4.0 SEDIMENTATION/SILTATION (STREAM BOTTOM DEPOSITS)

Impairment due to excessive Sedimentation/Siltation (previously listed as impairment due to Stream Bottom Deposits, [SBD]) was documented for the San Juan River (Animas River to Cañon Largo) and La Plata River (San Juan River to McDermott Arroyo) (NMED/SWQB 2004c). Consequently, these assessment units were listed on the 2004-2006 Integrated CWA §303(d)/§305(b) list for Sedimentation/Siltation (NMED/SWQB 2004a).

4.1 Target Loading Capacity

Target values for this Sedimentation/Siltation TMDL will be determined based on 1) the presence of numeric criteria or appropriate numeric translator to a narrative standard, 2) the degree of experience in applying the indicator, and 3) the ability to easily monitor and produce quantifiable and reproducible results. This TMDL is also consistent with New Mexico's antidegradation policy.

The state of New Mexico has developed and adopted a narrative "bottom deposit" standard. The current general narrative standard for the deposition of material on the bottom of a stream channel is specifically found in Section 20.6.4.12(A) of the State of New Mexico Standards for Interstate and Intrastate Surface Waters (NMAC 2002):

> *Bottom Deposits: Surface waters of the State shall be free of water contaminants from other than natural causes that will settle and damage or impair the normal growth, function, or reproduction of aquatic life or significantly alter the physical or chemical properties of the bottom.*

Clean stream bottom substrates are essential for optimum habitat for many fish and aquatic insect communities. The impact of fine sediment deposits is well documented in the literature. Impairment occurs when critical habitat components, such as spawning gravels and cobble surfaces, are physically covered by fines thereby decreasing intergravel oxygen and reducing or eliminating the quality and quantity of habitat for fish, macroinvertebrates, and algae (Chapman and McLeod 1987, Lisle 1989, Waters 1995). An increased sediment load is often the most important adverse effect of activities on streams, according to a monitoring guidelines report (USEPA 1991). This impact is largely a mechanical action that severely reduces the available habitat for macroinvertebrates and fish species that utilize the streambed in various life stages. Minshall (1984) cited the importance of substratum size to aquatic insects and found that substratum is a primary factor influencing the abundance and distribution of insects. Aquatic detritivores also can be affected when their food supply either is buried under sediments or diluted by increased inorganic sediment load and by increasing search time for food (Relyea et al., 2000). In addition, sediment loads that exceed a river's sediment transport capacity often trigger changes in stream morphology (Leopold and Wolman 1964). Streams that become overwhelmed with sediment often go through a period of accelerated channel widening and streambank erosion before returning to a stable form (Schumm 1977, Knighton 1984). These morphological changes tend to accelerate erosion, thereby reducing habitat diversity and placing additional stress on designated aquatic life uses.

4.1.1 San Juan River Basin Sedimentation Target Development

The SWQB Sediment Workgroup evaluated a number of methods described in the literature that would provide information allowing a direct assessment of the impacts to the stream bottom substrate. In order to address the narrative criteria for bottom deposits, SWQB compiled techniques to measure the level of sedimentation of a stream bottom. These procedures are presented in Appendix D of the *State of New Mexico Procedures for Assessing Standards Attainment for the Integrated §303(d)/§305(b) Water Quality Monitoring and Assessment Report* (NMED/SWQB 2004b). The purpose of the protocol is to provide a reproducible quantification of the narrative criteria for bottom deposits in small wadeable streams. A final set of monitoring procedures was implemented at a wide variety of sites during the 2001 monitoring season. These procedures included conducting pebble counts (to determine percent fines), stream bottom cobble embeddedness, geomorphologic measurements, and the collection and enumeration of benthic macroinvertebrates.

The target levels involved the examination of developed relationships between percent fines and biological score as compared to a reference site. Using existing data from NM, a strong relationship (r^2=0.75) was established between embeddedness and the biological scores using data collected in 1998 (NMED/SWQB 2004b). A strong correlation (r^2= 0.719) was also found when relating embeddedness to percent fines. Although these correlations were based on a limited data set, TMDL studies on other reaches, including those in the Cimarron Basin, the Jemez Basin, and the Rio Guadalupe, have shown this relationship to be consistent. These relationships show that at the desired biological score of at least 70, the target embeddedness for fully supporting a designated use would be 45% and the target percent fines would be 20% (NMED/SWQB 2004b). Since this relationship is based on NM streams, 20% was utilized for the target value for percent fines in previous TMDLs for small wadeable streams in New Mexico.

In 2002, SWQB applied for and received a CWA Section 104(b)(3) grant to develop a protocol for determination of sedimentation/siltation impairment in large southwest rivers. The San Juan and Animas Rivers were chosen as case studies for this protocol because these two rivers had historic sedimentation (a.k.a. SBD) listings on previous New Mexico CWA §303(d) Lists. Because these listings were on the 1998 list, they are also considered to be part of the consent decree (Forest Guardians v. Browner CIV. NO. 96-0826 LH).

