Chapter 5

Watershed Management

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Purpose and Scope

The 1995-2015 Regional Water Plan recognized the need for watershed management and included a corresponding policy. The Regional Water Planning Commission (RWPC) affirms its commitment to watershed management by including the same policy statement in this version of the plan:

> ***Policy 3.1.e: Watershed Protection***
>
> *Watershed protection programs shall be implemented for the Truckee River, its tributaries, and other perennial streams in the region.*

Chapter 2 discusses water resources and current pollution problems. Chapter 3 discusses wastewater treatment and Truckee River water quality. It also touches on some watershed management measures to reduce non-point source pollution, as a means to achieve water quality trades that are anticipated to provide greater flexibility for Truckee Meadows Water Reclamation Facility (TMWRF) effluent disposal and reuse practices. Chapter 4 discusses flood control and storm water management. Chapter 5 links these three chapters together in the context of a watershed, the source of our water resources.

This chapter provides background on current watershed management and protection efforts directed towards the Truckee River for improvement and protection of surface water quality, drinking water, protection of riparian habitats along stream corridors, storm water quality management, and protection of groundwater quality. Watershed management means the maintenance of the land, vegetation and water resources of a drainage basin for the conservation of all its resources to the benefit of all its residents. Watershed protection also means the treatment of watershed lands in accordance with predetermined objectives such as erosion control, stream flow or water yield, and habitat.

Summary of Findings

Below are the major findings in this chapter:

- TDS loading to the Truckee River doubles between East McCarran and Lockwood in large part due to discharges from Steamboat Creek, the North Truckee Drain, and TMWRF. Steamboat Creek is the largest contributor of "pollutants" to the Truckee River. It is anticipated that a reduction in nutrient and sediment load discharges from Steamboat Creek and the North Truckee Drain to the Truckee River will be required. Treatment facilities, improved irrigation practices and/or other measures can significantly reduce this loading to the Truckee River. Full implementation of the Steamboat Creek Restoration Plan would have a significant effect on both the water quality and the flood control issues within the watershed. Not as significant, but certainly measurable and worth addressing, are irrigation and subsurface return flows from areas downstream of the Truckee Meadows.
- Debris and sediment flows from the Gray Creek drainage and other similar creek drainages will continue to affect the Chalk Bluff Water Treatment Facility. Other potential sources of pollution to the Truckee River are wastewater discharges from septic tanks, industrial discharges and chemical spills, and river and stream bank erosion.

- Restoration of the lower Truckee River is proceeding to improve water quality and as a means of floodwater mitigation for the Truckee River Flood Management Project. Currently, the Nature Conservancy has begun a pilot restoration project at the McCarran Ranch. Other potential restoration and preservation sites under consideration are Lockwood Park, the Mustang Ranch, the 102 Ranch and the Ferretto Ranch. Other restoration efforts on the Truckee River within the Pyramid Lake Paiute Tribe Reservation are being addressed by the Tribe.
- The Watershed Assessment report (see Section 5.3) has identified several critical and sensitive tributary reaches that should be addressed. High priority items are TDS loadings to the Truckee River from Alum and Chalk creeks, and protection of Thomas and Whites creeks as drinking water sources.
- The Watershed Management and Protection strategy (see Section 5.3) should be implemented to maintain or improve water quality in our streams and the Truckee River. In order to succeed, the implementation requires five components:
    - Watershed recommendations should be incorporated into city and county policies.
    - The Interlocal Storm Water Committee should accept and incorporate aspects of the plan into storm water management actions.
    - The four land-use planning agencies (Regional, Sparks, Reno, Washoe County) should incorporate development policies that parallel watershed protection and management philosophies.
    - A Watershed Facilitator is needed to help implement this Plan, apply for grants to help fund plan objectives and coordinate efforts with advisory boards that implement this plan with actions that are specific within their boundaries.
    - Neighborhood and Citizen Advisory Boards should be willing to participate in this plan. A list of watershed priorities has been developed and can be achieved through a Watershed Facilitator. Water quality and restoration efforts can be achieved through local agencies and public involvement.
- The Truckee Meadows Storm Water Permit Coordinating Committee was directed to develop, administer, implement and enforce a Regional Storm Water Quality Management Program (RSWQMP). The goal of the program is to implement Best Management Practices (BMPs) and reduce the pollution in urban runoff prior to it entering the permittees storm drain systems, discharging to the Truckee River and its tributaries. Recommendations to several elements of the RSWQM plan should be implemented.
- Areas of southern Washoe County that currently support natural and incidental groundwater recharge are rapidly being developed. Increased areas of impermeable surfaces due to urbanization and high-density rural development have lead to a trend of diminishing groundwater recharge in these areas. To mitigate the reduction in natural and incidental recharge, new policies, procedures and programs will need to be developed and implemented to optimize and balance the use of surface water and groundwater resources of the Truckee Meadows.
- Septic tank effluent contamination of groundwater continues to affect areas of New Washoe City, Spanish Springs, the North Valleys, and Warm Springs. Mitigation options such as public sewers or advanced treatment septic systems appear to be the most feasible solutions. Plans for sewering portions of Spanish Springs and Verdi will help to eliminate the bulk of nitrate sources. Wellhead Protection Plans (WHPPs) may assist in these efforts.
- Within the Central Truckee Meadows Remediation District, groundwater contaminated by the chlorinated organic solvent perchloroethylene (PCE) has not yet been entirely

characterized. PCE contamination has affected 11 TMWA wells. Five wells have consistently exceeded the drinking water standard for PCE (5 ug/l) and have been equipped with air strippers that effectively remove the contamination allowing them to remain online. The other six affected wells have exhibited PCE concentrations to date that are below the standard. PCE contamination may also spread to affect additional wells.

General Discussion on Truckee Meadows Watersheds, Water Quality and Pollution

A watershed consists of all land enclosed by a hydrologic drainage divide that drains to a particular point on a stream or river, or into a lake or wetland, incorporating both surface and groundwater. Watersheds typically cover tens to hundreds of square miles and may span several political jurisdictions. As watersheds are urbanized, the activities of people living there can have major effects on the health of both the urban watershed and its waterways.

In an undeveloped watershed, precipitation in the form of rain and snowmelt runs off the land into streams or seeps into the soil replenishing groundwater, or surfaces further downstream. As areas are urbanized, the increased impervious cover results in more runoff and higher flows. Changes in stream morphology and flow increase stream temperature by the elimination of trees and shrubs from the stream bank and by the widening of the stream. In the Truckee Meadows, this urban runoff travels through storm drains directly into streams untreated and ultimately makes its way into the Truckee River. As runoff moves through fields, streets, and suburban yards, it collects soil particles, pesticides, fertilizers, animal wastes and other pollutants such as road salt and oil. To distinguish such diffuse runoff from point sources such as factory pipes, contaminated runoff and recharge are referred to as “non-point source pollution”.

Pollutants in urban storm water runoff, including solids, oxygen-demanding substances, nutrients, pathogens, petroleum hydrocarbons, metals and synthetic organics, are often present in greater concentrations than might be found in domestic wastewater after secondary treatment. These pollutant loadings can have a significant impact on urban streams and watersheds.

Many point sources of pollution are effectively controlled and regulated through the Clean Water Act, and much progress has been made in controlling direct discharges into our water bodies. Non-point sources of pollution, however, are less easily identified, more difficult to control, and are now the focus of many water protection activities based on a watershed scale. Protecting watersheds provides economic benefits, recreation, flood prevention, scenery, and overall quality of life. All of our drinking water sources are affected by the condition of the watershed. Present and future development has the potential to pollute the Truckee River, our main source of drinking water, above the Chalk Bluff and Glendale Treatment Plants. Groundwater is also affected by watershed activities, both the condition of its quality and its quantity.

The following sections focus on existing and recommended programs to ensure the health of the Truckee Meadows watershed and its water quality.

5.1 Truckee River

The Truckee River is a shared resource not only within the Truckee Meadows, but also among upstream users in California and downstream users such as the Pyramid Lake Paiute Tribe, as the terminus of the Truckee River is Pyramid Lake, and the Truckee Carson Irrigation District for large scale irrigation in the Fernley and Fallon area. Water quality issues are therefore important for all users. This section addresses the major concerns and efforts.

5.1.1 Water Quality Issues Specific to the Truckee River

General Statements

Maintenance of Truckee River water quality and meeting water quality standards, as discussed in Chapter 3, is expected to involve the control of non-point source pollution more in the future than in the past. Identified sources of non-point source pollution include:

- Agricultural return flows from Steamboat Creek and the North Truckee Drain
- Debris and sediment flows from the Gray Creek drainage and others
- Wastewater discharges from septic systems
- Industrial discharges and chemical spills
- River and stream bank erosion from development and storm water discharges

It is anticipated that a reduction in nutrient and sediment load discharges from Steamboat Creek and the North Truckee Drain to the Truckee River will be required. Treatment facilities, improved irrigation practices and/or other measures can significantly reduce this loading to the Truckee River. Not as significant, but certainly measurable and worth addressing, are irrigation and subsurface return flows from areas downstream of the Truckee Meadows.

The Truckee River is infrequently “polluted” from debris and sediment flows, primarily from the Gray Creek drainage basin. This can impair surface water treatment plants depending on the severity of sediment and treatment plant design. It is a natural situation that will not be eliminated. Therefore, the plan addresses improvements at treatment plants, the development of groundwater facilities, and treated water storage to offset surface water system demands until the sediment loading of the Truckee River returns to manageable levels. This planning can also serve in cases of pollution to the Truckee River from chemical spills.

Water Chemistry

A substantial effort to monitor Truckee River water quality has been in place for at least two decades. This is in part due to TMDLs that have been in place since 1994. Table 5-1 is an attempt to show the range in TDS loading from various sources during low flows (2001) and high flows (1998). The values listed in units of concentration (grab samples), flows (averaged daily averages) and loadings (calculated) have uncertainties that may exceed 20%. Flows and loadings do not add up to those calculated at Lockwood. Values used for 2001 represent low flow conditions (34% of normal precipitation) and values used for 1998 represent high flow years (118% of normal precipitation).

Table 5-1
Example of Average Total Dissolved Solids Loading to Truckee River

Truckee River or Tributary Discharge Site	Average TDS Concentration mg/l		Average Flow cfs		Average Loading lbs/day		Range in Percentage of Loading	
	2001	1998	2001	1998	2001	1998	low flow	high flow
Truckee River at E. McCarran	76	73	412	1,267	169,000	499,000	46	45
N. Truckee Drain	471	392	9	9.3	23,000	20,000	6	2
Steamboat Creek	394	364	29	179	62,000	351,000	17	32
TMWRF[1]	330	370	25	30	45,000	60,000	12	5
Truckee River at Lockwood	145	124	467	1,636	365,000	1,094,000	81	84

Notes: [1] TMWRF online database

This table indicates that the TDS loading to the Truckee River doubles between East McCarran and Lockwood most significantly due to contributions from Steamboat Creek (17-32% increase), and to a lesser degree, the North Truckee Drain (2-6% increase), and TMWRF (5-12% increase).

