Stormwater Handbook

Rathdrum Prairie Aquifer

Idaho Department of Environmental Quality &
Aquifer Protection District Board

2018

RathdrumPrairie
AQUIFER

Contents

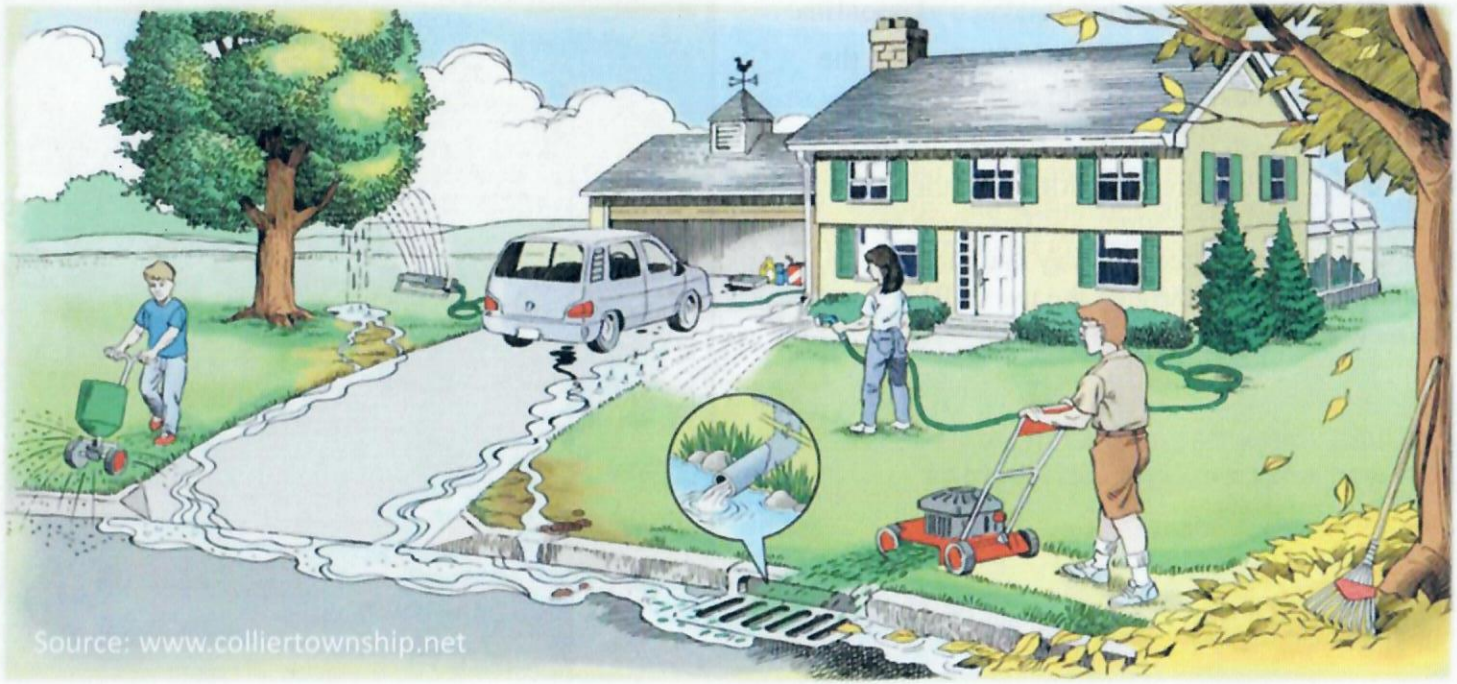
Introduction

Runoff generated from storm events is a natural process, but human activities can alter the volume and timing of the runoff and introduce contaminants that can have negative effects on water quality. Numerous processes and methods can be used to reduce and mitigate these water quality impacts.

Technical aspects of these methods have been documented in Idaho Department of Environmental Quality's (DEQ) *Catalog of Stormwater Best Management Practices for Idaho Cities and Counties*, which describes selecting, designing, installing, and maintaining best management practices (BMPs) to reduce pollution to this runoff, also called stormwater.

The general public encounters these BMPs and stormwater designs every day in their yards, neighborhoods, at work, and out in the community. Most people are likely unaware of the water quality and quantity issues associated with stormwater and how these BMPs help keep the surface and ground water quality from degrading.

This handbook provides a simplified tool for understanding the many factors of stormwater management over the Rathdrum Prairie aquifer in northern Idaho. This aquifer provides high quality drinking water to thousands of north Idaho residents.