The USDA NSL was contracted through a Joint Powers Agreement to provide technical support regarding the determination of potential sedimentation impairment in large southwest rivers, as well as a potential target for any subsequent TMDLs. The NSL has provided the research component necessary to develop sedimentation impairment protocols for several states around the country. They have also been working with USEPA to develop suspended sediment and bed material TMDL protocols. The entire study and results are detailed in the NSL report (Heins *et al.* 2004). The overall study approach was to determine bed-material conditions in stable reaches of the region and the local study area to use as a measure of "reference" bed-material condition. The study approach the NSL developed with input from the SWQB relied primarily on a rapid

geomorphic assessment (RGA) approach to determine reference condition and concurrent collection of bed material data to determine the amount of embeddedness in terms of percent (%) fines. This expanded geomorphic approach was intended to specifically address the later portion of New Mexico's narrative SBD criteria mentioned above, namely *"…or significantly alter the physical or chemical properties of the bottom"* (NMAC 2002). Through the use of particle counts as a measure of cobble embeddedness, stream bottom characteristics were compared to a reference condition or fine sediment benchmark and then evaluated to determine potential impairment due to sedimentation.

The SWQB impairment determination document (NMED/SWQB 2004c) that evolved from the NSL study represents a repeatable, quantitative assessment procedure for determining whether New Mexico's narrative "bottom deposit" standard is being attained in various river reaches in the San Juan River basin by:

1) determining fine sediment benchmarks for the ecoregion and basin level, and
2) comparing bed material characteristics between the stream reach of concern to these fine sediment benchmarks

The protocol was the basis for bed sediment impairment determinations for AUs in the San Juan River basin, and provides a detailed summary of the NSL project and associated impairment conclusions (NMED/SWQB 2004c). The protocol was not designed to determine exact sources, locations, quantities, or causes of excess stream bottom sediment. The protocol is applicable to coarse-material dominated river beds (in excess of 50% of bed material greater than 2mm) with wadeable, representative riffle areas.

4.1.1.1 Study Design

To determine reference bed sediment values, the NSL sampled several stations throughout Ecoregion 22 with direct funding from the USEPA Office of Water (Figure 4.1). To further define the reference condition for the San Juan basin study, the NSL also determined reference bed sediment values specific to the Animas and San Juan Rivers combined, and both the Animas and San Juan Rivers separately. This was possible in part because there were 92 sampling stations on the San Juan River and 21 stations on the Animas River as part of the CWA Section 104(b)(3) study. This high number of sites allowed statistical confidence in reference condition determination at a basin scale. Stations were originally selected by river mile on the San Juan river (corresponding to study locations in Bliesner and Lamarra [2000]) and every two miles on the Animas River. The nearest representative riffle area was the focus of the sampling station when possible. In reaches that were dominated by sandy bed materials with no riffle areas, sampling was carried out at the mile marker. In addition, two sites were sampled upstream and downstream of twelve tributaries confluences or, if no riffles were present, at 300 and 600 meters (m) away to measure changes in bed material characteristics as a result to tributary input. The tributaries themselves were also sampled at 300 m and 600 m upstream of the confluence with the mainstem. All field sampling occurred in October and November 2003 (Appendix D and G of Heins *et al*. 2004).

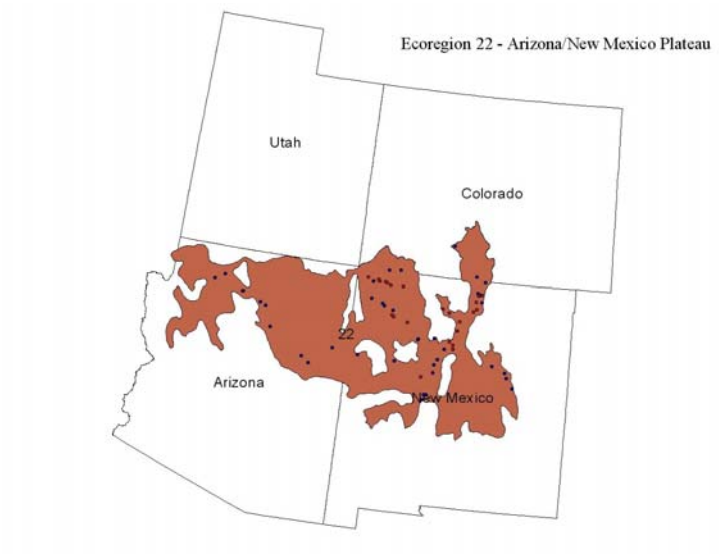

Figure 4.1 Ecoregion 22 (Omernik 1987)

RGAs were conducted at all sites to determine relative channel stability, and assess whether sites were stable (stage I or VI) or unstable (stage II, III, IV, or V) (Figure 4.2 and 4.3). Channel stability was assessed through examination of nine process-related geomorphologic indicators including primary bed material, degree of incision, streambank erosion, presence of riparian vegetative cover, and occurrence of bank accretion (Heins *et al*. 2004).

