

## A. Nonpoint Source Pollution

### *Background*

Clean water is essential to all life. Yet every-day activities impair water quality and thus reduce the availability of good water supplies. Throughout the U.S. and Nevada water resource experts and agencies are finding that the leading cause of water quality impairment is nonpoint source (NPS) pollution. Pollution from nonpoint, or diffuse, sources is more difficult to control than pollution from point sources, which are discharges through pipes or channels from a distinct source. Almost any activity can increase runoff and add to NPS pollution. Commonly identified sources activities and facilities such as mining, construction, grading, roads and trails, septic systems, underground storage tanks, modified water courses, feed lots, grazing and timber harvesting are commonly identified sources. These widespread activities can stir up, produce and release pollutants which are then picked up by runoff from melting snow, rain fall, or irrigation and deposited downstream in pulses.

NPS pollution occurs wherever water flowing across the land or underground picks up nutrients, salts, metals, organic material, soil, or chemicals and delivers the accumulated pollutants to streams, lakes, wetlands or ground water aquifers in amounts greater than natural background levels. The excess pollutants may result in impacts such as nutrient enrichment, undesirable algae growth, higher total dissolved solids, turbidity, lower dissolved oxygen, pH changes, higher temperatures and increases in pathogenic microorganisms. These conditions negatively affect water supplies by fouling water systems and increasing treatment requirements and operation and maintenance costs. Aquatic ecosystems may also be impacted by diffuse sources. For example, in the U.S. Fish and Wildlife Service (USFWS) recovery plans nonpoint sources are identified as an important cause of degraded fish habitat for endangered cui ui populations in the lower Truckee River system and for Lahontan cutthroat trout populations in the Truckee, Humboldt, Carson, and Walker River systems.<sup>1</sup> Accelerated eutrophication of lakes (e.g., Lake Tahoe) is also a concern.<sup>2</sup>

The presence of wetlands and water availability are important factors determining the degree of NPS impact to water quality. One of the reasons wetlands and riparian zones are valued and protected by regulation is their treatment capacity, which is the ability to detain, trap, convert and assimilate sediment, nutrients, and organic wastes. The actual relationship between stream flow and water quality is complex, but in general where river flows are lowered by drought and/or upstream diversions and nonpoint pollution is present, the negative water quality impacts can be amplified.

An innovative approach to improving water quality with increased stream flow is the Water Quality Settlement Agreement for the Truckee River. State, local, tribal and federal agencies cooperatively

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<sup>1</sup> *Cui-ui Recovery Plan*. U.S. Fish and Wildlife Service. 1978. *Lahontan Cutthroat Trout Recovery Plan*. U.S. Fish and Wildlife Service. 1995.

<sup>2</sup> Eutrophication is the aging process of a lake. Over long time spans lakes receive sediment, nutrients, and organic material. As these materials accumulate the lake slowly undergoes ecosystem changes as it fills-in.

developed a plan in 1996 to increase flows and dilute point and nonpoint source pollutant concentrations, primarily in the Lower Truckee River. Federal and local governments have agreed to share the cost of acquiring water and reservoir storage rights in the upper Truckee River system. The acquired water is intended to increase stream flow during periods when low water levels are likely to contribute to poor water quality conditions.

The dry climate, infrequency of rainfall events, and diversions from streams often are significant factors influencing the degree of nonpoint pollution impacts on water resources. For example, Steamboat Creek, a tributary of the Truckee River, collects urban and agricultural drainage. Below the creek's confluence with the Truckee River, water quality conditions deteriorate in late summer because river flows are lower, so the nonpoint source pollutant load from Steamboat Creek has a larger influence on river water quality. In the case of a large storm water runoff event that occurs after a long dry spell, larger quantities of NPS pollutants from urban development and suburban ranches can be mobilized and thus cause not only a short term water quality impact but also contribute to longer term levels of lower water quality as more solids become deposited in the creek and river channels. Circumstances vary on each river, so intensive field investigations are helpful in explaining site specific cause and effect relationships between nonpoint sources and hydrologic conditions that contribute to NPS pollutant discharges and water quality impairment.<sup>3</sup>