Sensitive Resource Aquifer

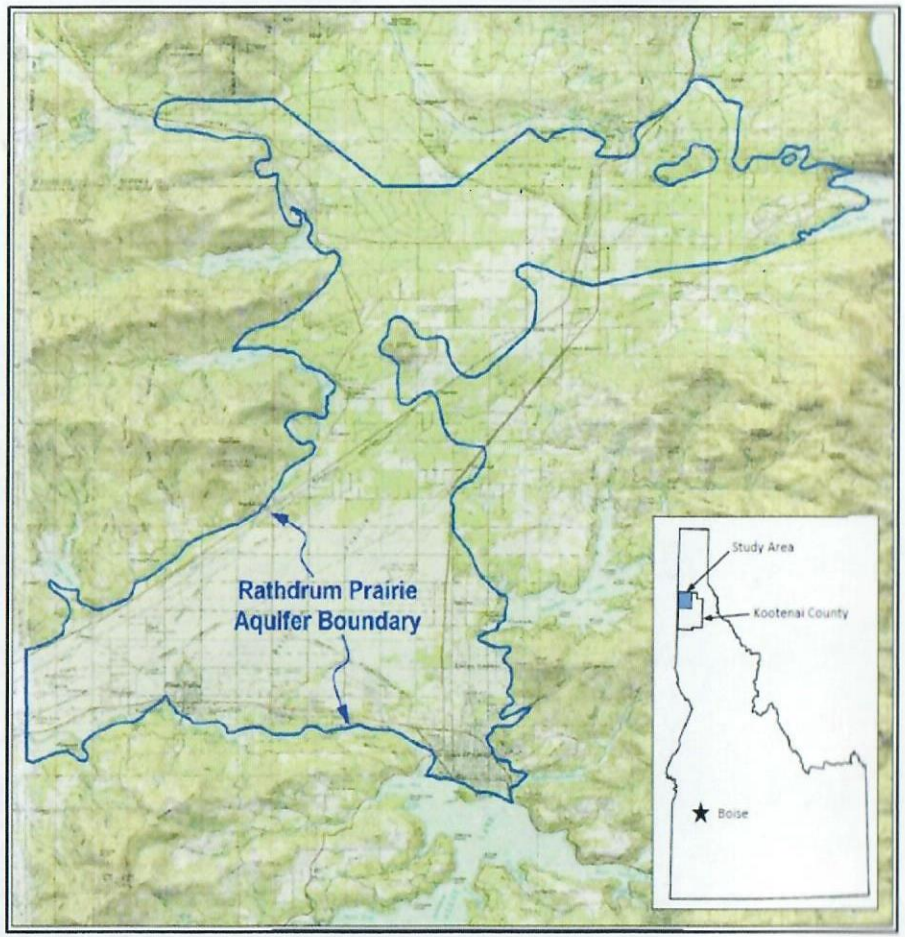
The Rathdrum Prairie aquifer (RPA) covers an area approximately 211 square miles in Idaho and extends from Lake Pend Oreille south to Coeur d'Alene and then west to the Idaho-Washington border. The RPA is part of the larger Spokane Valley-Rathdrum Prairie (SVRP) aquifer that extends across the state line to Washington. The SVRP aquifer is the primary source of drinking water for over 100,000 people in Kootenai County and approximately 400,000 people in Spokane County, Washington.

The aquifer is unconfined, meaning there are no protective layers covering the aquifer, which puts the aquifer at risk for potential contamination.

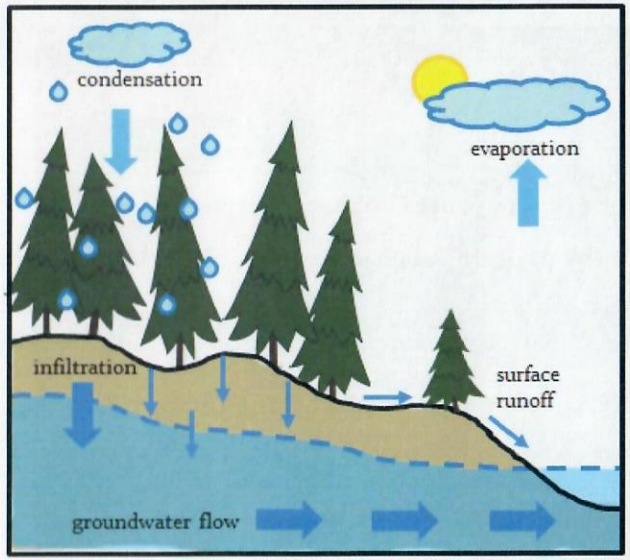
In 1997, the Board of Environmental Quality designated the RPA as a sensitive resource aquifer.

