THE 2010 SOUTH DAKOTA INTEGRATED REPORT FOR SURFACE WATER QUALITY ASSESSMENT

Protecting South Dakota's Tomorrow…Today

Prepared By
SOUTH DAKOTA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

STEVEN M. PIRNER, SECRETARY

South Dakota
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DEPARTMENT of ENVIRONMENT and NATURAL RESOURCES

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March 29, 2010

Carol Rushin, Acting Regional Administrator
US Environmental Protection Agency, Region VIII
1595 Wynkoop Street, Mail Code 8EPR-EP
Denver, CO 80202-1129

Re: Final 2010 South Dakota Integrated Report

Dear ~~Acting Regional Administrator Rushin~~ Carol,

I am pleased to submit to you, prior to the April 1, 2010, deadline, the 2010 South Dakota Integrated Report, with supporting documentation, as required under Sections 305(b) and 303(d) of the Clean Water Act.

This submittal represents a large effort by this department as well as interested members of the South Dakota public. The 2010 report is one of the most comprehensive reviews of water quality data completed in South Dakota to date.

We have provided your agency with an electronic copy of the list in addition to this submittal. It will also be available via our homepage at: http://denr.sd.gov/documents/10irfinal.pdf.

We look forward to your agency's full approval of our 2010 Integrated Report. We also want to thank members of your staff for their assistance during the development process.

Sincerely,

Steven M. Pirner
Secretary

Enclosure

Cc: Jim Ruppel, USEPA Region VIII
Tom Johnson, USEPA Region VIII
Carol Campbell, USEPA Region VIII

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Ref: 8EPR-EP

Steven M. Pirner, Secretary
Department of Environment & Natural Resources
Joe Foss Building
523 East Capitol
Pierre, SD 57501-3181

Re: Clean Water Act Section 303(d) Total Maximum Daily Load (TMDL) Waterbody List

Dear Mr. Pirner:

Thank you for your submittal of the South Dakota Department of Environment and Natural Resources' (DENR) 2010 Water Quality Integrated Report received March 29, 2010. The Environmental Protection Agency Region 8 (EPA) has conducted a complete review of the Clean Water Act Section 303(d) waterbody list (Section 303(d) list) and supporting documentation and information.

Based on our review of the State's submittal, EPA has determined that South Dakota's 2010 list of water quality limited segments (WQLSs) still requiring TMDLs partially meets the requirements of Section 303(d) of the Clean Water Act ("CWA" or "the Act") and EPA's implementing regulations. Therefore, EPA hereby partially approves and partially disapproves South Dakota's Section 303(d) list. Specifically, EPA approves the State's decision to list all the waterbodies and associated pollutants identified in Appendix F of the State's Integrated Report. EPA disapproves the State's failure to list 12 specific lakes. These lakes are: Waggoner Lake, Bierman Dam, Lake Carthage, Lake Isabel, Twin Lakes (Sanborn County), Wilmarth Lake, Rahn Lake, Cottonwood Lake (Sully County), East Vermillion Lake, Bullhead Lake (Deuel County), Lake Campbell (Campbell County), and Lake Pocasse. Further details of our 2010 partial approval/partial disapproval action are provided in the attachment.

Our office will seek public comment on its decision to add these 12 lakes to the State's 2010 Section 303(d) list. At the conclusion of the public review period we will make a final listing determination. The statutory and regulatory requirements as well as a summary of EPA's review of South Dakota's compliance with each requirement are described in the attachment.

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Division of Financial
& Technical Assistance

EPA's partial approval of South Dakota's Section 303(d) list extends to all waterbodies on the list with the exception of those waters that are within Indian Country, as defined in 18 U.S.C. § 1151. EPA is taking no action to approve or disapprove the State's list with respect to waters in Indian Country at this time. EPA, or eligible Indian Tribes, as appropriate, will retain responsibilities under Section 303(d) for those waters.

We appreciate your work to produce South Dakota's 2010 Section 303(d) list. If you have questions, the most knowledgeable EPA person is Tom Johnson and he may be reached at (303) 312-6226.

Sincerely,

Carol L Campbell

Carol L. Campbell
Assistant Regional Administrator
Office of Ecosystems Protection
and Remediation

Attachment

cc: Dave Templeton, SDDENR
Jim Feeney, SDDENR
Rich Hanson, SDDENR

Review of South Dakota's 2010 Section 303(d) Waterbody List

Attachment to letter from Carol L. Campbell, Assistant Regional Administrator, Office of Ecosystems Protection and Remediation, US EPA, Region VIII to Steve Pirner, Secretary, South Dakota Department of Environment and Natural Resources

Date of Transmittal Letter from State:	March 29, 2010
Date of Receipt by EPA:	March 29, 2010

I. Introduction

South Dakota Department of Environment and Natural Resources (SDDENR) submitted their final 2010 Integrated Report (IR) to the Environmental Protection Agency (EPA) on March 29, 2010. EPA has concluded that the State developed its Section 303(d) waterbody list in partial compliance with Section 303(d) of the Act and 40 C.F.R. § 130.7. Because South Dakota's submission does not include all waters that meet Section 303(d) waterbody listing requirements, EPA is partially approving and partially disapproving South Dakota's list submission and adding the additional water, pollutant, and corresponding priority to the final 2010 list. The purpose of this review document is to describe the rationale for EPA's partial approval/partial disapproval of South Dakota's 2010 Clean Water Act (CWA) Section 303(d) waterbody list ("Section 303(d) list"). The following sections identify those key elements to be included in the list submittal based on the CWA and EPA regulations. (See 40 C.F.R. § 130.7). In May 2009, EPA issued guidance for integrating the development and submission of 2010 Section 305(b) water quality reports and Section 303(d) lists of impaired waters. This guidance, and previous EPA guidance, recommends that states develop an Integrated Report of the quality of their waters by placing all waters into one of five assessment categories. By following this guidance, Category 5 of the Integrated Report is the State's Section 303(d) list. EPA's action in review and approval of this document is only on Category 5 that comprises the Section 303(d) list within the Integrated Report.

EPA reviewed the methodology used by the State in developing the Section 303(d) list and the State's description of the data and information it considered. EPA's review of South Dakota's 2010 Section 303(d) list is based on EPA's analysis of whether the State reasonably considered existing and readily available water quality-related data and information and reasonably identified waters required to be listed.

South Dakota's 2010 list is considered an update of the State's 2008 list, and as such, the Section 303(d) list EPA is partially approving today is comprised of 151 assessment units and 220 waterbody/pollutant combinations, compared with 169 assessment units included on the 2008 list. States may add and take waters off their Section 303(d) lists based on several factors. For the 2010 cycle, South Dakota delisted 104 waterbody/pollutant combinations from its year 2008 list. A total of 24 waterbody/pollutant combinations were delisted based on an EPA-approved total maximum daily load (TMDL). In addition, as a partial disapproval, EPA is adding 12 of those waters the state is delisting back to South Dakota's list, 4 of which are listed for other pollutants. Therefore, the total number of listed assessment units is 159 and the total number of listed waterbody/pollutant combinations is 232. The 12 lakes to be added to South Dakota's year 2010 list are: Waggoner Lake, Bierman Dam, Lake Carthage, Lake Isabel, Twin Lakes (Sanborn County), Wilmarth Lake, Rahn Lake, Cottonwood Lake (Sully County), East Vermillion Lake, Bullhead Lake (Deuel County), Lake Campbell (Campbell County), and Lake Pocasse.

II. Statutory and Regulatory Background

A. Identification of Water Quality Limited Segments (WQLSs) for Inclusion on Section 303(d) List

Section 303(d)(1) of the CWA directs states to identify those waters within its jurisdiction for which effluent limitations required by Section 301(b)(1)(A) and (B) are not stringent enough to implement any applicable water quality standard, and to establish a priority ranking for such waters, taking into account the severity of the pollution and the uses to be made of such waters. The Section 303(d) listing requirement applies to waters impaired by point and/or nonpoint sources, pursuant to EPA's long-standing interpretation of Section 303(d).

EPA regulations provide that states do not need to list waters where the following controls are adequate to implement applicable standards: (1) technology-based effluent limitations required by the CWA; (2) more stringent effluent limitations required by state or local authority; and (3) other pollution control requirements required by state, local, or federal authority. (See 40 C.F.R. § 130.7(b)(1).)

Note: The term "water quality limited segment," as defined by federal regulations, may also be referred to as "impaired waterbodies" or "impairments" throughout this document.

B. Consideration of Existing and Readily Available Water Quality-Related Data and Information

In developing Section 303(d) lists, states are required to assemble and evaluate all existing and readily available water quality-related data and information, including, at a minimum, consideration of existing and readily available data and information about the following categories of waters: (1) waters identified as not meeting designated uses, or as threatened, in the State's most recent CWA Section 305(b) report; (2) waters for which dilution calculations or predictive modeling indicate nonattainment of applicable standards; (3) waters for which water quality problems have been reported by governmental agencies, members of the public, or academic institutions; and (4) waters identified as impaired or threatened in any Section 319 nonpoint assessment submitted to EPA. (See 40 C.F.R. § 130.7(b)(5).) In addition to these minimum categories, states are required to consider any other data and information that is existing and readily available. EPA's 1991 Guidance for Water Quality-Based Decisions describes categories of water quality-related data and information that may be existing and readily available. (See Guidance for Water Quality-Based Decisions: The TMDL Process, EPA Office of Water, April 1991.) While states are required to evaluate all existing and readily available water quality-related data and information, states may decide to rely or not rely on particular data or information in determining whether to list particular waters.

In addition to requiring states to assemble and evaluate all existing and readily available water quality-related data and information, EPA regulations at 40 C.F.R. § 130.7(b)(6) require States to include, as part of their submissions to EPA, documentation to support decisions using or excluding particular data and information and decisions to list or not list waters. Such documentation needs to include, at a minimum, the following information: (1) a description of the methodology used to develop the list; (2) a description of the data and information used to identify waters; and (3) any other reasonable information requested by the Region.

C. Priority Ranking

EPA regulations also codify and interpret the requirement in Section 303(d)(1)(A) of the CWA that states establish a priority ranking for listed waters. The regulations at 40 C.F.R. § 130.7(b)(4) require states to prioritize waters on their Section 303(d) lists for TMDL development, and also to identify those water quality limited segments (WQLSs) targeted for TMDL development in the next two years. In prioritizing and targeting waters, states must, at a minimum, take into account the severity of the pollution and the uses to be made of such waters. (See CWA Section 303(d)(1)(A).) As long as these factors are taken into account, the CWA provides that states establish priorities. States may consider other factors relevant to prioritizing waters for TMDL development, including immediate programmatic needs such as wasteload allocations for permits, vulnerability of particular waters as aquatic habitats, recreational, economic, and aesthetic importance of particular waters, degree of public interest and support, and state or national policies and priorities. (See 57 FR 33040, 33045 (July 24, 1992), and EPA's 1991 Guidance.)

D. Applicable Water Quality Standards

For purposes of identifying waters for the Section 303(d) list, the terms "water quality standard applicable to such waters" and "applicable water quality standards" refer to those water quality standards established under Section 303 of the Act. On April 27, 2000, EPA promulgated a rule under which the "applicable standard" for Clean Water Act purposes depends on when the relevant state or tribe promulgated that standard. Standards that states or tribes have promulgated before May 30, 2000 are effective upon promulgation by the states or tribes. Standards that states or tribes promulgated on or after May 30, 2000 become effective only upon EPA approval. (See 65 FR 24641(April 27, 2000).)

III. Analysis of South Dakota's Submission

A. Background

In reviewing South Dakota's submittal, EPA first reviewed the methodology used by the State to develop their 2010 Section 303(d) list in light of South Dakota's approved water quality standards, and then reviewed the actual list of waters. The State's Assessment Methodology is presented on pages 22-33 of the Integrated Report. EPA has reviewed the State's submission and, with the exception of 12 lakes, has concluded that the State developed its Section 303(d) list in compliance with Section 303(d) of the CWA and 40 C.F.R. § 130.7. Details regarding EPA's concerns with SDDENR's lake methodology are described in Section C below. EPA's review is based on its analysis of whether the State reasonably considered existing and readily available water quality-related data and information and reasonably identified waters required to be listed. South Dakota considered all data and information pertaining to the categories under 40 C.F.R. § 130.7(b)(5).

In previous guidance, EPA recommended that states develop an Integrated Report of the quality of their waters by placing all waters into one of five assessment categories. (See EPA's Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act, July 21, 2005.) By following this guidance, Category 5 of the Integrated Report is the State's Section 303(d) list. EPA's action in review and approval of this document is only on Category 5 that comprises the Section 303(d) list within the Integrated Report.

The State's list was submitted to EPA enclosed with correspondence dated March 29, 2010 from Steve Pirner, Secretary, South Dakota Department of Environment and Natural Resources, in a document entitled *South Dakota 2010 Integrated Report for Surface Water Quality Assessment*.

The year 2010 Integrated Report submitted to the EPA, from the South Dakota DENR consisted of the following portions that are necessary for the Section 303(d) waterbody list:

- **Waterbodies and corresponding pollutants that make up the State's Section 303(d) list** (See Appendix F: 303(D) Summary).
- **Prioritization of waterbodies for TMDL development** (See Appendix F: 303(D) Summary).
- **Identification of waters targeted for TMDL development over the next biennium** (See Appendix F: 303(D) Summary).

EPA's partial approval/partial disapproval action of South Dakota's year 2010 Section 303(d) list extends only to the items listed immediately above.

The 2010 Section 303(d) waters are found in Appendix F (303(D) Summary) of the State's Integrated Report. Tables included in Appendix F contain the following information for each waterbody: assessment unit identifier, waterbody name and location, cause of impairment, cycle first listed, TMDL status, and the priority ranking.

B. Identification of Waters and Consideration of Existing and Readily Available Water Quality-Related Data and Information

EPA has reviewed South Dakota's description of the data and information it considered for identifying waters on the Section 303(d) list. EPA concludes that the State properly assembled and evaluated all existing and readily available data and information, including data and information relating to the categories of waters specified in 40 C.F.R. § 130.7(b)(5). In particular, the State relied on information from the 2010 Section 305(b) water quality assessments, assessments performed under the CWA Section 319 non-point source program, as well as data and information obtained through an extensive process to solicit information from state, federal and citizen sources. The State's evaluation of data and information in each of these categories is described below.

- *Waters identified by the state in its most recent section 305(b) report as "partially meeting" or "not meeting" designated uses or as "threatened"* (40 C.F.R. § 130.7(b)(5)(i)): South Dakota produced a 2010 Integrated Report consistent with EPA's guidance regarding combined CWA 305(b) reports and 303(d) lists. EPA concludes that South Dakota made listing decisions consistent with results from the CWA Section 305(b) assessment, using all existing and readily available data and information, in development of its 2010 Section 303(d) waterbody list, with the exception of the 12 lakes discussed in Section C, below.

- *Waters for which dilution calculations or predictive models indicate non-attainment of applicable water quality standards* (40 C.F.R. § 130.7(b)(5)(ii)): South Dakota assembled and evaluated information from past and anticipated dilution calculations and predictive modeling. EPA concludes that South Dakota properly considered waters for which dilution calculations or predictive models indicate nonattainment of applicable water quality standards in development of its 2010 Section 303(d) waterbody list.

- *Waters for which water quality problems have been reported by local, state, or federal agencies; members of the public; or academic institutions* (40 C.F.R. § 130.7(b)(5)(iii)): The State solicited data and information in preparation for the 2010 Section 303(d) list. Data and information obtained as a result of this effort were evaluated and considered. The State's submittal identified several entities that contributed data or information and responded to public comments related to assessments for individual waterbodies

- *Waters identified by the State as impaired or threatened in a nonpoint assessment submitted to EPA under Section 319 of the CWA or in any updates of the assessment* (40 C.F.R. § 130.7(b)(5)(iv)): The State's 2010 Section 303(d) list includes all waters that have data to support nonpoint source pollution impairment. South Dakota's listing approach and methodologies direct CWA Section 319 activities and resources to the highest priorities. Watershed assessments are often conducted for waterbodies that are already listed in order to collect current data to support TMDL development.

Based upon its review, EPA concluded that the State's process for developing its 2010 Section 303(d) list meets the requirements of Federal regulation regarding the consideration of all existing and readily available water quality-related data and information, consistent with the expectations of 40 C.F.R. §§ 7(b)(5)(i)-(iv)), with the exception of the 12 lakes described in Section C below.

C. Section 303(d) Delistings (40 C.F.R. § 130.7(b)(6)(iv))

According to EPA regulations, each state must demonstrate good cause for not including waters on the list. (See 40 C.F.R. § 130.7(b)(6)(iv).) EPA acknowledges that states may re-evaluate the waters on their Section 303(d) lists. In an August 1997 memorandum, EPA stated that ". . . Regions and states should keep in mind that waterbodies may be added or subtracted over time as new lists are developed." The existing EPA regulations require states, at the request of the Regional Administrator, to demonstrate good cause for not including waterbodies on their lists. (See 40 C.F.R. § 130.7(b)(6)(iv).) Accordingly, in the May 15, 2007 guidance for preparing the (previous) 2008 Integrated Report, EPA identified good cause conditions that allow states to remove previously listed waters from Section 303(d) list.

In its review of the State's 2010 Section 303(d) waterbody list, EPA carefully reviewed the methodology and resultant delistings from South Dakota's list. A full accounting of waters delisted from the 2008 list is provided in Appendix B (pages 177-187) of the Integrated Report. Appendix B includes a column describing the reason for delisting each of the waters. For the 104 assessment unit/pollutant cause combinations that have been delisted in 2010, the decisions to take the waters off the list are based on: 1) a TMDL was completed and approved by EPA (24 waterbody/pollutant combinations); 2) applicable water quality standards attained, revised assessment method (41); 3) applicable water quality standards attained, due to change in water quality standards (12); 4) applicable water quality standards attained, due to restoration activities (3); 5) applicable water quality standards attained, reason for recovery unspecified (19); 6) applicable water quality standards attained, original basis for listing incorrect (2); and 7) applicable water quality standards attained, threatened water no longer threatened (3).

SDDENR delisted 39 lakes that had been listed with Trophic State Index (TSI) as the cause, based on comparing the available data to the State's revised assessment methodology (39 of the 41 from reason 2, above). Since the revised methodology relies on an interpretation of numeric water quality standards and does not interpret the applicable narrative water quality standard, EPA reviewed all waters to determine if the State had provided a solid "good cause" basis for delisting. Based on its initial review of the final list submission, EPA determined that 12 of the 39 delisted lakes were improperly delisted from the State's list because they are not meeting applicable narrative water quality standards. The definition of "water quality standards" for purposes of §303(d) listing includes numeric criteria, narrative criteria, waterbody uses (e.g., designated uses), and antidegradation requirements. (See 40 C.F.R. § 130.7(b)(3).) For these lakes, the water quality standard not being attained is contained within the following narrative standards for South Dakota: Administrative Rules of South Dakota Articles 74:51:01:05 (Materials causing pollutants to form in waters), 74:51:01:06 (Visible pollutants prohibited), 74:51:01:08 (Taste- and odor-producing materials), and 74:51:01:09 (Nuisance aquatic life).

EPA believes that water bodies where it is known that water quality does not meet applicable water quality standards or is not expected to meet applicable water quality standards, even after the application of the technology-based effluent limitations required by sections 301(b)(1)(A) and (B) of the Clean Water Act, should qualify as water quality-limited segments. These 12 lakes meet this standard. As such, these 12 lakes should remain on the State's year 2010 list of WQLSs in need of TMDLs.

EPA will solicit public comments on the addition of these lakes to the State's list and, following consideration of any comments received, will transmit a final determination regarding the lakes to the State for incorporation in its §303(d) list. The basis for adding these lakes to the State's list is discussed below.

1. Lake Assessment Methodology.

EPA is concerned that numeric criteria alone were used to assess lakes and that narrative standards that apply to those lakes were disregarded. Prior to the release of the draft 303(d) list, EPA encouraged SDDENR to develop methods to assess lakes for narrative criteria, specifically eutrophication, while numeric nutrient criteria are in development. Narrative standards encompass a broad array of potential impacts to waters, however, only the assessment methodology for narrative criteria limiting excessive algal growth and eutrophication is at issue here. Nutrient criteria development will likely take considerable time, and in the interim, numerous other indicators should be used to assess lakes for narrative criteria. As a result of SDDENR's decision to revise their assessment methodology to no longer assess lakes for narrative criteria, 39 lakes were considered to no longer be impaired and were subsequently delisted from the State's 303(d) list.

SDDENR primarily relied on measures of dissolved oxygen and pH to determine if lakes were impaired due to excessive eutrophication. Since dissolved oxygen measures were rarely taken at the most critical time and low dissolved oxygen concentrations typically occur only in cases of severe nutrient enrichment, this measure often did not indicate impairment despite a number of other measures indicating potential problems such as high nutrient and chlorophyll-a values. It is also possible that narrative criteria (representing recreation and aesthetic uses) could be exceeded before a dissolved oxygen exceedance has occurred. An assessment of narrative criteria using multiple measures (such as those described in Section C. 3. below) to complement the dissolved oxygen sampling would provide a more complete evaluation of impacts to lakes in South Dakota.

2. Lakes classified as warm water marginal fish life propagation waters may need reassessment of beneficial uses and/or criteria.

EPA first reviewed the set of 13 lakes classified as warm water marginal fish life propagation waters. For these waters, EPA recommends that SDDENR re-evaluate these lakes and determine if they are appropriately classified and/or if they warrant a new use class designation. For example, some warm water marginal lakes may be more appropriately classified in the future as wetlands or may constitute a unique class of lakes. High levels of nutrients may be the expected condition for many of these lakes. EPA is not disapproving lakes classified as warm water marginal not included in the Section 303(d) list, but encourages further investigation. We request that SDDENR submit a plan with timelines to EPA outlining the State's approach to addressing these waters. If reducing nutrient concentrations to necessary levels is unattainable due to physical factors or other conditions, a use attainability analysis should be done, and other options should be pursued. (See Region 8 Q&A document: "Water Quality Standards Based on Natural and Irreversible Water Quality Conditions").

3. EPA analysis of delisted lakes classified as warm water permanent, warm water semi-permanent, or cold water permanent fisheries.

EPA evaluated the 26 lakes delisted by SDDENR which were classified as warm water permanent, warm water semi-permanent, and cold water permanent fish life propagation waters.

Additionally, all of these lakes were classified for immersion recreation. Of the remaining 26 delisted lakes, EPA does not plan to disapprove those listed by SDDENR this cycle for dissolved oxygen (one lake) and those with completed TMDLs for TSI (5 lakes). One lake (Dewberry Dam), with sampling access and use classification issues was also removed from analysis, as was another (Academy Lake), which had only one chlorophyll-a sample and could not be assessed. It is recommended that SDDENR reassess Academy Lake when more data is available. As a result, there were 18 remaining lakes delisted by SDDENR subjected to further analysis of water quality data.

EPA consulted several other states' eutrophication assessment methods, methods used in EPA Region 7 to determine impairment, and several scientific studies in this area of research in order to determine how narrative standards have been addressed and applied. While EPA is not necessarily expecting South Dakota to adopt any of these methods, understanding how eutrophication impairments are commonly assessed is useful in determining the condition of these lakes. While each of these methods assesses impairment for eutrophication differently, this information was compiled to develop EPA's approach to determining if the lake would be considered impaired. Due to the difficulty in assessing lakes using TSI in South Dakota, EPA decided not to use it as an indicator in this process. EPA agrees with SDDENR regarding the problems encountered with setting thresholds for TSI and the resulting difficulties in developing TMDLs for lakes where TSI was the sole cause for listing.

In our assessment, we selected a suite of indicators that, when combined, provide a useful indication of eutrophication. The parameters reviewed are:

- Chlorophyll-a
- Frequency of chlorophyll-a values above a threshold
- Nutrient concentrations (i.e., TN, TP)
- Fishery information
- Secchi depth

Since numeric nutrient criteria have not yet been developed for South Dakota, for each indicator, we selected conservative thresholds to ensure that lakes identified as impaired through this process actually reflect impaired conditions. As a result, it is possible that some impaired lakes may be excluded from this process in order to be certain that what we define as impaired truly is impaired. Thresholds related to both aquatic life use support and recreational uses were established based on multiple lines of information such as:

- Thresholds with demonstrated impacts to the designated use (aquatic life, recreation, aesthetics, or drinking water)
- Reference-based values that served as a benchmark
- Literature values linked to use support

While EPA considers TSI a valuable index of nutrient enrichment, Trophic State Index (TSI) values were not considered in our assessment because we recognize the technical issues associated with SD's current TSI thresholds. In this assessment EPA focused primarily on chlorophyll-a concentrations, since chlorophyll is the direct result of excessive nutrient inputs.

However, EPA also evaluated nutrient concentrations (e.g. TP and TN) and other indicators to aid in this assessment before reaching a final determination of whether or not to list a lake. Each potential indicator is discussed below.

Chlorophyll-a

EPA selected a threshold value of **30 µg/l chlorophyll-a** based on evaluating multiple approaches to establishing thresholds. Chlorophyll-a thresholds associated with recreational use impacts were evaluated based on the number of expected nuisance algal blooms and user perception survey results. Literature-based values for chlorophyll-a and chlorophyll-a concentrations associated with reference lakes in the Northern Glaciated Plains, Northern Great Plains, and Western Corn Belt Plains ecoregions were reviewed in the threshold setting process. We also considered chlorophyll-a values used by other states for the assessment of beneficial uses (MNPCA, 2005; TXCEQ, 2009; USEPA, 2009; USEPA Region 7, Draft 2010). These values range from 8-32 µg/l chlorophyll-a. EPA used the multiple lines of information presented in Table 1 to derive the threshold of 30 µg/l used in this assessment.

Table 1. Various Chlorophyll-a Thresholds.

Approach	State/Study	Chlorophyll-a (µg/L)
Weight of Evidence (WOE)-Based Values[1]	Minnesota	32 (Northern Glaciated Plains)
WOE-Based Values[1]	EPA Region 7	8.0 (includes Northern Great Plains; Corn Belt Plains)
User Perception Survey[2]	Texas	26.7 (Reservoirs)
Literature-Based Value[3]	EPA National Lake Survey	30 (Hypereutrophic Threshold)
Literature-Based Value[3]	Nurnberg, 1996	25 (Hypereutrophic Threshold)
Literature-Based Value[3]	World Health Organization	10-50 (Cyanotoxin Moderate Risk)

[1]WOE- Based Values: This term indicates thresholds established based on a weight of evidence approach that considers reference-based values, stressor-response studies, literature-based values, and other relevant studies.

[2]User Perception Survey: Thresholds derived based on information from input from recreational users demonstrating reductions to their use of the waterbody due to decreased aesthetics or changes to the quality of the recreational opportunities.

[3]Literature-Based Value: Values obtained from peer-reviewed studies that show demonstrated impacts of a beneficial use (i.e., aquatic life use, recreational use)

Several studies (Walmsley, 1984; Walker, 1984) have linked chlorophyll-a concentrations greater than 30 µg/L with "severe nuisance blooms" of algae. Nuisance blooms are those that result in a perceived impairment by lake users (MNPCA, 2005). **Minnesota** conducted extensive studies comparing reference values observed at lakes and reservoirs in the Northern Glaciated Plains to user perception information, trophic status information and fishery considerations. This ecoregion extends into South Dakota and many of the lakes in question are found within it. Based on this combination of information, Minnesota adopted an assessment threshold for chlorophyll-a of 32 μg/l. In an effort to set regional benchmarks, **EPA Region 7** compiled all available lakes and reservoirs data for the entire region. The Regional Technical Advisory Group (RTAG) evaluated both reference distributions from sites identified through a rigorous screening process and percentile distributions (i.e., 25^{th}%) of the entire dataset. These values were compared to literature-based values (Nurnberg, 1996; Downing and others, 2001) and compared to potential thresholds that may suggest human health impacts (e.g. cyanobacteria, algal blooms). Based on these considerations, Region 7 identified a final chlorophyll-a benchmark of 8 μg/L chlorophyll-a for all plains lakes and reservoirs. In **Texas**, a user perception survey showed a diminished recreational experience when chlorophyll-a exceeded 26.7 μg/L (TXCEQ, 2009; Glass, 2006).

EPA's National Lake Survey used a chlorophyll-a value of 30 μg/L in defining hypereutrophic conditions and a range of 7 to 30 μg/L for eutrophic (USEPA, 2009). This threshold between about 25 and 30 μg/L indicates a change in aesthetics, recreational use support and changes to the fish community composition. The **World Health Organization** (1999) established risk thresholds for exposure to cyanotoxins. While the highest risk was set at >50 μg/L, the range from 10-50 μg/L was considered to be moderate risk of exposure to cyanotoxins. The 30 μg/L value is in the middle of this range. Lakes with these levels should be specifically sampled for cyanobacteria and microcystin levels.

After examining the various thresholds and approaches, Region 8 chose a conservative threshold of 30 μg/L of chlorophyll-a as a growing season average (May 1 to September 30) in this assessment. It is conservative since a somewhat lower threshold could potentially be justified, but this sets a clear threshold of impairment. In addition, we also rated sites based on the frequency of chlorophyll-a excursions that exceeded the 30 μg/l threshold more than 25% of the time. As opposed to a concentration-based metric, a frequency metric assesses the duration of time a lake is experiencing high chlorophyll-a levels and, therefore, the consistency of the impacts. We used an exceedance frequency of 25%, which is a conservative level, since this still allows for recreational impacts to exist for more than one month of the summer season.

Total Phosphorus and Total Nitrogen

Table 2 presents a number of nutrient thresholds considered by EPA for this assessment. Total phosphorus values in the range of 20-200 μg/L have been used or recommended for assessment of lake beneficial uses (MNPCA, 2005; TXCEQ, 2009; USEPA Region 7, Draft 2010; USEPA, 2009). Total nitrogen threshold values range from 440 to 2447 μg/L.

Table 2. Various Nutrient Thresholds.

Approach	State/Study	Total Phosphorus (μg/L)	Total Nitrogen (μg/L)
Recreation Use Support	Minnesota	90	-----
WOE Approach	Region 7	35	700

Approach	State/Study	Total Phosphorus (µg/L)	Total Nitrogen (µg/L)
User Perception Survey	Texas	200	-----
Aquatic Life Stressor Based Values	National Lake Survey	56 (NW Great Plains Reservoirs) 159 (NW Glaciated Plains) 193 (N Glaciated Plains)	824 (NW Great Plains Reservoirs) 1355 (NW Glaciated Plains) 2447 (N Glaciated Plains)
Reference-Based Values	EPA 304(a) Ecoregional Criteria	37.5 (Corn Belt/N. Great Plains) 20 (Great Plains Grass/Shrublands) 33 (South Central Cultivated Great Plains)	781(Corn Belt/N. Great Plains) 440 (Great Plains Grass/Shrublands) 560 (South Central Cultivated Great Plains)
Literature-Based Values	Nurnberg, 1996	100 (Hypereutrophic Threshold)	1200 (Hypereutrophic Threshold)
Literature-Based Values	Downing and others (2001)	70	700

Minnesota derived their total phosphorus assessment threshold from a number of studies (MNPCA, 2005) which are also relevant to this assessment of South Dakota lakes since they share ecoregions. The risk of nuisance algae blooms was the basis for setting the total phosphorus value in that region at 90 µg/L. In the Northern Glaciated Plains within Minnesota it was found that total phosphorus values in the 70-90 µg/L range increased the frequency of severe nuisance algae blooms to about 45% of the summer and very severe nuisance bloom frequency increased to 10%. **EPA Region** 7 (2010) reviewed reference-based values compared to thresholds associated with eutrophic conditions to establish the total phosphorus benchmark of 35 µg/l. Region 7's choice of a total nitrogen benchmark of 700 µg/l balanced Nurnberg's (1996) eutrophic range of 650 – 1200 µg/L with an increase in cyanobacteria that occurs around 700 µg/L (Downing and others, 2001). The **Texas** value for total phosphorus is a screening threshold (TXCEQ, 2009).

EPA's National Lake Survey nutrient thresholds were based on regional reference sites. We applied a very conservative approach and examined thresholds used in the NLA to assign lakes as in "poor" condition. Since these values represent "poor" conditions, not reference-based values, they reflect "impaired" conditions, and it is likely that impairments exist at levels lower than those presented. These values were derived at the broad ecoregional scales and results from only similar ecoregions are presented. In addition, EPA proposed aggregated ecoregional criteria **(EPA 304(a) criteria)** based on the 25th percentile of the entire dataset. The 25th percentile was intended to represent reference-based conditions absent having reference sites identified through targeted reference site sampling.

Values from the peer-reviewed literature were also considered. **Nurnberg** (1996) values for phosphorus and nitrogen considered changes in lake trophic status. **Downing** and others (2001) found the risk of cyanobacteria dominance rose to 80% when total phosphorus concentrations exceeded 70 µg/L.

Based on these studies, Region 8 selected a conservative upper threshold for total phosphorus (100 μg/L) and total nitrogen (1000 μg/L) for the purposes of this assessment. These values were considered conservative in that lower thresholds were theoretically possible, but also included a margin of safety.

Secchi Depth (Transparency)

Transparency (the depth of which a disk can be seen in the water) is also used by states in assessment of the recreation use for lakes. One example is provided in Table 3, below (MNPCA, 2005).

Table 3. Secchi Depth Metric Used in Lake Assessment.

Study	State	Secchi Depth (m)
User Perception Survey	Minnesota	<0.7

Minnesota (Heiskary and Walker 1988) conducted user perception surveys to determine the secchi depth at which swimming impairment was likely to occur. In the Northern Glaciated Plains, once the secchi depths fell into the range of 0.6 to 0.7 meters, swimming was not considered desirable, resulting in 0.7 meters as a threshold. EPA has decided to use a threshold of 0.7 meters as an average for secchi depth for the purposes of this assessment.

Fish Community

If available, fish community data were used as another source of information. While this information was used to support the decision, no lake was proposed for listing based solely on fishery studies. The fishery information used in this assessment for South Dakota came from the Statewide Fisheries Survey reports published by the South Dakota Department of Game, Fish, and Parks.

Schupp (1992) found in Minnesota lakes that an increase in total phosphorus produced changes in the fish communities, including increases in the abundance of carp and black bullhead. The basis for the draft Colorado nutrient criteria makes note of this relationship, stating that "Fishery yield tends to increase with increasing algal productivity, but associated changes in community composition may result in a low value fishery. In a warm water setting, eutrophic lakes (average chlorophyll-a 8-25 μg/L) generally support the game fish that anglers prefer. In contrast, hypertrophic lakes (chlorophyll-a >25 μg/L) are more likely to be dominated by carp and bullheads" (CDPHE, 2009).

Water Supply

Two lakes in this assessment (Lake Isabel and Lake Waggoner) are classified for domestic water supply use. The State of Oklahoma has a chlorophyll-a criterion of 10 μg/L for lakes classified for water supply (OWRB, 2005). Downing and others (2001) also found that the risk of an increase in cyanobacteria begins when chlorophyll-a is greater than 10 μg/L. The data for these two lakes in South Dakota was compared to this value.

Assessment

Table 4 summarizes our findings regarding the existing data for each of the 18 lakes and compares this data to the assessment values chosen based on the discussion above. For assessment purposes, results from all indicators were evaluated with more weight given to the two chlorophyll indicators than other parameters (i.e., average growing season concentrations > 30 µg/l and individual concentrations >30 µg/l more than 25% of the growing season). We based our final assessment on the number of indicators exceeded in each waterbody. If the waterbody exceeded both of the chlorophyll indicators (or two out of three for the water supply lakes) we considered it impaired. If it exceeded only one of the chlorophyll indicators, then two additional supplemental indicators had to be exceeded for the lake to be considered impaired.

Table 4 indicates (using "Yes"(Y) or "No" (N)) whether or not the waterbody exceeded each individual metric. Following the summary table, a more detailed description of each waterbody and the final attainment decision is summarized. All results presented are derived from surface samples collected between May 1 and September 30 from 2000 to 2009. The chlorophyll-a samples were corrected for pheophytin. Under the fish survey results, "NR" means no report available and under the water supply column, "NA" means not applicable. Although there was often data from lower levels (profiles) in many lakes, it was unknown if stratification was occurring and this information is more valuable in assessing dissolved oxygen and pH criteria attainment. Therefore, only surface samples were used in this analysis. In addition to chemical and physical samples, fish survey reports from the South Dakota Game, Fish and Parks Department were consulted, where available. Note that all of the lakes in this analysis exceeded the total nitrogen threshold used in this assessment. It is not surprising that at least one threshold would be exceeded by all since these lakes had been identified as not meeting narrative standards in the past.