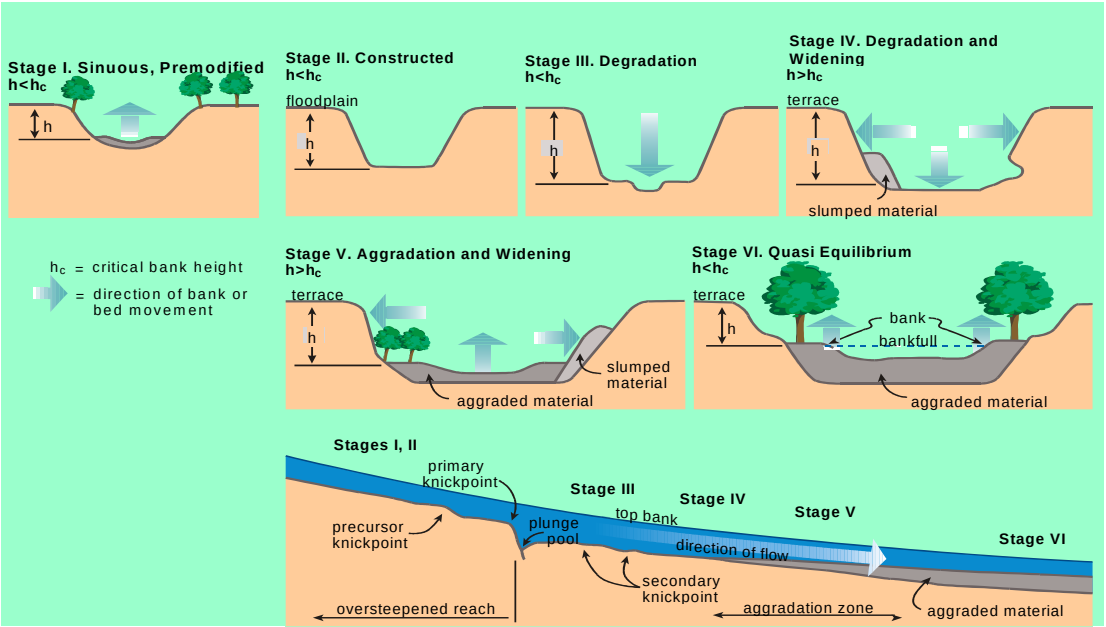

Figure 4.2 Six Stage Channel Evolution Model (Simon and Hupp, 1986)

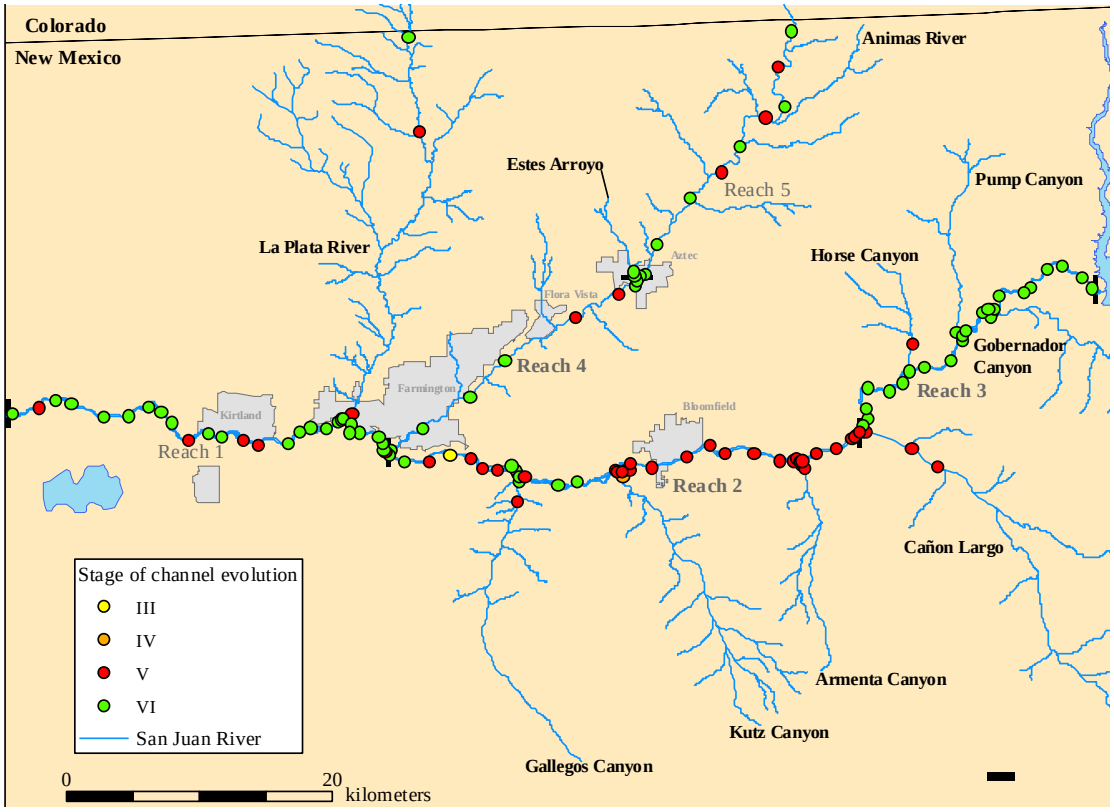

Figure 4.3 Stage of channel evolution for the San Juan River and tributaries

Embeddedness measurements were taken at all sampling stations. The primary tool used to determine the % fines (defined as the percentage of particles with an intermediate axis <2 millimeters [mm]) at each station was a combination of a particle count (PC) (i.e., measuring the intermediate diameter of 100 particles) and bulk sample (BS) at each site were bed material size was mixed, which was the case at most stations. A PC alone was used for purely coarse bed channels, and a BS along was used for 100% fine bed channels. PS/BC bed sediment sample results were plotted over river kilometer to examine any potential longitudinal trends in relationship to tributary confluences and flow diversion structures (Figures 4.4 and 4.5).