Table 5-2 displays TMDL constituents for various reaches of the Truckee River. This table further illustrates the impact of water quality degradation to the Truckee from various "pollutant" sources between Farad and Lockwood. The TDS concentration doubles at Lockwood from the average value found at East McCarran due to Steamboat Creek, the North Truckee Drain and TMWRF discharges. Total phosphorus and total nitrogen increase in order of magnitude. It is clear that while TMDLs are still being met, non-point and point sources of nitrogen, phosphorus and TDS still need to be controlled.

Table 5-2
Water Quality for Truckee River

	Minimum, mg/l	Date of Minimum	Maximum, mg/l	Date of Maximum	Annual Average, 1988 – 2000, mg/l
Truckee River at Farad					
TN	0	9/3/97	1.08	12/6/95	0.32
TP	0.005	3/1/95	0.101	6/28/97	0.02
TDS	48	6/5/91	148	11/2/94	75
Truckee River at E. McCarran Blvd.					
TN	0.003	10/16/00	1.78	3/5/91	0.32
TP	0.001	12/4/01	0.036	3/5/91	0.03
TDS	44	7/11/95	175	12/5/90	84
Truckee River at Lockwood					
TN	0.2	3/10/99	11.72	9/22/88	1.16
TP	0.03	5/16/95	0.58	9/4/90	0.11
TDS	63	6/16/95	440	9/19/94	160

Source: NDEP data set from 1988 to 2000

Pollution and Problem Areas

Existing water quality should be improved or maintained for several reasons:

- First and foremost is that the Truckee River is our main source of public drinking water.
- To meet the water quality standards or TMDLs set for the Truckee River. If the water quality of tributaries to the Truckee River degrades, the Truckee River also degrades and TMDLs could be seriously impacted. Exceeding TMDLs could result in this community having to construct and operate expensive water quality treatment plants in order to meet the TMDLs. Conversely, improving the water quality in the Truckee River, especially near Steamboat Creek and North Truckee Drain confluences with the Truckee River, could result in negotiations of the TMWRF discharge permit in terms of pollutant trading. This could significantly reduce future costs at TMWRF.
- There is increasing pressure from the EPA to meet water quality standards for these tributaries. By meeting these standards or goals, the community can avoid having TMDLs set for these tributaries.
- Aquatic and riparian habitats are negatively impacted by the degradation of water quality. An increase in algal growth will occur with increases in nutrients (nitrogen and phosphorus) that can overwhelm the stream channel. Algal growth is not only unsightly, but destroys the natural aquatic life.
- The fact that we are able to improve the water quality makes it a good reason.

Tables 5-1 and 5-2 show convincingly that the major contributors to the water quality degradation of the Truckee River are Steamboat Creek, TMWRF and the North Truckee Drain. The following section describes current efforts to improve the quality of the Truckee River and tributaries.

5.1.2 Current Watershed Management Efforts

This section summarizes current efforts in surface water management that include flood control, flood plain management, storm water quality management, Steamboat Creek restoration, and TDS pollutant trading efforts.

Truckee River Flood Control

The Army Corps of Engineers (Corps) and this community have pursued a solution to flooding on the Truckee River over the last 35 years, as described in Chapter 4. In order to develop a consensus for a flood plan with public input, Reno, Sparks and Washoe County created the Community Coalition for Truckee River Flood Management, which works in cooperation with the Corps. The Coalition Concept Plan recognizes four major elements:

- Structural solutions that return the river to a more natural state
- Restoration to create a "living" river and river parkway areas in the Truckee Meadows
- Mitigation of flood waters downstream of Sparks through river restoration
- Flood plain management to protect the flood control investment

The recommended Flood Management Plan includes measures to restore the Truckee River as a "living" river. According to geomorphologists (surface water scientists), rivers can be revitalized using techniques that fit with their natural tendencies:

- Stable slopes, depths and widths throughout their course
- Native riparian vegetation that reduces bank erosion and improves water quality
- Habitats for river wildlife
- River meanders and an intermediate flood plain that dissipate flood velocities
- Natural channels that cool water for fish and increase water flows
- Natural pools, riffles, sandbars and gravel beds that build a naturally uneven river bottom for fish and aquatic life

These are the geomorphic qualities envisioned for the Truckee River and also those sought for the tributaries to the Truckee River.

Flood Plain Management

A major reason for watershed protection is to ensure the proper management of storm water and floodwater. This community is currently investing significant monies and efforts towards constructing flood control works on the Truckee River. This effort is primarily being funded through the US Congress. However, the Corps "mandates" that the community provide protection for the flood control program. This can be accomplished through flood plain management. This type of management will:

- Reduce storm water runoff to the river and thereby reduce flood impacts in the Truckee Meadows and downstream to Wadsworth
- Control sediment accumulation in the Truckee River and its tributaries
- Reduce erosion along the Truckee River and its tributaries
- Provide for flood protection upstream of the Truckee River

The Regional Flood Plain Management Strategy (RWPC, 2003) was formulated by a technical advisory committee with input from interested parties. This Strategy addresses flood control and protection to the tributaries of the Truckee River through preservation of their flood plains. The Strategy is more thoroughly discussed in Chapter 4.

Water Quality Settlement Agreement

The Truckee River Water Quality Agreement of 1996 settled longstanding litigation between the Pyramid Lake Paiute Tribe and the EPA, State of Nevada and the Cities of Reno and Sparks (see Chapter 7). A key element of this agreement was a commitment by the Cities and the Department of the Interior to spend up to $24 million to purchase Truckee River water rights, particularly within the State of Nevada. Purchased water would subsequently be stored in upper basin reservoirs for release under low flow conditions to help the Cities meet water quality objectives, particularly those related to nutrients and dissolved oxygen. As of April 2003, 4,150 af of Truckee River water rights have been purchased.

Source Water Assessment for the Truckee River and Lake Tahoe in Northern Nevada

According to the 1996 amendments to the Safe Drinking Water Act, every public water system (PWS) serving more than 20,000 residents must complete a source water assessment. These assessments are meant to provide opportunities and tools to protect drinking water at its sources through the identification of contaminants and activities that potentially threaten public drinking water systems. Recently, an assessment was made on the Truckee River from Lake Tahoe to the Reno-Sparks corporate boundary. The study results indicated that a contaminant spill from either the railroad or highway poses the most significant threat to both the Truckee River and Lake Tahoe drinking water sources. Other potential sources of contamination (PCAs) observed include storm drains, sewage transfer stations and businesses. The report can be viewed at the State Health Division, Bureau of Health Protection Services in Carson City.

Non-Point Source Pollutant Trading

Non-Point Source Pollutant Trading is a concept being promoted by the EPA and the State of Nevada. The main thrust of this concept, for the Truckee Meadows, is for future TMWRF discharges. If pollution sources to the Truckee River can be mitigated, there is the potential for TMWRF to be credited with higher discharge concentrations, such as for TDS. There would be a net benefit to the river by this action.

The City of Reno has taken a lead role in water quality trading programs. River and watershed models (DSSAMt, WARMF and HSPF) have been developed to simulate Truckee River and Steamboat Creek for non-point source pollution identification. These provide the basis for watershed and water quality modeling frameworks that will be used to develop water quality trading programs. More discussion can be found in Section 3.2.1, Viability of Water Quality Trading.

Investigations have been directed to the Wadsworth area where groundwater discharges have been identified that are relatively high in TDS (Desert Research Institute (DRI), 2001). This project investigated other pollutant sources within the Wadsworth area as well as within the Truckee Meadows. Potential sources of TDS trading within the Truckee Meadows are Steamboat Creek, North Truckee Drain, and Chalk Creek. Watershed Management efforts may also assist in securing cost savings to TMWRF in the future.

5.1.3 River and Stream Restoration

This community is actively engaged in restoration efforts on the Lower Truckee River and within the Steamboat Creek watershed (see Figure 5-1). Restoration efforts are necessary in areas where, in the past, the natural streams have been altered for flood control or irrigation purposes. In many locations, such alterations to waterways have eliminated flood plains and meanders. This has caused steeper stream gradients, bank erosion, channel down cutting, lower stream bed elevations and lower groundwater tables. Without a higher water table and frequent flood plain inundation, the natural habitat died including riverine forests that kept water temperatures cool and provided habitat for wildlife. The streams now are commonly shallow and fully exposed to the sun, which contributes to increased water temperatures. Increased temperatures decrease the amount of oxygen dissolved in the water that supports the native habitat. The results of all this has lead to the non-functional river and stream reaches observable in the region today.

Lower Truckee River Restoration

Recent studies have demonstrated that there are opportunities for various entities with interest in the lower river to work together to improve water quality through river restoration, flow augmentation, water quality trading and other non-point source pollution reductions. The Cities of Reno and Sparks have been leaders in implementing non-structural programs on the Truckee River to pursue these opportunities. As a result, TMWRF may be able to compensate for additional nitrogen and total dissolved solids loads discharged to the river. Potential water quality trading projects that could help achieve water quality standards include those that improve the Truckee River morphology or channel environment. This long-term effort requires changing land management practices that have contributed to or caused river degradation in addition to providing sufficient water for in-stream flows. Because the channel is in a degraded state, it is very sensitive to changes in nutrients and temperature. Successful efforts directed toward improving the channel condition and creating habitat for spawning will result in a river that is less sensitive to changes in nutrient loading and able to provide habitat to support identified beneficial uses. An increase in river flows would result in the river being better able to assimilate nutrient loads.

The Corps and Washoe County have proposed a flood control alternative that would increase the rate of Truckee River floodwaters downstream of the Truckee Meadows. There is also an expected increase in erosional damage from these events. In order to mitigate these floodwaters, the Corps is interested in river restoration efforts on the lower Truckee River. Restoration efforts would include:

- Increasing the river sinuosity to help reduce floodwater velocity
- Reconnecting the flood plain to the river to reduce flood flow depths, velocity and scour
- Re-vegetating the banks and flood plains to reduce erosion of the banks and soils
- Increase the flood storage of reaches to attenuate flood peaks

There is a regional collaborative effort to restore the lower Truckee River below Vista. The three local governments and the Tribe have signed a Memorandum of Understanding supporting the multiple goals to be achieved through river restoration. The Memorandum of Understanding generally describes the benefits, goals and management principles that the major stakeholders agree are necessary to develop a comprehensive program to restore the

lower Truckee River. The lower river, running from the Truckee Meadows metropolitan area to Pyramid Lake, is a vital natural resource that serves multiple public and private purposes.