Table 4. Summary of EPA's Assessment of SDDENR Delisted Waters

Waterbody Name/ID	Chl-a >30µg/L	Chl-a >30 µg/L in more than 25% of samples	TP >100 µg/L	TN >1000 µg/L	Average Secchi Depth <0.7 m	Large #s of black bullhead or carp	Chl-a >10 µg/L (Water Supply)	N:P Ratio
Waggoner Lake (SD-BA-L-WAGGONER_01)	Y	Y	Y	Y	N	N	Y	8:1
Bullhead Lake (SD-BS-L-BULLHEAD_01)	Y	Y	Y	Y	Y	N	NA	18:1
Curlew Lake (SD-CH-L-CURLEW_01)	N	N	N	Y	N	N	NA	19:1
New Wall Lake (SD-CH-L-NEW_WALL_01)	N	N	N	Y	N	N	NA	28:1
Flat Creek Dam (SD-GR-L-FLAT_CREEK_01)	N	N	Y	Y	Y	NR	NA	12:1
Lake Isabel (SD-GR-L-ISABEL_01)	N	Y	Y	Y	N	NR	Y	7:1
Bierman Dam (SD-JA-L-BIERMAN_01)	N	Y	Y	Y	Y	NR	NA	13:1
Lake Carthage (SD-JA-L-CARTHAGE_01)	Y	Y	Y	Y	N	Y	NA	9:1
Roy Lake (SD-JA-L-ROY_01)	N	N	N	Y	N	N	NA	22:1
South Red Iron Lake (SD-JA-L-S_RED_IRON_01)	N	N	N	Y	N	N	NA	22:1

Waterbody Name/ID	Chl-a >30µg/L	Chl-a >30 µg/L in more than 25% of samples	TP >100 µg/L	TN >1000 µg/L	Average Secchi Depth <0.7 m	Large #s of black bullhead or carp	Chl-a >10 µg/L (Water Supply)	N:P Ratio
Twin Lakes (SD-JA-L-TWIN_01)	Y	Y	Y	Y	Y	Y	NA	24:1
Wilmarth Lake (SD-JA-L-WILMARTH_01)	Y	Y	Y	Y	N	Y	NA	3:1
Lake Campbell (SD-MI-L-CAMPBELL_01)	Y	Y	Y	Y	N	NR	NA	3:1
Cottonwood Lake (SD-MI-L-COTTONWOOD_01)	Y	Y	Y	Y	N	NR	NA	10:1
Lake Pocasse (SD-MI-L-POCASSE_01)	Y	Y	Y	Y	N	NR	NA	4:1
Rahn Lake (SD-NI-L-RAHN_01)	Y	Y	Y	Y	N	NR	NA	10:1
Lake Traverse (SD-RD-L-TRAVERSE_01)	N	N	Y	Y	N	NR	NA	10:1
East Vermillion Lake (SD-VM-L-E_VERMILLION_01)	Y	Y	Y	Y	N	Y	NA	4:1

Individual Lake Assessments

Waggoner Lake (Bad River Basin)

Waggoner Lake is classified as "warm water permanent fish life, domestic water supply, immersion recreation, limited contact recreation, and fish and wildlife propagation and stock watering." It is 97.68 acres in size with a maximum depth of about 21 feet and an average depth of about 10 feet. The N:P ratio was about 8:1 indicating that this lake is likely nitrogen limited. For the 2010 listing cycle, it has been delisted for TSI.

The average chlorophyll-a value was 36.1 μg/L (n=21) and 43% of samples exceeded the 30 μg/L threshold. The average secchi depth was 0.87 meters. Total phosphorus averaged 153 μg/L (n=21) and total nitrogen averaged 1290 μg/L (n=21). Compared to EPA's thresholds, Waggoner Lake exceeded the two chlorophyll-a metrics and the TP and TN thresholds. The latest fish survey (SDGFP, 2008a) found 50% of the shoreline covered by submerged vegetation and noted that submerged vegetation was a problem by mid-summer. However, the largemouth bass population was in excellent condition and the lake was not dominated by black bullhead or carp, indicating that the impacts had not yet impaired the fish community.

Finding: Impaired

Bullhead Lake (Big Sioux Basin)

Bullhead Lake is classified as "warm water semi-permanent fish life, immersion recreation, limited contact recreation, and fish and wildlife propagation and stock watering." It is 343.47 acres in size with a maximum depth of about 11 feet and an average depth of about 7 feet. The N:P ratio was about 18:1, indicating that this lake is likely phosphorus limited. For the 2010 listing cycle, it is listed for pH, but delisted for TSI.

The average chlorophyll-a value was 32.9 μg/L (n=18) and 50% of samples exceeded the 30 μg/L threshold. The average secchi depth was 0.42 meters. Total phosphorus averaged 103 μg/L (n=22) and total nitrogen averaged 1810 μg/L (n=15). Compared to EPA's proposed thresholds, Bullhead Lake exceeded both chlorophyll-a metrics and both nutrient metrics. The latest fish survey (SDGFP, 2008b) noted that the lake was "susceptible to periodic winterkill," but had a history of a quality walleye and perch fishery. At the time of this survey, however, both walleye and perch were below the management objectives and black bullhead was also low.

Finding: Impaired

Curlew Lake (Cheyenne Basin)

Curlew Lake is classified as "warm water permanent fish life, immersion recreation, limited contact recreation, and fish and wildlife propagation and stock watering." It is 150.97 acres in size with a maximum depth of about 22 feet and an average depth of about 10 feet. The N:P ratio is about 19:1, indicating that this lake is likely phosphorus limited. For the 2010 listing cycle, it is listed for temperature, but delisted for TSI.

The average chlorophyll-a value was 12.2 µg/L (n=6) and only 17% of samples exceeded the 30 µg/L threshold. However, the sample size was low. The average secchi depth was 0.75 meters. Total phosphorus averaged 58 µg/L (n=5) and total nitrogen averaged 1080 µg/L (n=5). Only the total nitrogen threshold was exceeded and the latest fish survey (SDGFP, 2007a) found large numbers of black crappie and few black bullhead, indicating that the lake was in fairly good condition.

Finding: Not Impaired, but more data needed

New Wall Lake (Cheyenne Basin)

New Wall Lake is classified as "warm water permanent fish life, immersion recreation, limited contact recreation, and fish and wildlife propagation and stock watering." It is 35.75 acres in size with a maximum depth of about 24 feet and an average depth of about 13 feet. The N:P ratio is about 28:1, indicating that this lake is likely phosphorus limited. For the 2010 listing cycle, it is listed for pH, but delisted for TSI.

The average chlorophyll-a value was 12.2 µg/L (n=5) and only 20% of samples exceeded the 30 µg/L threshold. However, the sample size was low. The average secchi depth was 0.78 meters. Total phosphorus averaged 58 µg/L (n=4) and total nitrogen averaged 1650 µg/L (n=4). Total nitrogen was the only metric exceeded and the latest fish survey (SDGFP, 2007b) found only bass but in fairly low numbers apparently due to a recent drought.

Finding: Not Impaired, but more data needed

Flat Creek Dam (Grand Basin)

Flat Creek Dam is classified as "warm water permanent fish life, immersion recreation, limited contact recreation, and fish and wildlife propagation and stock watering." It is 151.43 acres in size with a maximum depth of at least 20 feet and an average depth of about 8 feet. The N:P ratio is about 12:1, indicating that this lake is possibly both phosphorus and nitrogen limited. For the 2010 listing cycle it has been delisted for TSI.

The average chlorophyll-a value was 19.5 µg/L (n=4) and 25% of samples exceeded the 30 µg/L threshold. However, the sample size was low. The average secchi depth was 0.65 meters. Total phosphorus averaged 137 µg/L (n=4) and total nitrogen averaged 1580 µg/L (n=4). The two chlorophyll-a metrics were met (barely, in the case of the frequency metric). However, the secchi depth metric and the nutrient metrics were exceeded, but since both chlorophyll metrics were met it will not be listed. Using the thresholds developed for this assessment, Flat Creek Dam should be considered close to impairment and more samples should be collected to determine its status.

Finding: Not Impaired, but more data needed

Lake Isabel (Grand Basin)

Lake Isabel is classified as "warm water permanent fish life, domestic water supply, immersion recreation, limited contact recreation, and fish and wildlife propagation and stock watering." It is 112.58 acres in size with a maximum depth of at least 17 feet and an average depth of about 9 feet. The N:P ratio of 7:1 indicates that this lake is probably nitrogen limited. For the 2010 listing cycle this lake is listed for mercury in fish tissue, but delisted for TSI.

The average chlorophyll-a value was 24.3 µg/L (n=10) and 30% of samples exceeded the 30 µg/L threshold. Average secchi depth was 0.88 meters. Total phosphorus averaged 257 µg/L (n=12) and total nitrogen averaged 1790 µg/L (n=12). The average chlorophyll-a, total phosphorus and total nitrogen thresholds were exceeded, although the chlorophyll frequency metric and secchi depth were not. However, the chlorophyll-a level was exceeded for the water supply metric, meaning that two out of the three possible chlorophyll metrics for this waterbody were exceeded.

Finding: Impaired

Bierman Dam (James Basin)

Bierman Dam is classified as "warm water permanent fish life, immersion recreation, limited contact recreation, and fish and wildlife propagation and stock watering." It is 15.14 acres in size with a maximum depth of at about 13 feet. Average depth is unknown. The N:P ratio is about 13:1, indicating that this lake is possibly both nitrogen and phosphorus limited. For the 2010 listing cycle this lake has been delisted for TSI.

The average chlorophyll-a value was 23.9 µg/L (n=17) and 29% of samples exceeded the 30 µg/L threshold. The average secchi depth was 0.67 meters. Total phosphorus averaged 102 µg/L (n=14) and total nitrogen averaged 1410 µg/L (n=14). The chlorophyll-a frequency, secchi depth, and nutrient concentration thresholds were exceeded. Only the average chlorophyll-a concentration metric was met. While none of the metrics were exceeded by large amounts, overall they are indicating eutrophication problems in this lake.

Finding: Impaired

Lake Carthage (James Basin)

Lake Carthage is classified as "warm water permanent fish life, immersion recreation, limited contact recreation, and fish and wildlife propagation and stock watering." It is 206.93 acres in size with a maximum depth of about 23 feet and an average depth of about 8 feet. The N:P ratio was about 9:1, indicating that this lake is probably nitrogen limited. For the 2010 listing cycle this lake has been delisted for TSI.

The average chlorophyll-a value was 64.9 µg/L (n=31) and 52% of samples exceeded the 30 µg/L threshold. The average secchi depth was 1.32 meters. Total phosphorus averaged 282 µg/L (n=22) and total nitrogen averaged 2210 µg/L (n=22). Lake Carthage exceeded both chlorophyll-a metrics, both nutrient metrics, and fish information indicated nutrient enrichment. SDGFP (2007c) observed that the water was turbid and green with algae and cattails were plentiful. The fish catch was dominated by black bullhead and below the management objectives for crappie, bass, and bluegill.

Finding: Impaired

Roy Lake (James Basin)

Roy Lake is classified as "warm water permanent fish life, immersion recreation, limited contact recreation, and fish and wildlife propagation and stock watering." It is 1720.7 acres in size with a maximum depth of about 21 feet and an average depth of about 10 feet. The N:P ratio was about 22:1, indicating that this lake is likely phosphorus limited. For the 2010 listing cycle it has been delisted for TSI.

The average chlorophyll-a value was 15.6 µg/L (n=17) and 9% of samples exceeded the 30 µg/L threshold. The average secchi depth was 1.14 meters. Total phosphorus averaged 49 µg/L (n=26) and total nitrogen averaged 1090 µg/L (n=26). None of the proposed thresholds were exceeded for Roy Lake, except for total nitrogen, and in the most recent fish survey (SDGFP, 2008c) the fishery was found to be in fairly good condition although some sport fish species were below the management objective.

Finding: Not Impaired

South Red Iron Lake (James Basin)

South Red Iron Lake is classified as "warm water permanent fish life, immersion recreation, limited contact recreation, and fish and wildlife propagation and stock watering." It is 615.42 acres in size with a maximum depth of about 14 feet and an average depth of about 8 feet. The N:P ratio is about 22:1, indicating that this lake is likely phosphorus limited. For the 2010 listing cycle it has been delisted for TSI.

The average chlorophyll-a value was 17.2 µg/L (n=6) and 17% of samples exceeded the 30 µg/L threshold. However, the sample size was low. The average secchi depth was 0.83 meters. Total phosphorus averaged 48 µg/L (n=30) and total nitrogen averaged 1050 µg/L (n=30). None of the metrics were exceeded, except for total nitrogen, and in the most recent fish survey SDGFP (2006) found some sport fish species to be below the management objective, with others close to the objectives. However, carp and black bullhead numbers were low.

Finding: Not Impaired

Twin Lakes (James Basin)

Twin Lakes (Sanborn County) is classified as "warm water semi-permanent fish life, immersion recreation, limited contact recreation, and fish and wildlife propagation and stock watering." It is 213.16 acres in size with a maximum depth of about 12.5 feet and an average depth of about 6 feet. The N:P ratio is about 24:1, indicating that this lake is probably phosphorus limited. For the 2010 listing cycle this lake has been delisted for TSI.

The average chlorophyll-a value was 105.8 μg/L (n=24) and 92% of samples exceeded the 30 μg/L threshold. The average secchi depth was 0.26 meters. Total phosphorus averaged 158 μg/L (n=18) and total nitrogen averaged 4120 μg/L (n=19). All thresholds were exceeded and fish information indicated possible enrichment. SDGFP (2008d) noted that the lake had suffered a severe winterkill in 2007-08 and the lake was restocked. This particular survey was not able to collect those fish since they were too small; however, what they did catch was dominated by black bullhead, recognized as an indicator species for eutrophication, especially when dominant.

Finding: Impaired

Wilmarth Lake (James Basin)

Wilmarth Lake is classified as "warm water permanent fish life, immersion recreation, limited contact recreation, and fish and wildlife propagation and stock watering." It is 105.77 acres in size with a maximum depth of about 26 feet and an average depth of about 11 feet. The N:P ratio is about 3:1, indicating that this lake is probably nitrogen limited. For the 2010 listing cycle this lake has been delisted for TSI.

The average chlorophyll-a value was 32.7 μg/L (n=24) and 33% of samples exceeded the 30 μg/L threshold. The average secchi depth was 1.26 meters. Total phosphorus averaged 560 μg/L (n=18) and total nitrogen averaged 1640 μg/L (n=19). All thresholds except secchi depth were exceeded and fish survey information indicated possible enrichment issues. Specifically, the most recent fish survey (SDGFP, 2007d) noted that the water was turbid and, while bass and crappie numbers were good, there were high numbers of black bullhead.

Finding: Impaired

Lake Campbell (Missouri Basin)

Lake Campbell is classified as "warm water semi-permanent fish life, immersion recreation, limited contact recreation, and fish and wildlife propagation and stock watering." It is 45.45 acres in size with a maximum depth of about 17 feet and an average depth of about 7 feet. The N:P ratio is about 3:1, indicating that this lake is probably nitrogen limited. For the 2010 listing cycle this lake has been delisted for TSI, but listed as impaired for pH.

The average chlorophyll-a value was 30.3 µg/L (n=34) and 35% of samples exceeded the 30 µg/L threshold. The average secchi depth was 1.75 meters. Total phosphorus averaged 748 µg/L (n=36) and total nitrogen averaged 2180 µg/L (n=40). All the thresholds except for secchi depth were exceeded for Lake Campbell.

Finding: Impaired

Cottonwood Lake (Missouri Basin)

Cottonwood Lake is classified as "warm water semi-permanent fish life, immersion recreation, limited contact recreation, and fish and wildlife propagation and stock watering." It is 450.1 acres in size with a maximum depth of about 13 feet and an average depth of about 9 feet. The N:P ratio is about 10:1, indicating that this lake is probably nitrogen limited. For the 2010 listing cycle this lake has been delisted for TSI.

The average chlorophyll-a value was 34.9 µg/L (n=19) and 42 of samples exceeded the 30 µg/L threshold. The average secchi depth was 0.79 meters. Total phosphorus averaged 249 µg/L (n=18) and total nitrogen averaged 2570 µg/L (n=17). All the thresholds except for secchi depth were exceeded for Cottonwood Lake.

Finding: Impaired

Lake Pocasse (Missouri Basin)

Lake Pocasse is classified as "warm water permanent fish life, immersion recreation, limited contact recreation, and fish and wildlife propagation and stock watering." It is 1457.23 acres in size with a maximum depth of about 13 feet. Average depth is unknown. The N:P ratio is about 4:1, indicating that this lake is probably nitrogen limited. For the 2010 listing cycle this lake has been delisted for TSI, but was listed for *E. coli*.

The average chlorophyll-a value was 60.2 µg/L (n=26) and 54% of samples exceeded the 30 µg/L threshold. The average secchi depth was 0.84 meters. Total phosphorus averaged 977 µg/L (n=8) and total nitrogen averaged 3710 µg/L (n=29). All the thresholds except for secchi depth were exceeded for Lake Pocasse.

Finding: Impaired

Rahn Lake (Niobara Basin)

Rahn Lake is classified as "warm water permanent fish life, immersion recreation, limited contact recreation, and fish and wildlife propagation and stock watering." It is 19.11 acres in size with a maximum depth of about 14 feet and an average depth of about 6 feet. The N:P ratio is about 10:1, indicating that this lake is probably nitrogen limited. For the 2010 listing cycle this lake has been delisted for TSI.

The average chlorophyll-a value was 46.9 μg/L (n=12) and 83 % of samples exceeded the 30 μg/L threshold. The average secchi depth was 1.02 meters. Total phosphorus averaged 251 μg/L (n=23) and total nitrogen averaged 2270 μg/L (n=23). All the thresholds except for secchi depth were exceeded for Rahn Lake.

Finding: Impaired

Lake Traverse (Red Basin)

Lake Traverse is classified as "warm water permanent fish life, immersion recreation, irrigation, limited contact recreation, and fish and wildlife propagation and stock watering." It is 13,114.8 acres in size with a maximum depth of about 12 feet. The average depth is unknown. The N:P ratio is about 10:1, indicating that this lake is probably nitrogen limited. For the 2010 listing cycle this lake has been delisted for TSI.

The average chlorophyll-a value was 29.0 μg/L (n=33) and 24% of samples exceeded the 30 μg/L threshold. The average secchi depth was 1.21 meters. Total phosphorus averaged 174 μg/L (n=41) and total nitrogen averaged 1680 μg/L (n=41). Only the nutrient concentration thresholds were exceeded for Lake Traverse and since the chlorophyll metrics were not exceeded this lake is not considered impaired at this time.

Finding: Not Impaired

East Vermillion Lake (Vermillion Basin)

East Vermillion Lake is classified as "warm water permanent fish life, immersion recreation, limited contact recreation, and fish and wildlife propagation and stock watering." It is 577.71 acres in size with a maximum depth of at about 23 feet and an average depth of about 12 feet. The N:P ratio is about 4:1, indicating that this lake is probably nitrogen limited. For the 2010 listing cycle this lake has been delisted for TSI.

The average chlorophyll-a value was 51.9 μg/L (n=31) and 32% of samples exceeded the 30 μg/L threshold. The average secchi depth was 1.02 meters. Total phosphorus averaged 433 μg/L (n=42) and total nitrogen averaged 1730 μg/L (n=42). Both of the chlorophyll-a thresholds and nutrient concentration thresholds were exceeded for East Vermillion Lake and fish survey information indicated possible enrichment. Specifically, the latest fish Survey (SDGFP, 2008e) found fish catch samples dominated by black bullhead and walleye was “surprisingly low”. Black bullhead was actually below the management standard of <100 but it was noted that this was for only the third time since 1990.

Finding: Impaired

The process used by EPA in this analysis is not the only possible way to determine risk to lakes and SDDENR is encouraged to develop its own method to address these issues before the 2012 303(d) list is due. Nevertheless, using criteria from a number of states and eutrophication studies, EPA has determined that, for the 2010 cycle, 12 lakes are impaired for South Dakota's narrative standards prohibiting eutrophication. Based on EPA's review and evaluation, we are disapproving the following waters and adding them to South Dakota's 2010 Section 303(d) list: Waggoner Lake, Bierman Dam, Lake Carthage, Lake Isabel, Twin Lakes (Sanborn County), Wilmarth Lake, Rahn Lake, Cottonwood Lake (Sully County), East Vermillion Lake, Bullhead Lake (Deuel County), Lake Campbell (Campbell County), and Lake Pocasse.

D. Priority Ranking and Schedule for Development of TMDLS for Listed Waters and Pollutants

Pursuant to the listing methodology set out in the State's submittal, South Dakota prioritized water quality limited segments for TMDL development according to the severity of the impairment and the designated uses of the segment, taking into account the most serious water quality problems, most valuable and threatened resources, and risk to human health and aquatic life. South Dakota's TMDL prioritization strategy is fully described on pages 16-17 of the Integrated Report.

EPA reviewed the State's priority ranking of listed waters for TMDL development, and concluded that the State properly took into account the severity of pollution and the uses to be made of such waters, as well as other relevant factors such as imminent human health problems or local support for water quality improvement. In addition, EPA reviewed the State's list of WQLS targeted for TMDL development in the next two years, and concluded that the targeted waters are appropriate for TMDL development in this time frame.

IV. Final Recommendation on South Dakota's 2010 Section 303(d) List Submittal

After careful review of South Dakota's final Section 303(d) list submittal package, EPA has determined that South Dakota's 2010 Section 303(d) list partially meets the requirements of Section 303(d) of the Clean Water Act (CWA) and EPA's implementing regulations. EPA partially approves/partially disapproves South Dakota's 2010 Section 303(d) list.

V. References

The following list includes documents that were used directly or indirectly as a basis for EPA's review and approval of the State's Section 303(d) waterbody list. This list is not meant to be an exhaustive list of all records, but to provide the primary documents the Region relied upon in making its decisions to approve the State's list.

Correspondence/Guidance Documents

40 C.F.R. Part 130 Water Quality Planning and Management

40 C.F.R. Part 131 Water Quality Standards

July 29, 2005 memorandum from Diane Regas, Director, Office of Wetlands, Oceans, and Watersheds, US EPA to Water Division Directors transmitting EPA's "Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act."

October 12, 2006 Memorandum from Diane Regas, Director, Office of Oceans, Wetlands, and Watersheds entitled *Information Concerning 2008 Clean Water Act Sections 303(d), 305(b), and 314 Integrated Reporting and Listing Decisions.*

May 15, 2007 letter from Humberto Garcia, Director, Ecosystems Protection Program, EPA Region VIII to Tim Tollefsrud, Division Director, Environmental Services, South Dakota Department of Environment and Natural Resources regarding 2010 Cycle Integrated Reports.

May 5, 2009 Memorandum from Suzanne Schwartz, Acting Director, Office of Wetlands, Oceans, and Watersheds, entitled *Information Concerning 2010 Clean Water Act Sections 303(d), 305(b), and 314 Integrated Reporting and Listing Decisions.*

April 1991, "Guidance for Water Quality-Based Decisions: The TMDL Process," EPA 440/4-91-001.

July 24, 1992 Federal Register Notice, *40 C.F.R. Parts 122, 123, 130, Revision of Regulation*, 57 FR 33040.

August 8, 1997 Memorandum from Robert Perciasepe, Assistant Administrator for Water, US EPA, regarding "New Policies for Establishing and Implementing TMDLs."

September, 1997 Guidance from Office of Water, Headquarters, US EPA regarding "Guidelines for Preparation of the Comprehensive State Water Quality Assessments (305(b) Reports) and Electronic Updates" Supplement, EPA-841-B-97-002B.

November 5, 1997 Memorandum from Tudor Davies, Director, Office of Science and Technology to Water Management Division Directors entitled "Establishing Site Specific Aquatic Life Criteria Equal to Natural Background."

August 23, 1999. Federal Register Notice. *Proposed Revisions to the Water Quality Management and Planning Regulations,* 64 FR 46012.

April 27, 2000 Federal Register Notice, *EPA Review and Approval of State and Tribal Water Quality Standards*, 65 FR 24641

January 26, 2010 notice from Shannon Minerich, Environmental Program Scientist, South Dakota Department of Environment and Natural Resources announcing the availability of South Dakota's 2010 Draft Integrated Report for public comment.

March 1, 2010 letter from Thomas Johnson, Environmental Scientist, Office of Ecosystems Protection and Remediation, Ecosystems Protection Program, US EPA Region VIII, to Shannon Minerich, Environmental Program Scientist, South Dakota Department of Environment and Natural Resources.

South Dakota Department of Environment and Natural Resources response regarding EPA's comments on South Dakota's 2010 draft Integrated Report (included in the final Integrated Report).

Technical References

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Response to EPA Region VIII

Partial approval/partial disapproval recommendation to place 12 lakes on South Dakota's 303(d) list of impaired waters for the 2010 reporting cycle

Federal Registry Public Comment Period Ending September 27, 2010

Prepared by

South Dakota Department of Environment and Natural Resources

Secretary Steven M. Pirner

September 15, 2010

The South Dakota Department of Environment and Natural Resources (SDDENR) would like to take this opportunity to provide background information and rationale for not placing 12 lakes on the 2010 303(d) impaired waterbodies list, hereby recommended by EPA Region VIII to obtain full approval.

Background

In 1998, SDDENR produced a 303(d) list of impaired waters to comply with federal Clean Water Act (CWA) statutes and regulations. Beneficial use support and impairment determinations for assessed lakes in South Dakota were based primarily on a Trophic State Index (TSI) criterion. The TSI criterion was not incorporated into South Dakota Water Quality Standards (Administrative Rule Chapter 74:51:01). Rather, it was developed to better define narrative water quality standards (74:51:05, 74:51:06, 74:51:08, and 74:51:09) associated with eutrophication.

SDDENR placed several lakes across the state in category 5 during the 1998 listing cycle for not meeting an average TSI threshold of 55.5. As a result, several assessment studies were planned and conducted to focus on nutrient loading, in particular phosphorus, as part of a comprehensive watershed approach. Water quality information gained from the watershed assessment studies was also evaluated to determine if numeric Water Quality Standards assigned to the beneficial use designations were being met. The end result of a watershed assessment study was a comprehensive water quality assessment report and a Total Maximum Daily Load (TMDL) report. Phosphorus was the primary TMDL pollutant associated with the TSI impairment listing.

Following the 1998 listing cycle, SDDENR developed a TSI approach based on level III ecoregion classifications. Lake TSI impairment targets were based on natural breaks in TSI within each level III ecoregion. This TSI approach was thought to be more resourceful than assigning one common TSI threshold for lakes statewide due to the variation in geography, physical characteristics, and trophic state among lakes across the state. The ecoregion approach offered a more representative impairment target in comparison to the initial TSI criterion, although several shortcomings were later discovered with respect to TMDL development.

Significant changes were made to the lake 303(d) listing methodology for the 2006 IR. A new TSI approach was developed to resolve shortcomings associated with the previous ecoregion approach. The new TSI approach used fish beneficial use designations as a classification tool. TSI thresholds were based on the trophic state expected for each fish beneficial use classification. The phosphorus component of the TSI was removed from the over-all index to avoid trophic state misclassification expected in non-phosphorus limited lakes. The listing methodology also incorporated criteria based on numeric Water Quality Standards to make support determinations for the assigned beneficial uses of lakes. This listing methodology combination was used for the 2006 and 2008 303(d) listing cycles.

TSI approach and TMDL development

SDDENR spent a decade using a TSI approach to address narrative standards associated with eutrophication, in context, with 303(d) impairment listing. No matter what TSI approach was used, many TMDLs submitted to EPA required significant watershed phosphorus reductions (greater than 90 percent) to achieve TSI thresholds. In 2004, EPA recommended South Dakota begin incorporating reasonable assurance into TMDLs to document that the phosphorus reduction required to meet the TSI threshold could be achieved. SDDENR performed numerous land-use modeling analyses on several lake watersheds and determined that a phosphorus reduction of greater than 50 percent (conservative) was not achievable.

EPA provided guidance to ensure reasonable assurance was incorporated into TSI TMDLs. EPA recommended a site specific TSI approach for circumstances when modeled phosphorus reductions were considered unattainable to meet TSI thresholds. This approach entailed setting a site-specific or alternate TSI target based on the most practical modeled phosphorus reduction. For instance, if the most practical modeled phosphorus reduction for a given lake was 25 percent then the TSI target for the TMDL would be based on a 25 percent reduction in phosphorus. SDDENR followed this reasonable assurance policy for approximately four years and obtained EPA approval for several TSI TMDLs.

In 2008, EPA informed SDDENR they would no longer approve site-specific TSI TMDLs. EPA's rationale was based on federal CWA regulation which requires that a TMDL reflect the original numeric listing threshold or standard. The end result is that SDDENR developed and submitted several site-specific TSI TMDL documents that were no longer considered approvable by EPA. This EPA policy change had a significant impact on SDDENR's TMDL pace reporting measures. In addition, the Watershed Protection Program stopped writing TSI TMDLs because many would not be considered approvable by EPA.

EPA provided the following guidance in an attempt to facilitate the TSI TMDL approval process:

1) Write TMDL to original numeric TSI listing target and report actual phosphorus reduction required to meet the TMDL;
2) Site-specific TSI target based on the most practical modeled phosphorus reduction considered an approvable TMDL if a linkage could be established between the alternative TSI target and support of the designated beneficial uses;
3) Implement a phased TMDL approach; and
4) Remove the TSI approach from the 2010 303(d) listing methodology and delist lakes for TSI.

SDDENR provided the following response to EPA's recommended guidance:

1) SDDENR maintained that a significant number of lakes would require unattainable watershed phosphorus reductions in order to meet numeric TSI listing targets. A TMDL based on unattainable phosphorus reductions would be considered impractical and provide no reasonable assurance the TMDL could be met following potential watershed remediation actions. This option would lead to continued delays in the TMDL approval process.

2) SDDENR initially requested that EPA follow the original policy and grant approval for site-specific TSI TMDLs based on the most practical watershed phosphorus reduction. Narrative standards associated with eutrophication are subjective allowing opportunity for individual interpretation with respect to TMDL development. In addition, none of the numeric TSI criteria were incorporated into Administrative Rule which should also allow flexibility in the TMDL development process. EPA maintained that the TSI criteria provided a numeric standard in context with 303(d) listing and therefore, the TMDL had to reflect the numeric standard unless a beneficial use support linkage was provided to justify an alternative site-specific TSI.

In many instances, it would have been difficult to establish a reasonable linkage between an alternate TSI target and full support of the designated beneficial uses. Many TSI modeling analyses conducted by SDDENR revealed a minimal change in TSI when subject to the most practical watershed phosphorus reduction. For example, if a given lake was characterized as hypereutrophic with a TSI value of 75, the most practical watershed phosphorus reduction (i.e., 25 percent) could only achieve a minimal reduction in TSI (i.e., 72). In this type of circumstance, a definite linkage could not be established to suggest that the alternate TSI would provide full support of the designated beneficial uses. This is assuming that the trophic state was actually impairing the beneficial uses. This option was not considered due to disconnect with numeric TSI criteria and linkage with beneficial use support, especially in lakes with prominent hypereutrophic condition.

3) A phased TMDL approach involves periodic (3-5 years) evaluation of a waterbody to monitor the pollutant reduction total following different "phases" of remediation. The final endpoint of a phased TMDL is to reach the original pollutant reduction goal

regardless of what the model effort considers attainable. EPA recommended setting the TSI TMDL at the original numeric listing target and reporting the actual phosphorus reductions needed to achieve the TSI target. The TMDL document would require language stating the initial goal is to meet the lesser more practical modeled watershed phosphorus reduction. The TMDL document would require a monitoring plan to track reduction levels overtime and would be considered open until the final reduction endpoint was achieved.

SDDENR did not consider the phased TMDL approach to be a practical option for TSI TMDL development. A phased TSI TMDL would require significant resources to implement with no reasonable assurance the over-all endpoint could be achieved.

4) SDDENR gave careful consideration to the recommended guidance provided by EPA to facilitate TSI TMDL approvals. During the discussion process, SDDENR TMDL staff recognized several shortcomings with the TSI approach regarding 303(d) impairment listing and TMDL development. It became increasingly apparent the best option was to remove the TSI approach from the 303(d) listing methodology and delist lakes for TSI during the 2010 reporting cycle. This decision was made in 2009 during initial preparation of the 2010 IR.

EPA Review of South Dakota's 2010 Section 303(d) Waterbody List

SDDENR reviewed EPA's response letter and supporting documentation to justify partial approval/partial disapproval and the placement of 12 lakes back to South Dakota's 303(d) list of impaired waterbodies for the 2010 reporting cycle. The following comments address specific sections of the EPA review document.

1. Lake Assessment Methodology

SDDENR did not incorporate a definitive method for addressing narrative standards in the 2010 303(d) lake listing methodology. Narrative standards are void of numeric criteria necessary to make an impairment determination and ultimately provide a TMDL endpoint. SDDENR explained to EPA in several correspondences during development of the 2010 IR that a significant amount of time would be required to develop a eutrophication based criteria capable of making beneficial use support determinations and impairment decisions with attainable TMDL endpoints. Given the timeline it was not possible to develop and apply such criteria for the 2010 reporting cycle. For this reason, SDDENR relied on numeric Water Quality Standard based criteria to make support determinations and 303(d) listing decisions. Narrative standards were addressed through public opinion (complaint review process), professional judgment, and subsequent review of existing water quality information as described on page 27 of the 2010 IR document.

EPA recommended using any of the numerous nutrient or related indicators to address narrative standards in the interim, while a more formal eutrophication based criteria is being developed. SDDENR's primary issue with developing interim eutrophication based criteria to address broad narrative standards originates from lessons learned with the TSI approach. Using literature based numeric thresholds for phosphorus, chlorophyll-*a* and/or Secchi depth to make impairment decisions would ultimately lead to similar issues with TMDL development and subsequent EPA refusal to approve TMDLs as experienced with the TSI approach.

South Dakota has many productive hypereutrophic prairie glacial lakes and small reservoirs. The main issue involves hypereutrophic systems that can not meet literature based standards for chlorophyll-*a* or other related indicators through practical nutrient reductions. Until complex listing criteria can be developed to deal with hypereutrophic systems, formal numeric Water Quality Standard based criteria represent the best practical way to make 303(d) listing decisions.

<u>2. Lakes classified as warmwater marginal fish life propagation waters may need reassessment of beneficial uses and/or criteria.</u>

South Dakota has many relatively large, shallow glacial lakes and reservoirs that are highly productive and provide <u>marginal</u> uses. These systems differ physically from typical prairie pothole wetlands. In general, these lakes can provide excellent fishing opportunities and other recreational activities on a periodic basis, however are limited by physical factors and annual climatic conditions (wet and dry cycles). Several assessment studies involving warmwater marginal fisheries have demonstrated that it would be impractical to reduce nutrients to a level that would appreciably decrease algae biomass or change the trophic state. Therefore, SDDENR believes this unique class of lake is appropriately assigned to the warm water <u>marginal</u> fish life beneficial use designation.

<u>3. EPA analysis of delisted lakes classified as warm water permanent, warm water semi-permanent, or cold water permanent fisheries.</u>

Developing eutrophication based criteria for productive prairie lakes and reservoirs in South Dakota that consistently demonstrate hypereutrophic conditions will take careful consideration. Physical characteristics of the basins and annual climate influence internal nutrient dynamics and resulting abiotic/biotic condition. Many systems are naturally prone to periodic nuisance level algae blooms and reduced water clarity regardless of human intervention. Determining impairment due to anthropogenic influence will be a challenging venture and thus criteria development may not follow national or regional models.

EPA used conservative nutrient based thresholds to evaluate the impairment status of lakes proposed to be delisted for TSI. The primary indicator was chlorophyll-*a* though several other indicators of eutrophication were used in the final decision process. All measures of the criteria were based on a systematic review of national and regional literature. Lakes that consistently demonstrated hypereutrophic condition were considered impaired.

SDDENR is not disputing that the 12 lakes identified as impaired by EPA consistently demonstrate hypereutrophic condition. SDDENR's main concern lies with TMDL development and subsequent EPA approval. All the lakes with the exception of Isabel, have had comprehensive watershed assessment studies conducted in recent years. The TSI TMDL reports for Lake Waggoner, Twin Lakes (Sanborn County), Wilmarth Lake and Bullhead Lake were submitted to EPA. Because these lakes required unattainable phosphorus reductions to meet TSI thresholds and a linkage was not provided to support the alternate TSI target they were not considered for approval by EPA. The remaining lakes were in varying phases of TMDL development. However, analysis and reporting was not completed due to the realization they would yield similar TMDL results and consequently not be considered for approval by EPA.