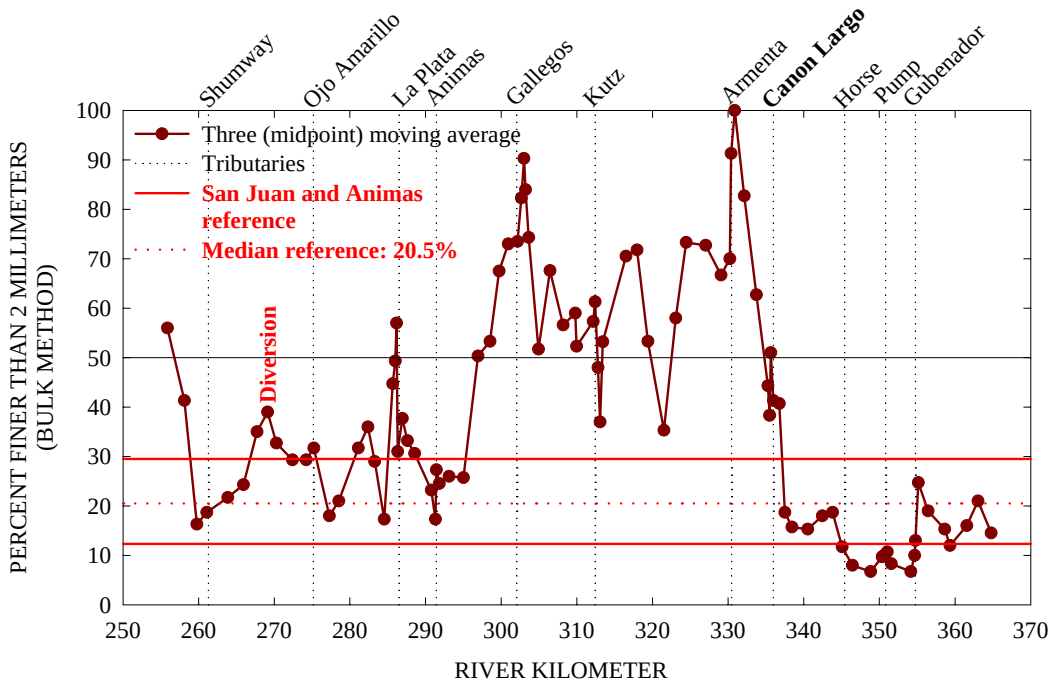

Figure 4.4 Bed material % fines on the San Juan River (adapted from Heins *et al*. 2004)

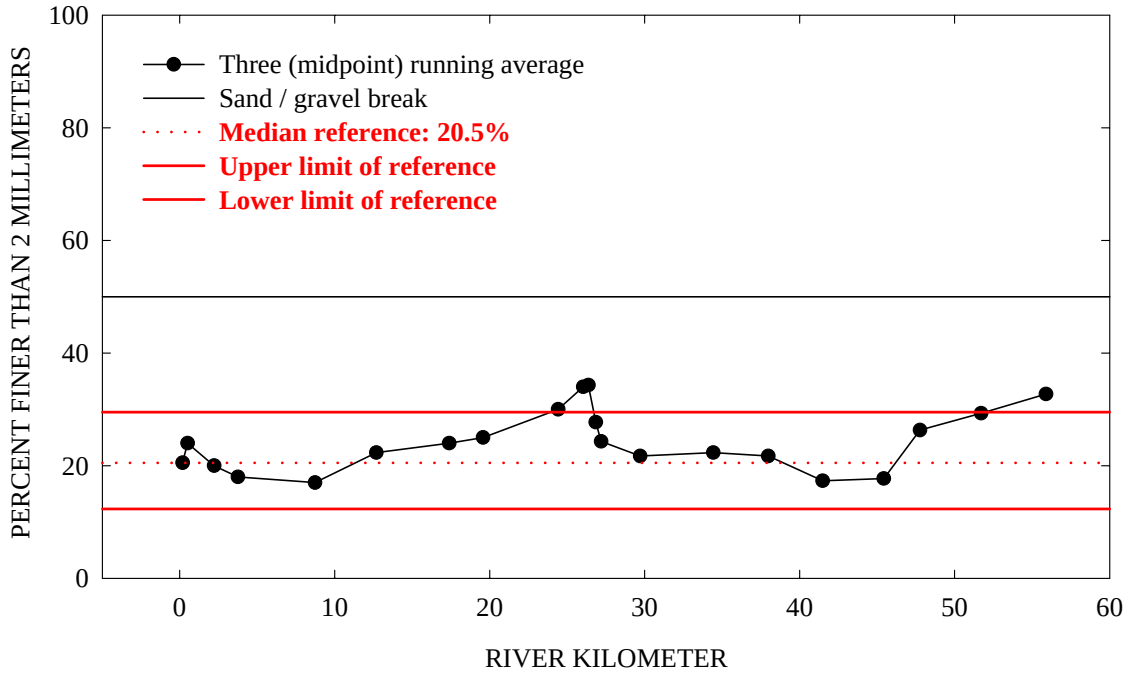

Figure 4.5 Bed material % fines on the Animas River (adapted from Simon presentation to San Juan Watershed Group April 2004)