An unprecedented opportunity exists for interagency collaboration to achieve multiple public goals. The lower river falls under the jurisdiction of multiple local, state, and federal agencies and units of government, and involves multiple private landowners. To successfully take advantage of this opportunity, public agencies and private landowners need to cooperate and coordinate their river restoration activities. This statement of public benefits, goals, and management principles agreed upon by key lower-river stakeholders, represents a common understanding and foundation from which more detailed work programs may be pursued with a high likelihood of success.

These goals and benefits are:

Public Benefits:

- Recreation, open space, fishing, non-motorized boating and activities that are fundamental to the region's quality of life
- Water quality and the related wastewater treatment capacity of the region, which is fundamental to economic growth
- Attenuation of peak flood flows for public safety and to protect private and public property and infrastructure
- Habitat and wildlife benefits for fish, birds, mammals and plant communities that are part and parcel of our region's natural heritage

Public Goals:

- Mitigation of flood flows
- Cost-effective wastewater quality treatment
- Public recreation opportunities that are high quality, easy to access and ample in number
- Preservation and restoration of aquatic and terrestrial habitat in the river corridor

Management Principles:

- The goals of public recreation, water quality, flood attenuation, and habitat restoration are, by and large, compatible
- Planning and implementation efforts for any single public goal (e.g. flood protection) in the lower river corridor shall consider and be consistent with other public goals, private interests, regional economic growth and preservation of tax revenue and public fiscal capacity
- Coordination of lower river activities is highly desirable to achieve economies of scale and avoid potential conflicts

Collaboration and cost sharing by and between agencies and land owners will, in many instances, help achieve the greatest benefits in the most cost-effective manner. As a result of these efforts, the RWPC has adopted the following policy:

Policy 3.1.d: Truckee River Restoration

In review of proposed projects and proposed land use changes within the areas identified for restoration in Exhibit A, the local governments shall make findings supporting the implementation of potential restoration projects as identified in the Lower Truckee River Restoration Plan or the Truckee River Flood Management project being developed in conjunction with the Corps of Engineers.

Currently, the Nature Conservancy has begun a pilot project on the Truckee River at the McCarran Ranch. Other potential restoration and preservation sites are Lockwood Park, the Mustang Ranch, the 102 Ranch, and the Ferretto Ranch. Other restoration efforts on the Truckee River within the Pyramid Lake Paiute Tribe Reservation are being addressed by the Tribe.

Steamboat Creek Restoration

Several studies based on water quality monitoring data have shown that Steamboat Creek is the major source of non-point source pollution to the Truckee River. The pollution contribution results from bank erosion, geothermal mineral deposits and the cumulative impacts of human activities throughout the watershed. Steamboat Creek emanates from Washoe Lake flowing through Pleasant Valley, Steamboat Valley, and along the eastern edge of the south and central Truckee Meadows before discharging to the Truckee River. The Steamboat Creek Restoration Master Plan (Codega, 2000) is a guide for policy makers, landowners, developers, and citizens with interest in improving water quality and conserving riparian zones. The plan recommends BMPs for specific reaches of Steamboat Creek and its tributaries, provides design recommendations to establish continuity between restoration projects, increases public awareness and also provides recommendations for public policies and implementation strategies for both developers and private property owners.

Currently, the Washoe-Storey Conservation District's (WSCD) main focus is to leverage state and private support to implement stream restoration projects in the Steamboat Creek / Truckee River Watershed. WSCD has already completed the planning and development of the Steamboat Creek Restoration Master Plan as well as securing the necessary permits and landowner participation to implement restoration projects. To date, several projects have been initiated or completed:

- Steamboat Creek Restoration at Andrew Lane
- Evans Creek Restoration at Anderson / Bartley Ranch Park
- Hidden Meadows / University Farms reach of Steamboat Creek
- Proposed UNR Farms Stream Restoration Project
- Public Outreach

Full implementation of the Steamboat Creek Restoration Master Plan would have a significant effect on both the water quality and the flood control issues within the watershed. The plan includes a summary and analysis of both existing and planned land uses in the drainage area, a listing of different BMPs available to improve the quality of water within Steamboat Creek, and policy and implementation guidelines for planned and future development within the Steamboat Creek watershed. In addition to this information, the Steamboat Creek Restoration Plan also offers a reach-by-reach analysis of the individual sections of Steamboat Creek. These analyses offer a summary of the water quality concerns, opportunities, and constraints for each reach, and conclude with recommendations for possible restoration practices on each reach. As

identified earlier in this section, two of the most important concerns on Steamboat Creek are flood control and dissolved solids concentration.

In its current state, much of Steamboat Creek is an incised straightened channel, acting as an unstable gully passing water and associated pollutants directly to the Truckee River. In many areas, restoration of Steamboat will involve the excavation and re-vegetation of new flood plains. As pollutant-laden water spreads out across a restored vegetated flood plain at average annual flows, it will slow down, sediment will settle out and more water will percolate into the ground, diminishing downstream peak flood flows and improving recharge. This process along with increased pollutant uptake by riparian flood plain vegetation acts as a bio-filtration process. TDS will be sequestered in the flood plain soils and vegetation, but more importantly, TDS stored in soils that would have been released by erosion or by leaching as water drains to a lower elevation will be retained in soil that does not erode nor leach.

By creating riparian flood plain corridors, re-meandering and re-vegetating Steamboat Creek, the banks will erode less. A joint study between UNR, the City of Reno, WSCD and the Corps based on the confluence of Steamboat and the Truckee is investigating the feasibility of such restoration. The design of this project will allow ordinary high water to access a vegetated flood plain annually for weeks or months in most years, thus improving wetland habitat, stabilizing stream banks, attenuating flood flows and reducing TDS, especially forms of nitrogen and phosphorus that contribute to excess algal growth in the Truckee River.

In addition to flood plain riparian vegetation, emergent standing water wetland plants are able to uptake significant amounts of dissolved salts without adversely affecting the health of the plant community. The Rosewood reach, between Pembroke Drive and Mira Loma Drive, has the potential to include a significant wetland area. The reach contains an existing degraded natural wetland area along the west side of the stream, which could potentially be utilized as a BMP to remove both suspended and dissolved solids from the stream.

For flood control concerns, the more urbanized reaches of the Steamboat Creek watershed are more significant than other areas. A developed watershed with high percentages of impervious cover will generate significantly greater runoff rates than an undeveloped area of similar slope and geology. Because much of the Steamboat Creek watershed falls into this category, it is important to consider flood control questions when evaluating and selecting restoration projects. Between Damonte Ranch and Curti Ranch, for example, much of the area is zoned high-density suburban, low-density urban, or commercial. The impervious surfaces created by the development in these zones can greatly increase runoff rates and result in higher peak flows from flood events. These areas are of the greatest concern for flood control.

Agricultural lands south and north of the Huffaker Hills stand poised for residential and commercial development. Steamboat Creek courses through these lands, often flooding them. On these lands there exists the opportunity to reshape the morphology of this creek to provide flood protection and water quality improvement, not only to Steamboat Creek, but to the Truckee River.

5.2 Truckee River Tributaries

During 2001 the RWPC initiated a cooperative effort to develop a watershed protection program for the Truckee Meadows. WCDWR, UNRCE and WSCD began that effort in December of 2001. The objectives were to determine the current health of Truckee River tributary streams through a water quality assessment process, set goals and objectives, and then develop a

management plan with action items aimed at preserving or improving water quality throughout the watershed.

Sub-watersheds, which generally include one main stream, are small enough to allow monitoring, mapping, and other watershed assessment processes within a reasonable amount of time. The condition of the streams themselves is often a good indicator of water quality. The following sub-watersheds of the Truckee River, encompassing the jurisdictions of Reno, Sparks, and Washoe County, were selected for this program, as depicted in Chapter 2, Figure 2-1:

- **Northern Carson Range - Peavine Creeks:** Hunter, Alum, Peavine, Unnamed (Mogul), Chalk, Evans, Dog, Sunrise, and Bull Ranch
- **Washoe Valley Creeks:** Jumbo, Davis, Ophir, Winters, Lewers, Franktown, McEwen and Muskgrove
- **North Truckee Drain**
- **South Truckee Meadows Creeks:** Galena, Whites, Thomas, Bailey, and Browns

Watersheds not tributary to the Truckee River that have not been addressed include Cold Springs Valley, Lemmon Valley, Warm Springs Valley and portions of Spanish Springs Valley.

5.3 Watershed Assessment

The RWPC published an assessment report "Watershed Assessment for Tributaries to the Truckee River" (Widmer and Jesch, 2002). This was done to provide the community a report card on the condition of urban tributary creeks. This report contains substantial mapping of geographic information and stream surveys noting the condition of the various stream reaches that can be used to trace the sources of watershed problems.

The assessment includes geographic and hydraulic descriptions of the streams, physical descriptions in terms of the geology, soils, slope, wetlands, areas prone to flooding, vegetative cover, and land use. Sanitary surveys were conducted to locate, within 300 feet of streams, potential sources of pollution such as hazardous material, landfills, road de-icing material, pesticides and herbicides at golf courses, and large concentrations of septic tanks. Limited water quality sampling was also undertaken. Most attention was given to the larger, perennial streams.

5.3.1 Stream Surveys

During January and February 2002, several reaches of each stream were assessed for functionality using methods described by the US Bureau of Land Management (BLM) (1988) and rated as "Properly Functioning", “Functioning at Risk”, and “Non-Functional” based on loss of habitat, excessive erosion and water quality degradation, development encroachment, and invasive plant species (Tall Whitetop). A "Critical" rating in this report reflects a reach where the stream is no longer functioning properly. “Sensitive” sections refer to a "Properly Functioning Stream at Risk" meaning the stream could easily slip to "Critical" without proper land use. The results were mapped for individual study areas and are shown in Figures 5-2 through 5-5.

Section 4.4 of the Watershed Assessment for Tributaries to the Truckee River (Widmer and Jesch, 2002) discusses action items to improve tributary conditions and to improve water quality. Table 5-3 is a list of priority water quality and stream restoration projects. It is

reformatted from the assessment's Tables 4.1-4.3 and recommends potential lead agencies to restore these site-specific reaches. Priorities are subjectively given as high, moderate and low. A high priority considers the immediate water quality impact to the Truckee River or future drinking water sources such as Thomas and Whites Creeks. Moderate priorities are given to concentrated sources of total suspended solids (TSS) and nutrient loads to tributaries. Low priorities are given to projects that restore stream functionality to streams that have been altered for flood control and drainage.

Stream management and restoration methods are summarized for each of the priority reaches. Further detail and explanation can be found in Section 4.2 of the report. The final column lists potential lead agencies that could provide project management as well as exploring federal and state grant opportunities. These items have neither a funding mechanism nor are they all considered "inexpensive". However, funding many of these action items is important in terms of improving water quality, protecting road infrastructures, protecting land from further erosion, and protecting residences from flooding.

Chalk Creek represents a water quality problem as its TDS level has been measured at 3,000 mg/l and flows regularly at one cfs. This is an excellent site for non-point source pollution trading for the benefit of TMWRF and this community. Chalk Creek also becomes a flood control problem for TMWA and their facilities. Therefore these two agencies are listed as potential lead agencies.