This designation, along with the "Ground Water Quality Rule" (IDAPA 58.01.11), requires activities with the potential to degrade sensitive resource aquifers, such as stormwater runoff, to be managed in a way that meets or exceeds existing water quality through the use of BMPs and best available methods.

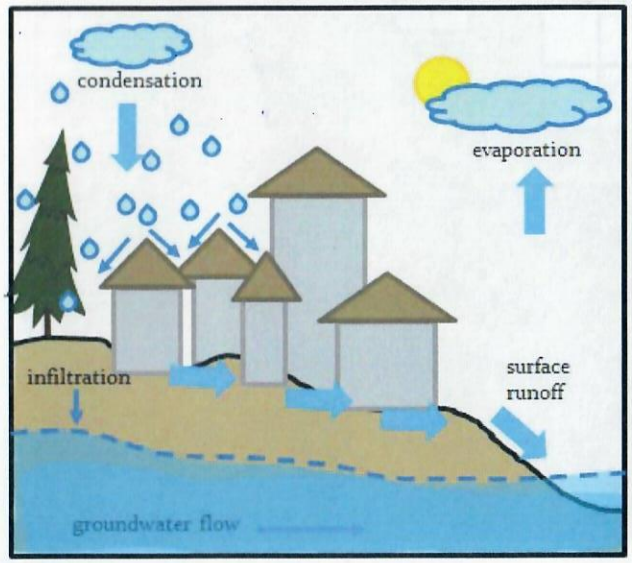
Stormwater is one of the many sources of recharge and replenishment to the Rathdrum Prairie aquifer.



Natural Cycle



Urban Cycle



What is Stormwater?

In natural environments and on a global scale, the process of condensation, evaporation, transpiration, and precipitation creates a natural water cycle.

Precipitation and snowmelt naturally absorb into the ground where it is filtered. This water slowly recharges streams, rivers, lakes, and the ground water supplies in the SVRP aquifer.

As the world has urbanized, fewer open green spaces provide infiltration, and the increase in impervious surfaces such as roads, parking lots, and rooftops have created more surface runoff. This surface runoff is also referred to as stormwater.

When rain and snowmelt flow over these impervious surfaces, two potential changes can occur:

- The discharge to nearby streams and rivers can occur much more rapidly and with larger volumes causing erosion and sedimentation.
- The water can pick up pollutants, trash, chemicals, oils, and sediment that can affect water quality in both surface and ground water.

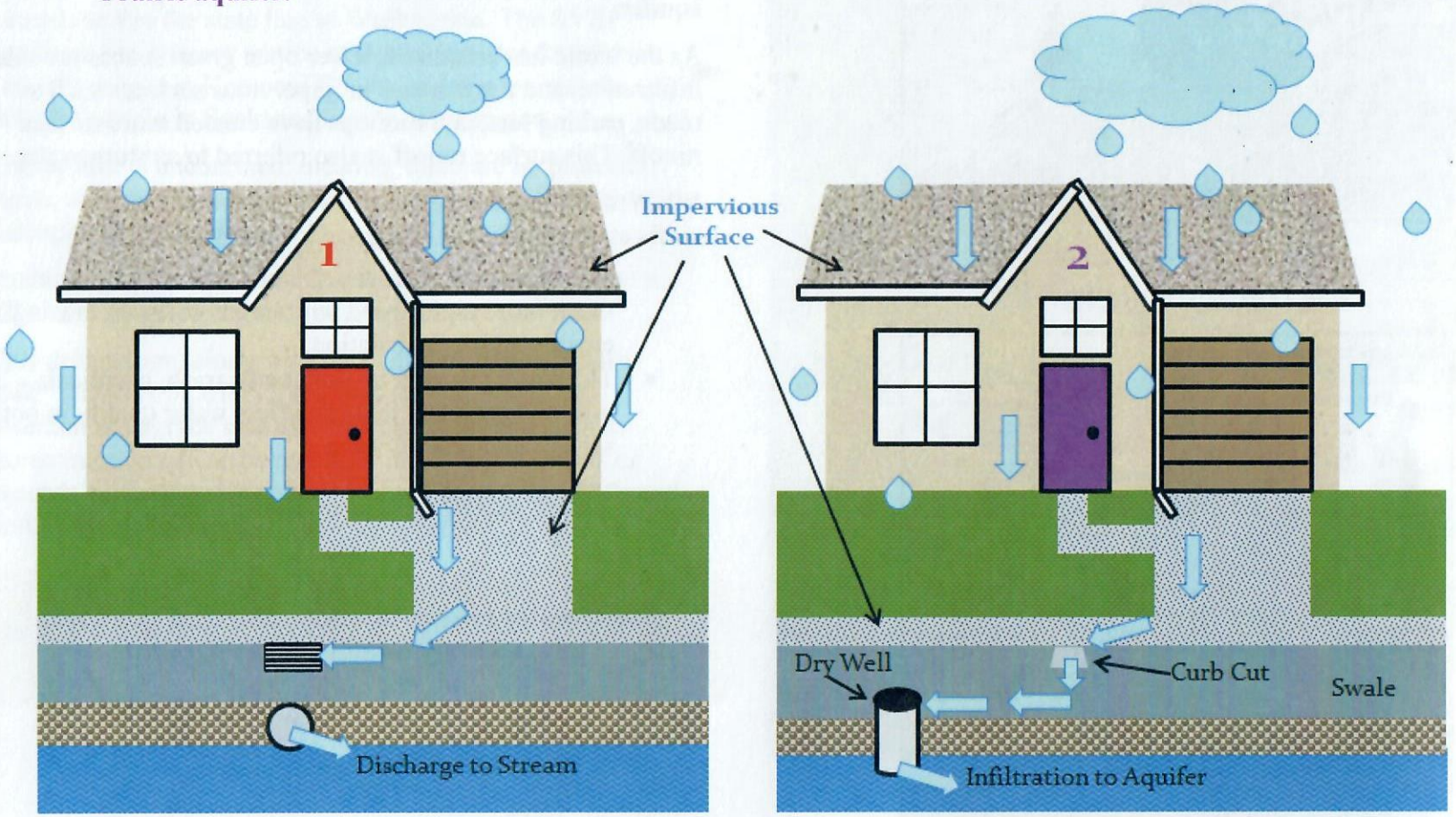
Stormwater is rain or snowmelt that does not immediately soak into the ground.