There were challenges associated with determining and sampling representative riffle areas at sampling stations in the San Juan River. One inaccuracy associated with the sampling technique was averaging across the channel width. At any given station cross section on the San Juan River, the channel bed was often composed purely of sand from the left bank to the midpoint of the channel, and cobbles from the midpoint to the right bank. As stated in the NSL report (Heins *et al.* 2004):

> "…[This site would] appear to have the same bed material as a channel consisting of cobbles across the width of the channel with sand lying in the spaces between the cobbles. However, these two situations present very different environments for habitat and breeding grounds of macro biota. The former ensures 50% of the channel is cobble bed with clean interstitial spaces, whereas the latter is highly embedded and hereby a poor habitat overall. Another accuracy issue was that sampling was biased towards regions of slower, shallower flow, where particle size may be different from the thalweg. This occurred where parts of the channel were too deep and or fast flowing to enter, thus this part of the channel was not sampled.
>
> Initially, the proposed method for acquisition of a PC/BS bed-sediment sample was to stretch a tape across the channel, and collect samples at regular intervals over the cross section using the distance on the table for a reference. However, most of the reaches

visited were too wide for the stretching of a tape across the channel to be practical. In these cases, channel width was estimated, and particles were selected at regular intervals over several transects across the channel perpendicular to the flow direction. For example, if channel width at the site was 25 m, particles would be sampled every meter over 4 transects across the riffle, to provide a fair representation of the bed material size distribution. If greater than 8% of the particles measured were finer than 2 mm in diameter, a bulk sample of the finer material of reasonable weight was collected to obtain a size distribution of this fines fraction."

4.1.1.2 Determination of Bed-Material Reference Values and TMDL target

Reference values for coarse-material dominated sites for Ecoregion 22, the San Juan and Animas Rivers combined, the San Juan and Animas Rivers independently, and the San Juan River only excluding Reach 3 were developed using % fines data determined from the pebble count and bulk sampling data. The NSL defined the reference value as the median percentage of bed sediment finer than 2 mm (i.e., % fines) at stable sites (stage I or VI) which had >50% coarse material (Heins *et al*. 2004). The median was selected instead of the mean because the data was log-normally distributed, so the median more accurately reflects the central tendency of the data. All data from stage I or VI sites within 5 km of dams were removed from the calculations, as was the case in other stations within Ecoregion 22. All values are included in Table 4.1 for comparison. All of these values are consistent with previous research in other parts of the country. In a study of 562 streams located in four northwestern states, Relyea *et al.* (2000) suggested that changes to invertebrate communities as a result of fine sediment (2mm or less) occur between 20-35% fines. Oregon Department of Environmental Quality has drafted a proposed fine sediment impairment benchmark protocol with 75th percentile values ranging between 10.9 and 29.1 % fines, and the 90th percentile values ranging between 14.6 and 32.7 % fines depending on the ecoregion. They are proposing to use the 90th percentile values as their fine sediment benchmark (Douglas Drake, OR DEQ, personal communication). New Mexico's existing protocol for assessing sedimentation in small wadeable streams notes that sites with 20 or less % fines should be noted as non-impaired regardless of the percent increase in % fines from a reference site (NMED/SWQB 2004b). Accordingly, previous TMDL documents prepared by SWQB have utilized a target of 20% fines (see http://www.nmenv.state.nm.us/swqb/library.html for examples).

In the impairment determination protocol, the **fine sediment benchmark** used to determine impairment was defined as the 75th percentile of the %fines measured at reference sites (NMED/SWQB 2004c). This will also be the TMDL target expressed as % fines (Table 4.1).

Table 4.1 Reference bed sediment values and fine sediment benchmarks based on stable coarse-bed sites (adapted from Heins *et al*. 2004)

Dataset	% fines (< 2 mm)		
	Lower quartile (25th percentile)	**Median (reference)**	**Upper quartile (75th percentile)**
San Juan and Animas Rivers (all stage I or VI sites except sites less than 5 km downstream of a dam)	12.8	20.5	**29.5 = fine sediment benchmark** for San Juan and Animas River assessment units
Ecoregion 22	0.25	15.5	**21.5 = fine sediment benchmark** for LaPlata River assessment units

4.2 Flow

No streamflow data are necessary because all loads are specified in %fines.

4.3 Calculations

No calculations were necessary because all loads are specified in %fines. The target loads for sedimentation are shown in Table 4.2.

