.

What is the remedy? Although unmanaged grazing in the past probably contributed to reducing fire frequency and competition for shrub seedlings from grasses, managed grazing, or even complete lack of grazing, will not reverse the trend of increasing woody plants. Restoration of natural fire regimes is also not possible in most cases. In the former grasslands and woodlands, the fine fuels (grasses mainly) are too reduced to carry a fire. In higher rainfall forests and woodlands, the amount of fuel has increased to the point that fires tend to be highly intense and cause damage not only to the soil and vegetation but also to property and human life (e.g., the Rodeo-Chediski and Wallow Fires). Concerns over smoke and liability are other factors restricting the use of fire. In most cases, some form of biological, chemical, or mechanical control is required to restore these vegetation types to healthy watershed conditions.

What kinds of vegetation are affected? The vegetation types can be roughly divided into three zones – desert shrub (<10”ppt), grassland/woodland/chapparral (10-18”ppt), and forests (>18”ppt):

- Desert shrub: The desert shrub areas historically were dominated by shrubs with little perennial understory. Plant cover in this zone is not very effective in protecting the soil, but erosion and runoff are relatively low due to lack of rainfall. Natural fire was not a major factor in shaping the vegetation in this zone. The main concern here is invasion of cool season annuals (e.g., cheatgrass, red bromd) and warm season perennials (e.g., buffelgrass). These plants increase fuel and the risk of fire which may radically alter the vegetation and reduce both its scenic value and wildlife values. Targeted livestock grazing is a tool which can be used to reduce this fuel loading.
- Grassland/Woodland/Chaparral: Plant communities (desert grassland, pinyon-juniper, oak woodland, etc.) in this zone have a higher potential for increased runoff and erosion when plant cover is reduced because of higher rainfall. This zone is where competition for moisture from increased shrubs reduces the cover of herbaceous plants and resulting in increased bare ground, reduced forage production, and reduced wildlife habitat values. Seasonal stream flow and springs may have reduced flow and flooding increased due to increased rate and amount of runoff. On some soils, especially where precipitation is over 16 inches, shrub control can increase the duration of streamflow and amount of ground water recharge along mountain fronts.
- Forests – The principal forest type is ponderosa pine, with smaller amounts of mixed conifers. Ponderosa pine forests historically experienced frequent low intensity ground fires that kept tree stands open and a good grass understory. Fire protection and lack of logging and thinning of forest stands has resulted in increased density of smaller trees and understory shrubs (e.g., alligator juniper) which provide greatly increased total fuel loading and “ladder fuels” that allow crown fires to develop. Increase tree density has led to reduced water yield, both in terms of stream flow and ground water recharge, as well as reduced habitat value for many species of wildlife, reduced forage for livestock, and reduced economic benefits to local communities from wood products, and increased danger to life and property when catastrophic wildfires occur.

These problems have been well-recognized in recent years by both Federal and State agencies (e.g., BLM, FS, NRCS, ASLD, AZGFD) as well as conservation groups (hunters, off roaders, environmental, etc.). Arizona’s Conservation Districts are the only entity of state government with the charge to address conservation needs on all categories of land ownership and all resource concerns. Thus, they have an important role in coordinating the efforts of various agencies and private entities on a landscape scale, and for providing input from the local landowners and producers who are knowledgeable about their local areas and benefit from better management. But the benefits in terms of water quantity and quality, flood control, risk of wildfire, aesthetic values important to the tourism industry, wildlife and fisheries habitat, timber products, livestock production, etc. extend to all of Arizona’s residents.