Stormwater: Two Pathways

Stormwater has a direct relationship with surface water and ground water sources.

In an urban environment, stormwater runoff is directed to one of the following:

1. **Stormwater is collected in pipes and discharged to streams or other surface water sources.**
2. **Stormwater is directed to swales and dry wells and infiltrated into the ground, eventually reaching the Rathdrum Prairie aquifer.**



Stormwater Runoff and Water Quality

Precipitation that flows across lawns or impervious surfaces will pick up various types of chemicals. Typical chemicals include nitrate and phosphorus from fertilizers, pesticides, and herbicides, along with gasoline and oil.

Stormwater typically has elevated concentrations of metals such as lead, zinc, cadmium, chromium, and copper. Sources of metals include vehicle traffic, roofs, outdoor scrap metal storage, coal and salt, and airborne emissions from burning coal, oil, or municipal waste.

Another contaminant associated with stormwater runoff is bacteria. Bacteria counts in stormwater runoff can be very high and exceed health standards. Sources of bacteria include sewer overflows, pets, and wildlife such as geese and deer. If the runoff has significant organic material such as leaves, grass clippings, and litter, these materials will use up oxygen as they decay. The reduced oxygen in water can create problems for fish and other aquatic life.

Stormwater runoff also collects and transports sediment, which can carry other pollutants and can smother fish eggs or other aquatic life if transported to surface waters.

If it's on the ground, it flows into the stormwater!