Table 4.2 Calculation of Target Loads for Sedimentation/Siltation

Location	Sedimentation Standard[(a)] (% fines)	Sedimentation Target Load Capacity (% fines)
San Juan River (Animas River to Cañon Largo)	29.5	29.5
La Plata River (San Juan River to McDermott Arroyo)	21.5	21.5

Notes:
[(a)] This value is based on numeric translators for the narrative bottom deposit standard. The numeric translators (fine sediment benchmark) for sedimentation/siltation in the San Juan River basin were developed from the NSL study (Heins *et al.* 2004) and subsequent impairment determination protocol (NMED/SWQB 2004c).

It is important to remember that the TMDL itself is a value calculated at a defined critical condition, and is calculated as part of planning process designed to achieve WQSs. Since flows

vary throughout the year in these systems, the actual load at any given time will vary based on the changing flow. Management of the load to improve stream water quality should be a goal to be attained. Meeting the calculated TMDL may be a difficult objective.

Measured load was determined by PC/BS analysis as described above in Section 4.1.1.1 and in the NSL study (Heins *et al.* 2004). Fines are defined as particles less than 2 millimeters (mm) in diameter. Results are displayed in Table 4.3. The field data can be found in Appendix D and G of Heins *et al* 2004.

Table 4.3 Calculation of Measured Loads for Sedimentation/Siltation

Location	Embeddedness[(a)] (% fines)	Sedimentation Measured Load (% fines)
San Juan River (Animas River to Cañon Largo)	52[(a)]	52
La Plata River (San Juan River to McDermott Arroyo)	30[(b)]	30

Notes:
[(a)] This value is the median value for % fines from all stations within this assessment unit (Heins *et al.* 2004).
[(b)] This value is % fines measured at the one station in this assessment unit – La Plata River @ gage above San Juan River (NMED/SWQB 2004c).

4.4 Waste Load Allocations and Load Allocations

4.4.1 Waste Load Allocation

The City of Bloomfield Wastewater Treatment Facility (WWTF) (NM0020770), Blanco School (NM0028142), and McGee Park (NM0030473) facilities are located within the impaired San Juan River AU, and discharge directly to the San Juan River. There is some debate regarding whether or not total suspended solids (TSS) from wastewater facilities has an impact on sedimentation. TSS sampling in ambient streams typically measures suspended sediment from erosional processes. Since TSS sampling in Wastewater Treatment Plant (WWTP) effluent typically measures biosolids, which are less inclined to settle on the stream bottom, USEPA contends that TSS from WWTPs have no impact on sedimentation.

There are no Municipal Separate Storm Sewer System (MS4) storm water permits in these AUs. Sediment may be a component of some industrial and construction storm water discharges covered under General Permits, so these discharges should be addressed. In contrast to discharges from other industrial storm water and individual process wastewater permitted facilities, storm water discharges from construction activities are transient because they occur mainly during the construction itself, and then only during storm events. Coverage under the National Pollutant Discharge Elimination System (NPDES) construction general storm water permit (CGP) requires preparation of a Storm Water Pollution Prevention Plan (SWPPP) that includes identification and control of all pollutants associated with the construction activities to minimize impacts to water quality. In addition, the current CGP also includes state specific

requirements to implement best management practices (BMPs) that are designed to prevent to the maximum extent practicable, an increase in sediment, or a parameter that addresses sediment (e.g., TSS, turbidity, siltation, SBDs, etc.) and flow velocity during and after construction compared to pre-construction conditions. In this case, compliance with a SWPPP that meets the requirements of the CGP is generally assumed to be consistent with this TMDL.

Other industrial storm water facilities are generally covered under the current NPDES Multi Sector General Storm Water Permit (MSGP). This permit also requires preparation of an SWPPP that includes identification and control of all pollutants associated with the industrial activities to minimize impacts to water quality. In addition, the current MSGP also includes state specific requirements to further limit (or eliminate) pollutant loading to water quality impaired/water quality limited waters from facilities where there is a reasonable potential to contain pollutants for which the receiving water is impaired. In this case, compliance with a SWPPP that meets the requirements of the MSGP is generally assumed to be consistent with this TMDL.

Individual wasteload allocations for the General Permits were not possible to calculate at this time in this watershed using available tools. Loads that are in compliance with the General Permits from facilities covered are therefore currently calculated as part of the watershed load allocation.

4.4.2 Load Allocation

In order to calculate the LA, the WLA and MOS were subtracted from the target capacity TMDL following **Equation 1**:

$$WLA + LA + MOS = TMDL \qquad \text{(Eq. 1)}$$

The MOS is estimated to be 20 percent of the target load calculated in Table 4.2. Results are presented in Table 4.4. Additional details on the MOS chosen are presented in Section 4.7.

Table 4.4 TMDL for Sedimentation/Siltation

Location	WLA (% fines)	LA (% fines)	MOS (20%) (% fines)	TMDL (% fines)
San Juan River (Animas River to Cañon Largo)	0	23.6	5.9	29.5
La Plata River (San Juan River to McDermott Arroyo)	0	17.2	4.3	21.5

The extensive data collection and analyses necessary to determine background sedimentation loads for these AUs was beyond the resources available for this study. Therefore, it is assumed that a portion of the load allocation is made up of natural background loads. The load reduction

necessary to meet the target load (Table 4.6) was estimated as the difference between the target allocation (Table 4.4) and the measured load (Table 4.3).