SDDENR recently completed preliminary TMDL analyses on Lake Waggoner, Twin Lakes (Sanborn County), Wilmarth Lake and Bullhead Lake using the EPA's recommended chlorophyll-*a* threshold. In all instances, the phosphorus reductions required to meet the threshold would be considered unattainable based on AnnAGNPS land-use modeling results. Based on available data and knowledge gained from previous assessment studies, the remaining lakes in question would also require similar unattainable phosphorus reductions to meet the chlorophyll threshold. Listing the 12 lakes in question would present the same issues encountered with the TSI approach, which has lead to TMDL pace reporting issues and impeded progress in the department's Watershed Protection Program.

IV. Final Recommendation on South Dakota's 2010 Section 303(d) List Submittal

SDDENR is requesting that EPA withdraw its recommendation to place 12 lakes back on the 2010 303(d) list of impaired waterbodies. SDDENR's request is based on the current lack of eutrophication based criteria to address narrative standards capable of making linkage based beneficial use support determinations and impairment decisions with attainable TMDL endpoints. In addition, it is imperative that eutrophication based criteria be capable of addressing lakes with hypereutrophic condition through reclassification or some other mechanism. SDDENR believes it is not feasible to develop eutrophication based TMDLs for the 12 lakes in question with any reasonable assurance that attainable nutrient (phosphorus) reductions could achieve logical eutrophication targets no matter what indicators or thresholds are used.

SDDENR has already expended significant local, state and federal funds and staff resources conducting watershed assessment studies and developing TMDLs for 11 of the 12 lakes in question. Placing this subset of lakes back on the 303(d) list for chlorophyll-*a* will lead to further resource expenditures and minimal progress with TMDL development and subsequent EPA approval.

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Steven M. Pirner, Secretary
Department of Environment & Natural Resources
Joe Foss Building
523 East Capitol
Pierre, SD 57501-3181

Re: Clean Water Act Section 303(d) Total Maximum Daily Load (TMDL) Waterbody List

Dear ~~Mr. Pirner~~ Steve:

On July 9, 2010, EPA partially approved and partially disapproved South Dakota's 2010 Section 303(d) waterbody list. In particular, EPA approved the State of South Dakota's (State's) decision to list the waters and pollutants and associated priority rankings as found in the State's 2010 Section 303(d) Total Maximum Daily Load Waterbody List. EPA disapproved the State's decision to not include 12 lakes on the list. These lakes were Waggoner Lake, Bierman Dam, Lake Carthage, Lake Isabel, Twin Lakes (Sanborn County), Wilmarth Lake, Rahn Lake, Cottonwood Lake (Sully County), East Vermillion Lake, Bullhead Lake (Deuel County), Lake Campbell (Campbell County), and Lake Pocasse.

EPA provided public notice and solicited public comment on its identification of these additional waterbodies for inclusion on South Dakota's list. The comment period opened with a Federal Register notice published on August 27, 2010, and closed September 27, 2010. EPA has carefully reviewed the written comments received from the State. No comments from other parties were received. A review of the State's comments and our response to those comments are included in the enclosure to this letter. No information was provided that would alter EPA's decision to place these 12 lakes on the State's 303(d) list, therefore these lakes are considered to be impaired and it will be necessary to complete TMDLs for each of them.

Pursuant to the requirements of federal regulations implementing the Clean Water Act at 40 CFR § 130.7, I am hereby transmitting to you the waters that, along with the waters and pollutants found previously approved, will make up the State's year 2010 Section 303(d) list. The waters, pollutant and priority ranking being added to the list are identified in Table 1.

Table 1 **Waterbody, Pollutant, and Priority Ranking to be added to South Dakota's Section 303(d) Waterbody List.**

Waterbody	Pollutant(s)	Water Quality Standard Not Met	Designated Use Not Met	Priority Ranking
Waggoner Lake	Chlorophyll-a	Narrative	Recreation/ Aquatic Life	Low
Bierman Dam	Chlorophyll-a	Narrative	Recreation/ Aquatic Life	Low
Lake Carthage	Chlorophyll-a	Narrative	Recreation/ Aquatic Life	Low
Lake Isabel	Chlorophyll-a	Narrative	Recreation/ Aquatic Life	Low
Twin Lakes (Sanborn County)	Chlorophyll-a	Narrative	Recreation/ Aquatic Life	Low
Wilmarth Lake	Chlorophyll-a	Narrative	Recreation/ Aquatic Life	Low
Rahn Lake	Chlorophyll-a	Narrative	Recreation/ Aquatic Life	Low
Cottonwood Lake (Sully County)	Chlorophyll-a	Narrative	Recreation/ Aquatic Life	Low
East Vermillion Lake	Chlorophyll-a	Narrative	Recreation/ Aquatic Life	Low
Bullhead Lake (Deuel County)	Chlorophyll-a	Narrative	Recreation/ Aquatic Life	Low
Lake Campbell (Campbell County)	Chlorophyll-a	Narrative	Recreation/ Aquatic Life	Low
Lake Pocasse	Chlorophyll-a	Narrative	Recreation/ Aquatic Life	Low

As mentioned in our July 9 letter, it is current Agency policy that a state should address the need for a TMDL no later than thirteen years from the time a waterbody/pollutant combination is added to its list. Additionally, there may be the need for additional work regarding monitoring or re-evaluation of the appropriateness of the standards and beneficial uses associated with these lakes.

We acknowledge the State already is working in some manner in all of these waterbodies. We look forward to working collaboratively with the State as it addresses these waters. If you have questions, please contact Tom Johnson at (303) 312-6226 or Vern Berry at (303) 312-6234.

Sincerely,

Carol L. Campbell

Carol L. Campbell
Assistant Regional Administrator
Office of Ecosystems Protection
and Remediation

Enclosure

cc: Dave Templeton, SDDENR
Jim Feeney, SDDENR
Rich Hanson, SDDENR
Tom Johnson, EPA Region 8
Karl Herman, EPA Region 8
Vern Berry, EPA Region 8
Karen Hamilton, EPA Region 8

Enclosure

Responsiveness Summary to Public Comments on EPA's Partial Disapproval of South Dakota's 2010 Section 303(d) Waterbody List

I. Introduction

Section 303(d) of the Clean Water Act (CWA) requires each state to identify waters for which existing point source pollution controls are insufficient for the affected waters to implement all applicable state water quality standards. States must also establish a priority ranking for waters, taking into account the severity of the pollution and the uses to be made of such waters, and develop total maximum daily loads (TMDLs) for these waters. A TMDL specifies the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and allocates pollutant loadings between point and nonpoint pollutant sources.

Under Section 303(d), EPA has the obligation to review and either approve or disapprove waterbody lists submitted by states. EPA reviewed South Dakota's 2010 submission, which included a description of the data and information the State of South Dakota (State) considered, its methodology for identifying waterbodies, and responses to public comment on the list, and the final list of waters that qualify for listing under Section 303(d). EPA's review of South Dakota's Section 303(d) list is based on EPA's analysis of whether the State reasonably considered existing and readily available water quality-related data and information and reasonably identified waters required to be listed.

After review of the State's submittal, on July 9, 2010, EPA partially approved and partially disapproved South Dakota's Section 303(d) list submittal for the year 2010 listing cycle. Specifically, EPA approved South Dakota's listing of 151 waters, associated pollutants, and associated priority rankings. EPA disapproved South Dakota's decision not to list 12 lakes. EPA determined that these lakes were improperly excluded from the State's list because they are not meeting applicable water quality standards. Evidence of impairment for these waters was submitted to the South Dakota Department of Environment and Natural Resources (SDDENR) during the State's Section 303(d) listing process.

EPA sought public comment on its decision to include these 12 lakes on the State's list. Solicitation for public comment was made in a Federal Register Notice published on August 27, 2010, and through the EPA Region VIII TMDL program website. Comments were due to EPA no later than September 27, 2010.

EPA received comment only from SDDENR and did not receive any new data or information through this public notification that would cause the Agency to alter its decision with respect to the State's 2010 Section 303(d) list. This document contains a summary of comments EPA received during the public comment period and EPA's responses to those comments.

II. List of Commenters

South Dakota Department of Environment and Natural Resources (SDDENR)

III. Comments and Responses

Comment: SDDENR stated that in 2008, EPA informed SDDENR they would no longer approve site-specific trophic state index (TSI) TMDLs. EPA's rationale was based on federal CWA regulation which requires that a TMDL reflect the original numeric listing threshold or standard. The end result is that SDDENR developed and submitted several site-specific TSI TMDL documents that were no longer considered approvable by EPA. This EPA policy change had a significant impact on SDDENR's TMDL pace reporting measures. In addition, the Watershed Protection Program stopped writing TSI TMDLs because many would not be considered approvable by EPA.

Response: After EPA finalized the new regulations affecting the TMDL and NPDES programs in mid-2000 (65 FR 43585; 07-13-2000), there was some emphasis on showing that TMDL load reductions were "achievable." During that time the Region asked states to include language in TMDLs that showed that if enough controls were put in place in the watershed, the TMDL targets could eventually be met. Ultimately, the 2000 regulations were withdrawn by EPA (68 FR 13607; 03-19-2003). However, EPA continued to encourage states to show how TMDL targets could be met through BMP implementation throughout the watershed to a level necessary to meet existing water quality standards.

Section 303(d) of the Clean Water Act requires states to define water quality goals for a waterbody by setting designated uses and establishing criteria to protect those uses. TMDLs written for the waterbody need to ensure that the targets and estimates of the loading from the watershed sources are protective of the uses and ensure the waterbody will meet the applicable criteria. It may be appropriate to set multiple targets for nutrient TMDLs for lakes that are protective of numeric and narrative criteria and are also protective of designated uses. For example, one or more targets may be directly tied to nutrient loadings (e.g., TP or TN), and one or more targets may be more directly related to the designated uses (e.g., dissolved oxygen, pH, chlorophyll-a, macrophyte coverage, transparency).

For some watersheds, attaining the water quality standards may result in targets that are fairly easy to meet, others may require a long time and greater landowner participation in order to restore water quality. Those TMDLs that require significant load reductions and a long time horizon to show results may appear "unachievable" at the time they are developed. However, they are approvable by EPA as long as the targets are designed to meet water quality standards. Use of an iterative implementation process, sometimes called adaptive implementation, may work best for TMDLs that require significant load reductions (see August 2, 2006 EPA Memorandum: *Clarification Regarding "Phased" Total Maximum Daily Loads*). Another option is to develop phased TMDLs that include interim targets based on levels of achievability, a process for evaluating progress towards meeting each target, and a long-term goal of meeting the applicable water quality standards. If during the implementation process it is determined that additional reductions are not possible, and the target cannot be met, then changes to the applicable water quality standards could be considered.

Comment: SDDENR commented that EPA provided the following guidance in an attempt to facilitate the TSI TMDL approval process: 1) write TMDLs to the original numeric TSI listing target and report actual phosphorus reductions required to meet the TMDL; 2) develop a site-specific TSI target based on the most practical modeled phosphorus reduction considered approvable if a linkage could be established between the alternative TSI target and support of the designated designated uses; 3) implement a phased TMDL approach; and, 4) remove the TSI approach from the 2010 303(d) listing methodology and delist lakes for TSI.

Response: As mentioned in the previous response, writing the TMDL to meet the narrative or numeric criteria and protect the designated uses, even if it appears unachievable at the time, is a necessary component of an approvable TMDL. Using multiple targets as well as adaptive or phased implementation has worked in other Midwestern states. Some TMDLs may require a combination of approaches, particularly if the nonpoint sources are the primary source of nutrient loading to the waterbody, or in situations that will require a longer period of time to achieve a significant level of landowner participation.

EPA continues to support the use of TSI and other metrics as a means to determine if narrative standards are being met, if waters are impaired, and as TMDL targets. EPA recommended that SDDENR revise their TSI methodology to add additional metrics and thresholds as part of a weight-of-evidence approach. EPA provided several examples of the weight-of-evidence approach from other states in the Midwest to SDDENR. Many of those states use TSI or chlorophyll-*a* concentrations as a component in assessing lakes and reservoirs.

Further, EPA continues to approve TMDLs that use TSI or a weight-of-evidence approach to interpret the narrative standard along with applicable numeric standards (e.g., pH, dissolved oxygen) as TMDL targets. Within the past two years, Region 8 has approved TMDLs in both Utah and North Dakota with TSI targets. The Utah TMDL for East Canyon Reservoir set a chlorophyll-*a* TSI target of 50 based on recreational use protection. The TMDL also set TMDL targets based on the suite of indicators used by the State to interpret their narrative standard. The suite of indicators included: a mean seasonal chlorophyll-*a* target of 8 µg/L, a nuisance algal threshold of 30 µg/L, algal dominance other than blue-green species, dissolved oxygen concentrations and total phosphorus. The North Dakota TMDL for Larimore Dam set a total phosphorus TSI target of 50 which would reduce the total phosphorus concentration in the lake to below 0.024 mg/L and would bring the chlorophyll-*a* concentration to 8.2 µg/L. For both states the nutrient reductions needed to reach the targets are significant and are likely not achievable in the near term, but may be in the long term. Both states set targets needed to meet their narrative criteria and protect the designated uses of the waterbody.

Comment: In their comment letter to EPA, SDDENR provided the following summary of the State's response to EPA's recommended guidance on the TSI TMDL approval process:

1) SDDENR maintained that a significant number of lakes would require unattainable watershed phosphorus reductions in order to meet numeric TSI listing targets and would provide no reasonable assurance the TMDL could be met.

2) SDDENR initially requested that EPA follow the original policy and grant approval for site-specific TSI TMDLs based on the most practical watershed phosphorus reduction. Narrative standards associated with eutrophication are subjective allowing opportunity for individual interpretation with respect to TMDL development.

3) A phased TMDL approach involves periodic (3-5 years) evaluation of a waterbody to monitor the pollutant reduction total following different "phases" of remediation. The final endpoint of a phased TMDL is to reach the original pollutant reduction goal regardless of what the model effort considers attainable. SDDENR did not consider the phased TMDL approach to be a practical option for TSI TMDL development.

4) SDDENR gave careful consideration to the recommended guidance provided by EPA to facilitate TSI TMDL approvals. During the discussion process, SDDENR TMDL staff recognized several shortcomings with the TSI approach regarding 303(d) impairment listing and TMDL development. It became increasingly apparent the best option was to remove the TSI approach from the 303(d) listing methodology and delist lakes for TSI during the 2010 reporting cycle.

Response: TMDLs that require significant nutrient reductions may require significant landowner participation and a long timeframe to see the results. As noted in our previous responses, this may appear to be unattainable in the near term, but may be possible in the future as agricultural practices change and technological information improves. For watersheds that receive loading only from nonpoint sources, EPA encourages states to include documentation in the TMDL that demonstrates that the load allocations are technically feasible. However, the reasonable assurance demonstration is not a requirement for EPA approval of nonpoint source only TMDLs.

SDDENR's TSI guidance is an interpretation of the narrative water quality standards. The fisheries based TSI values from the guidance were used as targets in many TMDLs. Deviations from written policy or guidance should be accompanied by a consistent, well-reasoned explanation of why alternative numbers are needed and how the designated uses will be protected. Perhaps the data from the periodic fish surveys, conducted by the South Dakota Department of Game, Fish and Parks (SD GF&P), could be used to evaluate the current fishery status and provide trend information on fishery status if multiple surveys exist for the same lake. The information about fish assemblages could be used along with other lake data such as trophic condition, chlorophyll-*a*, algal bloom frequency, algal species dominance, aquatic macrophyte coverage, dissolved oxygen, temperature, or pH to determine if the range is within the expected conditions for the designated fishery and recreational uses for the lake.

Comment: SDDENR commented that numeric criteria are the best way to make 303(d) listing determinations for lakes.

Response: EPA agrees that numeric criteria streamline and facilitate the 303(d) listing process, TMDL development, and permitting. To address this gap, we encourage SDDENR to move aggressively towards developing and adopting numeric nutrient criteria for all waterbody types. Absent numeric nutrient criteria for South Dakota waterbodies, the narrative standard must still be achieved for all waters. Narrative standards were designed to protect against the threats that specific numeric criteria might not cover and a weight-of-evidence approach is often used to determine attainment. Based on EPA's interpretation of the State narrative standard, we determined that designated uses were not being attained.

The use of numeric criteria such as dissolved oxygen often by itself cannot determine if a lake is being impacted by excess nutrients. In many cases, low dissolved oxygen concentrations do not occur until waterbodies have experienced numerous other changes indicative of excess nutrient enrichment. Additionally, the use of dissolved oxygen as an indicator is problematic unless samples are collected at the most sensitive time of day or unless continuous dissolved oxygen probes are deployed.

Comment: SDDENR commented that for the warm water marginal lake classification it would be impractical to reduce nutrients to a level that would appreciably decrease algae biomass or change the trophic state.

Response: EPA recognizes that it may be appropriate to classify these waters as a separate group in the development of numeric nutrient criteria. However, this concept should be evaluated with empirical data. Since SDDENR has not submitted a final nutrient criteria plan to EPA, it is difficult to know if these waters are truly unique and warrant different nutrient thresholds or if a use attainability analysis (UAA) is a more appropriate avenue to pursue. We encourage SDDENR to develop and submit a nutrient criteria plan to EPA and to collaborate with EPA in the future to develop a technically robust classification approach for South Dakota lakes and reservoirs. As part of this effort, we would critically examine whether these lakes are truly a unique class.

Comment: SDDENR did not dispute that the warm water permanent and warm water semipermanent lakes disapproved by EPA are hypereutrophic. They stated that TMDLs for these lakes would be unattainable and that all of the 12 disapproved lakes except Isabel have comprehensive watershed assessments. TMDL reports were done for Waggoner, Twin, Wilmarth, and Bullhead, but were not considered approvable by EPA. The other seven are in varying phases of TMDL development and were not completed since they would also result in unapprovable TMDLs.

Response: EPA found that these waters are hypereutrophic as a result of excess nutrient enrichment and are not meeting their recreational and aquatic life uses; therefore, these waters should remain on the State's 303(d) list. However, EPA has identified these waters as a low priority for TMDL development. This approach allows time for the State to collaborate with EPA staff to develop scientifically defensible numeric nutrient thresholds for South Dakota lakes. Once developed, these thresholds would serve as TMDL targets and drive projected nutrient reductions. This approach may address some of the TMDL technical issues (e.g., attainability) and help identify waters needing additional investigation or that cannot meet their designated uses.

In the interim, EPA recommends SDDENR consider using accepted literature values for TSI in the development of TMDL targets. EPA could approve TMDLs if the accepted literature TSI values were used as targets. For example, EPA could approve a TMDL for warm water semipermanent fisheries with a TSI target in the range of 55-60 (chlorophyll-*a* = 12-20 μg/L), or for warm water permanent fisheries with a TSI in the range of 50-55 (chlorophyll-*a* = 7.3-12 μg/L).These values likely would be protective of the fisheries and recreational uses specified by SDDENR for those lakes. If necessary, the TMDLs should also include targets for dissolved oxygen, pH and temperature. Carlson and others recommend that chlorophyll be used as the primary predictor for measuring algal biomass (See: Carlson, R.E. and J. Simpson. 1996. *A Coordinator's Guide to Volunteer Lake Monitoring Methods*. North American Lake Management Society). However, for macrophyte dominated lakes it may be necessary to add some measure of the impact of the macrophytes on the recreational uses of the lake. An iterative, adaptive management approach to BMP implementation along with continued monitoring may be the best way to measure progress over a long time period.

Comment: SDDENR commented that EPA recommended using any of the numerous nutrient indicators to address narrative standards in the interim, during the development of more formal eutrophication based criteria. SDDENR's main concern with this approach stems from lessons learned with the TSI approach. Using literature-based numeric thresholds for phosphorus, chlorophyll-*a* and/or Secchi depth to make impairment decisions would ultimately lead to similar issues with TMDL development and subsequent EPA refusal to approve TMDLs as experienced with the TSI approach.

South Dakota has many productive hypereutrophic prairie glacial lakes and small reservoirs. These hypereutrophic systems cannot meet literature based standards for chlorophyll-*a* or other related indicators through practical nutrient reductions. Until complex listing criteria can be developed to deal with hypereutrophic systems, formal numeric Water Quality Standard based criteria represent the best practical way to make 303(d) listing decisions.

Response: Many states have used literature based values combined with available lake data to establish thresholds for their state. Often one or more of these thresholds are used to set targets for TMDLs. EPA recommends that SDDENR develop, collaboratively with EPA, nutrient-related thresholds for use in TMDL target setting and agree that the best approach to resolving these complex issues is through the adoption of numeric nutrient criteria.

SOUTH DAKOTA WATER QUALITY
WATER YEARS 2004-2009 (streams) and
WATER YEARS 2000-2009 (lakes)

The 2010 South Dakota Integrated Report
Surface Water Quality Assessment

By the State of South Dakota

Pursuant to
Sections 305(b), 303(d), and 314 of the
Federal Pollution Control Act

South Dakota Department of Environment and
Natural Resources

Steven M. Pirner, Secretary

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I. INTRODUCTION

This integrated 305(b) and 303(d) report (Integrated Report) was prepared by the South Dakota Department of Environment and Natural Resources (DENR) pursuant to Sections 305(b), 303(d), and 314 Federal Water Pollution Control Act (P.L. 95-217).

The 305(b) report in previous years provided an assessment of the quality of South Dakota's water resources and summarized state programs established to prevent and control water pollution. The 303(d) report identified impaired waterbodies within South Dakota that require the development of Total Maximum Daily Loads (TMDLs). DENR routinely used the 305(b) report to create the 303(d) impaired waterbody list.

This document combines the 305(b) report and 303(d) list into one Integrated Report, which provides an assessment of the quality of South Dakota's surface water resources and identifies the impaired waterbodies that need TMDLs. It is the intent of this report to inform the citizens of South Dakota and the United States Environmental Protection Agency (EPA) of the condition of state surface water resources and to serve as the basis for management decisions by government and other entities for the protection of surface water quality.

EPA will use the information from the Integrated Report to document the State's progress in meeting and maintaining Clean Water Act goals for the ecological health of the nations surface waters and their domestic, commercial, and recreations uses. DENR will use the information in this report along with population data, economic analyses, program capability assessments, and other appropriate information to plan and prioritize water pollution control activities.

DENR will also use the Integrated Report as a tool to continue to stimulate development of nonpoint source (NPS) projects and to produce a priority waterbody list for the department. The Integrated Report will be available to all state conservation districts and water development districts. Each district can review watershed information for its geographical area of interest. This helps the districts focus on the location, nature, and discussions, which start the long process toward nonpoint source pollution control implementation.

This report is shared with the Nonpoint Source Task Force to help focus its efforts and provide information used in the priority waterbody ranking system. The Nonpoint Source program also uses this document to supplement news articles released through the DENR Information and Education (I&E) program.

The surface water quality assessments listed in this report rely primarily on the analyses of data generated by the DENR, the United States Geological Survey (USGS), United States Army Corp of Engineers (USACE), Camp Dresser McGee consulting (CDM), water quality data submitted by Wharf Resources, and the cities of Watertown, Huron, and Sioux Falls, and best professional judgment. While this assessment is as comprehensive as resources permit, some of the state's surface water quality problems may not be identified or documented in this report.

South Dakota Law (SDCL 34A-2-4 and 34A-2-6) authorizes the Department's Secretary to provide this assessment of current state surface water quality to the people of the State of South Dakota and the EPA.

II. EXECUTIVE SUMMARY

The purpose of this report is to assess the water quality of South Dakota's water resources and to identify the impaired waterbodies that require TMDL development. This report meets the requirements of Sections 305(b), 303(d), and 314 of the federal Clean Water Act which mandates a biennial report on state water quality to Congress. This report is also intended to inform the citizens of South Dakota on the status of the quality of their water resources and to serve as the basis for management decisions by government staff and report along with population data, economic analyses, program capability assessments, and other appropriate sources to plan and prioritize water pollution control activities.

Surface Water Quality

South Dakota has about 9,289 miles of perennial rivers and streams (Table 1) and about 85,841 miles of intermittent streams. About 6,206 stream miles have been assessed in the past five years (October 2004 to September 2009). During this 5-year interval, 33% of assessed stream miles were found to support the assigned beneficial use; 67% did not support one or more beneficial uses. Fifty-four percent of stream miles designated for immersion recreation supported that beneficial use. DENR has listed a total of 106 different streams or stream segments as impaired and require TMDL development.

In addition to rivers and streams, South Dakota has 569 lakes and reservoirs with specific aquatic life and recreational beneficial use classifications. The four Missouri River mainstem reservoirs were not included in the total lake acres but were included in the monitored river mileage.

DENR has assessed 132 of the 569 classified lakes. The assessed lakes account for 70% of the total classified lake acreage. An estimated 77% of the assessed lake acreage was considered to support one or more beneficial uses. DENR has listed a total of 53 lakes as impaired and require TMDL development. Sediment and nutrients conveyed in surface water runoff are the main nonpoint source pollutants impacting South Dakota lakes and reservoirs.

Similar to previous reporting periods, nonsupport for fishery/aquatic life uses was caused primarily by total suspended solids (TSS) from agricultural nonpoint sources (NPS) and natural origin. Nonsupport for recreational uses was primarily caused by fecal coliform and *E. coli* contamination from livestock and wildlife contributions.

DENR continues to conduct chemical, physical, and biological stream surveys and ambient monitoring to assess the quality of receiving streams and to document water quality problem sources and improvements.

Table 1: Atlas

State Population 2000 Census	754,844
State Surface Area (sq. mi.)	77,047
Number of water basins (according to state subdivision)	14
Total number of river/stream miles	95,130*
Number of perennial river miles (subset)	9,289*
Number of intermittent stream miles (subset)	85,841*
Number of border river miles of shared river/streams (subset)	360**
Miles of ditches and canals (man-made waterways)	424**
Number of classified lakes/reservoirs/ponds	569
Acres of classified lakes/reservoirs/ponds	193,298*
Square miles of estuaries/harbors/bays	0
Number of Ocean coastal miles	0
Number of Great Lakes shore miles	0
Acres of freshwater wetlands	1,780,859***
Acres of tidal wetlands	0
Name of border rivers: Missouri River, Big Sioux River, Bois de Sioux River.	

* Estimated from the National Hydrography Dataset (1:100,000 scale)
** (EPA, 1991)
*** National Wetlands Inventory

Wetlands

South Dakota has an estimated 1.78 million acres of small depressional wetlands with shallow water habitat. South Dakota Surface Water Quality Standards contain provisions to include wetlands as “waters of the state.” DENR has assigned wetlands with the beneficial use (9) Fish and wildlife propagation, recreation, and stock watering, which provides protection under existing narrative and numeric water quality standards.

The EPA is encouraging states to develop monitoring and assessment tools to determine the ecological integrity of wetland environments. EPA currently promotes three approaches to wetland assessment each containing a different level of assessment. South Dakota State University-Wildlife and Fisheries in cooperation with South Dakota Game, Fish, and Parks (GF&P) developed a Level-1 and Level-2 wetland rapid assessment protocol for prairie pothole wetlands in eastern South Dakota. The South Dakota wetland rapid assessment protocol was developed for the State’s Natural Heritage and Wildlife Habitat Programs (GF&P) for identifying reference wetlands, monitoring randomly selected sites, and evaluating wetland restoration efforts.

A Level-3 wetland assessment was developed within the prairie pothole region of South Dakota. An Index of Plant Community Integrity (IPCI) was used to evaluate the vegetative composition of wetlands across classification (temporary and semipermanent) and disturbance (native grass to cropland) gradients within the Northern Glaciated Plains and Northwestern Glaciated Plains ecoregions. The IPCI method can be used in South Dakota to allow the placement of wetlands into disturbance classes for ecological and mitigation needs (Hargiss et al. 2007).

Water Pollution Control Programs

The water quality goals of the state are to: identify water quality problems, set forth effective management programs for water pollution control, alleviate water quality problems, and achieve and preserve water quality for all intended uses.

Point Source Pollution Control (Surface Water Discharge System):
DENR continues to administer the National Pollutant Discharge Elimination System (NPDES) program in South Dakota, referred to as the Surface Water Discharge permitting program. The Surface Water Quality Program issues Surface Water Discharge permits and develops water quality-based effluent limits to ensure water quality standards are maintained.

Nonpoint Source Pollution Control:
Nonpoint Source (NPS) pollution originates from diverse and diffuse sources. Nonpoint pollution controls must reflect this by wisely using resources available from various state, federal, and local organizations, plus have landowner support and participation. South Dakota primarily uses voluntary measures for the implementation of Best Management Practices (BMPs) to control NPS pollution. During the past 20 years, the program has initiated many development and implementation projects throughout the state. The Clean Water Act section 319 program is the focal point for a majority of the existing NPS control programs.

Educating the public about NPS pollution issues has been effective in prompting many landowners to voluntarily implement activities to control NPS pollution. However, the technical and financial assistance currently available is not sufficient to solve all of the NPS pollution problems in the state. Other solutions must be explored. Landowners have the capability to accomplish much if they understand the problems and the methods to solve them. Many of the solutions involve land management changes that benefit the landowner by making their lands more productive and sustainable.

A total of 106 stream segments and 45 lakes require TMDLs to address impairments. Of the total number of required TMDLs, 70% are for streams and 30% are for lakes.

Bordering State's 303(d) and 305(b) Lists

North Dakota, Minnesota, Iowa, Nebraska, Wyoming, and Montana possess waterbodies that border South Dakota. Under the authority of the Clean Water Act, states are granted the right to prevent, reduce, and eliminate pollution, and to plan the development and use of land and water resources. Under this right, states may adopt federal water quality regulations or promulgate their own. States that border South Dakota often have differences in water quality criteria and/or waterbody beneficial use designations. Due to these possible differences, 305(b) and 303(d) list support determination may differ on waterbodies that border South Dakota and another state. For more specific information on a border waterbody, interested parties should contact each state.

III. SURFACE WATER QUALITY ASSESSMENT

SURFACE WATER QUALITY MONITORING PROGRAM

General Discussion

South Dakota DENR monitors surface waters in the state through an established ambient water quality monitoring program, water quality surveys, fish surveys, TMDL assessments, Surface Water Discharge permits, and state nonpoint source implementation projects. The United States Geological Survey (USGS) also conducts routine monitoring throughout the state. All data resulting from USGS monitoring efforts are available from the USGS website. DENR has entered most water quality data into the EPA data storage and retrieval (STORET) system. DENR also maintains an internal database (NR92) and will be submitting data through EPA's Water Quality Exchange (WQX) in the future. WQX replaced STORET in 2009.

Water samples are analyzed for physical, chemical, biological, and bacteriological parameters to provide baseline data for the determination of potential effects of point and nonpoint sources of pollution. Baseline data are also used as a management tool to determine the effectiveness of control programs on existing point and nonpoint sources and for directing future activities. Water samples can show whether or not a waterbody is meeting its assigned beneficial uses.

Water quality standards were first established for all surface waters by the state's Committee on Water Pollution in 1967. The Water Management Board completed the final steps of its most recent triennial review and revisions on March 11, 2009. The Interim Legislative Rules Review Committee approved these revisions on April 21, 2009. EPA formally approved South Dakota's water quality standards revisions on August 19, 2009. The water quality standards consist of water quality criteria necessary to protect those beneficial uses and an antidegradation policy that protects existing uses and high water quality.

DENR designates all surface waters in the state for one or more of the following beneficial uses:

(1) Domestic water supply waters;
(2) Coldwater permanent fish life propagation waters;
(3) Coldwater marginal fish life propagation waters;
(4) Warmwater permanent fish life propagation waters;
(5) Warmwater semipermanent fish life propagation waters;
(6) Warmwater marginal fish life propagation waters;
(7) Immersion recreation waters;
(8) Limited contact recreation waters;
(9) Fish and wildlife propagation, recreation, and stock watering waters;
(10) Irrigation waters; and
(11) Commerce and industry waters.

All streams in South Dakota are assigned the beneficial uses (9) and (10) unless otherwise stated in the Administrative Rules of South Dakota (ARSD) Chapter 74:51:03. Lakes listed in ARSD Chapter 74:51:02 are assigned the beneficial uses of (7) and (8) unless otherwise specified. All lakes in South Dakota are also assigned the beneficial use of (9) unless otherwise stated in the same reference (74:51:02). Table 2 contains a summary of the established beneficial uses and a listing of numeric water quality criteria. State toxic pollutant standards for human health and aquatic life are presented in Table 3.

Fixed Station Ambient Monitoring

The DENR water quality monitoring network is currently made up of 148 stations located on various rivers and creeks within the state. Sampling stations are located within high quality beneficial use classifications, above and below municipal/industrial discharges, or within watersheds of concern. Currently, the department collects these samples on a monthly, quarterly, or seasonal basis. This type of water sampling is invaluable for monitoring historical information, natural background conditions, possible runoff events, and acute or chronic water quality problems.

Typically, grab samples are collected mid-stream, either from a bridge or by wading into the stream. Some stations may have to be sampled from the bank depending on conditions. Every station is sampled in the same manner and location each time. When the sample has been collected, the sampler immediately obtains water and air temperatures, specific conductance, pH, and dissolved oxygen measurements. Time of sample, water depth, channel width, and other visual observations are also recorded. The samples are properly preserved and transported to the laboratory for analysis. Data is uploaded into DENR's internal database.

The most commonly sampled parameters include fecal coliform, *E. coli*, hardness, alkalinity, residue (total solids, total suspended solids, total dissolved solids), pH, ammonia, nitrates, and phosphorous (total and dissolved). Several stations are sampled for sodium, calcium, and magnesium during the irrigation season. Stations located along streams that receive flows from historic Black Hills mining areas are also analyzed for cyanide, cadmium, lead, copper, zinc, chromium, mercury, nickel, selenium, silver, and arsenic. Stations along streams that receive flows from historic uranium mining or current exploration are analyzed for arsenic, barium, molybdenum, uranium, radium 226, and radium 228. Six sampling stations were added in 2009 to the area surrounding the proposed Hyperion oil refinery location. These sites are being sampled to determine background levels of contaminants and will remain to monitor ambient water quality conditions if the oil refinery is built.

Ambient station locations, descriptions, and schedules are included in Appendix D. More detailed descriptions of individual stream sites are available from DENR on request.

Intensive Water Quality Monitoring (Special Studies)

Intensive water quality monitoring is sometimes initiated to assess special problem areas, to obtain data for use in site-specific criteria modification studies, or to provide an updated database for a waterbody. In 2004, DENR developed a special water quality monitoring plan for the Missouri River reservoirs. The focus of the plan was to develop a long term monitoring strategy to determine beneficial use support. Intensive sampling of the reservoirs was performed in 2005 and 2006. Data analyses are currently underway and selected preliminary findings are included in the Missouri River Basin section.

Use Attainability Analysis

DENR conducts a Use Attainability Analysis (UAA) on waterbodies with the beneficial use designation (9) Fish and wildlife propagation, recreation, and stock watering waters that receive or are proposed to receive a permitted surface water discharge under the Surface Water Discharge Permitting Program. During the UAA, physical characteristics of the stream and surrounding land use are documented, physical and chemical properties of the surface water are analyzed, and fish species presence/absence determinations are made. The waterbody reach is visited several times to include different seasons and years. Based on the information collected, the existing beneficial use designation may remain or be assigned a more appropriate fish life propagation and recreational use designation.

Recreation Use Study

During the summer months of 2008 through 2010, DENR has been assessing and will continue to assess the recreation beneficial use of waters that are only assigned the (8) Limited contact recreation waters beneficial use. The purpose of the study is to determine if the existing beneficial use is appropriate or if the waterbody should be assigned the (7) Immersion recreation waters beneficial use. During the study, field personnel measure channel depth and width, stream flow, dissolved oxygen, and pH. A surface water quality sample is collected and analyzed for fecal coliform and *E. coli* bacteria. In addition, public access, land use, channel morphology, and other physical characteristics of the waterbody are documented and photographed. Area residents are interviewed and asked questions regarding stream flow and recreational use in the waterbody.

Biological Sampling Program

Biological samples are often included as part of a watershed assessment study or a special study. DENR's Water Resource Assistance Program incorporates aquatic plant/algae surveys and chlorophyll-*a* testing into lake studies. Stream studies occasionally incorporate bioassessment surveys using fish and aquatic invertebrates as primary water quality indicators.