Whites and Thomas Creeks will soon become sources of drinking water supply. The RWPC is listed as the potential lead agency for public education efforts led by the Watershed Facilitator. Alum Creek is listed as a high priority because of its relatively poor water quality (nutrient loads) that can be improved for the benefit of the Truckee River. Reducing nutrient loads to the river helps TMWRF in their efforts to meet Truckee River TMDLs.

Nutrient and TSS loads to the Truckee River are found coming from the Sunrise watershed, lower Galena Creek in Pleasant Valley, and Muskgrove Creek. Washoe County and the Watershed Facilitator could work together in an effort to mitigate this problem. Private property and roads are threatened on Dog, Jones, and Whites Creeks, which are rated moderate. Washoe County and Reno are proper lead agencies, as improvements to these creeks will reduce this risk. Jumbo Creek is subjected to storm water and road encroachment problems that are currently being addressed by the BLM and Washoe County. Jumbo Creek could become a local water amenity through restoration efforts and reduction of the detrimental effects of storm events.

Stream restoration efforts are needed on Evans Creek, Dry Creek, and the north fork of Whites Creek in order to protect private property and to reduce sediment loads (TSS). These represent difficult challenges because of the encroachment of buildings and roads, but solutions are proposed in Chapter 4 of the assessment report.

Moderate priorities are given to the realignment of the lower reaches of the North Truckee Drain and Steamboat Creek. These projects will require extensive restoration and represent large community challenges. However, they represent the biggest sources of nutrient, TDS and TSS to the Truckee River. Efforts to reduce these pollutant loads can clear many hurdles for the future growth of the community in terms of wastewater discharge to the Truckee River.

Finally, low priority is given to restoring the flood and drainage conveyance structures of Boynton Slough, Dry Creek, and Thomas Creek. These drainages are located in the valley floors and are viewed, by some, as eyesores particularly where Tall Whitetop has completely enveloped them. A long-term, visionary program to restore a dual functionality as streams and flood conveyance could have large appeal to the community. Rather than eyesores, they could become natural resource amenities lined with native vegetation and cottonwood canopies. Such projects would also increase property values and attract commercial investment. However, funding for this type of restoration represents a big challenge to the community.

Table 5-3
Priority List of Water Quality and Stream Restoration Projects

Tributary	Priority	Storm water runoff treatment	Reduce chemical applications	Encourage riparian buffers	Public education	Reduce animal impacts	Enforce construction site BMPs	Control building encroachment	Control road encroachment	Create flood plain (excavate)	Shape banks	Install toe protection	Implement soil bioengineering	Entity
Chalk 3	H	X	X		X				X					TMWA, TMWRF
Whites S Fork 2	H			X				X		X	X		X	WC
Thomas 4	H			X	X	X	X	X	X				X	WC, RWPC
Alum 3	H		X	X	X									TMWRF, RWPC
Alum 1	M		X	X	X		X							ISC
Sunrise	M	X			X	X						X		RWPC, NDEP, WC, TMWRF
Dog 2	M				X			X	X			X	X	WC
Jones 2	M									X	X		X	WC
Galena 4	M			X	X	X				X	X		X	WC, RWPC
Muskgrove 2	M		X	X	X	X		X		X	X			WC, RWPC
N. Truckee Drain 4	M	X	X		X		X			X	X			Corps, Sparks
Dry 2	M	X		X	X	X	X				X		X	Reno
Steamboat	M	X		X	X					X	X	X	X	Corps
Jumbo	M				X			X	X	X	X	X	X	WC, BLM
Whites N. Fork 2	M	X	X	X	X		X	X	X	X	X		X	WC, Reno
Evans 2, 3	L	X			X	X	X	X		X	X		X	Reno
Thomas S. Fork	L			X				X		X	X		X	Reno
Boynton	L	X		X	X			X		X	X		X	Reno
Dry 4	L			X						X	X			Reno
Unnamed (Mogul)	L	X	X	X	X		X	X	X		X	X	X	ISW

Notes: Stream reaches may be numbered from most upstream location (1) to downstream location (2, 3 or 4)
ISW: Interlocal Storm Water Committee
NDEP: Nevada Division of Environmental Protection
RWPC: RWPC (through Facilitator)
TMWA: Truckee Meadows Water Authority
TMWRF: Truckee Meadows Water Reclamation Facility
Corps: US Army Corps of Engineers
BLM: US Bureau of Land Management
WC: Washoe County

H: High Priority M: Moderate Priority L: Low priority

Source: Watershed Assessment for Tributaries to the Truckee River (Widmer and Jesch, 2002)

5.3.2 Tributary Water Quality

Steamboat Creek

Steamboat Creek is the largest tributary to the Truckee River in the Region. It is also the major source of pollution to the Truckee River. The quality of Steamboat Creek degrades from relatively clean water to relatively polluted water along its fifteen-mile course from Washoe Lake to the Truckee River. This is shown in the following table by tracking TDS downstream from Washoe Lake.

Table 5-4
Bi-Monthly Water Quality Data for Steamboat Creek, Above and Below Confluence with Galena, Whites and Thomas Creeks

	Minimum, mg/l	Date of Minimum	Maximum, mg/l	Date of Maximum	Annual Average, 1988 – 2000, mg/l
SB3: Steamboat Creek in Pleasant Valley upstream of confluence with Galena Creek (Class C)					
TN	0.14	8/16/94	1.8	8/8/00	0.632
TP	0.04	12/7/93	0.8	8/8/00	0.183
TDS	121	12/5/98	372	8/8/00	209
TSS	1	12/5/89, 2/13/01	90	4/10/00	14.7
SB7: Steamboat Creek at Geiger Grade downstream of confluence of Galena Creek and upstream of confluence with Whites and Thomas Creeks (Class D)					
TN	0.19	8/14/01	2.05	10/6/93	0.610
TP	0.11	6/13/95	0.88	8/14/91	0.304
TDS	111	6/13/95	1871	10/13/92	518
TSS	0	8/14/01	86	10/6/93	16.6
SB11: Steamboat Creek at Short Lane downstream of confluence with Whites and Thomas Creeks (Class D)					
TN	0.3	6/10/97	2.8	6/5/90	0.989
TP	0.12	10/13/98	0.96	6/5/90	0.351
TDS	151	6/13/95	1362	2/10/98	646
TSS	3	6/7/94	238	6/5/90	40.1
Steamboat Creek upstream of Truckee Meadows Water Reclamation Facility (class D)					
TN	0.228	11/08/88	4.06	1/09/95	1.30
TP	0.134	10/13/86	0.799	3/25/98	0.27
TDS*	173*	7/11/95	674*	10/14/92	360*
TSS	NA	NA	NA	NA	NA

Notes: *This row uses 1992 to 2000 data only whereas other data are from 1988 to 2000.

Source: NDEP

TDS increases from Pleasant Valley (209 mg/l) to Geiger Grade (518 mg/l). An increase continues through the South Truckee Meadows to Short Lane Road (646 mg/l), and along the eastern edge of the Central Truckee Meadows to the confluence with the Truckee River (360 mg/l). The sources of the pollution are farming and livestock activities adjacent to the creek, poor quality groundwater and geothermal discharges to the creek, and discharges from Yori, Rio Poco and Boynton drains.

North Truckee Drain

The North Truckee Drain originates in Spanish Springs Valley. Well over 100 years of farming with Orr Ditch water created the need for the drain. The City of Sparks has used the drain for storm water discharges and has developed the drain locally as a public amenity. However, water quality could be improved, especially in the reach south of Interstate 80. Table 5-5 lists the water quality of the drain at the confluence of the Truckee River where the average TDS concentration is 390 mg/l. Flows average 15-25 cfs.

Table 5-5
Water Quality of North Truckee Drain

	Minimum, mg/l	Date of Minimum	Maximum, mg/l	Date of Maximum	Annual Average, 1985 – 2001, mg/l
TN	0.608	9/22/98	3.48	4/21/98	1.63
TP	0.01	11/13/00	0.413	1/21/97	0.144
TDS	149	09/15/97	1039	2/8/99	390

Source: TMWRF data set.

Steamboat Tributaries

In addition to the one-time samples collected for this study (see Widmer and Jesch, 2002), limited water quality data is available for most of the tributaries. Bi-monthly sampling data from NDEP is available for Galena Creek, Whites Creek and Thomas Creek. Data from samples collected at the mountain front from October 1987 to April 2001 are presented in Table 5-6. The data can be used to compare water quality in these three creeks at this relatively “pristine” point to water quality standards for class waters and water quality standards for the Truckee River as set forth in NAC445A.

Table 5-6
Bi-Monthly Water Quality Data, Mountain Front Sampling Points

	Minimum, mg/l	Date of Minimum	Maximum, mg/l	Date of Maximum	Annual Average, 1988 – 2000, mg/l
Galena Creek					
TN	0.17	6/5/91, 9/8/93, 6/13/00	1.14	2/2/99	0.45
TP	0.02	12/2/91, 7/7/93, 4/9/97	0.12	8/10/99	0.04
TDS	49	6/15/99	147	2/15/95	97
TSS	0	12/7/93, 4/14/98, 10/10/00	40	4/9/96	7
Whites Creek					
TN	0.08	10/13/92	0.67	6/8/93	0.27
TP	0.02	Numerous	0.19	6/15/99	0.04
TDS	37	6/10/97	85	4/8/89	62
TSS	0	2/12/97, 8/12/97, 4/14/98	131	6/15/99	13
Thomas Creek					
TN	0.1	10/9/90	1.02	8/13/96	0.32
TP	0.04	Numerous	0.12	9/8/93	0.06
TDS	55	6/15/99	107	2/15/99, 8/11/98	88
TSS	0	2/12/97	32	8/7/90	9.5

Source: NDEP

Average annual values of total nitrogen (TN), total phosphorus (TP) and total dissolved solids (TDS) are highest for Galena Creek; average annual total suspended solids (TSS) is highest for Whites Creek. While all values conform to the Class A water standards, as a point of comparison, average annual TN for Galena Creek and Thomas Creek exceeds the requirements to maintain existing higher quality for the Truckee River at East McCarran (≤0.3 mg/l). The single value is also exceeded (≤0.43 mg/l) in all three creeks. Water quality standards, including those for class waters beneficial use standards and requirements to maintain existing higher quality, are located in NAC 445A.118-226.

Other Tributaries

There is little water chemistry data for creeks not already discussed. During the autumn of 2001, water chemistry samples were taken at the confluences with the Truckee River for the creeks listed in Table 5-7. These data represent low flow conditions. Because of the limited size of the data set, more aggressive surveys should be undertaken to better sample normal flow and storm water runoff. Until this is accomplished, the effects of urbanization upon the creeks will be poorly understood. However, the data to date are illustrative of the magnitude of the existing water quality.