Table 4.6 Calculation of Load Reduction for Sedimentation/Siltation

Location	TMDL (% fines)	Measured Load (% fines)	Load Reduction (% fines)
San Juan River (Animas River to Cañon Largo)	29.5	52.0	22.5
La Plata River (San Juan River to McDermott Arroyo)	21.5	30.0	8.5

It is important to note that load allocations are estimates based on a specific flow condition (i.e., low flow in this case). Under differing hydrologic conditions, the loads will change. For this reason the load allocations given here are less meaningful than are the relative percent reductions. TMDLs are planning documents that provide a framework for working towards the goal of achieving water quality standards or appropriate numeric translators.

4.5 Identification and Description of Pollutant Source(s)

Probable NPSs that may be contributing to the observed load are displayed in Table 4.7:

Table 4.7 Pollutant source summary for Sedimentation/Siltation

Pollutant Sources	Magnitude[(a)]	Location	Potential Sources[(b)]
Point:			
None	0	--------	0%
Nonpoint:			
Sedimentation[(c)]	52.0	San Juan River (Animas River to Cañon Largo)	100% Crop Production (Crop Land or Dry Land) Drought-related Impacts Flow Alterations from Water Diversions Loss of Riparian Habitat Petroleum/natural Gas Activities (Legacy) Petroleum/natural Gas Production Activities (Permitted) Rangeland Grazing
	30.0	La Plata River (San Juan River to McDermott Arroyo)	100% Animal Feeding Operations (NPS) Drought-related Impacts Flow Alterations from Water Diversions Loss of Riparian Habitat Rangeland Grazing Streambank Modifications/Destabilization

Notes:
NA = Not applicable
[(a)] Measured % fines
[(b)] From the 2004-2006 Integrated 303(d)/305(b) list (NMED/SWQB 2004a). This list of probable sources is based on staff observation and known land use activities in the watershed. These sources are not confirmed or quantified at this time.
[(c)] Expressed as % fines.

4.6 Linkage of Water Quality and Pollutant Sources

SWQB fieldwork includes an assessment of the potential sources of impairment (NMED/SWQB 1999). The *Pollutant Source(s) Documentation Protocol* form and summary in Appendix B. provide documentation of a visual analysis of probable sources along an impaired reach. Although this procedure is subjective, SWQB feels that it provides the best available information for the identification of potential sources of impairment in this watershed. Staff completing these forms identify and quantify potential sources of NPS impairments along each reach as determined by field reconnaissance and assessment. It is important to consider not only the land directly adjacent to the stream, which is predominantly privately held, but also to consider upland and upstream areas in a more holistic watershed approach to implementing these TMDLs.

New Mexico's existing bottom deposits narrative WQS includes the phrase " …*from other than natural causes*…" Therefore, the degree to which sediment delivery and transport from Cañon Largo and other ephemeral tributary is a natural phenomenon, has been exacerbated by human activities, or is the result of a combination of both should be considered. The dominant source of fine sediment found on the bed of the San Juan in Reach 2 is Cañon Largo (see Figure 2.4 and Photo 4.1). Upstream of the confluence of Cañon Largo and the San Juan River, the % fines on the bed ranged from 6 to 15%. Downstream of the confluence, the % fines steadily increased to 100% within 5 km of the confluence. This pattern is a clear indication of sediment loads from Cañon Largo and the subsequent impact on bed-material conditions in Reach 2 (Heins *et al*. 2004).

Even though Cañon Largo is the primary source of excessive fine sediment loads and storm events during the summer and fall are the primary source of sediment transport from ephemeral tributaries, the anthropogenic influence of the dam and dam operations are contributing to impairment in Reach 2. Therefore, it cannot be stated that sediment impairment in the San Juan River is completely due to natural causes. There is evidence that the San Juan River above Cañon Largo before the installation of the dam in 1962 had a high suspended sediment load (Heins *et al*. 2004). This is not surprising given the geology of the San Juan Basin combined with the high occurrence of intense, convective summer storms. The geology in the watershed contributes to the amount of sediment available for transport. The San Juan River sediment load originates from the highly erodible sedimentary rock and eolian sand deposits (Holden 1999). The primary geologic layer in Cañon Largo in San Jose Formation (Figure 2.7). This sandstone/shall conglomerate erodes easily by wind and wind-driven rains (Chronic 1987). This large, active sediment load in the lower river plays an important role in the formation and maintenance of instream habitat. Intense summer and fall precipitation events contribute to the amount of sediment transported into the mainstem of the San Juan River. Prior to installation of the dam, the San Juan River was characteristic of other large southwest rivers, exhibiting large

spring runoff and low base flows (Bliesner and Lamarra 2000). Large, temporary increases in flow and sediment were common during intense, convective summer and fall precipitation events. High sediment input during summer and fall storm events, combined with a loss of sediment transport due to the effects of Navajo Dam, filled low-velocity habitats with sediment. This situation has the potential to adversely impact aquatic species such as the endangered Colorado pikeminnow and razorback sucker by reducing the availability and quality of aquatic habitat during crucial growth periods (Holden 1999). Objective 4.2 of the San Juan River Basin Recovery Implementation Plan (SJRIP) is to identify, protect, and restore habitats for these two fish species (Bliesner and Lamarra 2000).