DENR continues to develop a reference site network for perennial streams in the Glaciated Plains ecoregion of eastern South Dakota. Reference streams are considered to be least impacted by human activities and are generally of high quality. Reference quality stream reaches were selected using a tiered approach. The first tier used Geographic Information System (GIS) based screening tools incorporating land use attributes and scoring regimes to identify streams least impacted by human activity. The second tier involved field visits to verify habitat condition of select stream reaches using rapid scoring protocols. The third tier will involve a validation process to verify the candidate references sites ability to discriminate good from poor water quality. The field survey portion consists of collecting water samples, habitat and riparian assessment, and biological surveys. Fish, macroinvertebrates, and periphyton are the primary indicators of biological health. Grouping references sites into classification schemes to minimize variability across the level III ecoregion will also be part of the development process. The future reference site network will be used for a variety of water resource management applications.

Headwater-Intermittent Streams Project

A large majority of the stream miles (90%) in South Dakota are characterized as intermittent. These streams were once thought to be less significant than perennial streams due to the lack of constant flow. Intermittent streams have gained recognition nationwide with respect to their ecological importance as many contribute greatly to downstream water quality, habitat condition, and biotic integrity.

South Dakota DENR was awarded an EPA R-EMAP research grant to develop a reference network for intermittent headwater streams in the Glaciated Plains ecoregion of eastern South Dakota. This intermittent stream reference project is being conducted through a collaborative effort with environmental biology researchers at South Dakota State University. An intermittent stream reference network is being developed to provide the state with the tools necessary to identify “reference quality” stream reaches, and the framework for developing bioassessment tools required to make determinations about habitat and biotic integrity of potentially impacted streams. Aquatic macroinvertebrates (bugs) represent the primary biological indicator for determining health of these systems. Final deliverables associated with the intermittent stream reference project, including peer-reviewed publications, are expected for completion in July 2010. Information gained from the intermittent streams project is being used in the reference network development process for perennial streams within the Glaciated Plains ecoregion of Eastern South Dakota.

Lake Survey Design

South Dakota DENR modified its annual lake survey design from a targeted survey to a tiered Generalized Random Tessellation Stratified survey design. This three-tiered sampling design allowed DENR to continue to place emphasis on its most critical water resources in the state, while providing statistically valid results to make general determinations about the state’s entire population of classified lakes. The target population for the 2008-2009 survey included all lakes that have fishery beneficial uses (569), with an emphasis placed on lakes that have historical data. A small number of publicly important waterbodies were maintained as targeted sites on the list. The last group of lakes was selected at random. Additional information pertaining to the probabilistic sampling design and results from the 2008-2009 survey is documented in the Statewide Surface Water Quality Summary section of the 2010 Integrated Report.

Toxicity Testing Program

Priority toxic pollutants are expensive to analyze and are not routinely monitored except for special situations. Whole effluent toxicity tests are included as permit limits in some municipal and industrial Surface Water Discharge permits.

Parameters (mg/L) except where noted	(1) Domestic water supply	(2) Coldwater permanent fish life propagation	(3) Coldwater marginal fish life propagation	(4) Warmwater permanent fish life propagation	(5) Warmwater semipermanent fish life propagation	(6) Warmwater marginal fish life propagation	(7) Immersion recreation	(8) Limited-contact recreation	(9) Fish, wildlife, propagation, recreation & stock watering	(10) Irrigation	(11) Commerce and industry
Alkalinity ($CaCO_3$)									750[1]/1,313[2]		
Barium	1.0										
Chloride	250[1]/438[2]	100[1]/175[2]									
Coliform, total (per 100 mL)	5,000 (mean): 20,000 (single Sample)										
Coliform, fecal[4] (per 100mL)							200 (mean); 400 (single sample)	1,000 (mean) 2,000 (single sample)			
Escherichia coli[4] (per 100mL)							126 (mean); 235 (single sample)	630 (mean); 1,178 (single sample)			
Conductivity (umhos/cm @ 25ºC)									4,000[1]/ 7,000[2]	2,500[1]/ 4,375[2]	
Fluoride	4.0										
Hydrogen sulfide undisassociated		0.002	0.002	0.002	0.002	0.002					
Nitrogen, total ammonia as N		[5]Equation-based limit[1,2]	[5]Equation-based limit[1,2]	[5]Equation-based limit[1,2]	[5]Equation-based limit[1,2]	[5]Equation-based limit[1,2]					
Nitrogen, nitrates as N	10.0								50[1]/88[2]		
Oxygen, dissolved[3]		≥6.0; ≥7.0 (during spawning season)	≥5.0	≥5.0; ≥6.0 (in Big Stone Lk & Lk Traverse during Apr and May)	≥5.0	≥4.0 Oct-Apr; ≥5.0 May-Sep	≥5.0	≥5.0			
pH (standard units)	6.5-9.0	6.5 - 9.0	6.5 - 9.0	6.5 - 9.0	6.5 - 9.0	6.0 - 9.0			6.0 - 9.5		6.0 - 9.5
Sodium Adsorption Ratio										10	
Solids, suspended		30[1]/53[2]	90[1]/158[2]	90[1]/158[2]	90[1]/158[2]	150[1]/263[2]					
Solids, total dissolved	1,000[1]/1,750[2]								2,500[1]/ 4,375[2]		2,000[1]/ 3,500[2]
Sulfate	500[1]/875[2]										
Temperature (ºF)		65	75	80	90	90					
Total Petroleum Hydrocarbons	≤1.0								≤10		
Oil and Grease									≤10		

Table 2: Numeric Criteria Assigned to Beneficial Uses of Surface Waters of the State ARSD 74:51:01

[1] 30-day average as defined in ARSD 74:51:01:01(60) [2] daily maximum [3]DO as measured anywhere in the water column of a non-stratified waterbody, or in the epilimnion of a stratified water body
[4] May 1 through September 30 [5] See Table 4

Table 3: Surface Water Quality Standards for Toxic Pollutants

Pollutant	Human Health Value Concentration in ug/L		Freshwater Aquatic Life Value Concentrations in ug/L Uses 2-3-4-5-6-9		Pollutant	Human Health Value Concentrations in ug/L		Freshwater Aquatic Life Value Concentrations in ug/L Uses 2-3-4-5-6-9	
	Use 1(3)	Uses 2-3-4-5-6-9(4)	Acute (CMC)	Chronic (CCC)		Use 1(3)	Uses 2-3-4-5-6-9(4)	Acute (CMC)	Chronic (CCC)
Acenaphthene	670	990			2,4-Dimethylphenol	380	850		
Acenaphthylene (PAH)(6)					Dimethyl Phthalate	270,000	1,100,000		
Acrolein	190	290			Di-n-Butyl-Phthalate	2,000	4,500		
Acrylonitrile(5)	0.051	0.25			2-Methyl-4,6-Dinitrophenol	13	280		
Aldrin(5)	0.000049	0.000050	1.5		2,4-Dinitrophenol	69	5,300		
Anthracene (PAH) (6)	8,300	40,000			Dioxin (2,3,7,8- TCDD) (5)	5.0E-9	5.1E-9		
Antimony	5.6	640			2,4-Dinitrotoluene(5)	0.11	3.4		
Arsenic (5)	0.018(5)(13)	0.14(5)(13)	340	150	1,2-Diphenylhydrazine(5)	0.036	0.020		
Asbestos(5)	7,000,000 fibers/L				alpha-Endosulfan	62	89	0.22	0.056
alpha-BHC(5)	0.0026	0.0049			beta-Endosulfan	62	89	0.22	0.056
beta-BHC(5)	0.0091	0.017			Endosulfan Sulfate	62	89		
gamma-BHC (Lindane) (5)	0.98	1.8	0.95		Endrin	0.059	0.060	0.086	0.036
Benzene(5)	2.2	51			Endrin Aldehyde	0.29	0.30		
Benzidine(5)	0.000086	0.00020			Ethylbenzene	530	2,100		
Benzo(a)Anthracene(5)	0.0038	0.018			Fluoranthene	130	140		
Benzo(a)Pyrene(5)	0.0038	0.018			Fluorene(6)	1,100	5,300		
Benzo(b) Fluoroanthene(5)	0.0038	0.018			Heptachlor(5)	0.000079	0.00079	0.52	0.0038
Benzo(k) Fluoroanthene(5)	0.0038	0.018			Heptachlor epoxide(5)	0.000039	0.000039	0.52	0.0038
Beryllium(5)	4				Hexachlorobenzene(5)	0.00028	0.00029		
Bis(2-Chloroethyl) Ether(5)	0.030	0.53			Hexachlorobutadiene (5)	0.44	18		
Bis(2-Chloroisopropyl) Ether	1,400	65,000			Hexachlorocyclo-pentadiene	40	1,100		
Bis(2-Ethylhexyl) Phthalate(5)	1.2	2.2			Hexachloroethane(5)	1.4	3.3		
Bromoform(6)	4.3	140			Ideno(1,2,3-cd) Pyrene	0.0038	0.018		
Butylbenzyl Phthalate	1,500	1,900			Isophorone(5)	35	960		
Cadmium			2.0(9)	0.25(9)	Lead			65(9)	2.5(9)
Carbon Tetrachloride(5)	0.23	1.6			Mercury	0.050	0.051	1.4	0.77(10)
Chlordane(5)	0.00080	0.00081	2.4	0.0043	Methyl Bromide	47	1,500		
Chlorine			19	11	Methyl Chloride(6)				
Chlorobenzene	130	1,600			Methylene Chloride(5)	4.6	590		
Chlorodibromomethane (5)	0.40	13			N-Nitrosodimethylamine(5)	0.00069	3.0		
Chloroform(5)	5.7	470			N-Nitrosodi-n-Propylamine(5)	0.0050	0.51		
2-Chloronaphthalene	1,000	1,600			N-Nitrosodi-phenylamine(5)	3.3	6.0		
2-Chlorophenol	81	150			Nickel	610	4,600	470(9)	52(9)
Chromium(III)			570(9)	74(9)	Nitrobenzene	17	690		
Chromium(VI)			16	11	Polychlorinated Biphenyls, PCBs(2)(5)(7)(11)	0.000064	0.000064		0.14

Pollutant	Human Health Value Concentration in ug/L		Freshwater Aquatic Life Value Concentrations in ug/L Uses 2-3-4-5-6-9		Pollutant	Human Health Value Concentrations in ug/L		Freshwater Aquatic Life Value Concentrations in ug/L Uses 2-3-4-5-6-9	
	Use 1[3]	Uses 2-3-4-5-6-9[4]	Acute (CMC)	Chronic (CCC)		Use 1[3]	Uses 2-3-4-5-6-9[4]	Acute (CMC)	Chronic (CCC)
Chrysene[5]	0.0038	0.018			Pentachlorophenol	0.27	3.0	19[8]	15[8]
Copper	1,300		13[9]	9.0[9]	Phenanthrene[6]				
Cyanide (weak acid dissociable)	140	140	22	5.2	Phenol	21,000	1,700,000		
4,4'-DDD[5]	0.00031	0.00031			Pyrene[6]	830	4,000		
4,4'-DDE[5]	0.00022	0.00022			Selenium[7]	170	4,200	[12]	4.6
4,4'-DDT[5][7]	0.00022	0.00022	1.1	0.001	Silver			3.2[9]	
Dibenzo(a,h)Anthracene[5]	0.0038	0.018			1,2,4-Trichlorbenzene	35	70		
1,2-Dichlorobenzene	420	1,300			1,1,2,2-Tetrachloroethane[5]	0.17	4.0		
1,3-Dichlorobenzene	320	960			Tetrachloroethylene[6]	0.69	3.3		
1,4-Dichlorobenzene	63	190			Thallium	0.24	0.47		
3,3- Dichlorobenzidine[5]	0.021	0.028			Toluene	1,300	15,000		
Dichlorobromomethane [6]	0.55	17			Toxaphene[5]	0.00028	0.00028	0.73	0.0002
1,2-Dichloroethane[5]	0.38	37			1,2-Trans-Dichloroethylene	140	10,000		
1,1-Dichloroethylene[5]	330	7,100			1,1,1-Trichloroethane				
2,4-Dichlorophenol	77	290			1,1,2-Trichloroethane[5]	0.59	16		
1,2-Dichloropropane[5]	0.50	15			Trichloroethylene[5]	2.5	30		
1,3-Dichloropropene	0.34	21			2,4,6-Trichlorophenol[5]	1.4	2.4		
Dieldrin[5]	0.000052	0.000054	0.24	0.056	Vinyl Chloride[5]	0.025	2.4		
Diethyl Phthalate	17,000	44,000			Zinc	7,400	26,000	120[9]	120[9]

(1) The aquatic life values for arsenic, cadmium, chromium (III), chromium (VI), copper, lead, mercury (acute), nickel, selenium, silver, and zinc given in this document refer to the dissolved amount of each substance unless otherwise noted. All Surface Water Discharge permit effluent limits for metals shall be expressed and measured in accordance with § 74:52:03:16.

(2) Apply to the beneficial uses as designated but do not supersede those standards for certain toxic pollutants as previously established in §§ 74:51:01:31, 74:51:01:32, 74:51:01:44 to 74:51:01:54, inclusive, and § 74:51:01:56.

(3) Based on two routes of exposure - ingestion of contaminated aquatic organisms and drinking water.

(4) Based on one route of exposure - ingestion of contaminated aquatic organisms only.

(5) Substance classified as a carcinogen with the value based on an incremental risk of one additional instance of cancer in one million persons (10^{-6}).

(6) Chemicals which are not individually classified as carcinogens but which are contained within a class of chemicals with the carcinogenicity as the basis for the criteria derivation for that class of chemicals; an individual carcinogenicity assessment for these chemicals is pending.

(7) Also applies to all waters of the state.

(8) pH-dependent criteria. Value given is an example only and is based on a pH of 7.8. Criteria for each case must be calculated using the following equation taken from National Recommended Water Quality Criteria: 2002 (EPA-822-R-02_047, November 2002);

Pentachlorophenol (PCP), ug/L

Chronic = $e^{[1.005(pH) - 5.134]}$

Acute = $e^{[1.005(pH) - 4.869]}$

(9) Hardness-dependent criteria in ug/L. Value given is an example only and is based on a $CaCO_3$ hardness of 10mg/L. Criteria for each case must be calculated using the following equations taken from National Recommended Water Quality Criteria: 2002 (EPA-822-R-02-047, November 2002):

Cadmium ug/L

Chronic = (*0.909)$_e$(0.7409[ln(hardness)]-4.719)

Acute = (*0.944)$_e$(1.0166[ln(hardness)]-3.924)

*Conversion factors are hardness-dependent. The values shown are with a hardness of 100 mg/L as calcium carbonate ($CaCO_3$). Conversion factors (CF) for any hardness can be calculated using the following equations:

Chronic: CF = 1.101672 – [(ln hardness)(0.041838)]

Acute: CF = 1.136672 – [(ln hardness)(0.041838)]

Chromium (III), ug/L

Chronic = (0.860)$_e$(0.8190[ln(hardness)]+0.6848)

Acute = (0.316)$_e$(0.8190[ln(hardness)]+3.7256)

Copper, ug/L

Chronic = (0.960)$_e$(0.8545[ln(hardness)]-1.702)

Acute = (0.960)$_e$(0.9422[ln(hardness)]-1.700)

Lead, ug/L

Chronic = (*0.791)$_e$(1.273[ln(hardness)]-4.705)

Acute = (*0.791)$_e$(1.273[ln(hardness)]-1.460)

*Conversion factors are hardness-dependent. The values shown are with a hardness of 100 mg/L as calcium carbonate ($CaCO_3$). Conversion factors (CF) for any hardness can be calculated using the following equations:

Acute and Chronic: CF = 1.46203 – [(In hardness)(0.145712)]

Nickel, ug/L
Chronic = (0.997)$_e$(0.8460[In(hardness)]+0.0584)

Acute = (0.998)$_e$(0.8460[In(hardness)]+2.255)

Silver, ug/L
Acute = (0.85)$_e$(1.72[In(hardness)]-6.59)

Zinc, ug/L
Chronic = (0.986)$_e$(0.8473[In(hardness)]+0.844)

Acute = (0.978)$_e$(0.8473[In(hardness)]+0.844)

(10) These criteria are based on the total recoverable fraction of the metal.

(11) This criterion applies to total pcbs (e.g. the sum of congener or all isomer or homolog or Aroclor analyses).

(12) The (0.996)CMC = 1/[fl/CMC1) + (f2/CMC2)] where f1 and f2 are the fractions of total selenium that are treated as selenite and selenate, respectively, and CMC1 and CMC2 are 185.9 Φg/L and 12.82 Φg/L, respectively.

(13) This criterion for arsenic refers to the inorganic form only.

Table 4: South Dakota Surface Water Quality Standards for Total Ammonia as N

Equation 1: For Waters where salmonid fish are present.
$(0.275/(1+10^{7.204\text{-pH}})) + (39.0/(1+10^{\text{pH-}7.204}))$
Equation 2: For Waters where salmonid fish are not present.
$(0.411/(1+10^{7.204\text{-pH}})) + (58.4/(1+10^{\text{pH-}7.204}))$
Equation 3: For waters where early life stages are present
$(((0.0577/(1+10^{7.688\text{-pH}})) + (2.487/(1+10^{\text{pHh-}7.688}))) * \text{MIN}(2.85, 1.45 * 10^{0.028 * (25\text{-T})})$
Equation 4: For waters where early life stages are absent.
$(((0.0577/(1 + 10^{7.688\text{-pH}})) + (2.487/(1 + 10^{\text{pH-}7.688}))) * 1.45 * 10^{0.028 * (25\text{-MAX(T,7)})})$
T = *the water temperature of the sample in degrees Centigrade* pH - *the pH of the water quality sample in standard units* MIN = *use either 2.85 or the value of 1.45* $^{0.028 * (25\text{-T})}$*, whichever is the smaller value* MAX = *use either the water temperature (T) for the sample or 7, whichever is the greater value*

Total Maximum Daily Loads (TMDLs) and Section 303(d)

Overview of TMDLs

TMDLs are an important tool for the management and protection of South Dakota's surface water quality. The goal of TMDLs is to ensure that waters of the state attain and maintain water quality standards that support their designated beneficial uses. EPA defines a TMDL as "the sum of the individual waste load allocations for point sources and load allocations for both nonpoint sources and natural background sources established at a level necessary to achieve compliance with applicable surface water quality standards." In simple terms, a TMDL is the amount of pollution a waterbody can receive and still support its designated beneficial uses. TMDLs must be developed for impaired waters, should address a specific waterbody or watershed, and should specify quantifiable targets and associated actions that will enable a given waterbody to support its designated beneficial uses.

Section 303(d) of the federal Clean Water Act (CWA) requires states to develop and submit for approval a list of waters targeted for TMDL development every two years. This is referred to as the 303(d) list. Items that must accompany this list include targeted pollutants and timeframes for TMDL development.

Once identification of TMDL waters are completed, states are to develop TMDLs at a pace necessary to complete all the TMDLs during a 13-year period. TMDLs must allow for seasonal variations and a margin of safety that accounts for any lack of knowledge concerning the relationship between pollutant loadings and water quality. Appendix A is a list of waterbodies with EPA approved TMDLs.

Types of Waters Listed

The following information and data sources were used to determine which waterbodies require TMDLs based on the requirements of section 303(d) of the federal Clean Water Act:

- Waters included in the Integrated Report that are identified as "not supporting" or also known as "impaired" waters;
- Waters for which modeling indicates nonattainment of water quality standards; and
- Waters for which documented water quality problems have been reported by local, state, or federal agencies; the general public; or academic institutions.

Appendix F provides a summary of DENR's 2010 303(d) list.

Impaired Waters

Waters that are considered impaired require a TMDL. This includes waters that are identified under the "not supporting" beneficial use categories in this report unless the waterbody has a TMDL approved by EPA that addresses the impairments.

Waters with Surface Water Discharge-Related Wasteload Allocations
In 1993, DENR was delegated the authority to administer the National Pollutant Discharge Elimination System (NPDES) permitting program. As stated earlier, South Dakota's NPDES permitting program is referred to as the Surface Water Discharge (SWD) permitting program. SWD permits are used to control the discharge of pollutants from point sources. At a minimum, most SWD permits contain technology-based effluent limits which are attained using the best available technology that is economically achievable. However, in some cases the application of technology-based effluent limits is not sufficient to ensure the surface water quality standards are maintained. For these permits, DENR develops water quality-based effluent limits for the permit.

If a SWD permittee discharges a pollutant to an impaired waterbody, the TMDL for that pollutant will include a "wasteload allocation" for the permittee. The wasteload allocation is implemented through the SWD permit.

SWD permits are issued for a maximum of five years, after which time the effluent limits and existing in-stream water quality are reevaluated. Ammonia, biochemical oxygen demand (BOD), and dissolved oxygen are the primary parameters targeted for modeling to develop water quality-based effluent limit. Very few streams have impairments for ammonia or dissolved oxygen; therefore, South Dakota's point source control program has been effective at maintaining and improving the quality of surface waters in the state.

Waters Reported by Government Agencies, Members of the General Public, or Academic Institutions
DENR did not receive any recommendations to list specific water resources on the 303(d) list by any other government agencies, members of the general public, environmental organizations, or academic institutions for the 2010 Integrated Report.

Prioritization of TMDL Waters

Regulatory Requirements
Section 303 (d) of the federal CWA requires that *"each state shall establish a priority ranking for such waters, taking into account the severity of the pollution and the uses to be made of such waters."* Little other guidance is offered for states to use in the prioritization process.

A system of prioritization has been developed by DENR based on several factors. Included in these factors are the required elements of *"the severity of the pollution and the uses to be made of such waters."* The highest priorities are given to impaired waters meeting the following criteria (Priority 1):

- Imminent human health problems;
- Waters where TMDL development is expected during the next two years;
- Waters listed for four or more listing criteria; or
- Waters with documented widespread local support for water quality improvement.

Priority 2 waters meet the following criteria:

- Waters listed for three or less listing criteria;
- Waters where local support for TMDL development is expected but not documented;
- Waters with no evident local support for water quality improvements; or
- Waters where impairments are believed to be due largely to natural causes.

These criteria are a guide. If a waterbody met any one criteria in a category that did not necessarily mean the waterbody was prioritized as such.

Section 319 Related Waters
Section 319 TMDL assessments are developed based upon the prioritization criteria listed above. Section 319 TMDLs are developed as part of an assessment project. DENR prefers to develop TMDLs in 12 digit hydrologic units or larger “clusters” that include all nonpoint source TMDLs required for a river basin. For larger basins, such as the Big Sioux River basin, studies are completed by dividing the basin into sub-basins. Watershed implementation projects for completed nonpoint source TMDL assessments also follow the “clustering” format within associated river basins or sub-basins. Implementation projects for completed TMDL assessments hinge upon whether adequate local support exists. For more information on nonpoint source TMDL development and implementation refer to the “South Dakota Nonpoint Source Program Management Plan.” This document is located at the following web link:

http://denr.sd.gov/dfta/wp/NPSMgmtPlan07.pdf

Surface Water Discharge Related Waters
The priorities for developing water quality-based effluent limits are not based upon the severity of waterbody impairment but upon the importance of maintaining water quality improvements made through the permits. DENR issues Surface Water Discharge permits on a 5-year basis.

Summary of the State TMDL Waterbodies

Using the methodologies, data, information, and public input described for the surface water quality assessments, DENR included the waterbodies that require TMDLs (previously known as the 303(d) list) in Tables 19 - 32. These tables include waterbody names, pollutants of concern, basis for listing, and other information. A total of 151 different waterbodies require TMDLs (Table 6). Each waterbody may contain several different pollutants and thereby may constitute several TMDLs. In addition, some streams are listed more that once due to TMDLs identified for different segments of the same stream (even for the same pollutant).

If a specific waterbody required a TMDL for several different pollutants, all pollutants were grouped into one watershed assessment for that waterbody. In reality it may not be possible to incorporate each pollutant into a single study for each waterbody segment, but this assumption was made for planning purposes. There may be other cases where widespread support for water quality improvements, large single entity landholders (federal lands, state lands, etc.), or other factors allow several waterbodies to be targeted for improvement under a single study. Possible scenarios such as these make TMDL numbers difficult to project. Notwithstanding this fact, the implications of the list are that a monumental work effort is required to complete the number of TMDLs in the time frame suggested by the list.

Resource Implications
TMDL issues span a wide range of activities within DENR. Nonpoint source assessments, clean lakes assessments, discharge permitting, storm water discharge permitting, erosion control, water quality monitoring, water quality standards, water rights, feedlot regulations, and other areas are involved in or affect TMDL development

and implementation. Because of this, the development and implementation of TMDLs will rely on existing programs, resources, and activities. Effective TMDL development requires effective and continuous coordination within all DENR water programs. In addition, the development and implementation of effective TMDLs that will result in improving the quality of South Dakota's waters must have the support, input, and coordination of affected government agencies, local groups, and citizens. As such, the TMDL effort will involve the coordination of many diverse groups and the public with the common goal of improving water quality.

It is not possible to develop TMDLs for every waterbody within two years. The time frame to develop TMDLs on each biennial list is 13 years in accordance with EPA guidelines.

Status of 2008 Integrated Report TMDLs

South Dakota's 2008 303(d) list contained 168 waterbodies or waterbody reaches and a total of 232 waterbody/cause combinations that require TMDL development. One hundred two waterbody waterbody/cause combinations have had TMDLs completed or determined to be unnecessary by DENR since April 1, 2008. Table 5 and Figure 1 show the status of waters that required TMDLs in the 2008 Integrated Report.

Table 5: Status of TMDLs from 2008 Integrated Report

TMDL Status	Number and Percentage of TMDLs
TMDLs completed:	28 (12%)
Delisted based on new information:	74 (32%)
TMDLs in progress:	64 (28%)
TMDLs planned:	66 (28%)
Total reach/cause combinations:	232 (100%)

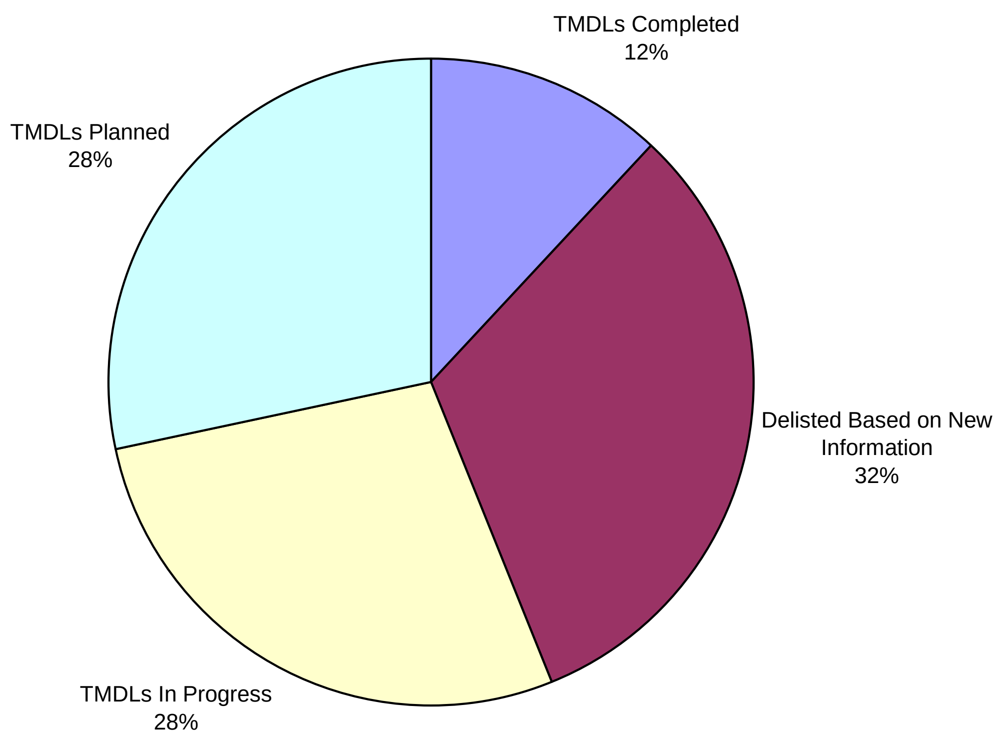

Figure 1: Status of TMDLs from the 2008 Integrated Report

Delisting of Certain 2008 TMDL Waters and Other Exclusions

Delisting of Waterbodies

Waters were delisted using the following criteria:

- EPA approved TMDL(s) in place for all pollutants of concern;
- Water quality standard (WQS) attained:
  - Due to restoration activities; or
  - Due to changes in WQS; or
  - According to new assessment method; or
  - Original basis for listing was incorrect; or
  - Threatened water no longer threatened; or
  - Reason for recovery unspecified.
- Flaws in original listing;
- Additional state effluent controls address water quality problems;
- Reservoir has been breached and is no longer a viable waterbody; or
- Data and/or information lacking to determine water quality status; original basis for listing was incorrect.

Appendix B is a list of impairment causes and associated waterbodies that were delisted in 2010.

TMDLs Required by the 2010 Integrated Report

Table 6 is a list of the projected number of TMDLs required in each basin and the associated pollutants of concern. Watershed assessments are currently underway in several basins. Several of these assessment efforts have identified additional impaired reaches that were not previously recognized in the 2008 Integrated Report. The number of TMDLs has slightly decreased from 2008 to 2010. TSI was removed from DENR's listing methodology which resulted in many lakes being delisted. However, the greater use of watershed assessment data and the adoption of an *E. coli* standard added more rivers and streams to the 303(d) list. Many of these impaired watersheds have TMDL development already in progress.

Table 6: 2010 Summary of TMDLs by Basin

Basin	Number of Waterbodies Requiring TMDLs	Pollutants of Concern
Bad River Basin	2	Dissolved oxygen, specific conductance, total dissolved solids, chlorophyll-*a*
Belle Fourche River Basin	18	Water temperature, fecal coliform, *E. coli*, pH, specific conductance, cadmium, total suspended solids
Big Sioux River Basin	25	Water temperature, fecal coliform, *E. coli*, pH, total suspended solids, mercury in fish tissue, dissolved oxygen, chlorophyll-*a*
Cheyenne River Basin	36	Water temperature, alkalinity, sodium adsorption ratio, total dissolved solids, fecal coliform, pH, specific conductance, *E. coli*, total suspended solids, dissolved oxygen
Grand River Basin	9	Water temperature, sodium adsorption ratio, fecal coliform, *E. coli*, specific conductance, total suspended solids, mercury in fish tissue, chlorophyll-*a*
James River Basin	30	Ammonia, total dissolved solids, fecal coliform, *E. coli*, pH, total suspended solids, dissolved oxygen, chlorophyll-*a*
Little Missouri River Basin	1	Total suspended solids
Minnesota River Basin	2	Dissolved oxygen, pH
Missouri River Basin	14	Dissolved oxygen, fecal coliform, *E. coli*, pH, total suspended solids, temperature, mercury in fish tissue, chlorophyll-*a*
Moreau River Basin	5	Dissolved oxygen, fecal coliform, *E. coli*, total suspended solids, total dissolved solids, sodium adsorption ratio, specific conductance
Niobrara River Basin	2	Fecal coliform, *E. coli,* chlorophyll-*a*
Red River Basin	0	
Vermillion River Basin	9	Fecal coliform, *E. coli*, pH, total suspended solids, chlorophyll-*a*
White River Basin	6	Fecal coliform, *E. coli*, water temperature, sodium adsorption ratio
TOTALS	159	

METHODOLOGY

Two major types of assessments were used to determine use support status of waterbodies: one based on monitoring, and the other based on qualitative evaluations. Monitoring data were primarily obtained from DENR, USGS, USACE, CDM, and the cities of Huron, Watertown, and Sioux Falls. In addition, the United States Army Corps of Engineer 2007 Report on Missouri River water quality was utilized in making support determinations. Sources of quantitative and qualitative lake assessment data were acquired from the Statewide Lakes Assessment project and individual assessment studies.

DENR maintains a Quality Assurance/Quality Control (QA/QC) Program to ensure that all environmental water quality data generated or processed meet standard accepted requirements for precision, accuracy, completeness, representativeness, and comparability. This entails the preparation and periodic review and revision of the DENR Quality Assurance Program and individual project plans. It also includes the preparation of periodic reports to DENR management and EPA; the review of contracts, grants, agreements, etc., for consistency with QA/QC requirements; and the administration of QA/QC systems and performance audits. The latter activity requires the establishment of schedules for the collection of duplicate and blank samples, periodic testing of field sampling techniques, and liaison with contracted labs to ensure compliance with QA/QC objectives. DENR maintains an EPA approved Quality Management Plan. In addition, the Surface Water Quality Program (July 2008) and Water Resources Assistance Program (December 2009) maintain a Quality Assurance Project Plan. An updated Standard Operating Procedure manual was completed in February 2005.

The ambient water quality monitoring (WQM) network provides useful information on overall stream water quality. Only a brief summary of water quality is included because of the large volume of data and reports. A more detailed description of the stream ambient monitoring program is found in the preceding Surface Water Quality Monitoring Program chapter of this document.

Fixed station monitoring data were assessed by dividing major streams into segments that contain the same designated beneficial uses, water quality standards criteria, and environmental and physical influences. When section, township, and range are used in ARSD Chapter 74:51:03 to describe the beginning or end point of a stream segment, the boundary of the segment is that point where the most downstream portion of the stream crosses the boundary of that section. Data obtained during the current reporting period were analyzed by utilizing DENR's NR92 Database system. The data for each monitored segment were compared to state water quality standards applicable to the beneficial uses assigned to the segment in question (Tables 2 and 3). Monitored stream course mileages and lake acreages were measured using EPA Reach Indexing Tool software.

Specific criteria were developed to define how data for streams would be evaluated to determine the status of each stream segment (waterbody). The following criteria were used:

Table 7: Sample Criteria for Determining Support Status

Description	Criteria Used
FOR CONVENTIONAL PARAMETERS (such as dissolved oxygen, total suspended solids, pH, water temperature, fecal coliform bacteria, *E. coli* bacteria, etc.) Number of observations (samples) required to consider data representative of actual conditions	STREAMS: at least 20 samples for any one parameter are usually required within a waterbody reach. The sample threshold is reduced to 10 samples if 3 or more samples exceed daily maximum water quality standards. A minimum of two 30-day average results is used for 30-day average criteria. LAKES: at least two independent years of sample data and at least two sampling events per year.
FOR CONVENTIONAL PARAMETERS Required percentage of samples exceeding water quality standards to consider segment water quality-limited	STREAMS: >10% (Or 3 or more exceedances between 10 and 19 samples) for daily maximum criteria. >10% (or 2 or more exceedances between 2 and 19 samples) for 30-day average criteria. LAKES: >10% exceedances when 20 or more samples were available. If < 20 samples were available, 3 exceedances were considered impaired. See lakes listing methodology section for specifics on parameters associated with a vertical profile (i.e., dissolved oxygen, water temperature, pH, and specific conductance).
FOR TOXIC PARAMETERS (such as metals, mercury, total ammonia, etc.) Number of observations (samples) required	STREAMS: At least one water quality sampling event. LAKES: At least one fish flesh sampling event. More than one exceedance of toxic criteria within the past 3 years.
FOR TOXIC PARAMETERS Required percentage of samples exceeding water quality standards in order to consider segment water quality-limited	STREAMS: More than one exceedance of toxic criteria within the past 3 years for both the acute and chronic standard. LAKES: If fish flesh samples are above the Federal Drug Administration's recommended action levels (such as 1 part per million for mercury).
Data age (for both conventional and toxic parameters)	STREAMS: Data collected from October 1, 2004, to September 30, 2009 LAKES: All available data from the most recent 10 year period, January 2000 to September 2009. Unless there is justification that data are (or are not) representative of current conditions. While data age of two years matches the report cycle, it does not allow for enough samples to accurately portray variability
Quality Assurance/Quality Control (for both conventional and toxic parameters)	STREAMS and LAKES: There must be a consensus that the data meet QA/QC requirements similar to those outlined in DENR protocols. QA/QC data were encouraged to be submitted. Internal and external data will only be used if proper QA/QC protocols, sampling methods, and EPA approved analytical methods were used.