Preventing and controlling NPS pollution is accomplished primarily by implementing Best Management Practices (BMPs).<sup>4</sup> BMPs work on the principles that materials belonging on the land should be kept there, and that decreasing the distance runoff travels from the source minimizes control costs. Some general categories of BMPs applicable to many source activities are soil conservation, revegetation of disturbed areas, erosion and storm water controls, fertilizer management planning, integrated pest management, wetland protection and enhancement, and storm water treatment cells. Land use planning practices such as open space master plan designations, zoning controls, and subdivision development ordinances also have been used to ameliorate nonpoint source pollution potential of land development.

State agency water quality assessments, more fully described below, have found that urban areas, irrigation, grazing, and flow regulation practices are the largest nonpoint pollutant contributors.<sup>5</sup>

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<sup>3</sup> The Washoe/Storey Conservation District, Washoe County and NDEP, are working on watershed planning activities that address NPS pollution in Steamboat Creek. A related study by a University of Nevada graduate student investigates the role of land uses, pathways, and seasonality of nutrient loading into the creek.

<sup>4</sup> Best Management Practices for water quality improvements are defined as "those methods, measures or practices designed to prevent or reduce water pollution, including, but not limited to structural and nonstructural controls, and including both operation and maintenance procedures." BMPs should be "the most effective, practical means of preventing or reducing the amount of water pollution from nonpoint sources to a level compatible with water quality goals". *Nevada Water Quality Assessment 305(b) Report*. Nevada Division of Environmental Protection. 1998. *State of Nevada Non-Designated Area Water Quality Management Plan, Handbook of Best Management Practices*. State Conservation Commission, et. al. Not dated.

<sup>5</sup> Flow regulation practices includes hydromodification, which involves re-shaping a channel or drainage to carry higher volumes of water or constructing bank protective measures, and stream diversions or reservoir storage. Changes in flow patterns can cause undesirable channel adjustments that lead to impaired water quality.

Statewide, the most common NPS pollutants of concern include suspended solids, total dissolved solids (salinity and chlorides), total phosphates, nitrogen species, turbidity, and thermal energy. In some waters, arsenic, boron, selenium, lead, and iron levels are elevated. These elements are associated with geothermal sources, and become concentrated in closed basins by high evaporation rates. Runoff and subsurface flow from irrigated agricultural land may increase the amount of these contaminants. A special concern is mercury in the Carson River from historic mining and milling operations. Rapid population growth, changing land uses, urbanization, and changing public expectations regarding water quality add to the complexity of managing NPS pollution. Given the prevalence of these factors in Nevada, it is not surprising that all major rivers are impacted to some degree by NPS pollution.

Much is being done cooperatively by state, local and federal agencies and land owners to manage nonpoint source pollution through education, encouraging and funding implementation of pollution prevention and BMP retrofit projects, installation of control technologies, monitoring and assessment of nonpoint sources, improving our understanding of the cause and effect relationships between water quality impairment and pollutant sources, and researching and implementing new, more effective strategies is an ongoing effort of all agencies within the Department of Conservation and Natural Resources (Department).

### ***State Agency Involvement with Nonpoint Sources***

To address the role of nonpoint source pollution in water quality impairment, new and enhanced policies and measures were included in section 319 of the 1987 Clean Water Act Amendments (CWA). A key provision in section 319 is the requirement for states to develop, adopt and implement NPS management plans and undertake periodic water quality assessments. Nevada's policy, to identify, control, and abate NPS pollution through a combination of regulatory requirements and voluntary control and prevention measures, is consistent with section 319. In addition, NPS problem assessments and control plans in Nevada are developed through the CWA section 208 area wide Water Quality Improvement Planning process.

The NPS management activities of agencies within the Department are discussed next, followed by a general description of local and federal agency involvement in NPS pollution management.