History

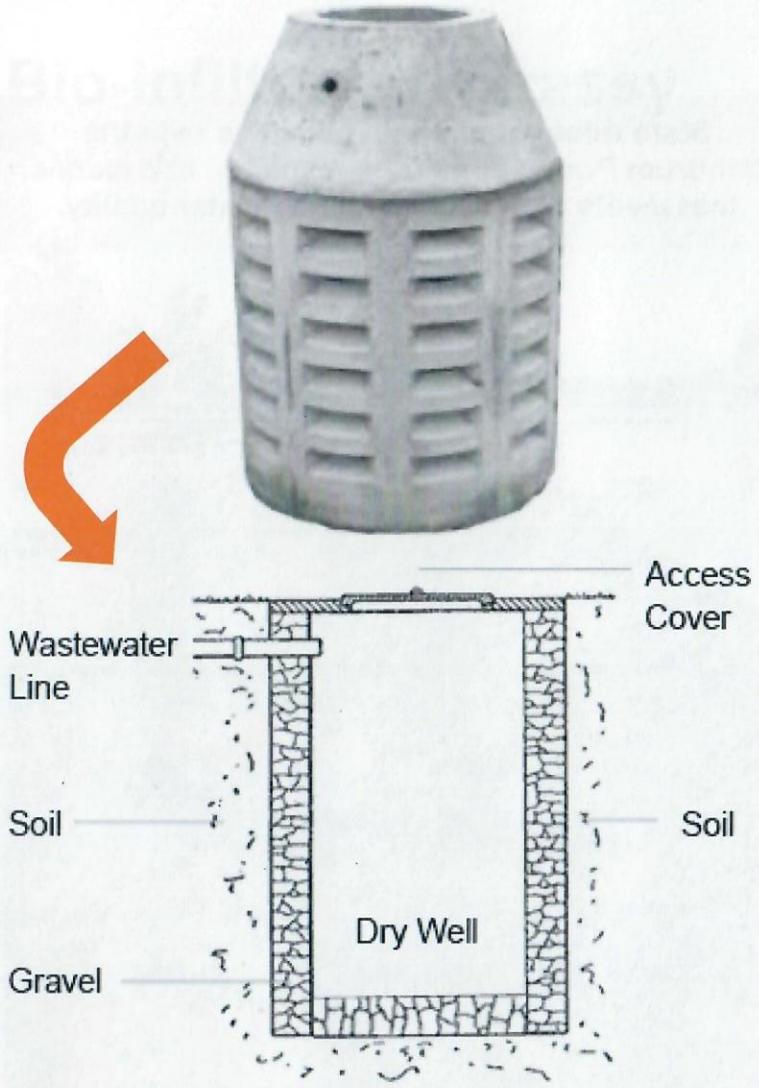
Historically, the largest concern regarding stormwater was removing it to prevent flooding.

Communities or municipalities near streams, rivers, and lakes would collect stormwater from streets and parking lots and pipe the water to the nearest surface water body. A catch basin system directed the stormwater to larger distribution pipes that eventually discharged directly to a stream, river, or lake.

If a surface water body was not available, stormwater was disposed of using dry wells. A dry well is generally constructed of a buried concrete chamber with a number of openings that collects and drains the stormwater into the ground. The stormwater eventually seeps downward to the aquifer and if it is untreated, any contaminants in the stormwater can affect the water quality of the aquifer.

A number of existing storm drains that were constructed decades ago continue to divert untreated stormwater to dry wells located over the RPA.

Historical stormwater disposal practices only focused on flood prevention.



A dry well is also called a class IV injection well or shallow injection well.

Dry Wells: What Are They?

A dry well is an underground structure that collects and disposes of unwanted water, most commonly surface runoff and stormwater. It is a covered, porous-walled chamber that allows water to slowly soak into the ground, eventually recharging the ground water. They are generally about 18 feet deep.

However, a dry well by itself could be a conduit for contamination to the aquifer. Over the RPA, dry wells are installed in grassed sections called grassy swales.

Since the first flush of stormwater runoff contains most of the pollutant load, the grassy swale bottom is designed to infiltrate this water. Grass filters out sediment, and roots absorb nutrients and trap other pollutants. Additional rainfall pools in the swale bottom and infiltrates in a short period of time. Water flows into the dry well only when the pooled water reaches the elevated top of the dry well rim. In this way, only the cleanest stormwater enters the dry well directly. Dry wells are necessary to prevent flooding during heavy rain.

Thousands of dry wells exist over the RPA. If not constructed properly and maintained, the dry wells could impact the quality of our drinking water.

All new dry wells in Idaho must be registered with either the Idaho Department of Water Resources or the Panhandle Health District.

Keeping Our Aquifer Clean

In research studies about the RPA, stormwater runoff has consistently been identified as one of the main sources of potential degradation to aquifer water quality.

In 1990, the Interagency Stormwater Committee was formed to evaluate stormwater treatment and disposal options and develop a model ordinance.