Deviations from the above criteria were allowed in specific cases and are generally discussed in the proceeding tables listing the surface water quality summaries. Use support assessment for all assigned uses was based on the number of exceedances of water quality standards for the following parameters: total suspended solids, total dissolved solids, pH, water temperature, dissolved oxygen, fecal coliform, *E. coli*, and others. Exceedances of more than one parameter were not considered additive in determining overall support status for any given waterbody. A stream segment with less than 10% exceedances with respect to the total number of samples for one or more parameters is considered fully supporting. However, toxic parameters including those in Table 3 are only allowed one violation in a three-year period. Chronic standards, including geometric means and 30-day averages, are applied to a calendar month. For hardness-based metals, the hardness and metal concentrations were averaged for the calendar month. Complete listings of relevant parameters appear in Tables 2 and 3. South Dakota has established the following general criteria for determining use support of monitored streams:

To ensure a sufficient number of samples were available for each stream segment (usually a minimum of 20) the period of record considered for this report was from October 1, 2004, to September 30, 2009, (5 years) for streams and January 1, 2000 to September 30, 2009, (10 years) for lakes. The ten-year timeframe in lakes was designated to account for climatic variability (wet and dry cycles) and increase the chance of covering multiple sampling events. The ten-year time frame was thought to provide a more recent description of a lake's support status between reporting cycles in comparison to using all available data.

Waterbody support determinations are heavily influenced by the numbers of samples obtained based on the criteria in Table 7. DENR acknowledges that differences in the number of samples obtained for a waterbody reach between reporting cycles may influence the support determination and EPA reporting category. As a protective measure, DENR may designate a reach as "threatened waters." A "threatened water" designation may be assigned if the reach demonstrates: a declining trend that may result in water quality standard exceedances by the next reporting cycle, the reach has previously been listed as nonsupporting and the current number of samples obtained change the determination to full support but with a high percent of exceedances, or, there are proposed activities in the waterbody reach that may cause exceedances. A "threatened waters" designation may also be used when water quality monitoring does not indicate impairment of WQS; however, the waterbody is considered impaired for other reasons, including waterbodies with fish consumption advisories. Regardless of support determination, waterbodies designated as "threatened waters" are automatically placed in category 5 and are placed on the 303(d) list. Much of the waterbody impairment information is summarized in Tables 9 through 19. More detailed information on the lakes and streams in each river basin is presented in Tables 19 through 32.

In addition to use support assessment above, South Dakota has chosen to use the assessment categories that EPA recommends in its guidance that was issued in July 2005. South Dakota's assessment categories are as follows:

- Category 1: All designated uses are met;
- Category 2: Some of the designated uses are met but there is insufficient data to determine if remaining designated uses are met;
- Category 3: Insufficient data to determine whether any designated uses are met;
- Category 4A: Water is impaired but has an EPA approved TMDL;
- Category 4B: Water is impaired but implementation project (best management practices) is in place;
- Category 4C: Water is impaired by a parameter that is not considered a "pollutant;" and
- Category 5: Water is impaired or threatened and a TMDL is needed.

Support assessment for fish and aquatic life propagation use primarily involves monitoring the following major parameters: dissolved oxygen, total ammonia, water temperature, pH, alkalinity, and total suspended solids.

Support assessment for immersion recreation and limited contact recreation involves monitoring dissolved oxygen, *E. coli*, and fecal coliform. Fecal coliform and *E. coli* are monitored from May 1 through September 30 of each year (Table 2).

Support assessment for domestic water supply uses involves monitoring total dissolved solids, nitrates, pH, chlorides, and sulfates.

South Dakota adopted numeric surface water quality criteria with the 1967 "Water Quality Standards for the Surface Waters for the State of South Dakota." The main intent of numeric water quality criteria is to protect designated beneficial uses. Numeric criteria are needed to develop numeric effluent limits for facilities that discharge wastes to surface water. However, since South Dakota has numeric water quality criteria, a strict interpretation of the water quality standards could imply that a waterbody could potentially be listed as "impaired" or "nonsupporting" even if only one exceedance occurred within a five-year period. South Dakota and even EPA have traditionally viewed the 10% approach (as stated in the criteria for determining support status in Table 7) as an appropriate measuring tool to determine waters that require further in-depth study and TMDL development. Factors such as drought, high precipitation events, and other environmental factors can cause significant variation in water quality. One exceedance of a conventional parameter, such as pH or water temperature, does not indicate a waterbody is not supporting its beneficial use. The methodology employed by the department in the interpretation of the data for the 2010 Integrated Report is consistent with DENR's interpretation of the South Dakota Surface Water Quality Standards. Therefore, for Integrated Report purposes, DENR defines "impairment" or "nonsupport" of a beneficial use of a waterbody by the criteria found in Table 7.

Lakes 303(d) Listing Methodology

Support determinations and impairment listings were only made on those lakes considered assessed. The minimum requirements for a lake to be considered assessed includes two criteria: 1) at least two independent years of sample data and; 2) at least two sampling events per year. All available data from the most recent 10 year period (2000-2009) were used to make support determinations and impairment decisions. Data older than the most recent 10 years were considered in the impairment analysis if deemed important to make support determinations. For example, if a lake only had the minimum number of samples required to be assessed (e.g., 4 samples) in the most recent 10 year period, older data were used if available to increase the number of observations.

The primary water quality data used to make impairment decisions were acquired from the following sources: statewide lakes assessment project, individual lake assessment projects, outside entities, and when appropriate, citizens monitoring efforts.

Statewide Lakes Assessment (SWLA) Project
Lakes were historically sampled on a four-year rotation (i.e. about 31 lakes annually) twice during the growing season. Sampling stations consist of one to three predetermined site locations within the basin of each lake. The number of site locations assigned to each lake is dependent on basin size. Field measurements are collected at each site and water samples are composited from each site.

Individual Lake Assessment Projects
Project specific data are usually collected monthly throughout the growing season and during winter months with safe ice conditions from site locations consistent with those established during the SWLA project. Field measurements and water samples are usually collected at each site.

Data from outside entities and citizens monitoring efforts are used when sampling efforts follow similar protocol to the SWLA project or individual lake assessments.

A standard suite of water quality parameters are measured or analyzed. Water temperature, dissolved oxygen, conductivity, specific conductance, pH, and Secchi disk transparency are measured on site. Chlorophyll-*a* is extracted from 50-1000 ml of lake sample and analyzed by spectrophotometer as described by APHA (1995). The remaining nutrient, solids, and bacteria samples are preserved, iced, and shipped to the State Health Laboratory in Pierre, South Dakota for individual parameter analysis.

Since 2008, DENR has administered a three-tiered sampling design to monitor classified lakes as part of the statewide lakes assessment project. A brief description of the three-tiered lake sampling approach is as follows:

1) Annual sampling of the top 10-12 public high profile lakes;

2) Random selection from the population of previously monitored lakes to equal 10-12 lakes sampled annually; and,

3) Complete random selection from the remaining population of 10-12 classified lakes sampled annually.

The random component of this sampling design provides DENR with the tools necessary to draw inferences regarding the support status of the entire population of classified lakes to serve as a 305(b) reporting element. The number of lakes sampled annually in each tier varies depending on available resources and statistical requirements of the random sampling component. Lake survey data collected as part of the random sampling design were used to make impairment decisions if the lake was considered assessed based on the minimum requirements listed above.

DENR does not currently have a definitive method for addressing the support of narrative standards and, therefore, relies on available water quality data, public opinion, and professional judgment to make listing decisions related to narrative standards when appropriate.

South Dakota has numeric water quality standards designed to protect the designated beneficial uses of lakes under Administrative Rule (Article 74:51:01-Surface Water Quality Standards). Numeric water quality standards associated with lake and reservoir designated beneficial uses were used exclusively as benchmarks to make 303(d) listing decisions. The following tables describe the water quality parameters and associated criteria used to make beneficial use support determinations and impairment decisions. Parameters with an asterisk (*) represent conventional parameters typically collected during water quality monitoring efforts. The sample origin refers to the parameter specific data collection method.

Table 8: Lake Listing Criteria

Criteria for domestic water supply waters:

Parameter	Criteria	Sample origin
*Total Dissolved Solids	≤ 1750 mg/L	Water sample
*Nitrates as N	≤ 10 mg/L	Water sample
*pH	≥ 6.5 to ≤ 9.0 units	Vertical Profile
Total Coliform	≤ 20,000 / 100mL	Water sample
Barium	≤ 1.0 mg/L	Water sample
Chloride	≤ 438 mg/L	Water sample
Fluoride	≤ 4.0 mg/L	Water sample
Sulfate	≤ 875 mg/L	Water sample
Total Petroleum Hydrocarbons	≤ 1.0 mg/L	Water sample

Criteria for coldwater permanent fish life propagation waters:

Parameter	Criteria	Sample origin
*Total ammonia nitrogen as N	Equal or < result from Equation 1. Table 4.	Water sample
Chlorides	≤ 175 mg/L	Water sample
*Dissolved oxygen (see below)	≥ 5.0 mg/L	Vertical Profile
Undisassociated hydrogen sulfide	≤ 0.002 mg/L	Water sample
*pH	≥ 6.5 to ≤ 9.0 units	Vertical Profile
*Total Suspended Solids	≤ 158 mg/L	Water sample
*Temperature	≤ 65 °F	Vertical Profile

Dissolved oxygen: as measured anywhere in the water column of a non-stratified water body, or in the epilimnion and metalimnion of a stratified water body.

Criteria for coldwater marginal fish life propagation waters:

Parameter	Criteria	Sample origin
*Total ammonia nitrogen as N	Equal or < result from Equation 1. Table 4	Water sample
*Dissolved oxygen	≥ 5.0 mg/L	Vertical Profile
Undisassociated hydrogen sulfide	≤ 0.002 mg/L	Water sample
*pH	≥ 6.5 to ≤ 9.0 units	Vertical Profile
*Total Suspended Solids	≤ 158 mg/L	Water sample
*Temperature	≤ 75 °F	Vertical Profile

Dissolved oxygen: as measured anywhere in the water column of a non-stratified water body, or in the epilimnion and metalimnion of a stratified water body.

Criteria for warmwater permanent fish life propagation waters:

Parameter	Criteria	Sample origin
*Total ammonia nitrogen as N	Equal or < result from Equation 2. Table 4	Water sample
*Dissolved oxygen	≥ 5.0 mg/L	Vertical Profile
*Dissolved oxygen	≥ 6.0 mg/L Big Stone and Traverse Lake April and May	Vertical Profile
Undisassociated hydrogen sulfide	≤ 0.002 mg/L	Water sample
*pH	≥ 6.5 to ≤ 9.0 units	Vertical Profile
*Total Suspended Solids	≤ 158 mg/L	Water sample
*Temperature	≤ 80 ^{o}F	Vertical Profile

Dissolved oxygen: as measured anywhere in the water column of a non-stratified water body, or in the epilimnion and metalimnion of a stratified water body.

Criteria for warmwater semipermanent fish life propagation waters:

Parameter	Criteria	Sample origin
*Total ammonia nitrogen as N	Equal or < result from Equation 2. Table 4	Water sample
*Dissolved oxygen	≥ 5.0 mg/L	Vertical Profile
Undisassociated hydrogen sulfide	≤ 0.002 mg/L	Water sample
*pH	≥ 6.5 to ≤ 9.0 units	Vertical Profile
*Total Suspended Solids	≤ 158 mg/L	Water sample
*Temperature	≤ 90 ^{o}F	Vertical Profile

Dissolved oxygen: as measured anywhere in the water column of a non-stratified water body, or in the epilimnion and metalimnion of a stratified water body.

Criteria for warmwater marginal fish life propagation waters:

Parameter	Criteria	Sample origin
*Total ammonia nitrogen as N	Equal or < result from Equation 2. Table 4	Water sample
*Dissolved oxygen	≥ 4.0 mg/L Oct.1 - Apr. 30	Vertical Profile
*Dissolved oxygen	≥ 5.0 mg/L May 1 - Sept. 30	Vertical Profile
Undisassociated hydrogen sulfide	≤ 0.002 mg/L	Water sample
*pH	≥ 6.5 to ≤ 9.0 units	Vertical Profile
*Total Suspended Solids	≤ 263 mg/L	Water sample
*Temperature	≤ 90 ^{o}F	Vertical Profile

Dissolved oxygen: as measured anywhere in the water column of a non-stratified water body, or in the epilimnion and metalimnion of a stratified water body.

Criteria for immersion recreation waters:

Parameter	Criteria	Sample origin
*Dissolved oxygen	≥ 5.0 mg/L	Vertical Profile
*Fecal coliform- May 1st to Sept. 30	≤ 400 / 100mL	Water sample
**Escherichia coli* - May 1st to Sept. 30	≤ 235 / 100mL	Water sample

Dissolved oxygen: as measured anywhere in the water column of a non-stratified water body, or in the epilimnion and metalimnion of a stratified water body.

Criteria for limited contact recreation waters:

Parameter	Criteria	Sample origin
*Dissolved oxygen	≥ 5.0 mg/L	Vertical Profile
*Fecal coliform- May 1st to Sept. 30	≤ 2,000 / 100mL	Water sample
**Escherichia coli* - May 1st to Sept. 30	≤ 1178 / 100mL	Water sample

Dissolved oxygen: as measured anywhere in the water column of a non-stratified water body, or in the epilimnion and metalimnion of a stratified water body.

Criteria for fish and wildlife propagation, recreation, and stock watering waters:

Parameter	Criteria	Sample origin
*Total Alkalinity as calcium carbonate	≤ 1,313 mg/L	Water sample
*Total dissolved solids	≤ 4,375 mg/L	Water sample
*Conductivity at 25°C	≤ 7,000 micromhos/cm	Vertical Profile
*Nitrates as N	≤ 88 mg/L	Water sample
*pH	≥ 6.0 to ≤ 9.5 units	Vertical Profile
Total Petroleum Hydrocarbons	≤ 10 mg/L	Water sample
Oil and grease	≤ 10 mg/L	Water sample

Criteria for irrigation waters:

Parameter	Criteria	Sample origin
*Conductivity at 25°C	≤ 4,345 micromhos/cm	Vertical Profile
*Sodium adsorption ratio	≤ 10	Water Sample

Water sample data generally constitute parameters collected in a water sample approximately 0.5 meters from the surface and in some instances 0.5 meters from the bottom, at a particular monitoring station or composited from multiple stations or depths throughout the water column. Water samples require laboratory analysis and include water quality standard parameters such as nitrates, ammonia, alkalinity, total suspended solids, total dissolved solids, fecal coliform and *E. coli*. All available water sample data for a particular lake were used to analyze percent exceedances and ultimately make listing decisions.

Lakes are considered impaired if water quality standard parameters associated with a water sample exhibit greater than 10% exceedances when 20 or more samples are available. If less than 20 samples were available, 3 exceedances were considered impaired. Impairment is assigned to toxic parameters (i.e., Total Ammonia Nitrogen as N) if more than one violation occurred in the last 3 years.

Water column profiles are generally collected during lake sampling visits. Profile data are collected at different depth increments from the surface to the bottom at multiple stations (2-3) throughout a lake to provide spatial coverage. The number of individual measurements is dependent on the depth of the respective water column. Profile measurements are generally recorded at 1.0 meter increments throughout the water column. Water quality standard parameters associated with vertical profiles include: dissolved oxygen, temperature, pH and specific conductance.

Lakes are considered impaired specifically for temperature, pH and specific conductance if >10% exceedances (>20 samples) occurred within the entire collection of profile measurements available for the specified 10-year period. When <20 samples were available, 3 exceedances were considered an impairment. The initial surface temperature and pH values for each station were not included in the profile data to avoid anomalous values associated with environmental conditions at the air-water interface.

Shallow well-mixed lakes were also considered impaired for dissolved oxygen if >10% exceedances (>20 samples) occurred within the entire collection of profile measurements available for the specified 10-year period. When <20 samples were available, 3 exceedances were considered an impairment. Bottom dissolved oxygen readings were excluded from the datasets to avoid anomalous values associated with the sediment-water interface. For deeper thermally stratified lakes, dissolved oxygen measurements were evaluated exclusively within the epilimnion and metalimnion.

The epilimnion, metalimnion and hypolimnion are defined in the Surface Water Quality Standards (74:51:01:01) as follows:

"Epilimnion," in a thermally-stratified waterbody, the upper stratum of the water column. This layer is generally above the thermocline and is typically uniformly warm, circulating, and well mixed.

"Metalimnion," in a thermally-stratified waterbody, the middle layer of a water column generally encompassing the thermocline, is typically somewhat mixed and influenced by the epilimnion.

"Hypolimnion," in a thermally-stratified waterbody, the bottom layer of water column. This layer is generally below the thermocline and is typically less well mixed (at times, stagnant), colder than the epilimnion, and often of essentially uniform temperature.

Wetzel (2001) defines the thermocline as the *plane* of maximum rate of decrease of temperature with respect to depth. When thermal stratification was graphically evident and a well defined epilimnion, metalimnion, and hypolimnion were present, only the dissolved oxygen data associated with the epilimnion and metalimnion were included in the collective dataset to calculate percent exceedances (Figure 2).

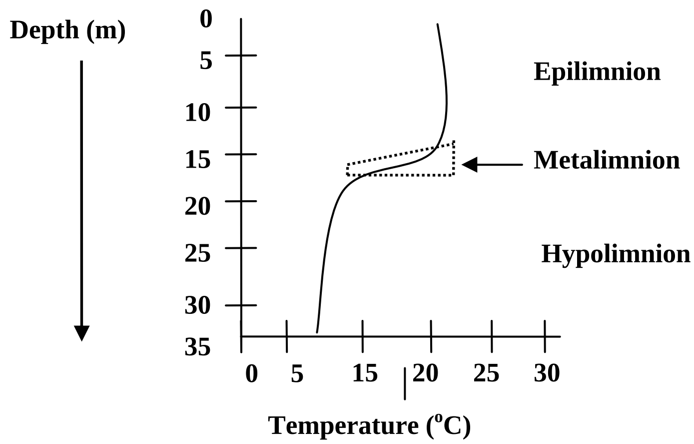

Figure 2: Diagram Depicting Classic Thermal Stratification and Associated Limnetic Zones.

If thermal stratification was not well defined an alternate process was used to evaluate whether an epilimnetic zone was present. In such instances, the epilimnion was determined by identifying the depth of the water column above the greatest thermal variation as defined by a change of greater than 1°C per meter (Wetzel 2001). The water column above this zone of temperature deviation was considered representative of the epilimnion.

Some lakes have various depths and degrees of stratification among sites and sampling events. All representative dissolved oxygen values based on previously described criteria were collectively pooled and evaluated based on a percent exceedance. Again, if greater than 10% exceedances (>20 samples) of the dissolved oxygen standard were observed within the collective profile measurements, the lake was considered impaired for dissolved oxygen and non-supporting the corresponding beneficial uses. If less than 20 samples were available, three exceedances were considered an impairment.

The Trophic State Index (TSI) approach was dismissed from the 2010 IR listing methodology. Many lakes could not meet the assigned numeric TSI targets due to unattainable watershed phosphorus reductions required to meet the targets. Lakes were often fully supporting based on numeric water quality standards though considered impaired for TSI. A clear linkage was not often evident to suggest that the fishery was impaired due to exceeding the TSI target. Because the TSI approach was developed to address narrative standards associated with eutrophication and not necessarily to derive support of a classified beneficial use, it was deemed necessary to place primary emphasis on the water quality standard criteria to make beneficial use impairment decisions. The TSI is considered an important parameter for quantifying the productivity status of lakes. Therefore, TSI was used as a 305(b) reporting element to characterize the trophic state of lakes in South Dakota. Appendix E depicts the calculated median TSI Secchi-chlorophyll-*a* values for assessed lakes categorized by their designated fish life beneficial use. Appendix C provides supplemental information on lakes where TSI was removed as an impairment cause.

Waterbodies were also evaluated based on beach closures, fish kills, and fish consumption advisories. Beach closure information collected during this reporting period (2008 – 2009) was used to make impairment decisions (Table 35). Lakes were listed if three beach closures per season occurred in a consecutive three week sampling period. A public beach is recommended for closure if the following fecal coliform levels are met.

(1) Any three consecutive samples exceed 200 fecal coliform per 100 milliliters;

(2) Any two consecutive samples exceed 300 fecal coliform per 100 milliliters; or

(3) Any single sample exceeds 1,000 fecal coliform per 100 milliliters.

Beneficial use support determinations made by South Dakota for border waters may differ from determinations made by bordering states. Each state may have different beneficial uses assigned for the waterbody with different applicable water quality standards. In addition, differences in monitoring strategy, assessment methodology, and other factors may affect the support determination.

STATEWIDE SURFACE WATER QUALITY SUMMARY

South Dakota has a total of about 9,289 miles of perennial rivers and streams (Table 1). Major or significant streams in this context are waters that have been assigned fish life use support in addition to the beneficial uses of (9) Fish and wildlife propagation, recreation, and stock watering; and (10)Irrigation. This definition includes primary tributaries and, less frequently, subtributaries of most state rivers and larger perennial streams. In a few cases, lower order tributaries may be included, for example in the Black Hills area, which has a relatively large number of permanent streams.

Approximately 6,206 miles of rivers and streams have been assessed to determine water quality status for a period covering the last five years (October 2004 through September 2009). Data needed to be evaluated over this longer time span to ensure enough data points were available for each stream segment (usually 20) to properly characterize existing stream conditions. Because some stream segments had only four (or fewer) samples available per year, evaluation of a data set covering at least five years of sampling was required to adequately portray the natural variability in water quality that is typical of stream environments.

Currently, 33% of the assessed stream miles fully support all assigned beneficial uses and 67% do not presently support one or more uses. The high percentage of impairment can be attributed largely to high levels of total suspended solids (TSS), *E. coli*, and fecal coliform bacteria. Elevated bacteria and TSS are generally associated with high flow events that were sampled during watershed assessment projects.

During this reporting cycle, 5,937 designated miles were assessed for fishery/aquatic life beneficial use attainment; 54% of assessed stream miles fully met fishery/aquatic life. 1,392 miles were also assessed for immersion recreation attainment. Fifty-four percent fully supported immersion recreation criteria.

Nonsupport in assessed streams was caused primarily by fecal coliform bacteria from agricultural nonpoint sources and wildlife. In approximate order of stream miles affected, causes of impairment this reporting cycle include: fecal coliform, total suspended solids, *E. coli*, sodium adsorption ratio (salinity), dissolved oxygen, water temperature, specific conductance, total dissolved solids, and pH. Natural pollutant sources of dissolved and suspended solids are exemplified by erosive soils that occur in western South Dakota badlands and within the Missouri River basin (including considerable exposed marine shale formations) and in extreme southeastern South Dakota (including large areas of highly erodible loess soils). Large storm events that produce significant amounts of precipitation may contribute to suspended sediment problems over large areas of the state, particularly in the west and southeast. Fecal coliform and *E. coli* concentrations also increase significantly during times of above normal rainfall. Appropriate best management practices should be applied to treat the sources of these and other parameters whose effects are likely to be masked during periods of low precipitation.

In addition to rivers and streams, South Dakota has 569 classified publicly owned lakes and reservoirs totaling approximately 193,298 acres. The 569 lakes are listed in ARSD Chapter 74:51:02 and classified for aquatic life and recreation beneficial uses. GF&P presently manages approximately 450 state lakes for recreational fishing.

Excluding the four mainstem reservoirs, an estimated 23% of the 569 lakes have been assessed, accounting for 70% of the total lake acreage. An estimated 77% (78 lakes) of the lake acreage was considered to support all assessed beneficial uses and 23% (54 lakes) did not support assessed beneficial uses. The majority of lakes categorized as nonsupporting are caused by pH and DO violations and are attributed to nonpoint pollution and natural sources. Most lakes in the state are characterized as eutrophic to hypereutrophic. They tend to be shallow, turbid, and are well supplied with dissolved salts, nutrients, and organic matter from often sizeable watersheds of nutrient rich glacial soils that are extensively developed for agriculture. Runoff carrying sediment and nutrients from agricultural land is the major nonpoint pollution source.

The mileage/acreage of use support, causes, and potential sources of impairment for assessed surface waters in South Dakota are summarized in Tables 9 through 14.

Table 9: Designated Overall Use Support Status for Rivers and Streams in South Dakota

Type of Waterbody: Rivers and Streams (miles)			
Degree of Use Support	Assessment Basis		Total Assessed
	Evaluated	Monitored	
Miles Fully Supporting	-	2,079	2,079
Miles Insufficient Data but Threatened	-	-	
Miles Not Supporting	-	4,127	4,127
TOTAL	-	6,206	

Table 10: Designated Overall Use Support Status for Lakes and Reservoirs in South Dakota

Type of Waterbody: Lakes and Reservoirs (acres)			
Degree of Use Support	Assessment Basis		Total Assessed
	Evaluated	Monitored	
Acres Fully Supporting	-	104,742	104,742
Acres Insufficient Data but Threatened	1,070	-	1,070
Acres not Supporting	-	30,835	30,835
TOTAL	1,070[a]	135,577	

[a] These lakes were only evaluated by fish flesh data, no water quality data were collected for this report cycle.

Table 11: Individual Use Support Summary for Rivers and Streams

Beneficial Use	Miles Fully Supporting	Miles Not Supporting	Miles Threatened	Miles With Insuff. Info. Or Not Assessed	Miles Assessed
Overall Use Support	2,079	4,127	-	756	6,206
Domestic Water Supply	776	36	-	21	813
Coldwater Permanent Fish Life	416	278	12	26	705
Coldwater Marginal Fish Life	121	39	28	12	187
Warmwater Permanent Fish Life	299	477	-	30	776
Warmwater Semipermanent Fish Life	1,390	1,466	40	80	2,896
Warmwater Marginal Fish Life	1,002	228	142	367	1,372
Immersion Recreation	750	642	-	36	1,392
Limited Contact Recreation	2,964	1,998	227	1,247	5,190
Fish/Wildlife Prop., Rec., and Stock Watering	5,572	250	-	1,140	5,822
Irrigation	4,709	609	579	1,065	5,897
Commerce and Industry	527	-	-	-	527

Mileage values generated by ADB are carried out to the 100th decimal place. The table reflects mileage values rounded to the nearest whole number and may not add up correctly due to rounding error.

Table 12: Individual Use Summary for Lakes and Reservoirs

Beneficial Use	Acres Fully Supporting	Acres Not Supporting	Acres Threatened	Acres with Insuff. Info. Or Not Assessed	Acres Assessed
Overall Use Support	104,742	30,835	-	9,333	135,577
Domestic Water Supply	7,995	-	-	-	7,995
Coldwater Permanent Fish Life	853	822	-	-	1,675
Coldwater Marginal Fish Life	146	17	-	-	163
Warmwater Permanent Fish Life	64,925	7,771	106	1,194	72,802
Warmwater Semipermanent Fish Life	27,320	10,465	375	214	38,160
Warmwater Marginal Fish Life	16,032	5,514	-	8,852	21,546
Immersion Recreation	118,388	10,025	-	16,192	128,414
Limited Contact Recreation	119,850	8,564	-	16,192	128,414
Fish/Wildlife, Prop., Rec., and Stock Watering	130,122	447	3,531	10,108	135,100
Irrigation	38,708	5,070	-	-	43,778

Acreage values generated by ADB are carried out to the 100th decimal place. The table reflects mileage values rounded to the nearest whole number and may not add up correctly due to rounding error.

Table 13: Total Sizes of Water Impaired by Various Cause Categories in South Dakota

River/Streams	
Causes/Stressor Category	**Miles**
Cadmium	2
Fecal Coliform	1,920
Nitrogen, Ammonia	44
Dissolved Oxygen (DO)	542
pH	146
Salinity/SAR	952
Specific Conductance	373
Temperature	384
Total Dissolved Solids (TDS)	285
Total Suspended Solids (TSS)	1,804
Alkalinity	87
E. coli	1,116
Lakes/Reservoirs	
Cause/Stressor Category	**Acres**
Dissolved Oxygen (DO)	7,647
Fecal Coliform	1,461
Fish Consumption Advisories (Mercury)	4,610
Nitrates	55
pH	12,705
Selenium	55
Specific Conductance	55
Temperature	1,376
Chlorophyll-*a*	3,674
Total Dissolved Solids (TDS)	55
E. coli	2,948

Mileage/acreage values generated by ADB are carried out to the 100th decimal place. The table reflects mileage values rounded to the nearest whole number.

Table 14: Total Sizes of Waters Impaired by Various Source Categories in South Dakota

Rivers/Streams	
Source Category	**Miles**
Acid Mine Drainage	2
Animal Feeding Operations	250
Combined Sewer Overflow	1
Crop Production (including irrigated and non irrigated crop production)	729
Grazing in Riparian or Shoreline Zones	435
Streambank Modification	77
Impacts from Abandoned Mine Lands	2
Livestock (Grazing or Feeding Operations)	1,335
Municipal (Urbanized High Density Area)	5
Municipal Point Source Discharge	44
Natural Sources (including drought-related impacts)	1,284
On-Site Treatment Systems	59
Rangeland Grazing	87
Residential Districts	17
Wet Weather Discharges	14
Wildlife	500
Lakes/Reservoirs	
Source Category	**Acres**
Natural Sources	5,179
Nonpoint Sources	4,610
Unknown Sources	3,674

Mileage values generated by ADB are carried out to the 100th decimal place. The table reflects mileage values rounded to the nearest whole number.

Not all sources of impairment have been identified for this reporting cycle. Unknown sources of impairment have been left blank in Tables 19 – 32 and are not included in the above summary table. Sources of impairment are based on best professional judgment. A formal evaluation of the source of impairment is identified during watershed assessments and TMDL development. In the basin tables, sources are not listed in any particular order and the reader should not assume the source list order lends greater significance.

The most common impairment source for lakes in South Dakota is a combination of natural and agricultural nonpoint source pollution. To avoid redundancy, these sources were not added to the source description in Tables 19-32. Lake impairment sources were only added to the basin tables if identified as something other than natural and agricultural nonpoint source pollution. The lake acreage associated with other identified impairment sources are reflected in Table 14. All other impaired lake acres in South Dakota assume a combination of natural and agricultural nonpoint source pollution.

STATEWIDE PROBABILISTIC LAKE ASSESSMENT

During 2008 and 2009, South Dakota incorporated a probabilistic design into the lake monitoring program. A Generalized Random Tessellation Stratified survey design was implemented with help from EPA Office of Research and Development. The data collected through this effort yielded statistically valid results for drawing inferences on the entire population of lakes designated a warmwater or coldwater fishery classification in the state.

The sample population consisted of 569 lakes in South Dakota that have the designated beneficial warmwater or coldwater fishery use. The survey design utilized three strata: a subset of targeted lakes with local or regional significance, random selection of lakes with an existing dataset, and a complete random selection of all other classified lakes. Sampling consisted of 50 lakes during the 2008 sampling season with an additional 30 lakes sampled in 2009. The data from the two years were combined to generate a single analysis of the condition of all classified lakes for the 2010 reporting cycle.

Water quality standards have been defined in South Dakota state statutes for warm and coldwater fishery beneficial uses. These standards consist of suites of numeric criteria that provide physical and chemical benchmarks from which support determinations and management decisions can be developed. A general analysis was performed on a subset of water quality standards to draw inferences on the entire population of classified lakes.

Population Description

South Dakota has 569 lakes in the Surface Water Quality Standards designated either a coldwater or warmwater fish life beneficial use. The Missouri River main stem reservoirs are excluded from this dataset. Lakes were classified based on characteristics such as depth, size, and permanency. Figure 3 depicts the size distribution of the classified lakes in the state.

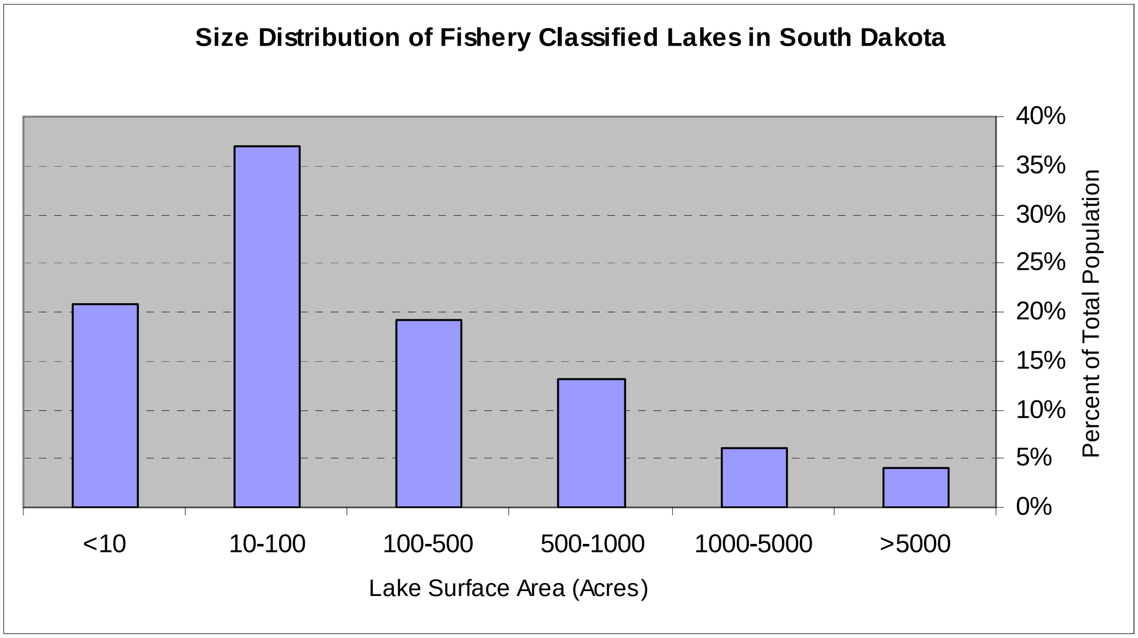

Figure 3: SD Classified Lakes Size Distribution.

E. Coli

To determine the percent of lakes that support their recreational use standards, bacterial samples were collected during the first week of June from each of the waterbodies and analyzed for both fecal coliform and *E. coli*. Sample site selection was conducted at the arrival at each waterbody. Sites were selected based on the likelihood of human use and contact. Boat launches and developed recreation areas were used as a first choice. In the absence of any sort of developed access or visible commonly used access point, samplers were instructed to collect the sample by wading in at the most convenient access point available. During 2009, an *E. coli* standard was adopted in state regulations for both immersion and limited contact recreation. *E. coli* were found in exceedance of the immersion recreation standard (maximum of 235 colonies/100mL) for 9% of lakes. The limited contact standard of 1178 colonies/100mL was exceeded in 1.3% of the waterbodies.

Dissolved Oxygen (DO)

Dissolved oxygen was found to be below the water quality standard throughout the entire waterbody on 4% of the lake visits. Data indicate 17% of the lakes in the state may be expected to have DO concentrations below the state water quality standard in at least half of their water column. These lakes all had sufficient DO values near the surface with large hypolimnions that were depleted in DO. Forty-four percent of the states lakes may be expected to experience depleted DO concentrations in a portion of their water column.

pH

All of the fishery lakes in South Dakota have a maximum pH value set at 9.0. At no time have there been issues with pH concentrations that were acidic in nature. References to standards exceedance are limited to lakes that exhibited pH values in excess of 9.0. Due to chronic pH probe failure on the YSI multi-parameter sondes used to collect profile data, 5% of the lakes are represented by no available data. Fifteen percent of lakes have at least one measurement that exceeds the standard, while 4% had a significant portion (>50%) of their water column that experienced pH impairment.

Temperature

Lakes are assigned a fishery beneficial use based on the type of fish and survival rates that are expected in that waterbody. Warmwater designated fisheries can be expected to support communities at greater temperatures than coldwater fisheries. The following table indicates the maximum allowable temperatures for each of the classified fish life beneficial uses. Water temperature data were compared to temperature water quality standards. Missing data resulted in 3% of the lakes not being represented in the statistics. Approximately 45 lakes experienced at least one measurement that exceeded the standard. This may be further divided by fishery type, 1% attributed to warmwater while 3% were attributed to coldwater systems. One percent of the lakes had a significant number of temperature exceedances that resulted in greater than half of the water column exceeding the standard.

Beneficial Use	Temp F	Temp C
Warmwater Marginal and Semipermanent	90	32.2
Warmwater Permanent	80	26.6
Coldwater Marginal	75	23.9
Coldwater Permanent	65	18.3

Trophic State Index (TSI)

The trophic state index provides a quantitative measure of a lake's trophic state. TSI is not a water quality standard parameter though is often used to characterize the productivity status of lakes and provides a measure of eutrophication (Table 15). The index is based on regression models and logarithmic transformation (scale 0-100) of three primary trophic state indicators: total phosphorus, Secchi depth transparency, and chlorophyll-*a*. As a function of the regression models, all parameters are in theory interrelated though the chlorophyll-*a* component is the best indicator of biological productivity or algal biomass (Carlson 1977, 1991).