### **Nevada Division of Environmental Protection**

The Nevada Division of Environmental Protection (NDEP) developed Nevada's initial Nonpoint Source Pollution Management Program and Nonpoint Pollution Assessment Report in 1989. Since then the state has instituted regulatory and voluntary programs to control and abate the impacts of NPS pollution through public awareness, cooperation with other agencies and land owners, and application of Best Management Practices (BMPs). Pollution control regulations and permit programs have been implemented for discharges from septic systems, municipal storm water systems and construction or land clearing activities on projects covering five acres or more.

The NDEP emphasizes the use of Best Management Practices (BMPs), technology transfer through

demonstration projects, and supporting NPS management activities by local agencies and organizations with CWA section 319 pass-through grants and technical assistance. With the assistance of NDEP and other state agencies, many NPS projects have been completed or are ongoing in all major river basins. Examples of projects funded by NDEP grants include wetland and riparian zone restoration, channel erosion controls, waste load assessments, urban BMPs, grazing management practices, and water education.

The Clean Water Action Plan (CWAP), a federal initiative launched in February 1998, provides incentives to states undertaking a multi-agency process of identifying and prioritizing watersheds in need of additional NPS management actions, referred to as a Unified Watershed Assessment. NDEP and the Natural Resource Conservation Service began the process in June 1998 with a statewide watershed assessment involving interested governmental agencies and non-governmental organizations. The assessment considered water quality and related natural resource goals, then set priorities on the area's ability to meet those goals. The 303(d) listed waters (see discussion below) were a major consideration in setting priorities for Nevada's Unified Water Assessment element of the CWAP. Restoration strategies are being developed for high priority watersheds which will then be implemented by watershed stakeholders.

Innovative water quality management practices include the use of Clean Water Act State Revolving Fund monies for the purchase of Truckee River water rights to maintain minimum stream flow and improve water quality. Additionally, the Division is considering implementing a program for NPS pollution credit trading. Conceptually, NPS pollutant loads would be quantified and then removed, generating a credit which then could be applied at a discounted rate to a point source discharge. Another innovative approach that is being evaluated is the use of biological indicators as a means to further assess water quality. NDEP is cooperating with EPA on the development of a rapid biological assessment protocol that could be modified to work on streams in Nevada.

NDEP, in cooperation with the U.S. Geological Survey (USGS), monitors various waters throughout the state. The data is used to produce the biennial *Nevada Water Quality Assessment 305(b) Report* and *Nevada's 303(d) List*. The *305(b) Report* provides an inventory of major river segments, lakes and wetlands where monitoring shows impairment of beneficial uses by both point sources and nonpoint sources. Source activities and causative agents of pollution are also identified. The *303(d) List* identifies water bodies that need additional controls to achieve or maintain water quality standards, including establishing total maximum daily loads (TMDLs), and is the basis for targeting water bodies for watershed-based solutions. The TMDL process provides an organized framework to develop these solutions. TMDLs have been set by the NDEP on segments of the Truckee, Carson, Walker, and Humboldt Rivers, and the Las Vegas Wash.

The Section 208 Water Quality Management Plan (WQMP) provides a framework within which state, regional and local agencies cooperatively prioritize the management of pollution sources, including NPS, Washoe, and Clark, and the Tahoe Regional Planning Agency (TRPA) have each developed Section 208 WQMP for their respective jurisdictions. NDEP has developed a Section 208 plan for the non-designated areas of the state (including the Walker and Humboldt river basins) plus another designated area, the Carson River Basin. Of this group, TRPA is unique in their use of a mandatory, tiered approach to implementing BMPs on private land in the Lake Tahoe Basin.

### **Nevada Division of Conservation Districts (NDCD)**

In its overall approach to conservation planning, the NDCD works to prevent and control NPS pollution with programs that build community awareness and provide technical assistance to rural and urban landowners. Areas of focus include resource planning to prevent soil erosion, protection and restoration of riparian areas and wetlands, and implementation of BMPs. The Division networks with other state, federal and local agencies in providing technical and education assistance to the public, land owners, and resource managers. The division has 27 locally led conservation districts. The districts participate in resource planning for cooperative NPS control projects, obtain the voluntary services of natural resource professionals, seek grants from state and federal funding sources, and assist local governments with NPS water quality planning projects and programs. In 1994, the NDCD and NDEP together produced the state *Best Management Practices Handbook*.