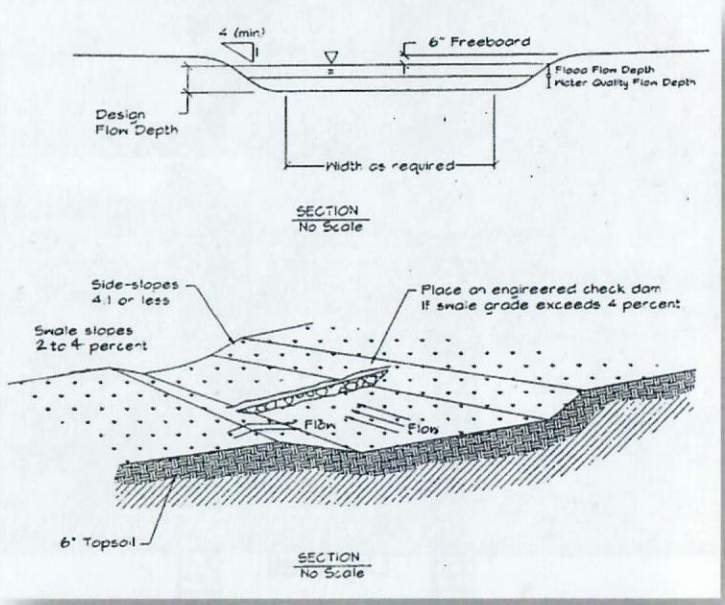
The *Stormwater Management Plan Criteria and Engineering Standards* (more commonly referred to as the "Kennedy Report") was the supporting document for the model ordinance. This report included engineering standards for the grassy infiltration swale, also known as a "208 swale" in reference to Section 208 of the Clean Water Act.

In 1997, the RPA was categorized as a sensitive resource aquifer in the "Ground Water Quality Rule."

In 2000, a new Stormwater Technical Advisory Committee was formed by local community and agency representatives. The committee improved the grassy swale BMP for use over the aquifer. This BMP was later added to DEQ's *Catalog of Stormwater Best Management Practices for Idaho Cities and Counties*.

The grassy swale or bioinfiltration swale BMP is considered the best available method for protecting the RPA and can be found in most local ordinances to protect our drinking water.

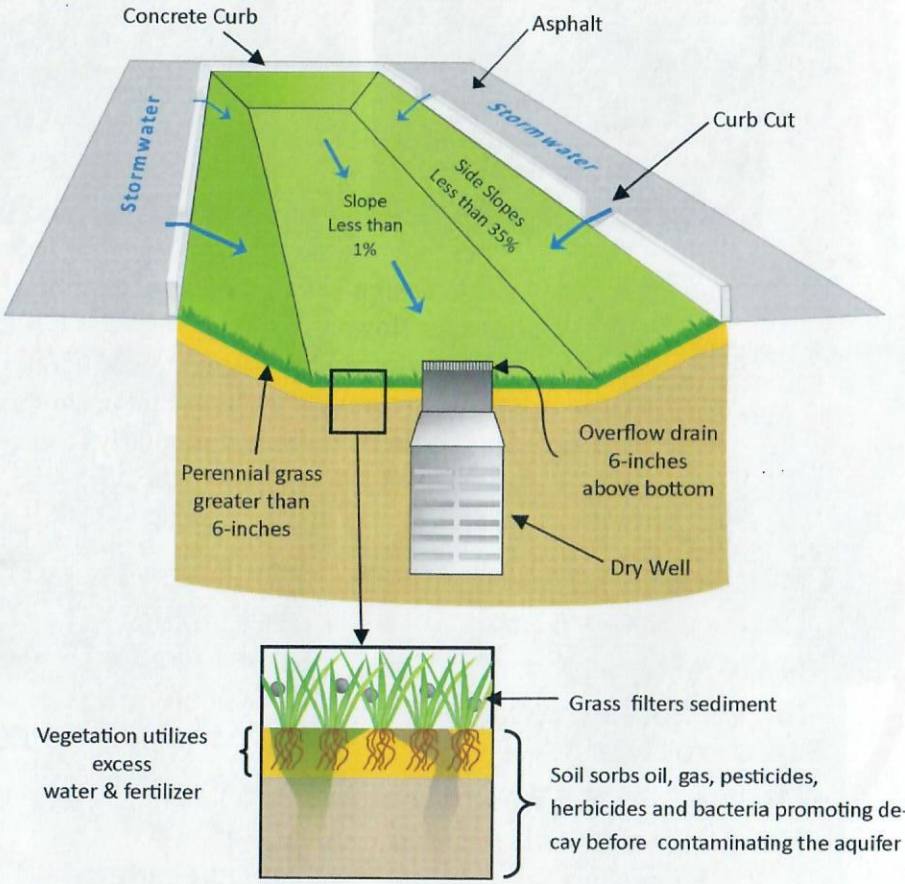
State rules require that activities over the Rathdrum Prairie aquifer be managed in a manner that meets or exceeds existing water quality.