Table 5-7
Single Sample Water Quality Data for Creeks Tributary to the Truckee River

Creek	Total Nitrogen mg/l	Total Phosphorus mg/l	Total Suspended Solids mg/l	Total Dissolved Solids mg/l
Lower Dog	0.2	0.03	3	172
Lower Hunter	0.15	0.05	5	116
Lower Alum	0.58	0.11	16	740
Lower Chalk	3.35	0.26	<1	3,080
Dry-Boynton	2.12	0.14	16	374
Lower Thomas	0.78	0.1	21	172
Lower Whites	0.26	0.02	<1	62

Notes: Data for this table are found in the report "Watershed Assessment for Tributaries to the Truckee River" (Widmer and Jesch, 2002)

From this table it is apparent that Alum Creek and particularly Chalk Creek add relatively high concentrations of TDS to the Truckee River. This is the result of changes in land use to agricultural (Alum Creek), residential and commercial development. Differences in land use are also seen in comparing Whites and Thomas Creeks where TDS and TSS are much higher at Thomas Creek due to agricultural activities. Both of these creeks have identical water quality upstream of developed lands. The quality of Boynton Slough is the result of land development drainage to this water body.

5.3.3 Watershed Management and Protection

A guidance document entitled “Watershed Management and Protection for Tributaries to the Truckee River” (Widmer and Donaldson, 2003) has been accepted by the RWPC. Effective implementation of this document will require the assistance of local jurisdictions, agencies, and the community as a whole. Much of the work can be accomplished through educational efforts, changes in development practices, and integrating this plan with storm water management.

Watershed management, storm water management and flood plain management are directly linked to land use planning efforts. In order to succeed, implementation requires five components:

1. Watershed management recommendations should be incorporated into city and county policies.
2. The Storm Water Permit Coordinating Committee should accept and incorporate aspects of the plan into storm water management actions.
3. The four land use planning agencies (Regional, Sparks, Reno, Washoe County) should incorporate development policies that parallel watershed protection and management philosophies.
4. A Watershed Facilitator is needed to help implement this Plan, apply for grants to help fund plan objectives and coordinate efforts with advisory boards that implement this plan with actions that are specific within their boundaries.
5. Neighborhood and Citizen Advisory Boards should be willing to participate in these efforts.

Watershed management and protection priorities and recommendations for Truckee River Tributaries are found in Section 5.6. However, this Section does not explicitly address the Truckee River itself. A formal watershed management and protection plan for the Truckee River should be made a priority that compliments all of the efforts currently underway.

5.4 Truckee Meadows Regional Storm Water Quality Management Program

The RWPC has adopted the following policy in support of the Regional Storm Water Quality Management Program (RSWQMP):

> ***Policy 3.1.f: Adoption of Uniform Storm Water Quality Programs***
>
> *A storm water quality program shall be implemented region-wide, including the continuation and/or enhancement of existing programs in Reno/Sparks/Washoe County, such as the Truckee Meadows Regional Storm Water Quality Management Program, to address not only urban runoff but also other non-point source contributions.*

This section provides a synopsis of the RSWQMP. Recommendations from this program can be found in Section 5.6 at the end of this chapter.

Historical Background

The NDEP issued the first Municipal Storm Water Discharge Permit jointly to the Cities of Reno and Sparks, Washoe County and the Nevada Department of Transportation (the permittees) in 1990. With the City of Reno as the lead agency, the permittees entered into an interlocal agreement and formed the Truckee Meadows Storm Water Permit Coordinating Committee. The purpose of the committee was to define responsibilities and funding options for implementing the required components of the permit, and to submit annual reports to NDEP and the EPA.

In January 2000, the second municipal storm water permit was issued to the permittees by NDEP. Under this current permit, the permittees are directed to develop, administer, implement and enforce a RSWQMP. The goal of the program is to implement BMPs and reduce the pollution in urban runoff prior to it entering the permittees' storm drain systems and discharging to receiving waters such as the Truckee River and its tributaries. Urban runoff includes dry weather flows from activities such as watering and outdoor washing, illegal connections and discharges to the storm drain system, as well as runoff from storm events.

In August 2000, the Storm Water Permit Coordinating Committee began the process of developing the required elements of the RSWQMP. A series of public meetings and workshops were conducted throughout 2000 and 2001 to define local water quality goals, resources, stakeholders and interested parties. In December 2001, the RSWQMP report was finalized, presented to the City, County and Nevada Department of Transportation (NDOT) managers, and submitted to NDEP. The RSWQMP document presents a comprehensive approach to implementing each program element and contains priorities, approaches, guidance and schedules for programs, activities and effectiveness evaluation for the term of the current permit. The RSWQMP will require periodic modifications to ensure that it is effectively accomplishing its objectives.

5.4.1 NPDES Permit Program

Since the 1980s, studies conducted by the EPA and others have indicated that storm water runoff from urbanized areas is a leading cause of impairment to the nation's receiving water bodies. These studies and numerous legal actions by environmental organizations culminated with the publication of Federal regulations that required municipalities to control non-point source pollution in urban runoff that flows through their storm drain systems. The regulatory process began in 1987 when Congress amended the Clean Water Act. In 1990, under Phase I, the EPA required National Pollutant Discharge Elimination System (NPDES) permit coverage for storm water discharges from medium and large municipal separate storm sewer systems (MS4s) located in urban areas with populations of 100,000 or more. On March 10, 2003, Phase II of the NPDES storm water program became effective. In addition to requiring permit coverage for certain regulated small MS4s, Phase II also lowered the threshold for regulation of construction activities from 5 acres to 1 acre of land disturbance.

In Nevada, the NPDES program is administered by the state through NDEP. Per federal regulations (40 CFR § 122.26), NDEP has issued the following three baseline general permits that regulate storm water discharges in the Truckee Meadows:

- The Municipal Storm Water Discharge Permit (NVS000001), effective term: January 14, 2000 to January 14, 2005
- The General Permit for Storm Water Discharges Associated with Construction Activity (NVR100000), effective term: September 16, 2002 to September 15, 2007
- The General Discharge Permit for Industrial Activity (NVR050000), effective term: April 11, 2003 to April 10, 2008

The full text of each of these permits can be viewed at http://ndep.nv.gov/bwpc/storm01.htm. The requirements of these permits apply to all urban development, whether public or private. Each of these permits indicates that a minimum set of BMPs shall be implemented and pollutants in storm water discharges shall be controlled to the maximum extent practicable. "Maximum extent practicable", also known by the acronym MEP, is a regulatory standard developed by the EPA that has been interpreted to give local governments some flexibility in developing storm water management programs that are adapted to their local conditions.

5.4.2 RSWQMP Program Area

The Municipal Storm Water Discharge Permit issued jointly to the four permittees applies to the Cities of Reno and Sparks and the adjacent urbanized areas. It authorizes discharge of municipal storm water runoff to the receiving waters of the Truckee River, Silver Lake Playa, Swan Lake Playa and Whites Lake Playa and to the tributaries that drain to these water bodies.

Program Schedule and Annual Reporting Requirements

The Truckee Meadows RSWQMP includes the following program elements:

- Intergovernmental coordination
- Public education and outreach
- Storm water discharge monitoring
- Construction site discharge
- Industrial discharge

- Structural controls
- Illicit discharge detection and elimination
- Municipal operations
- Land use planning

Each of these program elements is discussed in the following sections. Per NDEP and EPA, all nine elements of the RSWQMP are to be substantially implemented by January 14, 2005. Annual reports on the progress, future and funding of the RSWQMP are to be submitted to NDEP and EPA.

Intergovernmental Coordination

The goal of this program element is to establish clear roles and responsibilities among the local jurisdictions for program development and implementation and to establish the relationship of the local program within NDEP's program. The Storm Water Permit Coordinating Committee currently consists of a single representative from each of the permittees. The committee is organized with the City of Reno as the lead agency. In 2003, NDOT indicated that they would be withdrawing from the local Municipal Storm Water Discharge Permit and working with NDEP to develop a new statewide permit. One of the goals of the RSWQMP is the development of regionally consistent programs. However, each agency has its own different governmental and departmental structure and each agency is responsible for its own ordinances, permitting and inspection programs.

Public Education and Outreach

This program element is intended to increase public awareness of water quality issues related to urban runoff, the RSWQMP and implementation of the individual program elements.

A website for the RSWQMP www.tmstorm water.com provides information about the committee members, each program element, program news and meetings, frequently asked questions, hotlines for reporting spills and water quality related issues, information about storm water pollution and the storm drain system, related community programs, federal and state requirements, Best Management Practices, commonly used terms, and links to other storm water management programs and sources of information. Downloads of key program documents, such as the Construction Site BMP Handbook, are now available.

Press releases and television news interviews have been conducted on the subject of local installation of structural treatment controls and construction site BMPs. Presentations have been made to the local City Councils, the RWPC and the Board of County Commissioners. Additional presentations have been provided to the Las Vegas Storm Water Committee and a number of local organizations.

Training in 2002 primarily focused on the new General Permit for Construction Activity and the proper use of BMPs at construction sites and was widely attended by engineers, builders and the local agencies involved in development planning, plan review, construction and inspection.

Public Education and Outreach Program Needs

- New educational materials and outreach programs to support expanded development of the RSWQMP and its program elements
- Development and advertising of a complaint / reporting hotline system
- Modify, update and expand use of the storm water program website as program elements are developed
- Additional public workshops and training sessions to support each program element

5.4.3 Storm Water Discharge Monitoring

The objective of the Storm Water Discharge Monitoring element is to determine the quality of urban runoff in the Truckee Meadows, and assess if water quality improvements can be achieved by implementing the RSWQMP.

The Storm Water Permit Coordinating Committee developed a monitoring plan that was approved by NDEP. The first storm water samples were collected along Steamboat Creek in March 2003. In-stream water samples will be collected during storm events from the upper and lower reaches of Steamboat Creek, Whites Creek, Thomas Creek, and the North Truckee Drain. The monitoring effort will reflect water quality and quantity changes upstream and downstream of selected urban drainage areas with mixed land usages and significant areas of new development.

Constituents to be analyzed will initially be limited to those for which TMDLs have been established (P, N, TDS and TSS). Continuous monitoring of discharge, DO, EC, pH and temperature will also be conducted during sampling events. Figure 5-6 indicates the current storm water monitoring locations and a number of other existing surface water sampling locations monitored by NDEP, TMWRF and DRI. The storm water monitoring data will be compared to the other water quality data to assess the water quality of local streams and the Truckee River under a variety of conditions.

Storm Water Discharge Monitoring Program Needs

- Purchase of additional automated samplers and flow monitoring equipment
- Analyses of additional chemical constituents commonly found in urban runoff
- Posting of sampling results on the storm water website

5.4.4 Construction Site Discharge

The Construction Site Discharge Program is being developed to integrate storm water quality management and the requirements of the NPDES General Construction Permit into existing local construction permitting and inspection programs. Erosion, sediment transport and pollutant discharges from construction sites are of significant concern to NDEP and EPA. Figure 5-7 illustrates typical sediment concentrations in storm water runoff from construction sites and the effectiveness of implementing different BMPs.