### **Other State Agencies**

The Nevada Division of Forestry consults with landowners on plant community management techniques that emphasize erosion control. The division also operates the Forest Stewardship program through which funding and technical expertise is supplied for projects that control NPS.

The Nevada Division of Wildlife (NDOW) manages extensive wetlands on Wildlife Management Areas, evaluates fish and wildlife habitat conditions, and supports actions to alleviate NPS pollution that impact the functioning of aquatic ecosystems. In cooperation with the Nevada Divisions of State Lands and Water Resources, NDOW also seeks to obtain additional wetland areas and water supplies for fish and wildlife habitat improvement.

The Nevada Division of Agriculture (NDOA) regulates the use of pesticides and monitors for contamination. With the U.S. Environmental Protection Agency (EPA), NDOA is finalizing a management plan to protect Nevada's ground water resources from pesticide contamination.

### **Bi-State Agency — Tahoe Regional Planning Agency**

The Tahoe Regional Planning Agency (TRPA) administers and enforces land use ordinances in the Lake Tahoe Basin that are intended to reduce NPS pollution, among other things. BMPs are required by TRPA for all construction and other land use activity on private land in the Lake Tahoe Basin. The Nevada Division of State Lands (NDSL) administers the Tahoe Basin Act of 1996, a bond program which provides \$20 million to implement storm water quality improvement, erosion control and stream and wetland restoration projects in the basin.

### ***Local Agencies Involvement with Nonpoint Sources***

Nevada's nonpoint source control program places an emphasis on local management and enforcement. Local governments have a variety of tools available to accomplish this, including: 1) identifying environmentally sensitive lands during the Master Land Use Planning process; 2) adopting development ordinances with design criteria intended to minimize soil disturbance and erosion, retain wetlands and riparian zones, and preserve natural drainages and stream channels; 3) acquiring open

space to achieve environmental objectives; and 4) adoption of ordinances requiring application of BMPs. Cities and counties also collaborate with conservation districts and the University of Nevada Cooperative Extension offices to enhance public education efforts on pollution prevention and to review development plans for NPS concerns.

The two largest metropolitan areas located in Washoe and Clark Counties hold permits from NDEP for discharges from their municipal stormwater systems. Under these permits, agencies within the metropolitan areas agree to monitor water quality, apply BMPs, correct illegal discharges to storm drains, and work to alleviate significant NPS discharges to storm drainage system segments within their jurisdiction.

### ***Federal Agency Involvement with Nonpoint Sources***

The U.S. Environmental Protection Agency (EPA) administers the Clean Water Act (CWA), including section 319, which encourages states to establish plans for assessing and reducing NPS pollution “to the maximum extent practicable.” States meeting minimum requirements regarding assessment and management of NPS qualify for grant funding and technical assistance from the EPA.

NPS control is a key objective for federal land and water resource management agencies . The U.S. Forest Service (USFS) and U.S. Bureau of Land Management (BLM) address NPS pollution through land use decisions, permits issued for grazing, timber harvest, mining and other resource extraction activities, and the application of Best Management Practices. The U.S. Army Corps of Engineers (COE) plays an important role in NPS management under CWA section 404 and other regulatory programs regarding dredging and filling of wetlands and certain waterways. Restoration of previously modified river channels and protection of wetlands are major objectives of the COE. The U.S. Fish and Wildlife Service (USFWS) coordinates with other agencies to protect wetlands on public lands and manages wetlands on national wildlife refuges. The USFS, BLM, COE and Natural Resource Conservation Service, have entered into Memorandums of Understanding with NDEP that lay out state, local and federal agency responsibilities in management and abatement of NPS pollution and wetland protection on public lands.