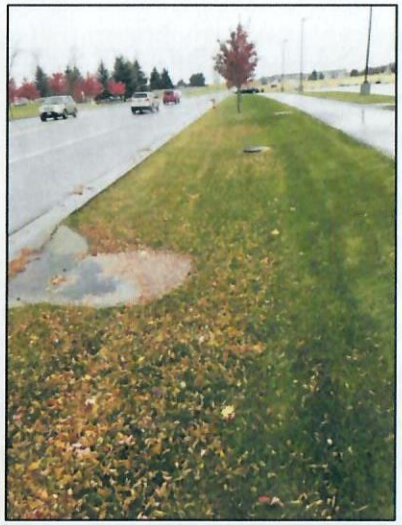


Best Management Practices

Bio-infiltration/Grassy Swale

Grassy swales are the preferred method of stormwater treatment over the Rathdrum Prairie aquifer.





- The grassy swale design is based on treatment of a precipitation rate of 0.10 inches per hour and treats greater than 90% of stormwater flows.
- Soils for grassy swales should be permeable enough to allow infiltration but should also contain fine soils and organic material to remove pollutants and promote the growth of deep-rooted, healthy vegetation.
- Grassy swales should be inspected regularly to ensure stormwater is pooling in the swale bottom until it reaches the top of the dry well rim and enters the dry well.

Limitations of the grassy swale

- Drainage area = 5 acres
- Minimum bedrock depth = 6 feet
- Natural Resources Conservation Service soil type = A, B
- Maximum slope = 4%
- Minimum water table = 3 feet

Grassy swale targeted pollutants

- Sediment = 75% removal factor
- Phosphorus = 30%
- Trace metals
- Bacteria
- Hydrocarbons

Design Parameters

- Impervious surface area of a tributary area should be less than 1 acre.
- Use several small grassy swales rather than one large grassy swale.
- Dry well rim elevation should be above the base of the grassy swale to provide some assurance of infiltration of the design storm prior to overflow.
- Planting soil depth of 4 feet. Adequate nutrient removal requires a minimum of 2.5 feet.

Maintaining Grassy Swales

- Don't over water.
- Fertilize sparingly.
- Maintain the grass.
- Don't replace the grass with rocks.

- Watch for grass die off.
- Keep inlets clear.
- Take harmful material to your local hazardous waste disposal site.
- Correct unanticipated flows.

Kootenai County Climate

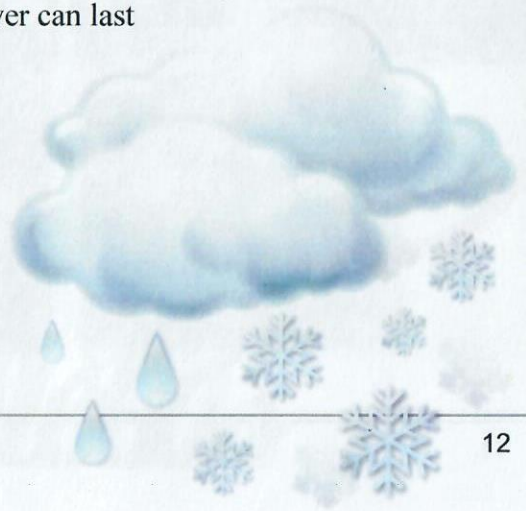
Weather conditions—temperature, rain, humidity, and wind speed—can have a big influence on how much water is needed for irrigation and available to recharge the water in the aquifer. The Bureau of Reclamation's AgriMet station on the Rathdrum Prairie collects weather data for use in water quantity studies but also reports the amount of water needed each day to irrigate lawns or crops to help conserve water.

Kootenai County has a dry-summer continental climate, characterized by a cold, moist climate in winter and very warm, dry conditions in summer. The average temperature during the summer is 61.7 °F, and the average daily maximum temperature is 76 °F. The average temperature during the winter is 29.6 °F, and the average daily minimum temperature is 22.8 °F.

The average annual total precipitation is 24.86 inches with 32% falling between May and September. At higher elevations, totals can average greater than 70 inches.

The average seasonal snowfall is 34.8 inches and at higher elevations totals can average 120 inches. On average, 31 days per year have at least 1 inch of snow on the ground, and at higher elevations snow cover can last more than 7 months.