During the SJRIP study period in the 1990s, various dam release scenarios were tested to determine potential impacts on aquatic habitat and sediment dynamics in the San Juan River. The conclusions of the SJRIP study and other factors led to the development of proposed changes to dam operations (USBOR 2002). In the preferred alternative, the dam operations would be modified to mimic the natural hydrograph (5,000 cubic feet per second (cfs) spring release with 250 cfs baseflow) when anticipated inflow predictions and current reservoir storage allow as determined by the San Juan Model Operating Rule Decision Tree (decision matrix). Among other goals, the peak flow recommendations in the Navajo Reservoir Operations Final Environmental Impact Statement (NROFEIS) were designed to meet the flow recommendations for the endangered fish by providing temporary cleaning of cobbles. Past dam operations did not generate flows sufficient to transport sediment through the system as indicated by measured sediment accumulation between spring runoff events (Holden 1999).

Photo 4.1 Aerial view of confluence of Cañon Largo with the San Juan River, Oct 2003

It should be noted that NROFEIS with the preferred alternative is not yet in place. Also, under the preferred alternative spring releases are only required based on the decision matrix when adequate water is available based on anticipated inflow predictions and current reservoir storage. Spring releases did not occur in 2002, 2003, or 2004 based on the decision matrix.

There are also land use activities that may also be contributing additional amounts of sediment to the river. There is an abundance of unimproved roads in the San Juan River basin associated with oil and gas development. Sediment loads from this potential source may be reduced through improved enforcement of the terms of coal bed methane leases on BLM and Carson National Forest lands, revision of standard conditions of approval language to improve drainage (and reduce erosion) from well access roads, and development of more effective reclamation techniques for well sites, roads, and pipelines (SJWG 2005). The BLM and several oil and gas operators formed the San Juan Basin Public Roads Committee in 2001 to address these issues. The approach is to cost-share road maintenance on BLM lands by dividing the oil and gas field into 14 road maintenance units with each unit having a designated supervisory operator. BLM contributes 10 percent of the total annual costs. The goal is to bring the primary access roads that receive the highest volume of traffic up to proper road standards by 2011 and maintain them to standards for years to come (USBLM 2002 and 2004).

Two area ranchers have developed collaborative relationships with BLM staff and with Burlington Resources and are experimenting with alternative reclamation techniques at their ranch in the Cañon Largo watershed. The method they are testing utilizes confined livestock and straw to introduce organic matter and break up the surface of the ground prior to applying an appropriate seed mix (SJWG 2005).

The area between Blanco and Bloomfield is sparsely populated relative to other parts of the San Juan River valley, but livestock grazing of irrigated pasture and riparian areas does occur. This land use practice can destabilize erodible banks which could deliver additional amounts of fine sediment to the river. Livestock do have access to the river at specific locations, but this access is not common. More commonly, fences, thick woody vegetation, or vertical banks prevent livestock from reaching the river or trampling banks (SJWG 2005). Livestock grazing in upland areas may contribute sediment via tributaries to the San Juan. In both upland and riparian areas, specific improvements in grazing management might be warranted including complete exclusion of cattle from specific riparian areas, limiting grazing to the dormant season, providing sources of water away from the river, or more carefully tracking utilization of plants (and moving cattle when appropriate) to maintain their productivity. The BLM implements or encourages several of these practices, and so the initial focus of improved grazing management may best be directed to private or other lands (SJWG 2005).

4.7 Margin of Safety (MOS)

TMDLs should reflect a MOS based on the uncertainty or variability in the data, the point and NPS load estimates, and the modeling analysis. For this TMDL, there will be no MOS for point sources since none that were accounted for in the TMDL calculation. However, the MOS is estimated to be 20% for sedimentation. This MOS is based on the uncertainty in the relationship

between embeddedness and percent fines. In this case, the percent fines numeric target was determined to interpret the narrative standard. There are also potential errors in measurement of NPS loads due to sampling technique, time of sampling, and other factors. Accordingly, a conservative MOS for sedimentation increases the TMDL by **20%**.

4.8 Consideration of Seasonal Variation

Data used in the calculation of this TMDL were collected during the fall, which is a biological index period; meaning fall is a critical time in the life cycle stages of aquatic biota. Fall is also generally the low-flow period of the mean annual hydrograph in New Mexico when bottom deposits are most likely to settle and cause impairment, after the summer monsoon season but before annual spring runoff. It is assumed that if critical conditions are met during this time, coverage of any potential seasonal variation will also be met.

4.9 Future Growth

Estimations of future growth are not anticipated to lead to a significant increase for sedimentation that cannot be controlled with BMP implementation in the watershed, continued improvement of road conditions and grazing allotments managed by the BLM, continued adherence to SWPPP requirements related to construction and industrial activities covered under the general permit, and the proposed changes to Navajo Dam operations that will result in an annual spring release (water supply permitting).