The Natural Resource Conservation Service (NRCS) administers programs that address NPS concerns in agricultural and suburban areas through partnerships with other agencies, such as the NDCD. The Emergency Watershed Protection, Environmental Quality Incentive Program (EQIP), and Wildlife Habitat Incentive Programs (WHIP) are examples of funding programs that help land owners pay for BMPs and NPS demonstration projects. Projects include fencing riparian areas, tailwater treatment in wetlands, and channel bank stabilization using bioengineering techniques.<sup>6</sup> Within a watershed framework, the NRCS periodically assesses natural resources to identify NPS problem areas and coordinates with NDEP to prioritize improvement projects.

Collection and analysis of water quality data is an essential part of the state NPS management

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<sup>6</sup> Bioengineering techniques refers to the use of vegetation to stabilize eroding stream channels. For example, willow branches which are capable of producing new plants in moist soils, are bundled and secured in shallow trenches along sloughing embankments.

program. The USGS conducts water quality investigations and maintains permanent water quality sampling stations throughout Nevada. In addition to monitoring physical and chemical water quality constituents, sediment and biological sampling and analysis is performed.

### *Issues*

1. The 1998 305(b) Nevada Water Quality Assessment Report indicates that ambient water quality is either partially not supporting or fully not supporting (i.e., does not meet some or all of the beneficial use standards) for 775 perennial river miles. Of the 14,988 miles of perennial rivers in Nevada, 1,639 were assessed in 1997. NPS pollution is a significant contributor to impairment of assessed waters. However, more comprehensive and watershed specific data may be necessary to track and correlate nonpoint source water quality consequences associated with hydrologic conditions (i.e., storm events, stream diversions, drought) and source areas. For example, more stream flow gauge data would be helpful in estimating nonpoint source loading during storm events and dry periods. This would result in greater cost, but these could be offset by performing field investigations in cooperation with other agencies and organizations. Furthermore, the possibility of producing more effective and lasting water quality solutions is greater.
2. Cost can be an obstacle to installing and maintaining BMPs. Federal grants are available through NDEP and NRCS (e.g., CWA section 319, EQIP, WHIP), money from which supports BMP projects on private land. The matching funds for these projects typically come from local agencies, organizations, and landowners. With the exception of the Tahoe Bond Act of 1996, currently there is no state source of funding for NPS projects.
3. Numerous studies have shown that wetlands act as relatively inexpensive NPS pollutant treatment systems, in addition to providing other natural resource benefits. The 1998 305(b) Report includes estimates that meadow wetlands historically may have covered about 246,000 acres in Nevada, and that 136,650 acres currently remain. Riparian wetland losses are uncertain. The NDEP, NDOW, community park planning departments, comprehensive planning departments, TRPA, COE and USFWS have stopped the decline of these sensitive areas. Projects encroaching upon wetlands are often required to mitigate losses in excess of the wetland acreage impaired. The cooperative approach to wetland protection between federal, state and local agencies needs to continue in order to prevent further losses and for wetland protection efforts to remain cost effective.
4. As the urban boundaries of communities in Nevada expand, development pressure on environmentally sensitive lands, such as hillslopes, wetlands, floodplains, and forested areas is likely to increase. Development of these areas can increase the potential for NPS pollution. Correcting NPS pollution problems after the fact is difficult and costly. Some local land use planning agencies in Nevada and elsewhere are addressing potential NPS impacts by incorporating water quality concerns into development policies and design standards. Examples include master planning to retain open space or protect environmentally sensitive areas, revising zoning ordinances to encourage cluster development, enlarging setbacks along drainage ways and flowing streams, limiting the amount of impervious surface, and incorporating a wide variety of BMPs into the design of roads and developments.

***Recommendations***

The management of nonpoint source pollution is an important water supply planning objective. To meet that objective, the following recommendation is offered.

1. The Division of Environmental Protection, in cooperation with other state agencies, should continue its nonpoint source program consisting of regulatory and voluntary measures, and coordination with federal, state, and local agencies, and the general public.

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