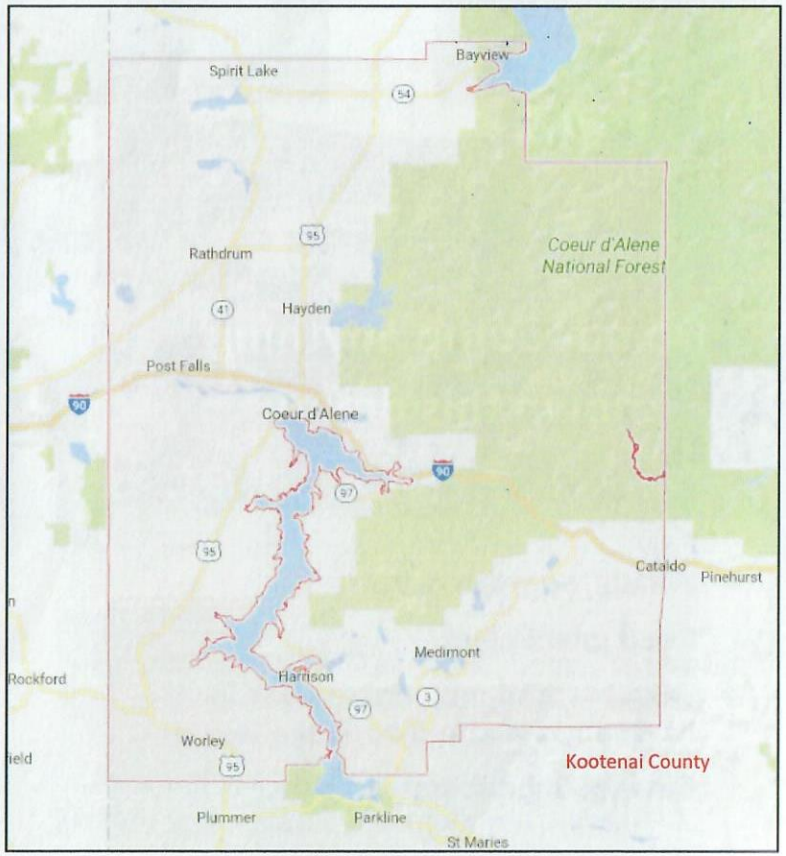
The average relative humidity in mid-afternoon is about 55%, with higher levels at night and an average of 82% at dawn.



During the summer, the sun shines 75% of the time and in the winter it shines 31% of the time.

Average wind speed is highest in April at 10 miles per hour with prevailing winds coming from the southwest.

The average annual precipitation for Kootenai County is 24.86 inches.



Responsibility for stormwater management is held collectively by landowners and several agencies and special districts.

What Can You Do?

- **Never pour anything hazardous into a stormwater drain.**
- **Sweep up litter and debris from sidewalks and driveways.**
- **Pick up pet waste and dispose of it properly.**
- **Correct automobile leaks and clean up any spills.**
- **Use pesticides and fertilizers sparingly.**
- **Regularly inspect grassy swales and report or fix any problems.**

Responsibility for Stormwater Management and Permitting

Landowners are responsible for managing stormwater runoff from their property.

Developers or local homeowner associations are responsible for maintaining stormwater facilities for local subdivisions, unless this responsibility has been given to the city, county, or local highway district.

Local highway districts and city public works departments are responsible for maintaining public roads and sometimes the associated stormwater facilities.

County building and planning departments are responsible for reviewing and issuing building permits in the unincorporated county. City building and planning departments are responsible for areas within the city's boundary.

Stormwater Ordinances

We want to reduce the amount of pollutants discharged to stormwater through best management practices.

State Rules

- DEQ administers the "Ground Water Quality Rule" and "Water Quality Standards" (for surface waters) that guide stormwater treatment in Idaho.
- DEQ's *Catalog of Stormwater Best Management Practices for Cities and Counties* has site design techniques for controlling stormwater runoff associated with land development activities.
- Panhandle Health District implements their Critical Materials Program and Memorandum of Understanding with Idaho Department of Water Resources for shallow injection wells, which assists in protecting the quality of stormwater.
- Idaho Department of Water Resources administers the Idaho waste disposal and injection well program. Dry wells associated with standard grassy swales are a type of injection well.
- Aquifer protection districts were established by the Idaho legislature in 2007. In 2008, Kootenai County established an aquifer protection district to protect ground water resources in Kootenai County.

City and County Ordinance Example

- All new development is required to retain stormwater runoff on-site, treat the runoff with approved BMPs, and then discharge it to a shallow injection well.
- Grassy swales are the only allowed treatment.
- Owners are required to operate and maintain their BMPs.
- Each development is required to submit a stormwater management plan for review and be inspected before a Certificate of Occupancy is issued.

Federal Regulations

The US Environmental Protection Agency, Region 10, is the National Pollutant Discharge Elimination System (NPDES) permitting authority for Idaho and is responsible for issuing NPDES stormwater permits. It also administers and provides for the Underground Injection Well Control Program to protect underground sources of drinking water.

For more information on stormwater management and guidance, please contact your local city and or county representative

or visit *www.deq.idaho.gov/rpa or*

www.deq.idaho.gov/water-quality/wastewater/stormwater.

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