The Truckee Meadows Construction Site BMP Handbook was finalized in March 2003. Policies and procedures were developed to provide regional consistency. The documents developed along with the BMP Handbook include a Construction Permit Submittal Checklist, a Performance Standards Compliance Checklist, a Construction Site Inspection Checklist and a model.

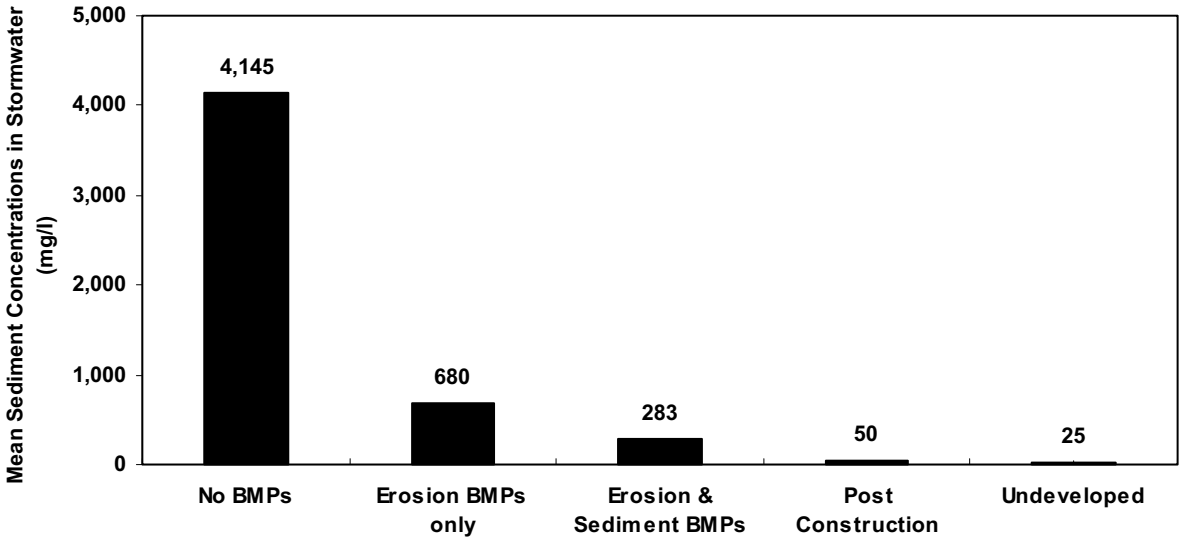

Figure 5-4

Typical sediment concentrations in storm water runoff from construction sites with various levels of control, compared to typical concentrations from undisturbed natural areas (Schueler and Lugbill, 1990).

Storm Water Pollution Prevention Plan (SWPPP)

Reno, Sparks and Washoe County are currently developing ordinances and inspection programs independently. The Construction Permit Checklist is to be used by the local agencies with all grading, site development, building, and encroachment permit applications. The checklist requires applicants to indicate the total planned area of disturbance. If the area is one acre or more, permit applicants must verify they have permit coverage from NDEP and have included standard notes on site plans that indicate that BMPs will be implemented for erosion, sediment and waste control. A Performance Standards Checklist will serve as plan review by the local agencies. The checklist requires construction permit applicants to indicate the specific BMPs they will use to meet 12 regionally consistent performance standards.

The Construction Site BMP Handbook provides fact sheets for implementing 49 different BMPs at construction sites. The categories of BMPs are:

- Planning
- Runoff Control
- Erosion Control
- Sediment Control
- Drainage Way Protection
- General Site and Materials Management

The BMP Handbook also includes guidance and a model for preparing required SWPPPs for any private or public construction project that disturbs one or more acres of land. Copies of the BMP Handbook and model SWPPP are available on the regional program website

www.tmstormwater.com as well as NDEP's storm water program website http://ndep.nv.gov/bwpc/storm01.htm.

Implementation of the Construction Site Discharge program, including inspections of construction sites, is substantially in place. NDEP has been conducting joint inspections with the Cities, the County, and NDOT since mid-2002.

Construction Site Discharge Program Needs

- Continued distribution and training on the Construction Site BMP Handbook
- Modification and development of new ordinances
- Implementation of local inspection programs
- Development of databases

5.4.5 Industrial Discharge

The Industrial Storm Water Discharge Regulation Program will build on the existing City of Reno and City of Sparks wastewater pretreatment programs, incorporating storm water quality management into the regulatory program for industrial wastewater control. Washoe County and the Cities are currently in the process of developing new ordinances and updating the program for inspection of industrial facilities in unincorporated areas of Washoe County. It is anticipated that the framework for the regional Industrial Discharge Program will be initiated in the near future.

NDEP issued a new General Discharge Permit for Industrial Activity in April 2003 and is in the process of identifying the additional industrial facilities that will require inspection and regulation. The number is expected to significantly increase.

Industrial Discharge Program Needs

- Development of an Industrial Storm Water Discharge BMP Handbook
- Development of written policies and procedures
- Expanded implementation of local industrial site inspection programs
- Expanded databases of inspections, violations and enforcement actions
- Workshops and training sessions for the industrial community and agency staff

5.4.6 Structural Controls

The Structural Controls Program will be implemented at areas of new development and significant redevelopment so that water quality improvements will be considered for inclusion in site drainage plans, storm drain projects, and flood control projects where applicable. A Structural Controls Design Manual was approved in 2004 by the RWPC to provide technical guidance on the proper application, limitations, siting criteria, design and construction criteria, and inspection and maintenance requirements of structural controls.

Structural controls are defined as physical features that reduce the potential of storm water pollution (structural source controls) or designed facilities that function to filter, trap and remove pollutants transported in urban runoff (structural treatment controls) prior to discharge to the storm drain system. Examples of structural source controls include roofs over loading and storage areas where spills might occur to minimize contact with storm water, or grading around fueling areas to prevent contaminated storm water from washing into storm drains.

The major categories of structural treatment controls include:

- Vegetative Treatment Systems (grassy swales and buffer strips)
- Extended Detention Basins
- Ponds and Constructed Wetlands
- Porous Pavement
- Media Filtration Systems
- Infiltration Systems (infiltration basins and trenches)
- Hydrodynamic Separators
- Oil and Water Separators
- Catch Basin Systems

Special attention will be given to infiltration systems, which can reduce peak flow rates and flooding potentials, increase groundwater recharge as well as provide effective storm water quality management. In addition, structural treatment controls that have the potential to pond open water for extended periods of time will consider insect vector control features as required by the Washoe County District Health Department.

Structural controls for water quality enhancement are only effective if maintained properly. Therefore a consistent standard access and maintenance agreement will be developed to promote regionally effective access and maintenance policies and procedures.

Structural Controls Program Needs

- Development and distribution of the Structural Controls Design Manual
- Development and implementation of local inspection and maintenance programs
- Workshops and training sessions for local designers, engineers, planners and agency staff

5.4.7 Illicit Discharge Detection and Elimination

The Illicit Discharge Detection and Elimination (IDDE) program will formalize an inspection and enforcement program for detecting and eliminating illegal discharges and connections to the storm drain system. The program will include ordinance revisions, adoption of new policies and procedures, a technical manual, staff training, storm drain mapping and outfall sampling, complaints reporting, public education and outreach, research and development of a program for the proper disposal of household hazardous wastes, and posting information on the storm water program web site.

In 2002, IDDE activities included routine spill response and cleanup investigations by the Environmental Control Sections for the Cities of Reno and Sparks. Serious problems were referred to the District Health Department for further enforcement. In addition, storm drain outfalls along the Truckee River in Reno and Sparks were located, inspected, photographed and logged into the Cities' GIS. Samples were collected and analyzed for fecal coliform when flow was noted. A partial inspection of outfalls to the North Truckee Drain was also conducted prior to the onset of winter storms. The City of Sparks is currently in the process of establishing a contract to complete mapping of its storm drain system.

Illicit Discharge Detection and Elimination (IDDE) Program Needs

- Complete mapping of the Cities' and County's storm drain systems

- Development of a technical manual with written policies and procedures
- Additional outfall and illegal discharge sampling
- Analyses of additional chemical constituents commonly found in urban runoff
- Posting of sampling results on the storm water website

5.4.8 Municipal Operations Program

The Municipal Operations Program will improve existing maintenance activities such as street sweeping, catch basin cleaning, ditch cleaning, and storm drain line cleaning to better protect water quality. This program element will include new policies and procedures, guidance documents, design criteria, training, a database and a study of street sweeper technologies and practices for water quality improvement. The permittees have participated in the Washoe County Board of Health's effort to upgrade street sweepers and study alternative de-icing methods to improve air quality in the Truckee Meadows during the winter months.

Since the corporation yards for the City of Reno and NDOT are located near the Truckee River, NDEP and EPA requested modifications to the existing facilities and operations at these locations in 2002. Preliminary designs for dewatering structures for street sweeping and storm drain debris were developed for the City of Reno corporation yard. NDOT re-graded and repaved a portion of its corporation yard and installed a sprung tent structure to cover sand and salt stockpiles. Additional facilities and operational modifications at the corporation yards for the Cities of Reno and Sparks and Washoe County have been and will be implemented in 2004.

Municipal Operations Program Needs

- New facilities and operational modifications at the agency's corporation yards
- Research new street sweeper technologies and practices for water quality improvement
- Development of a guidance document with written policies and procedures
- Purchase of additional street sweepers and/or vactor trucks where needed
- Training for agency staff

5.4.9 Land Use Planning

The goal of this program element is to develop land use planning practices that reduce runoff and protect water quality. Land use planning programs, techniques and educational methods used in other communities will be investigated to help determine what would be appropriately applied to the Truckee Meadows. A program for the Truckee Meadows might include mechanisms for modifying project densities (e.g. transfer of development rights, planned unit developments), new site design requirements (e.g. riparian setbacks, calculation of impervious coverage), land conservation tools (e.g., conservation easements, deed restrictions) and public outreach methods to encourage land use planning designs that protect water quality.

This program will be developed and coordinated with other programs such as the Flood Plain Management Program and the Watershed Protection Program. The goals of these programs are consistent with the goals of the RSWQMP and the policies of the RWPC.

Land Use Planning Program Needs

- Participation in development of the RWPC's Policy on Watershed Management Objectives
- Participation in the Non-Point Education for Municipal Officials (NEMO) program

- Research of planning programs, techniques and educational methods used in other communities
- Development and enforcement of written policies and procedures
- Workshops and training for local designers, engineers, planners and agency staff

5.5 Groundwater

The Region's groundwater aquifers serve a substantial amount of development in the greater metropolitan area. Large areas of Washoe County's population depend entirely upon groundwater. Groundwater can and should be used to offset Truckee River demands. However, previous regional water supply studies have not sufficiently addressed the details of our groundwater aquifers. From a regional perspective, there are quality and quantity problems throughout every hydrographic basin in southern Washoe County.