Nearly 60% of classified lakes in the state have phosphorus TSI values above 80, signifying extreme hypereutrophic conditions (Figure 4). Overall, approximately 80% of the classified lakes display TSI-phosphorus values above 60 indicating highly productive systems. The chlorophyll-*a* and Secchi TSI do not correspond well with TSI phosphorus values across the classified lakes. Using phosphorus TSI to describe the trophic state of classified lakes in South Dakota is likely to misclassify productivity in terms of biological production (algae and macrophyte growth) and water clarity.

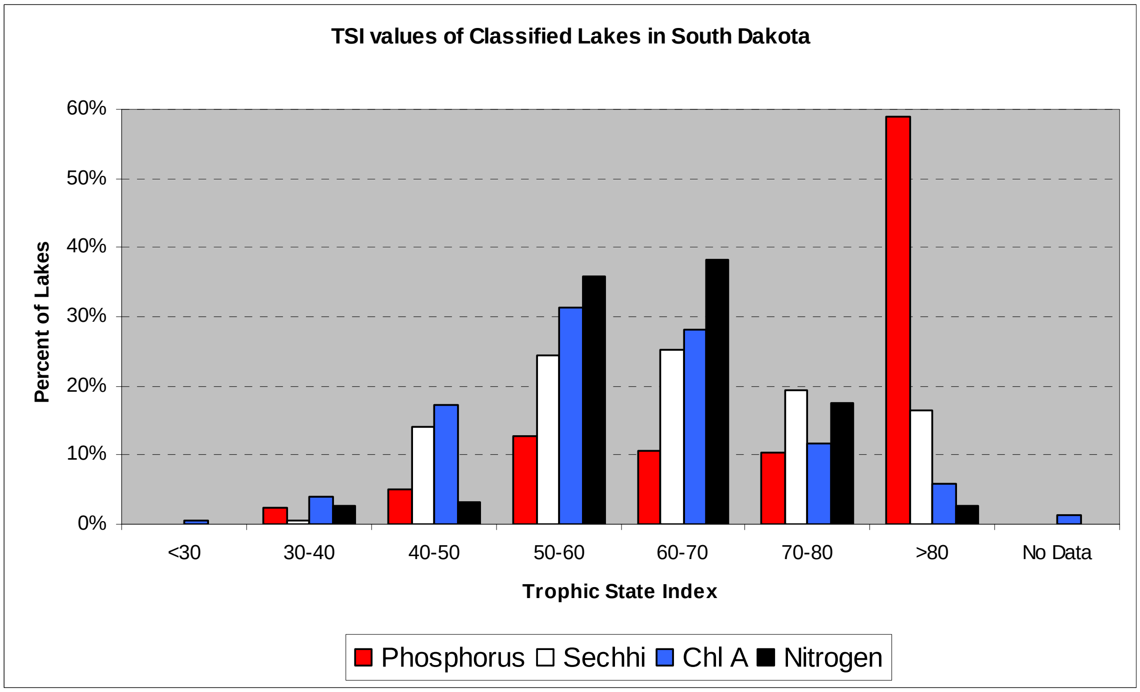

Figure 4: TSI Ranges for Fishery Classified Lakes in South Dakota.

Table 15: Range of TSI Scores Based on Indicator Values and Corresponding Response in Lake Trophic State

A list of possible changes that might be expected in a northern temperate lake as the amount of algae changes along the trophic state gradient.						
TSI	Chl (ug/L)	SD (m)	TP (ug/L)	Attributes	Water Supply	Fisheries & Recreation
<30	<0.95	>8	<6	**Oligotrophy:** Clear water, oxygen throughout the year in the hypolimnion	Water may be suitable for an unfiltered water supply	Salmonid fisheries dominate
30-40	0.95-2.6	4-8	6-12	Hypolimnia of shallower lakes may become anoxic		Salmonid fisheries in deep lakes only
40-50	2.6-7.3	2-4	12-24	**Mesotrophy:** Water moderately clear; increasing probability of hypolimnetic anoxia during summer	Iron, manganese, taste, and odor problems worsen; raw water turbidity requires filtration	Hypolimnetic anoxia results in loss of salmonids; walleye may predominate
50-60	7.3-20	1-2	24-48	**Eutrophy:** Anoxic hypolimnia, macrophyte problems possible		Warm-water fisheries only; bass may dominate
60-70	20-56	0.5-1	48-96	Blue-green algae dominate, algal scums and macrophyte problems	Episodes of severe taste and odor possible	Nuisance macrophytes, algal scums, and low transparency may discourage swimming and boating
70-80	56-155	0.25-0.5	96-192	**Hypereutrophy:** (light limited productivity) dense algae and macrophytes		
>80	>155	<0.25	192-384	Algal scums, few macrophytes		Rough fish dominate; summer fish kills possible

An ordination graph derived from Carlson (1991) was generated to explain potential environmental factors associated with deviation between the trophic state indices. In general, most assessed lakes demonstrate non phosphorus limitation as depicted by the negative deviation from the X-axis (Figure 5). Implications for many of the assessed lakes are that some variable other than phosphorus is limiting algal growth. Water transparency in most of the assessed lakes in South Dakota appears to be driven primarily by non algal turbidity and biological processes like zooplankton grazing.

An interpretation of the graph (Figure 5) suggests that lakes that fall to the right of the Y-axis indicate that water transparency is greater than that expected from the chlorophyll index. This particular deviation could arise if large particles, such as blue-green algae dominate and transparency is typically less affected by these larger particles. Deviations to the right may also occur if zooplankton grazing removes smaller particles (i.e. diatoms and green algae) and leaves only larger species. Points to the left of the Y-axis relate to conditions where transparency is dominated by small particles typically non-algal turbidity associated with high dissolved organic and/or inorganic (clay) matter.

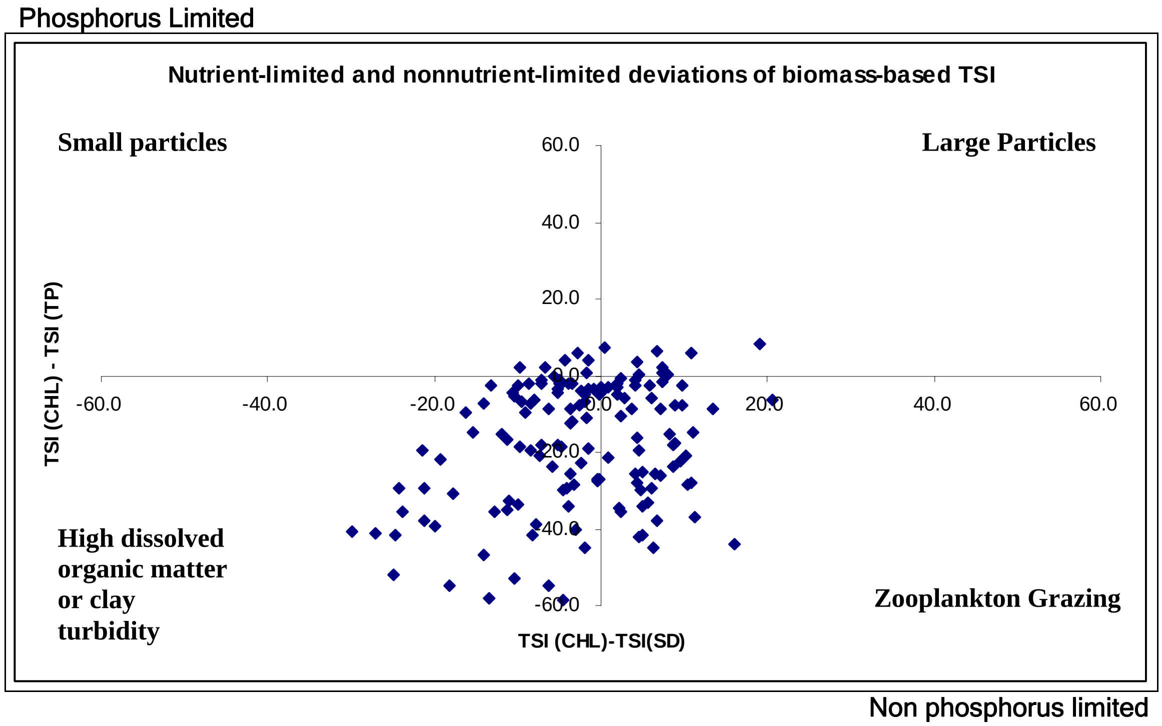

Figure 5: Explanation of Variation in TSI Parameters for the Assessed Lakes in SD.

Ninety five percent of classified lakes in South Dakota indicate that some variable other than phosphorus is limiting productivity (Table 16). The greatest percentage of lakes (61%) is potentially limited by non algal turbidity. The majority of classified lakes are shallow, windswept systems subject to sediment re-suspension and agitation, which is likely to impede the growth of plants and algae relative to nutrient availability.

Table 16: Potential Environmental Factors Limiting Biological Productivity for Classified Lakes in SD

X Axis	Y Axis	Percent of Lakes	
-	-	60.7%	High Dissolved Organic Matter (DOM) or clay turbidity Non P Limited
-	+	1.8%	P limitation
+	-	34.8%	Zooplankton Grazing Non P Limitation
+	+	2.7%	P limitation

Many lakes in South Dakota contain adequate phosphorus concentrations (>0.07 mg/L) to support significant algae biomass with communities dominated by blue-green algae (Downing et al. 2001). As previously demonstrated the chlorophyll-*a* index often deviates significantly from the phosphorus index leading to misclassification of the trophic state.

Since many lakes are shallow and wind swept, non-algal turbidity can best be described with the Secchi index. The chlorophyll-*a* index provides the best description of algal biomass with respect to eutrophication. Therefore, a decision was made to combine the Secchi and chlorophyll indices to characterize the trophic state of assessed lakes in South Dakota.

LAKE WATER QUALITY ASSESSMENT

A total of 569 lakes are currently designated for fishery/aquatic life beneficial uses in South Dakota. Twelve assessed lakes in South Dakota have a surface area greater than 4,000 acres and have a combined surface area of 91,134 acres. Lake monitoring and assessment efforts have been conducted routinely since 1989 as part of the DENR's Statewide Lakes Assessment (SWLA) project. Additional lake data have also been acquired from individual assessment projects and citizens monitoring efforts. When quantitative data were incomplete, a qualitative evaluation of lake water quality was provided. Approximately 23% of the 569 lakes have been assessed or are part of the SWLA cycle, accounting for 70% of the total lake acreage. The remaining lakes did not meet the assessment criteria listed below.

- Public access; and
- Regional significance.

Water quality standards designed to protect designated beneficial uses were evaluated for each individual lake. Based on numeric water quality standards, 78 lakes fully supported beneficial uses and 54 failed to support one or more beneficial uses (Table 12). Of the 144 lakes, 12 did not meet the requirements for sufficient data.

The TSI approach was used to determine the trophic state of assessed lakes (Carlson 1977). Parameters used to generate the median TSI value included Secchi depth and chlorophyll-*a*. Phosphorus was not included into the index value. The phosphorus component of the TSI was found to deviate more than ± 5 points from the chlorophyll-*a* TSI (median 11.3) in 82% of the assessed lakes. Carlson (1991) suggests that at this magnitude of deviation, the phosphorus component of the TSI will contribute to the misclassification of a lake's trophic state. Table 17 depicts the trophic status of assessed lakes across South Dakota.

Table 17: Trophic Status of Assessed Lakes

Trophic Status	Number of Lakes	Acreage of Lakes
Total with Beneficial Use Criteria	569	193,298
Total Assessed*	118	129,204
Oligotrophic	1	822
Mesotrophic	18	18,415
Eutrophic	58	78,668
Hypereutrophic	41	31,299
Unknown	26	15,704

***** May 15, 2000 to September 15, 2009

The major problems of South Dakota lakes continue to be excessive nutrients, algae, and siltation due to nonpoint source pollution (primarily agricultural). Although land-use practices have improved in many agricultural watersheds, internal phosphorus recycling continues to negatively impact the trophic state of many lakes. Aging reservoirs have also become more eutrophic as many are now approaching their expected life spans. Water quality degradation due to acid precipitation, acid mine drainage, or toxic pollutants, is presently not a problem in South Dakota lakes.

Water Resource Assistance Program

The approach used by the South Dakota Water Resource Assistance Program for addressing nonpoint source pollution is to first identify and target sources of pollution and determine alternative restoration methods, and second, to control the sources of pollution and restore the quality of impacted waterbodies. Most phases of the program are state and local efforts, with supplemental technical and financial assistance from EPA and other federal agencies used whenever possible.

The watershed assessment phase encompasses a series of procedures to assess the current condition of selected waterbodies. Included in this phase are water quality, water quantity, and watershed data collection. The state provides the local sponsor with technical assistance, training and equipment to conduct the assessment portion of the project. Generally, the local project sponsor is responsible for collecting the data using 319 federal funding, state grant funding, and existing local resources. Following the collection of sufficient data, the state evaluates the data and prepares a report which details baseline information, identifies sources of pollution, describes alternative pollution control methodologies and outlines implementation costs. A TMDL is then developed using this information. Prior to the implementation of specific pollution control and restoration alternatives, the project sponsor is responsible for the preparation of a watershed/lake restoration plan based on recommendations from the assessment. Technical assistance for this process is provided by DENR. If the plan is approved, the project sponsors are eligible to apply for appropriate state and federal funding.

The majority of the pollution sources that have affected the lakes in South Dakota are agricultural nonpoint sources. DENR Surface Water Quality Program generally prohibits point source discharges to lakes. The methods used to control nonpoint pollution sources are selected on a case-by-case basis. The selection of methods is based on the evaluation of individual watersheds using the Annualized Agricultural Nonpoint Source Model (USDA-ARS, 1998) or a manual inventory of land use, soil type, and nonpoint sources. The AnnAGNPS model delineates critical sub-watersheds within the entire watershed and is then used to predict which control methods would be the most effective. The AnnAGNPS model is also used to track success of best management practices (BMPs).

Following this evaluation, coordination with state and federal agricultural agencies is solicited to verify the critical nature of the identified sub-watersheds and the selected control methods. For those areas targeted as critical, the owners/operators are contacted to request their voluntary participation in the control program. The state does have in effect the Sediment and Erosion Control Act of 1976 which is implemented by individual state conservation districts. However, any action under the Act is based strictly in response to complaints. There are no provisions for forcing compliance on identified problem areas. Specific practices currently recommended for nonpoint source pollution control include large and small sediment control structures, stream bank erosion control, grazing management systems, and the installation of manure management systems.

Lake management in South Dakota is dependent upon many resource management programs and agencies. The Department of Environment and Natural Resources, the Department of Agriculture, U.S. Natural Resources Conservation Service, Department of Game, Fish and Parks, and many local agencies and special purpose districts are all crucial to the protection or restoration of lakes in the state. These groups provide financial and/or technical assistance essential for accomplishing lake water quality goals. Local and county land use zoning ordinances exist in South Dakota and are considered local responsibilities.

In conjunction with the development of recommended pollution control alternatives, the watershed assessment study is also designed to provide recommendations for in-lake restoration alternatives. The primary recommendations provided for lake restoration include, but are not limited to, natural flushing, reducing or eliminating sources of pollution, in-lake alum treatments, and shoreline stabilization. Restoration methods employed in the past also include aeration, sediment removal, weed harvesting, and chemical weed control.

A list of current assessment and implementation projects can be found on the DENR website:

http://denr.sd.gov/dfta/wp/tmdlpage.aspx

Impaired Lakes

A description of each impaired lake is included in the section of this document titled River Basin Assessments. The lakes are listed by their location in each major river basin in the state.

All waters of the state have been assigned the beneficial use of fish and wildlife propagation, recreation, and stock watering (9). 569 lakes listed in the ARSD have also been assigned one or more of the following beneficial uses:

(1) Domestic water supply waters;
(2) Coldwater permanent fish life propagation waters;
(3) Coldwater marginal fish life propagation waters;
(4) Warmwater permanent fish life propagation waters;
(5) Warmwater semipermanent fish life propagation waters;
(6) Warmwater marginal fish life propagation waters;
(7) Immersion recreation waters;
(8) Limited contact recreation waters;
(9) Fish and wildlife propagation, recreation and stock watering waters;
(10) Irrigation waters; and
(11) Commerce and industry waters.

Acid Effects on Lakes

During Lake Water Quality Assessments, each lake was measured for field pH. Monitoring efforts (January 2000-September 2009), suggest none of the assessed lakes had a pH reading less than 6.5 standard units (Table 18). DENR is not aware of any lakes in South Dakota that are currently impacted by acid deposition. This is attributed to a lack of industrialization and a natural buffering capacity of the soils.

Table 18: Acid Effects on Lakes

	Number of Lakes	Acreage of Lakes
Assessed for pH	126	134,035
Impacted by High Acidity	0	0
Vulnerable to High Acidity	0	0

Trends in Lake Water Quality

The trophic state of a lake can be monitored over time to track changes in water quality for prioritizing management decisions. Long term trends were determined for South Dakota lakes using all available growing season (May 15th-September 30th) data collected during DENR's annual Statewide Lakes Assessment efforts, individual lake water quality assessments projects, and when appropriate, citizens monitoring efforts. The TSI using the chlorophyll-*a*, and Secchi transparency were calculated for each individual sample. The slope of a regression line was calculated for each TSI measurement over time. If a lake had less than two years of data, it was not included due to insufficient data.

Most lakes' TSI values were within 5% slope range indicating stable or non-significant change (Table 19). Six lakes indicated negative slopes exceeding 5% and were considered degrading. In addition, five lakes showed positive slopes above 5% suggesting improvement. Due to the limited timeframe it is difficult to describe the significance of these conditions; however, it is likely due to natural hydrologic conditions. In general, most assessed lakes display relatively stable trophic status.

The maximum long term rate of change for any lake was approximately one TSI point every 125 years. Many of the lakes and reservoirs had much smaller changes. With only 20 years or less of data, it is difficult to draw any definite conclusions on the water quality trend of a lake. To have better trend analysis, more data over time will be needed.

A number of short term, cyclical changes or fluctuations were observed between monitoring periods. South Dakota experienced a relatively long wet cycle during much of the 1990's, with a relatively long dry cycle experienced during much of the 2000's (2002-2006), followed by a recovery beginning in 2007. Lake and reservoir trophic state responded to fluctuating water levels, however, results of this recently revised long term trend analysis indicate that no major changes have occurred in the monitored lakes.

Table 19: Long Term Trends in Assessed Lakes (1989-2009)

	Number of Lakes	Lake Acreage
Assessed for Trends	118	129,205
Improving	5	21,826
Stable	105	104,455
Degrading	6	1,391
Unknown	26	15,704
Fluctuating	2	1,533

RIVER BASIN WATER QUALITY ASSESSMENTS

South Dakota has fourteen major river basins, most of which drain into the Missouri River (Figure 6). The basin boundaries were redefined and certified by USGS in February 2008. As a result, some lakes are now located in a different basin than previous cycles. The following sections contain brief narratives that discuss noteworthy waterbodies and pollution problems. A detailed state map showing assessed lakes and streams provides general use support information (Figure 7). More specific information is provided in the accompanying river basin tables for the monitored waterbodies in each river basin that is identified in Figure 6 and shown in Figure 7.

Most water quality data used to evaluate waterbody reaches derives from the DENR ambient water quality monitoring program and individual watershed assessment projects. The fixed ambient monitoring network presently consists of 148 active in-stream stations. The collected data are evaluated to define water quality in the state, identify pollution, and report changes in the state's water quality.

Stream sampling station locations are determined by assessing areas located within high quality beneficial use classifications, located above and below municipal/industrial discharges, or within problem watersheds. Currently, DENR collects samples at those locations on either a monthly, quarterly, or seasonal basis for nutrient, bacterial, or general physical and chemical parameters. Stations that are located near historic hard rock mines are also analyzed for cyanide and ten metals, including arsenic. Stations that are located near historic uranium mining sites or current uranium exploratory sites are also sampled for four other metals including uranium and two forms of radium radionuclides. DENR has only recently begun sampling at several new water quality monitoring sites for uranium and other metals; therefore, there are not sufficient data to determine the support status of the new sites. Streams located near the perimeter of the proposed Hyperion oil refinery in Union County are also monitored for petroleum analytes. Several stations are sampled for sodium, calcium, and magnesium during the irrigation season. This type of water sampling is used to track historical sampling information, natural background conditions, and runoff events, and can indicate possible acute or chronic water quality problems.

The samples are handled in accordance with DENR's Quality Management Plan and Surface Water Quality Program Quality Assurance Project Plan. Sample test results are entered into DENR's NR92 Database. DENR is in the process of transitioning from EPA's STORET to EPA's WQX data warehouse system.

Lake monitoring within each river basin is conducted in conjunction with the Watershed Assessment Program's Statewide Lake Assessment project. Many of the standard parameters measured in streams are also evaluated for state lakes with the addition of Secchi disk transparency, chlorophyll-*a* level, oxygen/water temperature profiles, and total volatile solids. Similarly, in the course of sampling lakes and streams, any pollution sources of environmental conditions that may affect water quality are noted by field personnel. Lake trophic state and trends are estimated with Carlson's (1977) Trophic State Indices (TSI).

Baseline data show whether or not a waterbody is meeting its assigned water quality beneficial uses. A description of the procedure involved is found in the methodology section of this document. Baseline data evaluations are used as a management tool to determine the effectiveness of control programs on existing point and nonpoint sources and for directing future control activities.

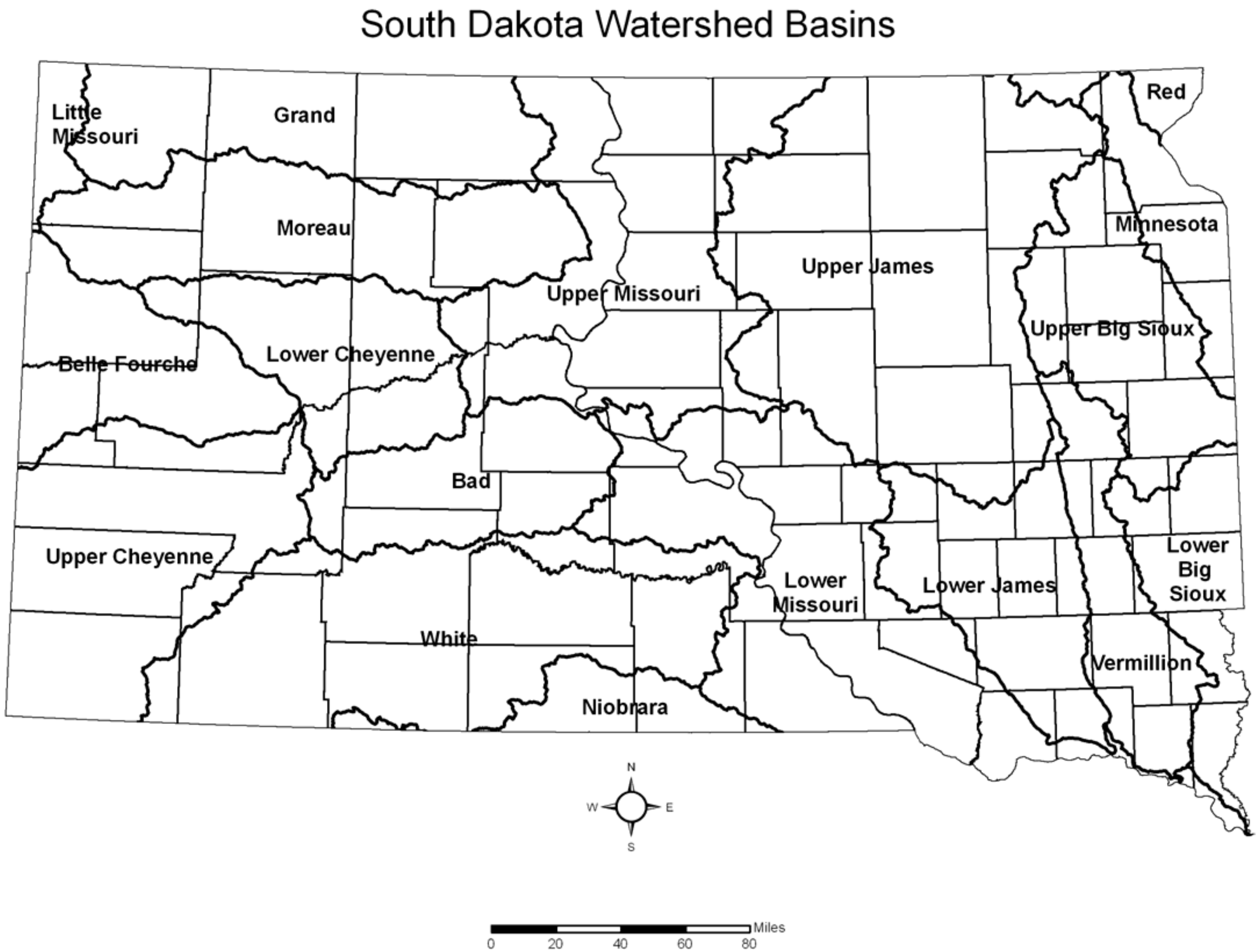

Figure 6: Major River Basins in South Dakota

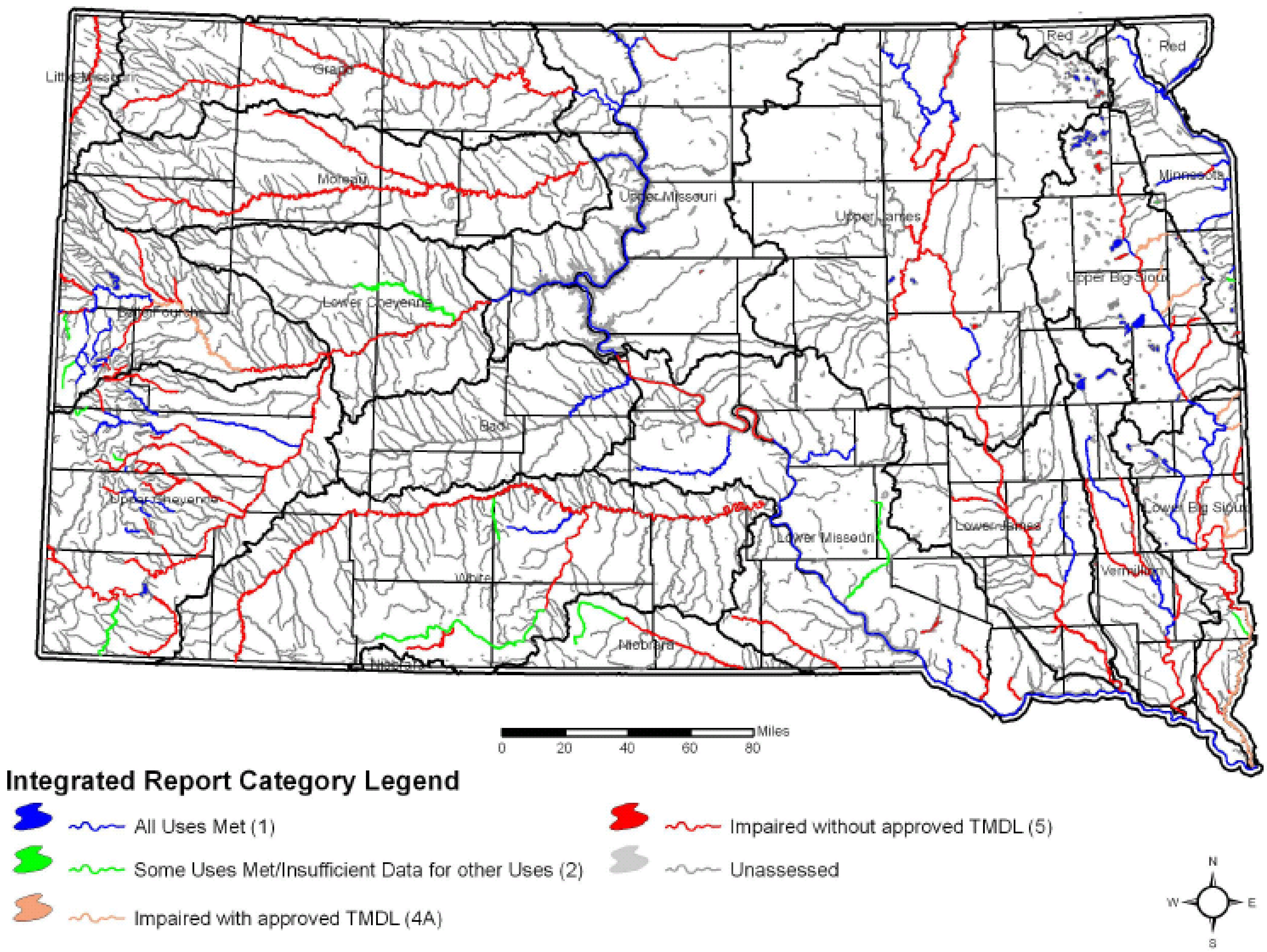

Figure 7: 2010 South Dakota Waterbody Status

KEY FOR RIVER BASIN INFORMATION TABLES

Waterbody-	Name of Waterbody
Location-	Best available description or reach segment
Map ID-	Map identification
Basis-	Monitoring agency
Use-	Beneficial use assigned to waterbody

EPA Category-	EPA Support Category
Category 1:	All designated uses are met;
Category 2:	Some of the designated uses are met but there is insufficient data to determine if remaining designated uses are met;
Category3:	Insufficient data to determine whether any designated uses are met;
Category 4A:	Water is impaired but has an EPA approved TMDL;
Category 4B:	Water is impaired but implementation project (best management practices) is in place;
Category 4C:	Water is impaired by a parameter that is not considered a "pollutant;" or
Category 5:	Water is impaired or threatened and a TMDL is needed.

Support status (lakes and streams):
Full = Full Support
Non = Nonsupport
INS = Insufficient sampling information (limited sample data)
NA = No sample data for the given beneficial use (not assessed)
TH = Threatened
* = Waterbody has an EPA approved TMDL

Source Categories -
Point Sources
Controlled by permit
- Industrial
- Municipal
- Combined sewer (end-of-pipe)
- Storm sewers (end-of-pipe)

Nonpoint Sources (includes agriculture sources)
- Residential districts

Agriculture Sources
- Non-irrigated crop production
- Irrigated crop production
- Pasture land
- Range land
- Animal feeding operations (non-regulated)
- Livestock
- Grazing

Hydromodification
- Channelization
- Streambank modification/destabilization
- Dredging
- Removal of riparian vegetation
- Dam construction
- Flow regulation/modification
- Bridge construction

Bad River Basin (Figure 8, Table 20)

The Bad River basin lies in west-central South Dakota between the Cheyenne and White River basins and drains approximately 3,175 square miles. Historically, a main characteristic of the basin has been a general lack of constant river flow. The upper portion of the Bad River receives water from artesian wells in the Phillip area. These wells contribute minimal flow to the upper portion of the Bad River. There are prolonged periods of low flow in the Bad River reach from Midland to the Missouri River.

DENR has assessed four lakes within the basin and also has one water quality monitoring site located the Bad River.

The USGS has water quality monitoring sites on the Bad River and on some of the intermittent streams in the basin on Plum Creek, the South Fork Bad River, and an unnamed tributary of Cottonwood Creek. However, the data are very limited, and for most sites, the only parameters that were measured were specific conductance and water temperature.

The Bad River is currently supporting its designated beneficial uses. In 2008, the Bad River was listed as “threatened” for total dissolved solids. In 2010, the threatened designation was removed due to attainment of water quality standards.

In 2009, DENR removed the (1) Domestic water supply beneficial use designation from Murdo Dam in Jones County because the dam was no longer being used as a domestic water supply source. As a result, water quality criteria associated with the domestic supply waters beneficial use were no longer applicable. Murdo Dam is fully supporting it beneficial uses.

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

Table 20: Bad River Basin Information

WATERBODY Lakes/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Freeman Lake SD-BA-L-FREEMAN_01	Jackson County	L1	DENR	Fish/Wildlife Prop, Rec, Stock	NON	Nitrates Specific Conductance Total Dissolved Solids	Natural Sources	5*	YES-2
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Permanent Fish Life	NON	Oxygen, Dissolved Selenium	 Natural Sources		
Hayes Lake SD-BA-L-HAYES_01	Stanley County	L2	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1*	NO
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	FULL				
Murdo Dam SD-BA-L-MURDO_01	Jones County	L3	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1	NO
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Permanent Fish Life	FULL				
Waggoner Lake SD-BA-L-WAGGONER_01	Haakon County	L4	DENR	Domestic Water Supply	FULL			5	YES-2
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Immersion Recreation	NON	Chlorophyll-*a*	Unknown		
				Limited Contact Recreation	NON	Chlorophyll-*a*	Unknown		
				Warmwater Permanent Fish Life	NON	Chlorophyll-*a*	Unknown		
WATERBODY Streams/AUID	**LOCATION**	**MAP ID**	**BASIS**	**USE**	**SUPPORT**	**CAUSE**	**SOURCE**	**EPA Category**	**ON 303(d) & Priority**
Bad River SD-BA-R-BAD_01	Stanley County line to Mouth	R1	DENR USGS	Fish/Wildlife Prop, Rec, Stock	FULL			1*	NO
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Marginal Fish Life	FULL				
Plum Creek SD-BA-R-PLUM_01_USGS	Near Hayes, SD	R2	USGS	Fish/Wildlife Prop, Rec, Stock	INS			3	NO
				Irrigation Waters	INS				
South Fork Bad River SD-BA-R-S_FORK_BAD_01_USGS	Near Cottonwood, SD	R3	USGS	Fish/Wildlife Prop, Rec, Stock	INS			3	NO
				Irrigation Waters	INS				
				Limited Contact Recreation	NA				
				Warmwater Marginal Fish Life	INS				
Unnamed tributary of Cottonwood Creek SD-BA-R-UNNAMED_TRIB_COTTONWOOD_01_USGS	Near Quinn, SD	R4	USGS	Fish/Wildlife Prop, Rec, Stock	INS			3	NO
				Irrigation Waters	INS				

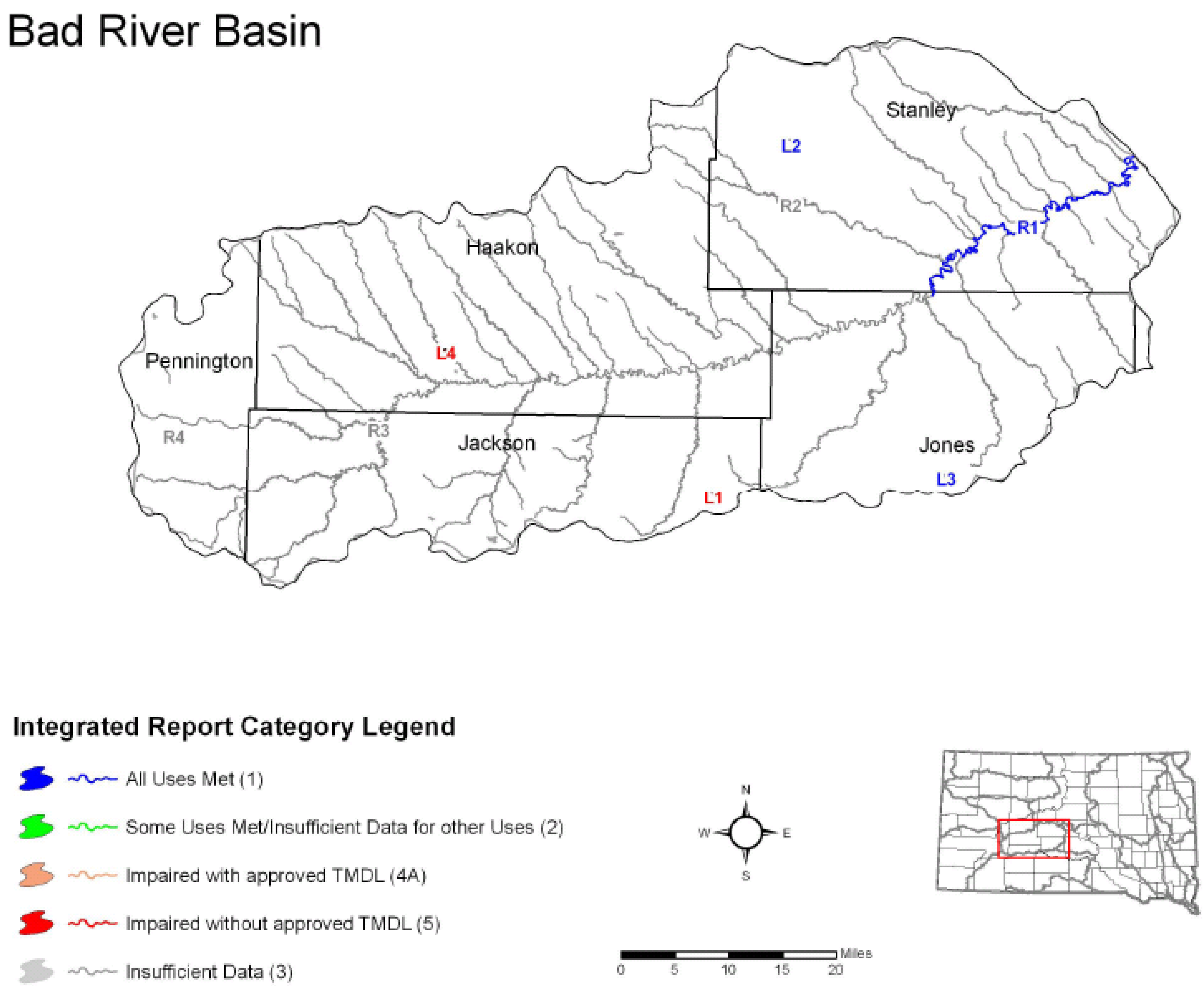

Figure 8: Bad River Basin

Belle Fourche River Basin (Figure 9, Table 21)

The Belle Fourche River basin lies in western South Dakota between the Cheyenne and Moreau River basins and drains approximately 3,271 square miles in South Dakota. The upper portion of the basin contains one active and several historic hard-rock mining operations. The middle and lower portion of the basin is mainly used for livestock watering and irrigation purposes.

