Water Storage Options in Rural Watersheds

Worksheet Purpose

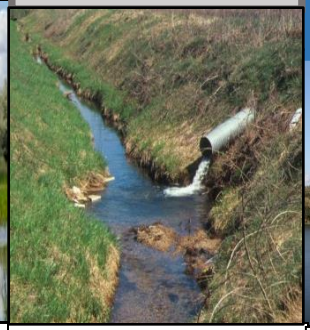
1. To set the stage for discussions on water storage options for individuals, groups, and government agencies.
2. To provide a path for engagement and to empower action for projects, programs, and policy.
3. To provide implementers a discussion framework to guide citizens, legislators, government staff, municipalities and other elected officials to make informed decisions on where to allocate resources for watershed storage.
4. To use as a template in the assessment of storage opportunities and costs for a specific watershed.
5. To support a standardization of concepts and terms relative to communicating and coordinating efforts related to watershed storage.
6. To discuss how a combination of storage options can create a more naturally functioning stream.

Identify Impacts to Specific Watersheds

1. Each storage strategy may be assessed for costs/benefits relative to:
    a. Soil Health
    b. Crop Production
    c. Nutrient Cycling
    d. Fish Migration
    e. Water Quality
    f. Wildlife Habitat
    g. Aquatic Habitat
    h. Stream Functions
    i. …

2. Each storage strategy may be assessed for short and long-term financial costs:
    a. Design Costs
    b. Implementation Costs
    c. Long-term Costs
    d. Operation and Maintenance Costs
    e. Public and Private Liabilities (in case of failure)
    f. Easement and Land Costs
    g. …

Water Storage Options in Rural Watersheds

Soil, Carbon, Crops, Cover Crops, and Vegetation	Ponds and Wetlands	Tile and Ditches	Lake Basins	Stream Channels	Floodplains
					
Depends on **soil, organic matter %** (*carbon sponge*), and vegetation types	Depends on acres available and management goals	Depends on linear feet, slope, and control structure options	Depends on acres available and management goals	Depends on potential impoundment areas, slope, and infrastructure	Depends on connectivity to floodplain, acres, and infrastructure
Low costs to install	**Low-medium costs** to install.	**Medium costs** to install	**Medium costs** to implement	**High costs and maintenance**	**Low to high costs**
High % storage potential across watershed	**Medium-high % storage potential** across watershed	**Low % storage potential** across watershed	**Low-medium % storage potential** across watershed	**Low % storage potential** across watershed	**High % storage potential** across watershed

Minnesota River

A watershed storage scenario: How much rainfall becomes runoff and then discharges from the watershed is related to land and water management.
For example - A 20,000-Acre Watershed: A 4 ½-inch, 24-hour rainstorm generates 7500 acre-feet or 2.44 billion gallons of water in this watershed. Soil with 2-3% organic matter could hold about 50,000 gallons of water/acre. A watershed with 16,000 acres of crops, prairies, groves, pastures and could hold ~800 million gallons of water (2455 acre-feet). A watershed with 1000 acres of wetlands (5%) and could hold 2500 acre-feet of water. **Therefore, 2455 + 2500 = 4,955 acre-feet (67%) of rainfall is stored in the early flow of the event.** The actual amount of runoff varies depending on current conditions (soil moisture, last rain event, vegetation cover, etc.) Working with nature to strategically store water in the soils-to-floodplains options can create a more naturally functioning stream that moves water and sediment through the channel, allows aquatic species/fish to move up and down the stream channel, provides recreational opportunities, and protects private and public infrastructure at the least cost.

Water Storage Options in Urban Watersheds

Worksheet Purpose

1. To set the stage for discussions on water storage options for individuals, groups, and government agencies.
2. To provide a path for engagement and to empower action for projects, programs, and policy.
3. To provide implementers a discussion framework to guide citizens, legislators, government staff, municipalities and other elected officials to make informed decisions on where to allocate resources for watershed storage.
4. To use as a template in the assessment of storage opportunities and costs for a specific watershed or neighborhood.
5. To support a standardization of concepts and terms relative to communicating and coordinating efforts related to watershed storage.
6. To discuss how a combination of storage options can create a more naturally functioning stream.

Identify Impacts to Specific Watersheds

1. Each storage strategy may be assessed for costs/benefits relative to:
    a. Home Values
    b. Curb Appeal
    c. Overall Water Use
    d. Community Access
    e. Stream Functions
    f. Nutrient Cycling
    g. …

2. Each storage strategy has short and long-term costs relative to:
    a. Design Costs
    b. Implementation Costs
    c. Long-term Costs
    d. Maintenance Needs Costs
    e. Public and Private Liabilities (in case of failure)
    f. …..

Water Storage Options in Urban Watersheds

Rain Barrels, Cisterns

Depends on rooftops and barrel capacity

Low-High costs to install

Low % storage potential across

Rain Gardens, Lawns, Boulevards

Depends on lawn size and soils

Medium-high costs to install.

Low-medium % storage potential across watershed

Storm Sewers

Depends on linear feet, slope, and structural options

High costs to install

Low % storage potential across watershed

Parks

Depends on acres available, uses, and management goals

Low-medium costs to implement

Medium % storage potential across watershed

Stormwater Ponds

Depends on potential impoundment areas

High costs and maintenance

Medium-high % storage potential across watershed

Floodway & Floodplains

Depends on connectivity to floodplain, acres, and infrastructure

Low to high costs

High % storage potential across watershed

Minnesota River

Watershed Storage Scenario: A town of about 40,000 people covers about 20 square miles or 12,800 acres. A 4 ½-inch, 24-hour rainstorm generates 4800 acre-feet or 1.5 billion gallons of water. Approximately 16,000 residential units with a 50-gallon rain barrel could store 800,000 gallons or 2.5 acre-feet. Rain gardens in 3200 1/4 –acre residential lots could store about 80 acre-feet. Storm sewers, parks, and stormwater ponds can transport and store significant amount of water. The amount of runoff that occurs depends on current conditions (soil moisture, last rain event, vegetation cover, impervious area etc.)