Figures 2-3 and 2-4 in Chapter 2 show major groundwater quality problem areas. It is becoming increasingly evident that while our surface water supply is used for direct municipal and industrial use, it may also be required to offset groundwater quality and quantity problems. Further, residential development is increasingly eliminating natural groundwater recharge areas by covering up these areas with impervious surfaces.

5.5.1 Groundwater Recharge

The 1995-2015 Regional Water Plan developed by the RWPC and local jurisdictions included specific statements of policy and goals for future projects, one of which addressed groundwater recharge, "*Natural recharge areas and undeveloped areas with similar characteristics shall be defined and protected for aquifer recharge*." In 2001, Kennedy/Jenks Consultants evaluated the potential for recharge in southern Washoe County based upon geology, water delivery infrastructure, and site suitability.

The following sections discuss the various types of recharge occurring in southern Washoe County and outline recommendations for protecting undeveloped recharge areas and natural water courses and enhancing recharge in existing developed areas.

Natural and Incidental Recharge in Southern Washoe County

A combination of natural and incidental recharge occurs throughout southern Washoe County and provides most of the region's groundwater recharge. Natural recharge describes the infiltration of surface waters into streambeds, alluvial fans, or through porous land surfaces into groundwater aquifers. In contrast, incidental recharge describes the infiltration that occurs as a secondary result of human use of water and from structures designed to convey, store or dispose of water and wastewater.

Natural groundwater recharge in southern Washoe County occurs on the alluvial fans, within the mountain ranges bordering basins, and to a lesser extent the valley floors. This is largely a result of appreciable amounts of precipitation in the form of snow and rainfall. Snowmelt and runoff from the Sierra Nevada is conveyed onto the alluvial fans in perennial and ephemeral streams. The groundwater system of the Truckee Meadows is recharged by infiltration of these surface waters and by subsurface flows from the mountain block.

Incidental recharge occurs as either agricultural recharge from ditch losses and flood-irrigated lands or as secondary recharge from septic systems and landscape watering. Flood control detention basin seepage and infiltration of wastewater effluent are also considered to be

sources of incidental recharge. Incidental recharge from these sources provides a considerable portion of the water needed to balance the overpumping of groundwater resources in southern Washoe County.

Areas of southern Washoe County that currently support natural and incidental recharge are rapidly being developed. Increased areas of impermeable surfaces due to urbanization and high-density rural development have lead to a trend of diminishing groundwater recharge in these areas. To mitigate the reduction in natural and incidental recharge, new policies, procedures and programs will need to be developed and implemented to optimize and balance the use of surface water and groundwater resources of the Truckee Meadows.

Recharge from Natural Drainage Ways

Another source of groundwater recharge in the Truckee Meadows area is the infiltration of runoff in stream channels. As streams discharge from the consolidated rock of the mountains onto the unconsolidated materials of the down-slope alluvial fans, a volume of surface water seeps through the stream bottoms. The most significant portion of this seepage takes place along the range front at the contact between the crystalline bedrock and the alluvial fill. Depending upon the size and gradient of the stream and the annual flow volume, this leakage can represent a significant amount of groundwater recharge.

Recharge from Ditch Losses

Irrigation waters have been delivered throughout the Truckee Meadows, the South Valleys and Spanish Springs Valley since the 1860s. Over the years, several studies have attempted to quantify the volume of water lost to infiltration from irrigation ditches in this region. The difference in construction, size, and maintenance of the ditches makes quantification of water loss very difficult to estimate. As the volume of water transported within the ditches decreases, the conveyance efficiency of the ditches also decreases. In 1996, the USGS completed an analysis of the Orr Ditch in Spanish Springs Valley, concluding that the 15 to 30% transmission loss used by the Water Master is a reasonable estimate. Since the Orr Ditch system (19.6 miles long) is representative of the 105 miles of irrigation ditch systems in southern Washoe County, it is reasonable to assume that a 15 to 30% transmission loss is typical for the irrigation ditches throughout the area.

Recharge from Irrigation

In southern Washoe County, the majority of the ±14,000 acres of irrigated lands are flood irrigated. The efficiency of flood irrigation practices in southern Washoe County is between 60 and 75%. It is estimated that approximately 20 to 35% of the applied irrigation water contributes to groundwater recharge. Based on the water rights of the Truckee Meadows and southern Spanish Springs, a 20 to 35% infiltration of applied irrigation water approximates 0.8 to 1.4 af of groundwater recharge per acre of irrigated land. Thus, a significant portion of groundwater recharge results from irrigation practices within Washoe County.

Detention Basin Recharge

Southern Washoe County has several unlined flood control detention basins that allow surface water runoff from storm events to pond and infiltrate into the groundwater system. A number of factors impact the usefulness of detention basins as sources of groundwater recharge. They include the ambient soil conditions, underlying geologic conditions, and the design of the detention basin. The design criteria required to increase the recharge potential of detention

basins employs maximizing the wetted area, providing vegetation to produce pathways through dense surface soils, and detaining the storm water for a long enough period to allow for infiltration. These design criteria can also function to increase storm water quality. Detention / retention basins in areas with appropriate soils can anticipate infiltration rates of >0.5 cm/hr (4.8 in/day). This rate equates to approximately 0.40 af per acre per day.

Effluent Recharge

Most wastewater in southern Washoe County (over 30,000 af/yr) is treated at TMWRF, where the majority of the treated effluent is then discharged to the Truckee River. In the North Valleys and Verdi area, small treatment plants and septic systems are used to treat wastewater. These small systems discharge secondary treated effluent to rapid infiltration basins (RIBs) or apply it as a source of agricultural irrigation. As outlined in NRS 445A, no tail water should be produced nor should the consumptive use or nitrogen limitation of the crops be exceeded when applying wastewater for agricultural irrigation. Therefore, due to the minimal volume of wastewater applied, agricultural irrigation with treated effluent does not contribute appreciably to groundwater recharge. However, since 50 to 60% of domestic water used is returned to the system as wastewater effluent, treated effluent infiltrated in RIB's can be a significant source of groundwater recharge.

Passive and Active Recharge Projects

A variety of facilities and design features can be applied to areas with permeable soils and favorable subsurface geology to increase the amount of passive groundwater recharge. Spreading basins are typically constructed three to six feet deep and cover a few acres of land. Depending on the quality of the source water, the beds of spreading basins must be maintained and silts and sands must be removed at regular intervals.

Infiltration galleries consist of a set of deep trenches filled with loose rock to provide storage and enhance infiltration while minimizing evaporation. When space constraints limit the use of spreading basins, infiltration galleries or a series of small storm water infiltration devices can be implemented to significantly provide enhanced recharge. Spreading basins, infiltration galleries and storm water infiltration devices have relatively low construction and maintenance costs.

If the contributing watershed is undisturbed or includes stabilized developed areas, sediment accumulation rates are typically very slow. A potential site for a combination spreading basin / infiltration gallery is located on Whites Creek Lane and Crossbow Court, near the Hunsberger Elementary School. This facility could be designed as a Multiple Use Basin with features for groundwater recharge, storm water quality and flood control. Multiple Use Basins can also include parks with hiking trails and sports fields. As their name suggests, the goal of these basins is to provide a variety of uses for the community while also contributing to groundwater recharge, storm water quality enhancement and flood control.

The ability to recharge deeper aquifer systems is often only possible with active recharge systems such as injection wells. At sites with existing municipal and domestic water supply wells and a developed infrastructure of pipelines, injection of treated surface water is possible during the winter months when water demand is low. Currently TMWA has developed a number of injection wells in the Truckee Meadows area using existing water supply wells. Dedicated injection wells could also be installed at areas with favorable subsurface geology to help mitigate the effects of overpumping during periods of peak groundwater demand.

Actions for the Protection and Enhancement of Groundwater Recharge

Acknowledging the potential loss of suitable recharge areas to urban development, the RWPC supports policies and programs that will work to identify, understand and protect the region's groundwater resources. The RWPC has adopted the following policy:

> ***Policy 1.3.b: Protection and Enhancement of Groundwater Recharge***
>
> *Natural recharge areas shall be defined and protected for aquifer recharge. Proposed projects and proposed land use changes in areas with good recharge potential shall be encouraged to include project features or adequate land for passive recharge.*

Criteria to implement this policy for the protection of natural recharge in drainage ways and undeveloped areas with recharge potential follows. Additional policy discussion is located in Chapter 1.

Natural Recharge in Drainage ways

As stated in Policy 1.3.b, local governments shall enforce existing ordinances such as the City of Reno Major Drainage Ways Ordinance and the Washoe County Development Code Article 418 "Significant Hydrologic Resources". The natural recharge and flood protection functions of the drainage ways shown on the USGS maps of Truckee Meadows must be protected by local governments using the existing ordinances noted above. Expanded training and enforcement of these ordinances should be conducted to ensure this policy is implemented.

The policy must also apply to the additional drainage ways that are not identified in the two ordinances but are shown on the USGS 7.5 minute quad maps and represent additional perennial and ephemeral streams. These additional drainage ways should be identified and mapped so that they are available within the Washoe County GIS database for analysis of groundwater recharge and the review of proposed developments and land use changes.

Undeveloped Areas with Recharge Potential

Local governments shall perform a review of lands within a proposed project or a proposed land use change area and rank the suitability for passive recharge based on site evaluation criteria (see Southern Washoe County Groundwater Recharge Analysis, Kennedy/Jenks, 2001). Sites with a Hydrology / Geology matrix score of 2.2 or higher are considered to be sites with "good recharge potential". If a site is determined to have "good recharge potential", local governments shall, to the extent practicable, work with the project developer or land use change proponent to explore development features or configurations that maximize recharge while meeting other obligations regarding storm water quality and flood control needs. Passive recharge elements shall be designed such that they are consistent with water quality, environmental, storm water and flood control policies or regulations.

In order to meet these criteria, a programmatic approach can be taken that incorporates policies and procedures for local governments, guidelines for land use planning and design, training for developers and engineers and continued analysis and field-testing. Activities that would be included are found in the Groundwater Recharge Recommendations section.

5.5.2 Wellhead Protection

Wellhead Protection Plans are encouraged by the EPA and the State of Nevada. The purpose is to protect the quality of groundwater supplies through the delineation of zones of groundwater movement to municipal supply wells, and through the subsequent management of potential contaminant sources in those areas. A focus of this water plan is to encourage private water systems to conduct watershed management plans. The NDEP can provide guidance and grant funding for these endeavors. The RWPC can participate in the development of these plans.