DENR has assessed six lakes and maintains 30 water quality monitoring sites on several streams within the Belle Fourche basin. Five water quality monitoring sites are located on the Belle Fourche River, six are located on Spearfish Creek, and seven are located on Whitewood Creek. The rest are located on various other streams. Most of the streams are routinely monitored for toxic pollutants, such as heavy metals, since a number of hardrock mining operations are or were located in this basin. Available data from DENR watershed assessment projects were also used to determine waterbody support. All DENR data, including WQM, assessment projects, implementation projects, citizens monitoring, special assessments, and other DENR funded projects, are all labeled as DENR as the basis in the basin tables.

The USGS has water quality monitoring sites on the Belle Fourche River, Crow Creek, Horse Creek, Little Spearfish Creek, Spearfish Creek, Willow Creek, and other waterbodies within the basin. The data on some streams are fairly extensive and include information on dissolved oxygen, pH, specific conductance, water temperature, and sodium adsorption ratio. Data collected on all USGS sites were analyzed for this report. In addition, Wharf Resources submitted stream monitoring data for waterbodies located near mining areas.

Past and current assessments show Spearfish Creek generally supports its beneficial uses; however, two segments near Elmore showed elevated pH in 2006. The elevated pH is due largely to the limestone formations located along the course of the stream (natural conditions). The segments near Elmore were listed as nonsupporting for pH in 2006 and listed as threatened in 2008. However, for the 2010 IR, there were no pH violations in the 5-year data set. Therefore, pH was delisted and both segments are now fully supporting their beneficial uses.

Strawberry Creek is impacted by historic mining activity and acid mine drainage. One of the contributing sources of impairment was from Brohm Mining Corporation's Gilt Edge Mine. In July 1999, Brohm Mining Corporation's parent corporation, Dakota Mining, declared bankruptcy, and the state of South Dakota took over water treatment. On December 1, 2000, the site was listed on the National Priorities List as a Superfund Site. Remediation activities at Gilt Edge Mine are contracted by EPA to CDM. Due to remediation activities, copper, low pH, and zinc were delisted as impairment causes in the 2010 cycle. Strawberry Creek continues to be nonsupporting for exceeding chronic cadmium levels.

A segment of Whitewood Creek near Lead continues to be nonsupporting for fecal coliform and is also listed for *E. coli*. Sources of the high bacteria numbers in the stream's middle reach may be due to livestock, wildlife, aging septic and sewer systems, and from the combined sewer overflow (CSO) in Lead. A SWD permit has been issued to the city of Lead for the CSO, requiring compliance with EPA's nine minimum controls for the CSO. The city of Lead continues to make progress to separate their sewer systems and ultimately eliminate the CSO.

West Strawberry Creek was listed as impaired for temperature in 2006 and 2008. In 2008, DENR placed temperature loggers in West Strawberry Creek during the summer months. Data from the temperature loggers indicate that West Strawberry Creek is meeting the (2) Coldwater permanent fishery beneficial use temperature criterion. As a result, temperature was delisted; however, West Strawberry Creek remains impaired due to fecal coliform.

An implementation project is currently on-going to address water quality of the Belle Fourche River and tributaries. In addition, the Belle Fourche River is currently being assessed for fecal coliform and *E. coli* for future TMDL development.

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

Table 21: Belle Fourche River Basin Information

WATERBODY Lakes/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Iron Creek Lake SD-BF-L-IRON_CREEK_01	Lawrence County	L1	DENR	Coldwater Permanent Fish Life Fish/Wildlife Prop, Rec, Stock Immersion Recreation Limited Contact Recreation	NON FULL FULL FULL	Temperature		5	YES-2
Mirror Lake East SD-BF-L-MIRROR_EAST_01	Lawrence County	L2	DENR	Coldwater Permanent Fish Life Fish/Wildlife Prop, Rec, Stock Immersion Recreation Limited Contact Recreation	NON FULL NA NA	Temperature		5	YES-2
Mirror Lake West SD-BF-L-MIRROR_WEST_01	Lawrence County	L3	DENR	Coldwater Permanent Fish Life Fish/Wildlife Prop, Rec, Stock Immersion Recreation Limited Contact Recreation	NON FULL NA NA	Temperature		5	YES-2
Newell Lake SD-BF-L-NEWELL_01	Butte County	L4	DENR	Fish/Wildlife Prop, Rec, Stock Immersion Recreation Limited Contact Recreation Warmwater Permanent Fish Life	FULL NA NA FULL			2	NO
Newell City Pond SD-BF-L-NEWELL_CITY_01	Butte County	L5	DENR	Coldwater Marginal Fish Life Fish/Wildlife Prop, Rec, Stock Immersion Recreation Limited Contact Recreation	NON FULL FULL FULL	Temperature		5	YES-2
Orman Dam (Belle Fourche Reservoir) SD-BF-L-ORMAN_01	Butte County	L6	DENR	Fish/Wildlife Prop, Rec, Stock Immersion Recreation Irrigation Waters Limited Contact Recreation Warmwater Permanent Fish Life	FULL FULL FULL FULL FULL			1	NO
WATERBODY Streams/AUID	**LOCATION**	**MAP ID**	**BASIS**	**USE**	**SUPPORT**	**CAUSE**	**SOURCE**	**EPA Category**	**ON 303(d) & Priority**
Annie Creek SD-BF-R-ANNIE_01	Spearfish Creek to S3, T4N, R2E	R1	DENR USGS	Coldwater Marginal Fish Life Fish/Wildlife Prop, Rec, Stock Irrigation Waters Limited Contact Recreation	FULL FULL FULL FULL			1	NO
Bear Butte Creek SD-BF-R-BEAR_BUTTE_01	Headwaters to Strawberry Creek	R2	DENR	Coldwater Permanent Fish Life Fish/Wildlife Prop, Rec, Stock Irrigation Waters Limited Contact Recreation	NON FULL FULL FULL	Temperature	Natural Sources	5	YES-2

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Streams/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Bear Butte Creek SD-BF-R-BEAR_BUTTE_02	Strawberry Creek to S2, T4N, R4E	R3	DENR USGS	Coldwater Permanent Fish Life	NON	Temperature	Natural Sources	5*	YES-2
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
Belle Fourche River SD-BF-R-BELLE_FOURCHE_01	Wyoming border to Redwater River	R4	DENR USGS	Fish/Wildlife Prop, Rec, Stock	FULL			5*	YES-1
				Immersion Recreation	NON	Fecal Coliform	Wildlife Other than Waterfowl Grazing in Riparian or Shoreline Zones		
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Permanent Fish Life	NON	Total Suspended Solids	Livestock (Grazing or Feeding Operations) Crop Production (Crop Land or Dry Land)		
Belle Fourche River SD-BF-R-BELLE_FOURCHE_02	Redwater River to Whitewood Creek	R5	DENR USGS	Fish/Wildlife Prop, Rec, Stock	FULL			1*	NO
				Immersion Recreation	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Permanent Fish Life	FULL				
Belle Fourche River SD-BF-R-BELLE_FOURCHE_03	Whitewood Creek to Willow Creek	R6	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			4A*	NO
				Immersion Recreation	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Permanent Fish Life	NON	Total Suspended Solids	Source Unknown		
Belle Fourche River SD-BF-R-BELLE_FOURCHE_04	Willow Creek to Alkali Creek	R7	DENR USGS	Fish/Wildlife Prop, Rec, Stock	FULL			4A*	NO
				Immersion Recreation	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Permanent Fish Life	NON	Total Suspended Solids	Source Unknown		
Belle Fourche River SD-BF-R-BELLE_FOURCHE_05	Alkali Creek to mouth	R8	DENR USGS	Fish/Wildlife Prop, Rec, Stock	FULL			5*	YES-1
				Immersion Recreation	NON	Fecal Coliform	Source Unknown		
				Irrigation Waters	FULL				
				Limited Contact Recreation	NON	Fecal Coliform			
				Warmwater Permanent Fish Life	NON	Total Suspended Solids	Source Unknown		

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Streams/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Cleopatra Creek SD-BF-R-CLEOPATRA_01	Confluence with East Branch Cleopatra Creek to mouth	R9	DENR USGS	Coldwater Permanent Fish Life	FULL			1	NO
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Immersion Recreation	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
Crow Creek SD-BF-R-CROW_01_USGS	S22, T6N, R1E to Redwater River	R10	USGS	Coldwater Permanent Fish Life	FULL			2	NO
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	NA				
Deadwood Creek SD-BF-R-DEADWOOD_01	Rutabaga Gulch to Whitewood Creek	R11	DENR USGS	Coldwater Marginal Fish Life	FULL			1	NO
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Immersion Recreation	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
False Bottom Creek SD-BF-R-FALSE_BOTTOM_01	S23, T7N, R3E to S26, T5N, R2E	R12	DENR USGS	Coldwater Marginal Fish Life	FULL			1	NO
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
Fantail Creek SD-BF-R-FANTAIL_01	Headwaters to Nevada Gulch	R13	DENR	Coldwater Permanent Fish Life	FULL			1	NO
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Immersion Recreation	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
Horse Creek SD-BF-R-HORSE_01_USGS	Indian Creek to mouth	R14	USGS	Fish/Wildlife Prop, Rec, Stock	FULL			5*	YES-2
				Irrigation Waters	NON	Specific Conductance			
				Limited Contact Recreation	NA				
				Warmwater Semipermanent Fish Life	FULL				
Little Spearfish Creek SD-BF-R-LITTLE_SPEARFISH_01_USGS	S16, T4N, R1E to Spearfish Creek	R15	USGS	Coldwater Permanent Fish Life	FULL			2	NO
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	NA				
Murray Ditch SD-BF-R-MURRAY_DITCH_01_USGS	Above headgate at WY-SD state line	R16	USGS	Fish/Wildlife Prop, Rec, Stock	FULL			1	NO
				Irrigation Waters	FULL				

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Streams/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Redwater River SD-BF-R-REDWATER_01	US HWY 85 to mouth	R18	DENR USGS	Coldwater Marginal Fish Life	FULL			1	NO
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
Redwater River SD-BF-R-REDWATER_01_USGS	WY border to Hwy 85	R17	DENR USGS	Coldwater Permanent Fish Life	NON	Temperature	Natural Sources	5	YES-2
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	NA				
Spearfish Creek SD-BF-R-SPEARFISH_01	Intake Gulch to Annie Creek	R19	DENR USGS	Coldwater Permanent Fish Life	FULL			1	NO
				Commerce & Industry	FULL				
				Domestic Water Supply	FULL				
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Immersion Recreation	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
Spearfish Creek SD-BF-R-SPEARFISH_02	Annie Creek to McKinley Gulch	R20	DENR	Coldwater Permanent Fish Life	FULL			1	NO
				Commerce & Industry	FULL				
				Domestic Water Supply	FULL				
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Immersion Recreation	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
Spearfish Creek SD-BF-R-SPEARFISH_03	McKinley Gulch to Cleopatra Creek	R21	DENR USGS	Coldwater Permanent Fish Life	FULL			1	NO
				Commerce & Industry	FULL				
				Domestic Water Supply	FULL				
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Immersion Recreation	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
Spearfish Creek SD-BF-R-SPEARFISH_04	Cleopatra Creek to Spearfish City intake dam in S33, T6N, R2E	R22	DENR USGS	Coldwater Permanent Fish Life	FULL			1	NO
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Streams/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Spearfish Creek	Homestake Hydroelectric Plant at Spearfish in S15, T6N, R2E to Higgins Gulch	R23	DENR	Coldwater Permanent Fish Life	FULL			1	NO
			USGS	Domestic Water Supply	FULL				
				Fish/Wildlife Prop, Rec, Stock	FULL				
SD-BF-R-SPEARFISH_05				Immersion Recreation	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
Spearfish Creek	Higgens Gulch to mouth	R24	DENR	Coldwater Permanent Fish Life	FULL			1	NO
SD-BF-R-SPEARFISH_06				Domestic Water Supply	FULL				
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Immersion Recreation	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
Stewart Gulch	Whitetail Creek to NW1/4, NW1/4, S7, T4N, R3E	R25	DENR	Coldwater Permanent Fish Life	FULL			1	NO
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Irrigation Waters	FULL				
SD-BF-R-STEWART_01				Limited Contact Recreation	FULL				
Strawberry Creek	Bear Butte Creek to S5, T4N, R4E	R26	DENR	Coldwater Marginal Fish Life	FULL			5	YES-1
SD-BF-R-STRAWBERRY_01			CDM	Fish/Wildlife Prop, Rec, Stock	NON	Cadmium	Acid Mine Drainage Impacts from Abandoned Mine Lands (Inactive)		
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
West Strawberry Creek	Headwaters to mouth	R27	DENR	Coldwater Permanent Fish Life	FULL			5	YES-2
SD-BF-R-W_STRAWBERRY_01				Fish/Wildlife Prop, Rec, Stock	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	NON	Fecal Coliform			
Whitetail Creek	Whitewood Creek to S18, T4N, R3E	R28	DENR	Coldwater Permanent Fish Life	FULL			1	NO
SD-BF-R-WHITETAIL_01			USGS	Fish/Wildlife Prop, Rec, Stock	FULL				
				Immersion Recreation	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
Whitewood Creek	Whitetail Summit to Gold Run Creek	R29	DENR	Coldwater Permanent Fish Life	FULL-TH	Temperature		5	YES-2
SD-BF-R-WHITEWOOD_01				Fish/Wildlife Prop, Rec, Stock	FULL				
				Immersion Recreation	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Streams/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Whitewood Creek SD-BF-R-WHITEWOOD_02	Gold Run Creek to Deadwood Creek	R30	DENR	Coldwater Marginal Fish Life	FULL			1	NO
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Immersion Recreation	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
Whitewood Creek SD-BF-R-WHITEWOOD_03	Deadwood Creek to Spruce Gulch	R31	DENR	Coldwater Permanent Fish Life	FULL			5	YES-2
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Immersion Recreation	NON	Escherichia coli			
						Fecal Coliform	Wildlife Other than Waterfowl		
							Grazing in Riparian or Shoreline Zones		
							Combined Sewer Overflows		
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
Whitewood Creek SD-BF-R-WHITEWOOD_04	Spruce Gulch to Sandy Creek	R32	DENR	Coldwater Permanent Fish Life	FULL			1	NO
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Immersion Recreation	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
Whitewood Creek SD-BF-R-WHITEWOOD_05	Sandy Creek to I-90	R33	DENR USGS	Coldwater Marginal Fish Life	NON	pH (high)	Natural Sources	5	YES-2
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Immersion Recreation	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
Whitewood Creek SD-BF-R-WHITEWOOD_06	I-90 to Crow Creek	R34	DENR USGS	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-2
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Permanent Fish Life	NON	pH (high)			
Whitewood Creek SD-BF-R-WHITEWOOD_07	Crow Creek to mouth	R35	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-2
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Permanent Fish Life	NON	Total Suspended Solids			
Willow Creek SD-BF-R-WILLOW_01_USGS	Near Vale, SD	R36	USGS	Fish/Wildlife Prop, Rec, Stock	INS			5	YES-2
				Irrigation Waters	NON	Specific Conductance			
				Limited Contact Recreation	NA				
				Warmwater Marginal Fish Life	INS				

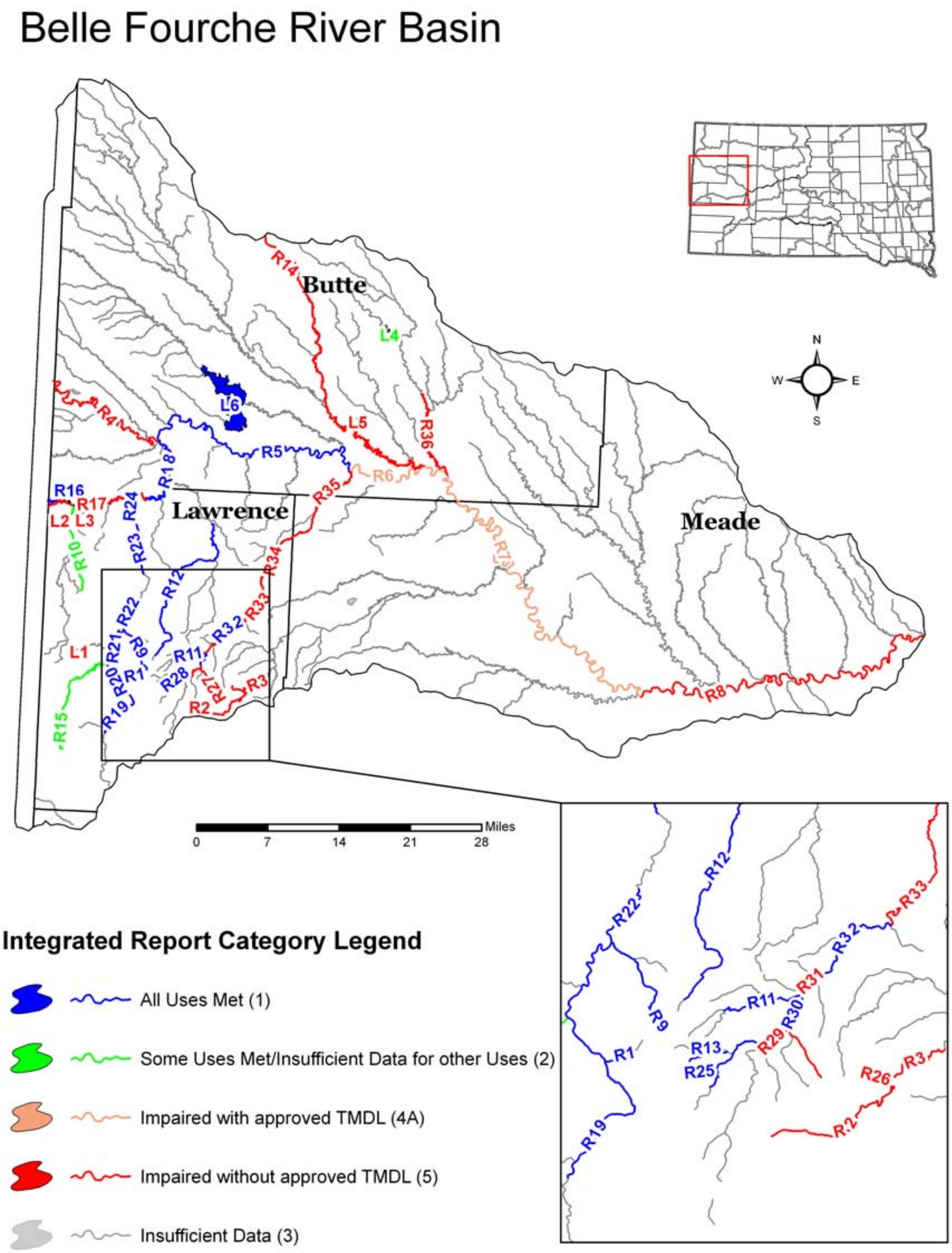

Figure 9: Belle Fourche River Basin

Big Sioux River Basin (Figure 10 and 11, Table 22)

The Big Sioux River basin is located in eastern South Dakota. The lower portion of the river forms the Iowa-South Dakota border. The basin drains an approximate 5,382 square miles in South Dakota and an additional 3,000 square miles in Minnesota and Iowa. The basin's primary source of income is agriculture, but it also contains a majority of the state's light manufacturing, food processing, and wholesaler industries. Four state educational institutions, several vocational schools, and Sioux Falls, the state's largest city, are located within this basin, making this the heaviest populated basin in the state.

DENR has assessed 27 lakes and maintains 24 water quality monitoring sites within the Big Sioux basin. Seventeen water quality monitoring sites are located on the Big Sioux River. Six sampling stations were added in 2009 to the area surrounding the proposed Hyperion oil refinery location. These sites are being sampled to determine background levels of contaminants and will remain to monitor ambient water quality conditions if the oil refinery is built. In addition, available data from DENR watershed assessment projects were also used to determine waterbody support. All DENR data, including WQM, assessment projects, implementation projects, special assessments, and other DENR funded projects are all labeled as DENR as the basis in the basin tables.

The USGS has water quality monitoring sites on the Big Sioux River, Beaver Creek, Flandreau Creek, Owens Creek, Skunk Creek, Willow Creek, Hidewood Creek, and Split Rock Creek within the basin. USGS data on the Big Sioux River are fairly extensive and includes information on dissolved oxygen, pH, specific conductance, water temperature, and sodium adsorption ratio. Data collected on all USGS sites were analyzed for this report. The cities of Watertown and Sioux Falls supplied water quality data for the Big Sioux River. The city of Sioux Falls also supplied water quality data for Skunk Creek.

The main causes of nonsupport within the Big Sioux River basin are due to fecal coliform, *E. coli*, and total suspended solids. The presence of bacteria in the Big Sioux basin is mainly due to runoff from livestock operations, wet weather discharges within municipal areas, and from the presence of wildlife. Sediment sources are overland runoff from nearby croplands, inflow from tributaries, and streambank erosion.

Lakes in the Big Sioux River basin are highly productive due to algae, nutrient, enrichment, and siltation. Nearly 50% of the monitored lakes are considered hypereutrophic. The moderate size and shallow depth of most lakes contributes to the hypereutrophic conditions. Lakes are susceptible to rapid changes produced by large nutrient and sediment loads from sizeable agricultural watersheds comprised of nutrient-rich glacial soils.

During this 2010 cycle, DENR made minor changes to some of the Big Sioux River reach descriptions and locations due to differences in beneficial use designations and TMDL development. SD-BS-R-BIG_SIOUX_09 was a river reach on the Big Sioux River that was integrated into the above and below reaches. SD-BS-R-BIG_SIOUX_09 was listed as impaired for fecal coliform in the 2008 cycle. The above and below reaches are still listed as impaired for fecal coliform and are currently involved in a TMDL.

In 2009, DENR removed the (1) Domestic water supply beneficial use designation from five reaches in the Big Sioux River from Lake Kampeska (area) to the Brookings/Moody County line. This segment of the Big Sioux River was no longer being used as a domestic water supply source. As a result of this change, water quality criteria associated with the domestic water supply use are longer applicable and the Big Sioux River downstream of Watertown is no longer listed as impaired for nitrates.

Jack Moore Creek and Skunk Creek were listed in 2008 for not supporting the (8) Limited contact recreation beneficial use designation for fecal coliform. A fecal coliform TMDL was approved on May 28, 2008, for each waterbody; however, both streams were fully supporting all beneficial uses this cycle and were delisted for attaining water quality standards.

Watershed management programs are attempting to reduce sediment and nutrient loads from both manmade and natural sources within the basin. On-going watershed implementation projects include Lake Poinsett, and the upper, north central, central, and lower Big Sioux River.

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

Table 22: Big Sioux River Basin Information

WATERBODY Lakes/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Lake Albert SD-BS-L-ALBERT_01	Kingsbury County	L1	DENR	Fish/Wildlife Prop, Rec, Stock Immersion Recreation Limited Contact Recreation Warmwater Marginal Fish Life	FULL FULL FULL FULL			1	NO
Lake Alvin SD-BS-L-ALVIN_01	Lincoln County	L2	DENR	Fish/Wildlife Prop, Rec, Stock Immersion Recreation Limited Contact Recreation Warmwater Permanent Fish Life	FULL FULL FULL NON	 Temperature		5*	YES-2
Bitter Lake SD-BS-L-BITTER_01	Day County	L3	DENR	Fish/Wildlife Prop, Rec, Stock Immersion Recreation Limited Contact Recreation Warmwater Permanent Fish Life	INS-TH FULL FULL NON	Mercury in fish tissue pH (high)		5	YES-1
Blue Dog Lake SD-BS-L-BLUE_DOG_01	Day County	L4	DENR	Fish/Wildlife Prop, Rec, Stock Immersion Recreation Limited Contact Recreation Warmwater Permanent Fish Life	FULL NON FULL NON	 Escherichia coli Fecal Coliform pH (high)		5*	YES-2
Brant Lake SD-BS-L-BRANT_01	Lake County	L5	DENR	Fish/Wildlife Prop, Rec, Stock Immersion Recreation Limited Contact Recreation Warmwater Permanent Fish Life	FULL FULL FULL FULL			1*	NO
Bullhead Lake SD-BS-L-BULLHEAD_01	Deuel County	L6	DENR	Fish/Wildlife Prop, Rec, Stock Immersion Recreation Limited Contact Recreation Warmwater Semipermanent Fish Life	FULL NON NON NON	 Chlorophyll-*a* Chlorophyll-*a* pH (high) Chlorophyll-*a*	 Unknown Unknown Unknown	5	YES-2
Lake Campbell SD-BS-L-CAMPBELL_01	Brookings County	L7	DENR	Fish/Wildlife Prop, Rec, Stock Immersion Recreation Limited Contact Recreation Warmwater Marginal Fish Life	FULL FULL FULL FULL			1	NO
Clear Lake SD-BS-L-CLEAR_D_01	Deuel County	L8	DENR	Fish/Wildlife Prop, Rec, Stock Immersion Recreation Limited Contact Recreation Warmwater Marginal Fish Life	FULL FULL FULL FULL			1*	NO

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Lakes/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Covell Lake SD-BS-L-COVELL_01	Minnehaha County	L9	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			2	NO
				Immersion Recreation	NA				
				Limited Contact Recreation	NA				
				Warmwater Marginal Fish Life	FULL				
Dry Lake SD-BS-L-DRY_01	Codington County	L10	DENR	Fish/Wildlife Prop, Rec, Stock	INS			3	NO
				Immersion Recreation	NA				
				Limited Contact Recreation	NA				
				Warmwater Marginal Fish Life	INS				
East Oakwood Lake SD-BS-L-E_OAKWOOD_01	Brookings County	L12	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1*	NO
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	FULL				
Enemy Swim Lake SD-BS-L-ENEMY_SWIM_01	Day County	L13	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1	NO
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Permanent Fish Life	FULL				
Lake Herman SD-BS-L-HERMAN_01	Lake County	L14	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1*	NO
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	FULL				
Lake Kampeska SD-BS-L-KAMPESKA_01	Codington County	L15	DENR	Domestic Water Supply	FULL			1*	NO
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Permanent Fish Life	FULL				
Lake Madison SD-BS-L-MADISON_01	Lake County	L16	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1*	NO
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Permanent Fish Life	FULL				
Lake Marsh SD-BS-L-MARSH_01	Hamlin County	L17	DENR	Fish/Wildlife Prop, Rec, Stock	INS			3	NO
				Immersion Recreation	NA				
				Limited Contact Recreation	NA				
				Warmwater Marginal Fish Life	INS				
Minnewasta Lake SD-BS-L-MINNEWASTA_01	Day County	L18	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1	NO
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	FULL				

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Lakes/AUID	MAP LOCATION	EPA ID	ON 303(d) BASIS	USE	SUPPORT	CAUSE	SOURCE	Category	& Priority
Lake Norden SD-BS-L-NORDEN_01	Hamlin County	L19	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1	NO
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Marginal Fish Life	FULL				
North Island Lake SD-BS-L-ISLAND_N_01	Minnehaha/McCook counties (formerly SD-VM-L-ISLAND_N_01)	L31	DENR	Fish/Wildlife Prop, Rec, Stock	NA			5	YES-1
				Immersion Recreation	NA				
				Limited Contact Recreation	NA				
				Warmwater Semipermanent Fish Life	INS-TH	Mercury in fish tissue	Non-Point Source		
Pelican Lake SD-BS-L-PELICAN_01	Codington County	L20	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5*	YES-2
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	NON	pH (high)			
Pickerel Lake SD-BS-L-PICKEREL_01	Day County	L21	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1	NO
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Permanent Fish Life	FULL				
Lake Poinsett SD-BS-L-POINSETT_01	Hamlin County	L22	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1*	NO
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	FULL				
School Lake SD-BS-L-SCHOOL_01	Deuel County	L23	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1*	NO
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Marginal Fish Life	FULL				
Lake Sinai SD-BS-L-SINAI_01	Brookings County	L24	DENR	Fish/Wildlife Prop, Rec, Stock	INS			3	NO
				Immersion Recreation	NA				
				Limited Contact Recreation	NA				
				Warmwater Permanent Fish Life	INS				
Lake St. John SD-BS-L-ST_JOHN_01	Hamlin County	L25	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1	NO
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Marginal Fish Life	FULL				
Twin Lakes/W. Hwy 81 SD-BS-L-TWIN_01	Kingsbury County	L26	DENR	Fish/Wildlife Prop, Rec, Stock	INS-TH	Mercury in fish tissue		5	YES-1

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Lakes/AUID	MAP LOCATION	EPA ID	ON 303(d) BASIS	USE	SUPPORT	CAUSE	SOURCE	Category	& Priority
Twin Lakes SD-BS-L-TWIN_02	Minnehaha County	L27	DENR	Fish/Wildlife Prop, Rec, Stock Immersion Recreation Limited Contact Recreation Warmwater Permanent Fish Life	NON NA NA NA	Mercury in fish tissue		5	YES-1
West Oakwood Lake SD-BS-L-W_OAKWOOD_01	Brookings County	L28	DENR	Fish/Wildlife Prop, Rec, Stock Immersion Recreation Limited Contact Recreation Warmwater Semipermanent Fish Life	FULL FULL FULL FULL			1*	NO
Wall Lake SD-BS-L-WALL_01	Minnehaha County	L29	DENR	Fish/Wildlife Prop, Rec, Stock Immersion Recreation Limited Contact Recreation Warmwater Semipermanent Fish Life	FULL FULL FULL FULL			1	NO
Waubay Lake SD-BS-L-WAUBAY_01	Day County	L30	DENR	Fish/Wildlife Prop, Rec, Stock Immersion Recreation Limited Contact Recreation Warmwater Semipermanent Fish Life	FULL FULL FULL FULL			1	NO

WATERBODY Streams/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Beaver Creek SD-BS-R-BEAVER_01	Big Sioux River to S9, T98N, R49W	R1	USGS	Fish/Wildlife Prop, Rec, Stock Irrigation Waters	INS INS			5	YES-1
				Limited Contact Recreation	NON	Fecal Coliform	Livestock (Grazing or Feeding Operations)		
				Warmwater Marginal Fish Life	INS				
Beaver Creek SD-BS-R-BEAVER_02	Split Rock Creek to South Dakota-Minnesota border	R2	DENR	Fish/Wildlife Prop, Rec, Stock Irrigation Waters	FULL FULL			4A*	NO
				Limited Contact Recreation	NON	Fecal Coliform	Livestock (Grazing or Feeding Operations)		
				Warmwater Marginal Fish Life	FULL				
Big Ditch Creek SD-BS-R-BIG_DITCH_01	headwaters to S21, T92N, R50W	R3	DENR	Fish/Wildlife Prop, Rec, Stock Irrigation Waters	INS INS			3	NO
Unnamed tributary to Big Ditch Creek SD-BS-R-BIG_DITCH_TRIB_01	headwaters to Big Ditch Creek	R36	DENR	Fish/Wildlife Prop, Rec, Stock Irrigation Waters	NA NA			3	NO

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Streams/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Big Sioux River	S28, T121N, R52W to Lake Kampeska	R4	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-2
			USGS	Irrigation Waters	FULL				
SD-BS-R-BIG_SIOUX_01				Limited Contact Recreation	NON	Escherichia coli Oxygen, Dissolved			
				Warmwater Semipermanent Fish Life	NON	Oxygen, Dissolved			
Big Sioux River	Lake Kampeska to Willow Creek	R13	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1	NO
			USGS	Irrigation Waters	FULL				
SD-BS-R-BIG_SIOUX_02			City of Watertown						
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	FULL				
Big Sioux River	Willow Creek to Stray Horse Creek	R14	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5*	YES-2
			USGS	Irrigation Waters	FULL				
SD-BS-R-BIG_SIOUX_03				Limited Contact Recreation	NON	Escherichia coli			
						Fecal Coliform	Livestock (Grazing or Feeding Operations)		
				Warmwater Semipermanent Fish Life	FULL				
Big Sioux River	Stray Horse Creek to near Volga	R15	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1	NO
			USGS	Irrigation Waters	FULL				
SD-BS-R-BIG_SIOUX_04				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	FULL				
Big Sioux River SD-BS-R-BIG_SIOUX_05	Near Volga to Brookings	R16	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1	NO
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	FULL				
Big Sioux River	Brookings to Brookings/Moody County Line	R17	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-2
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
SD-BS-R-BIG_SIOUX_06				Warmwater Semipermanent Fish Life	NON	Total Suspended Solids			
Big Sioux River	Brookings/Moody County Line to S2, T104N, R49W	R18	DENR	Domestic Water Supply	FULL			1*	NO
			USGS	Fish/Wildlife Prop, Rec, Stock	FULL				
				Irrigation Waters	FULL				
SD-BS-R-BIG_SIOUX_07				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	FULL				

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Streams/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Big Sioux River	S2, T104N, R49W to I-90	R19	DENR	Domestic Water Supply	FULL			5*	YES-1
SD-BS-R-BIG_SIOUX_08			USGS	Fish/Wildlife Prop, Rec, Stock	FULL				
			City of Sioux Falls	Immersion Recreation	NON	Escherichia coli			
						Fecal Coliform	Livestock (Grazing or Feeding Operations)		
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	NON	Total Suspended Solids			
Big Sioux River	I-90 to diversion return	R5	DENR	Domestic Water Supply	FULL			5	YES-1
SD-BS-R-BIG_SIOUX_10			USGS	Fish/Wildlife Prop, Rec, Stock	FULL				
			City of Sioux Falls	Immersion Recreation	NON	Escherichia coli			
						Fecal Coliform	Residential Districts		
				Irrigation Waters	FULL				
				Limited Contact Recreation	NON	Escherichia coli			
						Fecal Coliform			
				Warmwater Semipermanent Fish Life	NON	Total Suspended Solids			
Big Sioux River	Diversion return to SF WWTF	R6	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-1
SD-BS-R-BIG_SIOUX_11			USGS	Immersion Recreation	NON	Escherichia coli			
			City of Sioux Falls						
						Fecal Coliform	Municipal (Urbanized High Density Area)		
							Livestock (Grazing or Feeding Operations)		
				Irrigation Waters	FULL				
				Limited Contact Recreation	NON	Escherichia coli			
				Warmwater Semipermanent Fish Life	NON	Total Suspended Solids			
Big Sioux River	SF WWTF to above Brandon	R7	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-1
SD-BS-R-BIG_SIOUX_12			City of Sioux Falls	Immersion Recreation	NON	Escherichia coli			
						Fecal Coliform	Livestock (Grazing or Feeding Operations)		
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	NON	Total Suspended Solids			
Big Sioux River	Above Brandon to Nine Mile Creek	R8	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5*	YES-1
SD-BS-R-BIG_SIOUX_13				Immersion Recreation	NON	Fecal Coliform	Livestock Grazing in Riparian or Shoreline Zones		
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	NON	Total Suspended Solids			