Policy 1.3.a: Wellhead Protection

To protect public health and to ensure the availability of safe drinking water, the Washoe County District Health Department (for domestic wells) or local governments with input from the water purveyors with groundwater production facilities in the vicinity of a proposed project shall review any proposed project that may cause possible groundwater contaminating activities. Water purveyors are encouraged to develop wellhead protection programs that can be integrated with local government new business or development review processes.

The development of a wellhead protection plan (WHPP) typically follows seven steps, including:

- Roles and responsibilities of the agencies involved
- Discussion of the hydrogeology and modeling of groundwater capture zone delineation
- Siting of future wells and their relation to potential contamination sources
- An inventory of sources of potential contamination
- Management options towards the prevention of contamination of the groundwater
- Contingency planning in case of contamination of the aquifer
- Public education and participation

Once a program has been developed and endorsed by the NDEP, implementation assures that monitoring and plan updates are attended to for the life of the water system. A benefit to the program is that the amount and type of water quality sampling can be reduced and therefore result in cost savings. Development planning can be used to reduce or eliminate the risk or the potential for groundwater quality contamination.

Wellhead Protection Areas should be delineated and provided, in map form, to the local planning agencies. Commercial and industrial zoning should then be cognizant of these areas and take precautions to ensure groundwater quality protection. Future zoning should respect these Wellhead Protection Areas and possibly be limited in allowable activities.

The WCDWR has received NDEP endorsement of the WHPP submitted for the Lemmon Valley water system and anticipates endorsement of programs for systems in the South Truckee Meadows and Hidden Valley. A plan for County wells in the Mt. Rose system is currently being developed under an NDEP grant. Future plans will be undertaken in Spanish Springs Valley, Pleasant Valley and Washoe Valley. This will include the largest water systems that WCDWR operates. WHPPs are currently being developed for the TMWA system and are expected to be complete in 2004. Other wellfields that could be considered for WHPP development are:

- Cold Springs and Sky Ranch (Utilities Inc.)
- Steamboat Springs Waterworks
- Glen Meadows Water System
- Various Trailer Parks

5.5.3 Geothermal Influences

Our groundwater supply is limited in part due to the geothermal influence of, most notably, the Moana Hot Springs and the Steamboat Hot Springs. Smaller geothermal systems also exist in Spanish Springs, New Washoe City, Warm Springs, and at the River Inn west of Reno. These geothermal systems have created aquifer areas that cannot be developed for municipal use and have also limited the location of domestic well sites. While these areas are fairly well known, it should also be understood that large centers of municipal pumping peripheral to geothermal areas can and will induce geothermal water migration to the production wells. Consequently, consideration should be given to the prevention of geothermal migration as a result of pumping schedules. More discussion can be found in Section 2.3.4 and maps of these areas can be found in Figures 2-8 and 2-9.

Nitrate Contamination

Nitrate contamination from septic tanks is a problem for this region. Actions are being taken to correct these problems and to prevent problem areas from further degradation. Further discussions can be found in Sections 2.3.5, 2.6 (individual basins) and 3.7.

Industrial Contamination

Groundwater contamination from industrial sources occurs beneath the central Truckee Meadows and near the Stead Airport. These sites are in various stages of remediation and study. Individual cleanups will take years to achieve, and groundwater production near these areas may be limited until corrective action is taken. Further discussion can be found in Section 2.6.

5.6 Other Values

This section discusses other watershed concepts that should be addressed in this Regional Water Plan.

5.6.1 Low Impact Development

Water resource agencies are using a regulatory approach to water quality issues that includes the NPDES Storm Water Program, TMDLs and Source Water Assessment Program (SWAP). This approach deals with the symptoms of the problem without attacking the source, which is failure to plan growth based on its cumulative impacts on natural resources. The most effective way to decrease the impacts of development on non-point source pollution is instead to provide communities with the education and technical assistance they need to improve overall land use policy.

Low Impact Development (LID) is a new comprehensive land planning and engineering design approach with a goal of maintaining and enhancing the pre-development hydrologic regime of urban and developing watersheds. This design approach incorporates strategic planning with micro-management techniques to achieve superior environmental protection, while allowing for development or infrastructure rehabilitation to occur. This innovative approach can be used to help meet a wide range of Wet Weather Flow (WWF) control and community development goals.

The Watershed Management and Protection Plan and the RSWQMP both promote LID technology for future development in the Truckee Meadows. LID has been shown to be a cost-

effective means of residential and commercial development. It also has the benefit of reducing construction and maintenance costs to storm water infrastructure. Currently, the UNRCE has initiated a program for educating the Truckee Meadows municipal officials in this nationally emerging technology. In tandem with this effort, the RWPC, through the Storm Water Permit Coordinating Committee, has contracted a Watershed Facilitator to develop Low Impact Development and Watershed Protection Handbooks.

5.6.2 Hill Slope Development

Truckee Meadows Regional Plan Policy 2.2.1 requires local governments to develop management strategies for areas with slopes greater than 15 percent but less than 30 percent within one year of adoption of the Regional Plan (TMRPA, 2002). Proposals for watershed changes in areas with slopes greater than 15 percent are of concern as they relate to subjects of the Regional Water Plan. Therefore, the management strategies that are developed as a requirement of Regional Plan Policy 2.2.1 shall be submitted to the RWPC for review, comment and recommendation.

> ***Policy 3.1.g: Management Strategies for Slopes Greater than 15 Percent***
>
> *Local government management strategies for hillsides with natural slopes greater than 15 percent and less than 30 percent shall be submitted to the RWPC for review, comment, and recommendations prior to incorporation into local government Master Plans.*

Local government management strategies should ensure that:

- Activities comply with the terms of the storm water NPDES permits
- Development on such slopes incorporates on-site and/or off-site mitigation measures for impacts to habitat and water quality
- Ordinances are enforced with respect to erosion control and runoff
- Local governments and entities with responsibility for the provision of utilities such as water, wastewater, and flood control services have identified the additional costs of infrastructure, operations, and maintenance associated with development in these areas, and said costs are economically feasible
- Natural recharge areas are identified and protected
- An analysis is performed to identify flood and erosion hazard areas, and potential mitigation measures

5.6.3 Noxious Weed Control

Tall Whitetop may look like a delicate, harmless flower, but this non-native weed has invaded thousands of acres of Nevada's lands and waterways. It threatens water quality, wildlife habitat, recreational activities and the economic stability of some of our ranchers. If it's not contained now, this invasive species will cause major environmental damage and economic losses.

Several large areas of the Truckee Meadows have been identified as overgrown with Tall Whitetop, in particular, along Steamboat Creek from Washoe Valley to the Truckee River. Eradication of this invasive weed could be accomplished through restoration efforts on Steamboat Creek as well as on lower Thomas and lower Whites Creeks. This would not only improve the riparian corridor, but also add to the recreational value of these creeks and the real

values of the properties. Efforts to eradicate Tall Whitetop are underway by the UNRCE, however, additional support from the public and the RWPC is needed.

5.7 Recommendations

Truckee River Recommendations:

- Formalize a Watershed Management Plan specific to the Truckee River
- More efforts should be made towards reducing nutrient loading to the Truckee River for water quality improvement and TMDL management.
- Lower Truckee River restoration should continue to be supported as well as restoration efforts on Steamboat Creek.

Watershed Management and Protection Recommendations:

The first priority is jurisdictional approval of the Watershed Management and Protection Plan. This is accomplished through recommendation of the RWPC and the Regional Planning Commission and through adoption by the Cities of Reno and Sparks and Washoe County. The NDEP should recognize this strategy as a community effort for providing water quality improvements to the Truckee River.

- A Watershed Facilitator should be contracted, annually, for a period of three years. This contracted position is not envisioned to be permanent, but rather as a means to coordinate the implementation. Funding should be through the RWPC and through state or federal grant opportunities.
- Citizen and Neighborhood Advisory Boards should be enlisted for the benefits they can provide in the management and monitoring process of our watersheds. Incorporating the public into watershed management and protection can only present to the community a better sense of stewardship, pride and commitment to the preservation of our watersheds.
- Funding opportunities through federal and state grants should be pursued immediately. Key opportunities may be found in the recently approved State Bond Issue "Conservation and Natural Resource Protection (Question 1)".
- Coordinate water quality monitoring with the RSWQMP. Research sources for funding such as NDEP 319 grants.
- A concerted effort should be given to publicly recognizing stream buffers for their benefits to water quality, flood control, riparian habitat, and as public amenities.
- Educational programs should be developed and implemented through the Watershed Facilitator, the WSCD and the UNRCE. Programs should include those listed in the Education Management Objectives and those recommended by the storm water and flood plain management plans.
- Management and restoration efforts on the specific areas of concern should be researched by the Watershed Facilitator for feasibility and cost. A priority list should be prepared and discussed by Advisory Boards and the proper municipality for possible action.
- Low Impact Development methodologies should be researched and, where applicable, be considered by land use planners and the development community for inclusion in development codes.
- A formal watershed management and protection plan for the Truckee River should be made a priority that compliments all of the efforts currently underway.

Recommendations for Storm Water Quality Management:

- Modification and development of new ordinances
- Development of an Industrial Storm Water Discharge BMP Handbook
- Development of written policies and procedures for Industrial Storm Water Discharge
- Complete mapping of the Cities' and County's storm drain systems
- Development of a technical manual with written policies and procedures for addressing illegal discharges
- Development of a guidance document with written policies and procedures for Municipal Operations
- Participation in development of the RWPC's Policy on Watershed Management Objectives
- Participation in the Non-Point Education for Municipal Officials (NEMO) program

Recommendations for Groundwater Recharge:

- Development of policies to review recharge impacts and enable implementation of recharge measures
- Refinement of the interpretation and methodology of the Hydrology / Geology matrix, and its use as criteria for requiring recharge measures
- Integration of the Hydrology / Geology matrix into the local governments' Community Development databases so that the recharge potential is readily available for use in the review of projects and proposed land use changes
- Development of policies and guidelines to enhance recharge for use in redevelopment and public works projects in existing developed areas
- Establishment of appropriate recharge goals for new development and establishment of design criteria for BMPs and structural controls
- Development of a design handbook for BMPs and structural controls with respect to groundwater recharge
- Develop policies for incentives to project developers in terms of infrastructure sizing and development density
- Development of projects to mitigate loss of recharge from existing development, such as spreading basins, infiltration galleries or injection wells to replace natural and incidental recharge
- Training for planning, design and development professionals

Wellhead Protection Recommendations:

- Wellhead Protection Areas should be delineated in map form and distributed to the local planning agencies. Future zoning and planning activities should be respectful of these areas.
- Other well fields within the planning area should be encouraged and assisted in the development of wellhead protection programs.

Other Value Recommendations:

- A Low Impact Development program should be initiated within the Region.
- The RWPC should assist local governments in developing Hill Slope Development management strategies.

- The RWPC and the community as a whole should assist in the eradication of Tall Whitetop, particularly in the South Truckee Meadows.

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