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Streams/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Big Sioux River SD-BS-R-BIG_SIOUX_14	Nine Mile Creek to near Fairview	R9	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5*	YES-1
				Immersion Recreation	NON	Escherichia coli Fecal Coliform	Livestock (Grazing or Feeding Operations)		
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	NON	Total Suspended Solids			
Big Sioux River SD-BS-R-BIG_SIOUX_15	Fairview to near Alcester	R10	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			4a*	No
				Immersion Recreation	NON	Escherichia coli Fecal Coliform	Grazing in Riparian or Shoreline Zones Animal Feeding Operations (NPS)		
				Irrigation Waters	FULL				
				Limited Contact Recreation	NON	Escherichia coli			
				Warmwater Semipermanent Fish Life	NON	Total Suspended Solids	Grazing in Riparian or Shoreline Zones Crop Production (Crop Land or Dry Land)		
Big Sioux River SD-BS-R-BIG_SIOUX_16	Near Alcester to Indian Creek	R11	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			4a*	No
				Immersion Recreation	NON	Escherichia coli Fecal Coliform	Livestock (Grazing or Feeding Operations) Grazing in Riparian or Shoreline Zones		
				Irrigation Waters	FULL				
				Limited Contact Recreation	NON	Escherichia coli Fecal Coliform			
				Warmwater Semipermanent Fish Life	NON	Total Suspended Solids	Streambank Modifications/destabilization Non-irrigated Crop Production Crop Production (Crop Land or Dry Land)		

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Streams/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Big Sioux River SD-BS-R-BIG_SIOUX_17	Indian Creek to mouth	R12	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			4a*	NO
				Immersion Recreation	NON	Escherichia coli			
						Fecal Coliform	Livestock (Grazing or Feeding Operations)		
							Grazing in Riparian or Shoreline Zones		
				Irrigation Waters	FULL				
				Limited Contact Recreation	NON	Fecal Coliform	Grazing in Riparian or Shoreline Zones		
				Warmwater Semipermanent Fish Life	NON	Total Suspended Solids	Streambank Modifications/destabilization		
							Grazing in Riparian or Shoreline Zones		
							Crop Production (Crop Land or Dry Land)		
Brule Creek SD-BS-R-BRULE_01	Big Sioux River to confluence of its east and west forks	R20	DENR	Fish/Wildlife Prop, Rec, Stock	INS			5	YES-1
				Irrigation Waters	INS				
				Limited Contact Recreation	NON	Fecal Coliform	Livestock (Grazing or Feeding Operations)		
							Animal Feeding Operations (NPS)		
				Warmwater Marginal Fish Life	NON	Total Suspended Solids			
East Brule Creek SD-BS-R-EAST_BRULE_01	confluence with Brule Creek to S3, T95N, R49W	R21	DENR	Fish/Wildlife Prop, Rec, Stock	INS			5	YES-1
				Irrigation Waters	INS				
				Limited Contact Recreation	NON	Fecal Coliform	Livestock (Grazing or Feeding Operations)		
							Animal Feeding Operations (NPS)		
				Warmwater Marginal Fish Life	NON	Total Suspended Solids			
Flandreau Creek SD-BS-R-FLANDREAU_01	Big Sioux River to Minnesota Border	R22	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			4A*	NO
				Irrigation Waters	FULL				
				Limited Contact Recreation	NON	Fecal Coliform	Livestock (Grazing or Feeding Operations)		
							Animal Feeding Operations (NPS)		
				Warmwater Marginal Fish Life	FULL				

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Streams/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Hidewood Creek SD-BS-R-HIDEWOOD_01	Big Sioux River to U.S. Highway 77	R23	DENR USGS	Fish/Wildlife Prop, Rec, Stock Irrigation Waters	FULL FULL			4A*	NO
				Limited Contact Recreation	NON	Fecal Coliform	Livestock (Grazing or Feeding Operations) Animal Feeding Operations (NPS)		
				Warmwater Marginal Fish Life	FULL				
Jack Moore Creek SD-BS-R-JACK_MOORE_01	Big Sioux River to S33, T107N, R49W	R24	DENR	Fish/Wildlife Prop, Rec, Stock Irrigation Waters	FULL FULL			1*	NO
				Limited Contact Recreation Warmwater Marginal Fish Life	FULL FULL				
North Deer Creek SD-BS-R-NORTH_DEER_01	Six Mile Creek to U.S. Highway 77	R25	DENR	Fish/Wildlife Prop, Rec, Stock Irrigation Waters	FULL FULL			5*	YES-1
				Limited Contact Recreation Warmwater Marginal Fish Life	NON FULL	Oxygen, Dissolved			
Owens Creek (Blue Dog Lake inflow) SD-BS-R-OWENS_01_USGS	S18, T122N, R52W to Blue Dog Lake	R26	USGS	Fish/Wildlife Prop, Rec, Stock Irrigation Waters	INS INS			3	NO
				Limited Contact Recreation Warmwater Permanent Fish Life	NA INS				
Pattee Creek SD-BS-R-PATTEE_01	Big Sioux River to Lake Lakota	R27	DENR	Fish/Wildlife Prop, Rec, Stock Irrigation Waters	FULL FULL			2	NO
				Limited Contact Recreation Warmwater Semipermanent Fish Life	NA NA				
Peg Munky Run SD-BS-R-PEG_MUNKY_RUN_01	Big Sioux River to S17, T113N, R50W	R28	DENR	Fish/Wildlife Prop, Rec, Stock Irrigation Waters	INS INS			5	YES-2
				Limited Contact Recreation	NON	Fecal Coliform	Livestock (Grazing or Feeding Operations) Animal Feeding Operations (NPS)		
				Warmwater Marginal Fish Life	INS				

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Streams/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Pipestone Creek SD-BS-R-PIPESTONE_01	Split Rock Creek to Minnesota border	R29	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5*	YES-1
				Immersion Recreation	NON	Escherichia coli			
						Fecal Coliform	Livestock (Grazing or Feeding Operations)		
				Irrigation Waters	FULL				
				Limited Contact Recreation	NON	Fecal Coliform	Livestock (Grazing or Feeding Operations)		
				Warmwater Semipermanent Fish Life	FULL				
Six Mile Creek SD-BS-R-SIXMILE_01	Big Sioux River to S30, T112N, R48W	R30	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-2
				Irrigation Waters	FULL				
				Limited Contact Recreation	NON	Fecal Coliform			
				Warmwater Marginal Fish Life	FULL				
Skunk Creek SD-BS-R-SKUNK_01	Brandt Lake to Big Sioux River	R31	DENR USGS City of Sioux Falls	Fish/Wildlife Prop, Rec, Stock	FULL			1*	NO
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Marginal Fish Life	FULL				
Split Rock Creek SD-BS-R-SPLIT_ROCK_01_USGS	At Corson, SD	R32	DENR USGS	Fish/Wildlife Prop, Rec, Stock	FULL			4A*	NO
				Immersion Recreation	NON	Fecal Coliform	Livestock (Grazing or Feeding Operations) Animal Feeding Operations (NPS)		
				Irrigation Waters	FULL				
				Limited Contact Recreation	NON	Fecal Coliform			
				Warmwater Semipermanent Fish Life	FULL				
Spring Creek SD-BS-R-SPRING_01	Big Sioux River to S22, T109, R47W	R33	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			4A*	NO
				Irrigation Waters	FULL				
				Limited Contact Recreation	NON	Fecal Coliform	Livestock (Grazing or Feeding Operations) Animal Feeding Operations (NPS)		
				Warmwater Marginal Fish Life	FULL				

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Streams/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Stray Horse Creek SD-BS-R-STRAYHORSE_01	Big Sioux River to S26, T116N, R51W	R34	DENR	Fish/Wildlife Prop, Rec, Stock Irrigation Waters	FULL FULL			4A*	NO
				Limited Contact Recreation	NON	Fecal Coliform	Livestock (Grazing or Feeding Operations) Animal Feeding Operations (NPS)		
				Warmwater Marginal Fish Life	FULL				
Union Creek SD-BS-R-UNION_01	Big Sioux River to confluence with East and West Forks	R35	DENR	Fish/Wildlife Prop, Rec, Stock Irrigation Waters	FULL FULL			5	YES-2
				Limited Contact Recreation	NON	Fecal Coliform	Livestock (Grazing or Feeding Operations) Animal Feeding Operations (NPS)		
				Warmwater Marginal Fish Life	NON	Total Suspended Solids			
Willow Creek SD-BS-R-WILLOW_01	Big Sioux River to S7, T117N, R50W	R37	DENR USGS	Fish/Wildlife Prop, Rec, Stock Irrigation Waters	INS INS			4A*	NO
				Limited Contact Recreation	NON	Fecal Coliform	Livestock (Grazing or Feeding Operations) Animal Feeding Operations (NPS)		
				Warmwater Marginal Fish Life	INS				

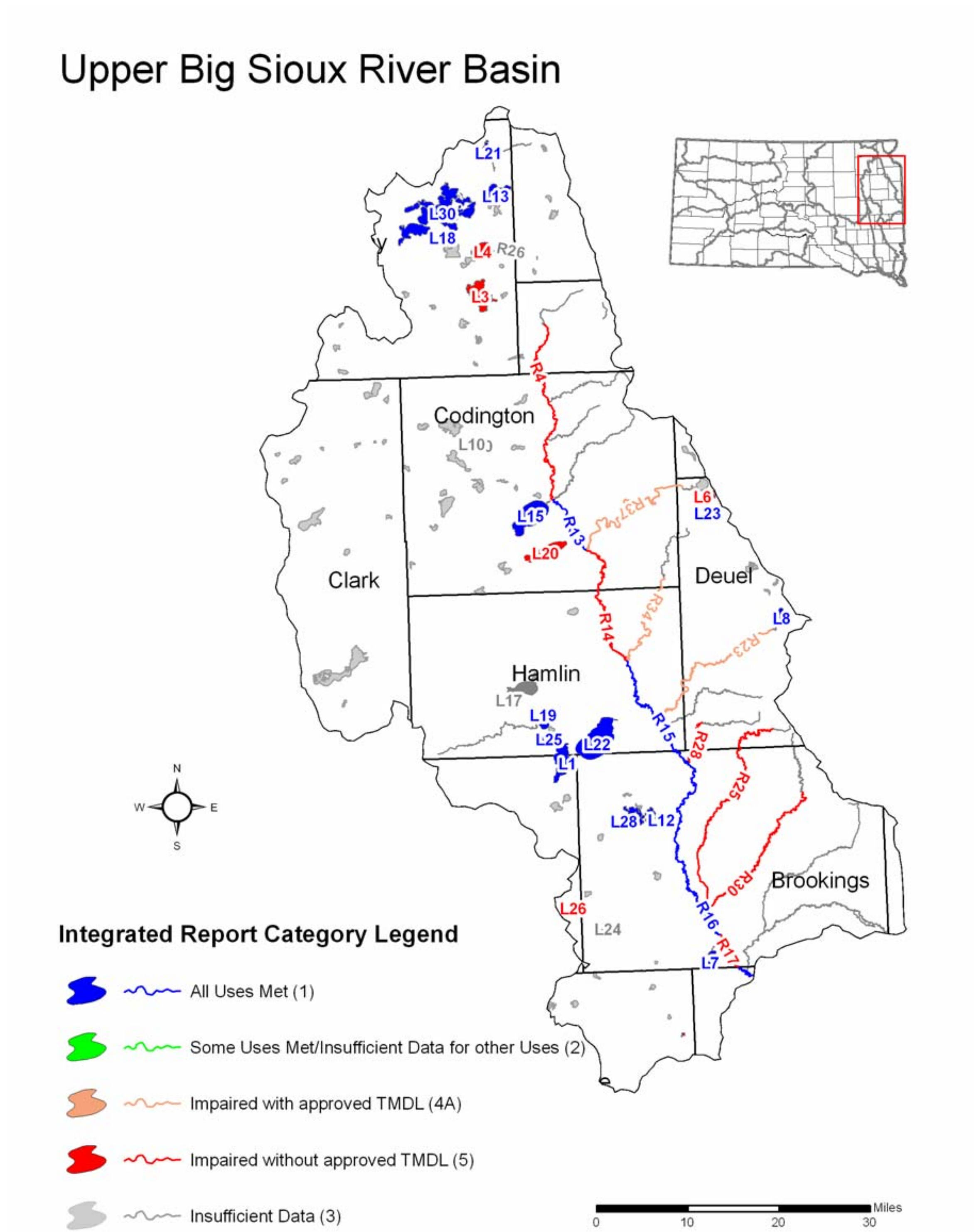

Figure 10: Upper Big Sioux River Basin

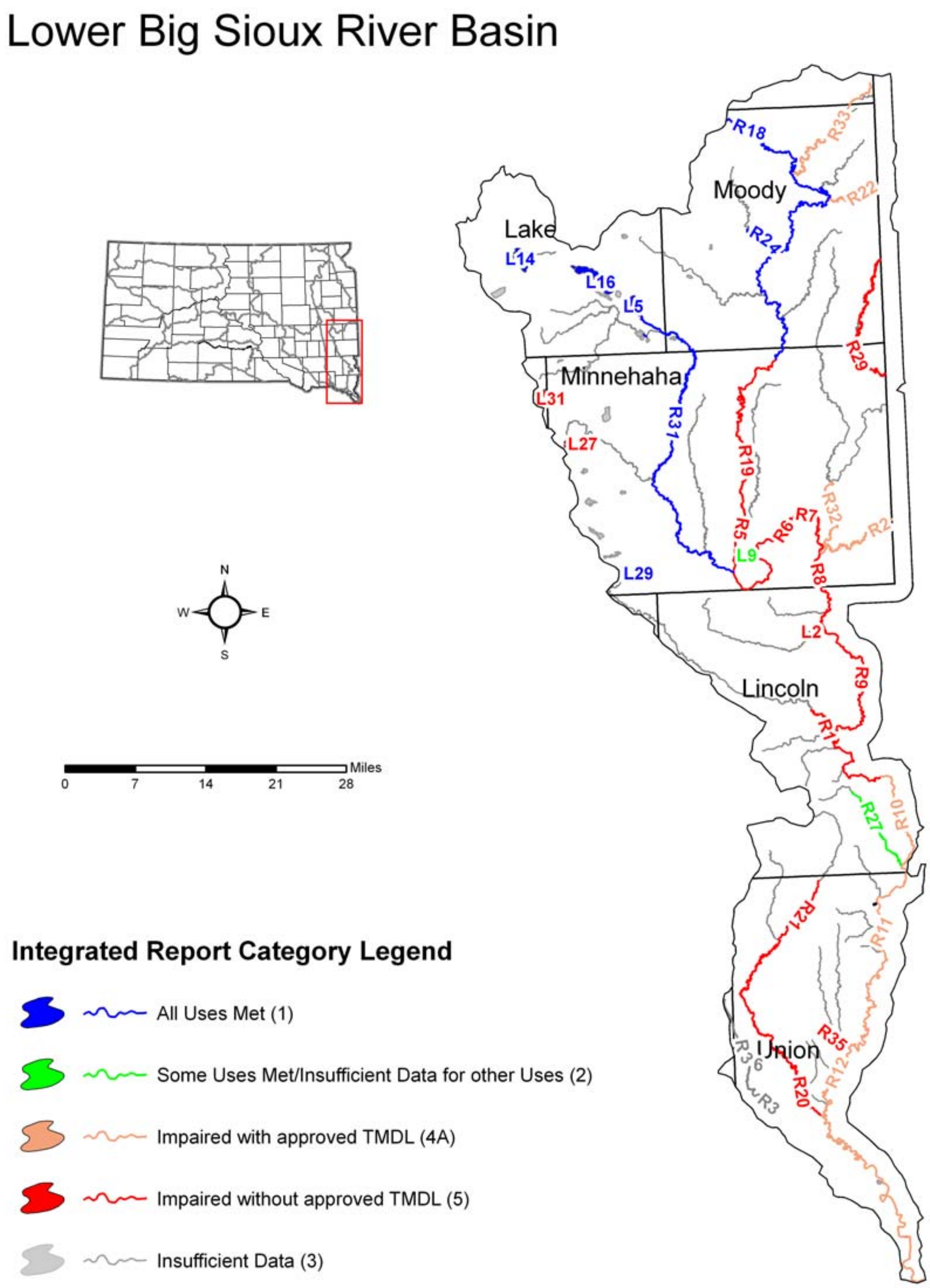

Figure 11: Lower Big Sioux River Basin

Cheyenne River Basin (Figures 12 and 13, Table 23)

The portion of the Cheyenne River basin that lies in southwestern South Dakota drains about 9,732 square miles within the boundaries of the state. The area in this basin is very diverse. It includes part of the Black Hills and Badlands, rangeland, irrigated cropland, and some mining areas. The Cheyenne River originates in Wyoming, flows through the southern Black Hills, and enters Lake Oahe near the center of the state.

DENR has assessed 16 lakes and maintains 28 water quality monitoring sites within the Cheyenne basin. Eight monitoring sites are located on the Cheyenne River, three are located on French Creek, and five are located on Rapid Creek. The other sites are located on various other streams in the basin. In addition, available data from DENR watershed assessment projects were also used to determine waterbody support. All DENR data, including WQM, assessment projects, implementation projects, special assessments, and other DENR funded projects, are all labeled as DENR as the basis in the basin tables.

The USGS also maintains a number of water quality monitoring sites located along streams in the Cheyenne River Basin including: Battle Creek, Bear Gulch, Hat Creek, Highland Creek, Rapid Creek, Sunday Gulch, Cheyenne River, and others. The USGS data are limited for most sites and mostly includes specific conductance and water temperature information. Data collected on all USGS sites were analyzed for this report.

The Cheyenne River basin is home to deposits of natural uranium and historic uranium mining activities. With the increasing price of uranium compounded with rising energy needs, uranium exploration drilling has resumed. DENR has established two new monitoring locations and expanded parameters on three locations within the basin to monitor for uranium and other associated parameters. For this reporting cycle, there are insufficient data to determine support on newly established monitoring sites. Support determinations have been made on previous existing sites based on conventional parameters but there are insufficient data to report on uranium and other associated parameters. However, there have been no surface water quality exceedances for any parameters associated with past uranium mining or current explorations.

The Cheyenne River water quality continues to be generally poor due to both natural and agricultural sources. The lower Cheyenne drainage, in general, contains a high percentage of erodible cropland and rangeland in west-central South Dakota. This cropland may contribute additional amounts of eroded sediment during periods of heavy rainfall. Irrigation return flows, cropland, and rangeland also contribute to water quality problems. The latter two sources are particularly prevalent in the lower half of the river course.

Hat Creek was listed as impaired for specific conductance in 2006 and 2008. Water quality data collected by DENR and data obtained from USGS indicate that Hat Creek is now meeting all designated beneficial uses. Specific conductance was delisted as an impairment cause on Hat Creek due to the creek attaining water quality standards.

Water quality in Rapid Creek is good in its upper reaches, but is poor downstream of Rapid City. A major recurring problem in the downstream segments of Rapid Creek is excessive fecal coliform bacteria levels. Lower Rapid Creek is also now listed as impaired for TSS and *E. coli*.

The Black Hills region traditionally has some of the best surface water quality in the state. This is due in a large part to a cooler climate and higher precipitation than the surrounding plains as a result of greater elevation and forest cover. Also contributing to the water quality in this region are the local bedrock formations which are much less erodible than the highly erosive and leachable marine shales and badlands on the surrounding plains. However, the Black Hills streams are vulnerable to losses of flow exacerbated by periodic droughts. In addition, high summer ambient air temperature causes elevated water temperature and results in temperature impairments for coldwater fisheries. Grazing of streamside vegetation, which increases stream bank erosion, water temperature, and nutrient loading, also continues to be a problem in some streams in this area.

In 2009, DENR removed the (1) Domestic water supply beneficial use from Angostura Reservoir because the reservoir was no longer being used as a domestic water supply source. As a result, water quality criteria associated with that beneficial use were no longer applicable. Angostura Reservoir is now meeting all beneficial uses.

Assessment projects in the Cheyenne River basin include the Lower Cheyenne River Assessment project and the French Creek Assessment project.

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

Table 23: Cheyenne River Basin Information

WATERBODY Lakes/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Angostura Reservoir SD-CH-L-ANGOSTURA_01	Fall River County	L1	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1	NO
				Immersion Recreation	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Permanent Fish Life	FULL				
Bismark Lake SD-CH-L-BISMARK_01	Custer County	L2	DENR	Coldwater Marginal Fish Life	FULL			1	NO
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
Canyon Lake SD-CH-L-CANYON_01	Pennington County	L3	DENR	Coldwater Permanent Fish Life	FULL			2	NO
				Domestic Water Supply	FULL				
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Immersion Recreation	INS				
				Limited Contact Recreation	INS				
Center Lake SD-CH-L-CENTER_01	Custer County	L4	DENR	Coldwater Permanent Fish Life	NON	pH (high) Temperature		5*	YES-2
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
Cold Brook Reservoir SD-CH-L-COLD_BROOK_01	Fall River County	L5	DENR	Coldwater Permanent Fish Life	NON	Temperature	Natural Sources	5	YES-2
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Immersion Recreation	INS				
				Limited Contact Recreation	INS				
Cottonwood Springs Lake SD-CH-L-COTTONWOOD_SPRINGS_01	Fall River County	L6	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1	NO
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Permanent Fish Life	FULL				
Curlew Lake SD-CH-L-CURLEW_01	Meade County	L7	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-2
				Immersion Recreation	NA				
				Limited Contact Recreation	NA				
				Warmwater Permanent Fish Life	NON	Temperature			
Deerfield Lake SD-CH-L-DEERFIELD_01	Pennington County	L8	DENR	Coldwater Permanent Fish Life	NON	Temperature		5	YES-2
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Immersion Recreation	NA				
				Limited Contact Recreation	NA				

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Lakes/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Horsethief Lake SD-CH-L-HORSETHIEF_01	Pennington County	L9	DENR	Coldwater Permanent Fish Life	NON	pH (high) Temperature	Natural Sources	5	YES-2
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
Lakota Lake SD-CH-L-LAKOTA_01	Custer County	L10	DENR	Coldwater Marginal Fish Life	FULL			1	NO
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
Legion Lake SD-CH-L-LEGION_01	Custer County	L11	DENR	Coldwater Marginal Fish Life	NON	Oxygen, Dissolved pH (high)	 Natural Sources	5*	YES-2
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
New Wall Lake SD-CH-L-NEW_WALL_01	Pennington County	L12	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-2
				Immersion Recreation	NA				
				Limited Contact Recreation	NA				
				Warmwater Permanent Fish Life	NON	pH (high)			
Pactola Reservoir SD-CH-L-PACTOLA_01	Pennington County	L13	DENR	Coldwater Permanent Fish Life	FULL			1	NO
				Domestic Water Supply	FULL				
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Immersion Recreation	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
Sheridan Lake SD-CH-L-SHERIDAN_01	Pennington County	L14	DENR	Coldwater Permanent Fish Life	NON	Oxygen, Dissolved Temperature		5*	YES-2
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
Stockade Lake SD-CH-L-STOCKADE_01	Custer County	L15	DENR	Coldwater Marginal Fish Life	FULL			1	NO
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
Sylvan Lake SD-CH-L-SYLVAN_01	Custer County	L16	DENR	Coldwater Permanent Fish Life	NON	Temperature		5*	YES-2
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Streams/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Battle Creek SD-CH-R-BATTLE_01	Near Horsethief Lake to Teepee Gulch Creek	R2	DENR USGS	Coldwater Permanent Fish Life	NON	Temperature	Natural Sources	5	YES-2
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
Battle Creek SD-CH-R-BATTLE_01_USGS	Hwy 79 to mouth	R1	DENR USGS	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-2
				Irrigation Waters	FULL				
				Limited Contact Recreation	NON	Fecal Coliform			
						Oxygen, Dissolved			
				Warmwater Marginal Fish Life	NON	Total Suspended Solids			
Battle Creek SD-CH-R-BATTLE_02	Teepee Gulch Creek to SD HWY 79	R3	DENR	Coldwater Permanent Fish Life	NON	Temperature	Natural Sources	5	YES-2
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
Bear Gulch SD-CH-R-BEAR_GULCH_01_USGS	Near Hayward, SD	R4	USGS	Coldwater Marginal Fish Life	INS			3	NO
				Fish/Wildlife Prop, Rec, Stock	INS				
				Irrigation Waters	INS				
				Limited Contact Recreation	NA				
Beaver Creek SD-CH-R-BEAVER_01	WY border to Cheyenne River	R7	DENR	Fish/Wildlife Prop, Rec, Stock	NON	Specific Conductance		5	YES-1
						Total Dissolved Solids			
				Irrigation Waters	NON	Salinity			
						Specific Conductance			
				Limited Contact Recreation	FULL-TH	Fecal Coliform			
				Warmwater Semipermanent Fish Life	NON	Total Suspended Solids			
Beaver Creek SD-CH-R-BEAVER_01_USGS	Near Buffalo Gap	R5	DENR USGS	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-2
				Irrigation Waters	FULL				
				Limited Contact Recreation	NON	Fecal Coliform			
				Warmwater Permanent Fish Life	FULL				
Beaver Creek SD-CH-R-BEAVER_02_USGS	S13, T5N, R4E to SD Hwy 79	R6	USGS	Coldwater Permanent Fish Life	INS			3	NO
				Fish/Wildlife Prop, Rec, Stock	INS				
				Irrigation Waters	INS				
				Limited Contact Recreation	NA				

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Streams/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Box Elder Creek SD-CH-R-BOX_ELDER_01	Cheyenne River to S22, T2N, R8E	R8	DENR	Fish/Wildlife Prop, Rec, Stock Irrigation Waters Limited Contact Recreation Warmwater Marginal Fish Life	FULL FULL FULL FULL			1	NO
Box Elder Creek SD-CH-R-BOX_ELDER_02	S16, T2N, R6E to S14, T3N, R4E	R9	DENR USGS	Coldwater Permanent Fish Life Fish/Wildlife Prop, Rec, Stock Irrigation Waters Limited Contact Recreation	FULL FULL FULL FULL			1	NO
Castle Creek SD-CH-R-CASTLE_01	Deerfield Reservoir to Rapid Creek	R10	DENR USGS	Coldwater Permanent Fish Life Fish/Wildlife Prop, Rec, Stock Irrigation Waters Limited Contact Recreation	FULL FULL FULL FULL			1	NO
Cherry Creek SD-CH-R-CHERRY_01	Cheyenne River to Sulphur Creek	R11	DENR USGS	Fish/Wildlife Prop, Rec, Stock Irrigation Waters Limited Contact Recreation Warmwater Marginal Fish Life	FULL FULL INS FULL			2	NO
Cheyenne River SD-CH-R-CHEYENNE_01	WY border to Beaver Creek	R13	DENR	Fish/Wildlife Prop, Rec, Stock Irrigation Waters Limited Contact Recreation Warmwater Semipermanent Fish Life	NON NON FULL FULL	Specific Conductance Total Dissolved Solids Salinity Specific Conductance		5	YES-1

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Streams/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Cheyenne River SD-CH-R-CHEYENNE_02	Beaver Creek to Cascade Creek	R14	DENR USGS	Fish/Wildlife Prop, Rec, Stock	NON	Specific Conductance Total Dissolved Solids	Natural Sources Livestock (Grazing or Feeding Operations) Crop Production (Crop Land or Dry Land)	5	YES-1
				Irrigation Waters	NON	Salinity Specific Conductance	Crop Production (Crop Land or Dry Land)		
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	NON	Total Suspended Solids			
Cheyenne River SD-CH-R-CHEYENNE_02B	Cascade Creek to Angostura Reservoir	R12	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-1
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	NON	Total Suspended Solids			
Cheyenne River SD-CH-R-CHEYENNE_03	Fall River to Cedar Creek	R15	DENR USGS	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-1
				Immersion Recreation	NON	Fecal Coliform			
				Irrigation Waters	FULL				
				Limited Contact Recreation	NON	Fecal Coliform			
				Warmwater Semipermanent Fish Life	NON	Total Suspended Solids	Natural Sources Irrigated Crop Production Grazing in Riparian or Shoreline Zones		
Cheyenne River SD-CH-R-CHEYENNE_04	Cedar Creek to Belle Fourche River	R16	DENR USGS	Fish/Wildlife Prop, Rec, Stock	NON	Alkalinity, Total Dissolved Solids		5	YES-1
				Immersion Recreation	NON	Fecal Coliform	Wildlife, Livestock (Grazing or Feeding Operations)		
				Irrigation Waters	FULL				
				Limited Contact Recreation	NON	Fecal Coliform			
				Warmwater Semipermanent Fish Life	NON	Total Suspended Solids	Rangeland Grazing Natural Sources Crop Production (Crop Land or Dry Land)		

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Streams/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Cheyenne River SD-CH-R-CHEYENNE_05	Belle Fourche River to Bull Creek	R17	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-1
				Immersion Recreation	NON	Escherichia coli			
						Fecal Coliform	Wildlife Other than Waterfowl Livestock (Grazing or Feeding Operations)		
				Irrigation Waters	FULL				
				Limited Contact Recreation	NON	Escherichia coli Fecal Coliform			
				Warmwater Permanent Fish Life	NON	Total Suspended Solids	Irrigated Crop Production		
Cheyenne River SD-CH-R-CHEYENNE_06	Bull Creek to Lake Oahe	R18	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-1
				Immersion Recreation	NON	Fecal Coliform	Wildlife Other than Waterfowl Livestock (Grazing or Feeding Operations)		
				Irrigation Waters	FULL				
				Limited Contact Recreation	NON	Fecal Coliform	Wildlife Other than Waterfowl		
				Warmwater Permanent Fish Life	NON	Total Suspended Solids			
Cold Springs Creek SD-CH-R-COLD_SPRING_01_USGS	0.1 mile west of park boundary on Hwy 385	R19	USGS	Fish/Wildlife Prop, Rec, Stock	FULL			1	NO
				Irrigation Waters	FULL				
Elk Creek SD-CH-R-ELK_01_USGS	S9, T3N, R7E to S27, T4N, R3E	R20	USGS	Coldwater Permanent Fish Life	NON	Temperature		5	YES-2
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Immersion Recreation	NA				
				Irrigation Waters	FULL				
				Limited Contact Recreation	NA				
Elm Creek SD-CH-R-ELM_01_USGS	Near Fairpoint, Red Owl, SD	R21	DENR	Fish/Wildlife Prop, Rec, Stock	INS			3	NO
				Irrigation Waters	INS				
Fall River SD-CH-R-FALL_01	Hot Springs to mouth	R22	DENR USGS	Coldwater Marginal Fish Life	FULL			5	YES-2
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Permanent Fish Life	NON	Temperature	Natural Sources		

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Streams/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Flynn Creek SD-CH-R-FLYNN_01	SF Lame Johnny Creek to S23, T4S, R5E	R23	DENR	Coldwater Marginal Fish Life	FULL			1	NO
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
French Creek SD-CH-R-FRENCH_01	S23, T3S, R3E to Custer	R24	DENR USGS	Coldwater Marginal Fish Life	NON	Oxygen, Dissolved	Natural Sources Drought-related Impacts	5	YES-1
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	NON	Oxygen, Dissolved			
French Creek SD-CH-R-FRENCH_02	Custer to Stockade Lake	R25	DENR USGS	Coldwater Marginal Fish Life	FULL			1	NO
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
French Creek SD-CH-R-FRENCH_03	Stockade Lake to SD HWY 79	R26	DENR USGS	Coldwater Marginal Fish Life	FULL			1	NO
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
Grace Coolidge Creek SD-CH-R-GRACE_COOLIDGE_01	S12, T3S, R5E to Battle Creek	R27	DENR USGS	Coldwater Permanent Fish Life	NON	Temperature	Drought-related Impacts	5	YES-2
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
Grizzly Bear Creek SD-CH-R-GRIZZLY_BEAR_01_USGS	Near Keystone, SD	R28	USGS	Coldwater Permanent Fish Life	NON	Temperature		5	YES-2
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	NA				
Hat Creek SD-CH-R-HAT_01_USGS	Near Edgemont, SD	R29	DENR USGS	Fish/Wildlife Prop, Rec, Stock	FULL			2	NO
				Irrigation Waters	FULL				
				Limited Contact Recreation	INS				
				Warmwater Semipermanent Fish Life	FULL				
Highland Creek SD-CH-R-HIGHLAND_01_USGS	Wind Cave Natl Park and near Pringle, SD	R30	USGS	Coldwater Permanent Fish Life	INS-TH	pH (high) Temperature	Natural Sources	5	YES-2
				Fish/Wildlife Prop, Rec, Stock	INS				
				Irrigation Waters	INS				
				Limited Contact Recreation	INS				

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Streams/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Horsehead Creek SD-CH-R-HORSEHEAD_01_USGS	At Oelrichs	R31	DENR USGS	Fish/Wildlife Prop, Rec, Stock Irrigation Waters Limited Contact Recreation Warmwater Semipermanent Fish Life	INS INS - TH INS INS			5	YES-2
Hot Brook Creek SD-CH-R-HOT_BROOK_01	Fall River to S19, T7S, R5E	R32	DENR	Coldwater Marginal Fish Life Domestic Water Supply Fish/Wildlife Prop, Rec, Stock Irrigation Waters	NON NA NA NA	Temperature	Natural Sources	5	YES-2
Lime Creek SD-CH-R-LIME_01_USGS	At Rapid City, SD	R33	USGS	Coldwater Permanent Fish Life Fish/Wildlife Prop, Rec, Stock Irrigation Waters Limited Contact Recreation	NA NA NA NA			3	NO
Lindsey Draw SD-CH-R-LINDSEY_DRAW_01_USGS	Near Farmingdale, SD	R34	USGS	Fish/Wildlife Prop, Rec, Stock Irrigation Waters	INS INS			3	NO
Pass Creek SD-CH-R-PASS_01_USGS	Near Dewey, SD	R36	USGS	Fish/Wildlife Prop, Rec, Stock Irrigation Waters	INS INS			3	NO
Rapid Creek SD-CH-R-RAPID_01	Headwaters to Pactola Reservoir	R37	DENR USGS	Coldwater Permanent Fish Life Domestic Water Supply Fish/Wildlife Prop, Rec, Stock Immersion Recreation Irrigation Waters Limited Contact Recreation	FULL FULL FULL FULL FULL FULL			1	NO
Rapid Creek SD-CH-R-RAPID_02	Pactola Reservoir to Canyon Lake	R38	DENR USGS	Coldwater Permanent Fish Life Domestic Water Supply Fish/Wildlife Prop, Rec, Stock Immersion Recreation Irrigation Waters Limited Contact Recreation	FULL FULL FULL FULL FULL FULL			1	NO

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Streams/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Rapid Creek SD-CH-R-RAPID_03	Canyon Lake to S15, T1N, R8E	R39	USGS	Coldwater Permanent Fish Life	NON	Temperature		5	YES-1
				Domestic Water Supply	INS				
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Immersion Recreation	NON	Fecal Coliform	Wet Weather Discharges On-site Treatment Systems Livestock (Grazing or Feeding Operations)		
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
Rapid Creek SD-CH-R-RAPID_04	S15, T1N, R8E to above Farmingdale	R40	DENR USGS	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-1
				Immersion Recreation	NON	Fecal Coliform	On-site Treatment Systems (Septic Systems and Similar Decentralized Systems) Animal Feeding Operations (NPS)		
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Permanent Fish Life	FULL				
Rapid Creek SD-CH-R-RAPID_05	Above Farmingdale to Cheyenne River	R41	DENR USGS	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-1
				Immersion Recreation	NON	Escherichia coli			
						Fecal Coliform	Livestock (Grazing or Feeding Operations)		
				Irrigation Waters	FULL				
				Limited Contact Recreation	NON	Fecal Coliform			
				Warmwater Permanent Fish Life	NON	Total Suspended Solids			
North Fork Rapid Creek SD-CH-R-RAPID_N_FORK_01	From confluence with Rapid Creek to S8, T3N, R3E	R35	DENR	Coldwater Permanent Fish Life	NON	Temperature		5	YES-1
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Irrigation Waters	NA				
				Limited Contact Recreation	FULL				
Reno Gulch SD-CH-R-RENO_GULCH_01_USGS	Near Hill City, SD	R42	USGS	Coldwater Marginal Fish Life	FULL			2	NO
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	NA				

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Streams/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Rhoads Fork SD-CH-R-RHOADS_FORK_01_USGS	Near Rochford, SD	R43	USGS	Coldwater Permanent Fish Life Fish/Wildlife Prop, Rec, Stock Irrigation Waters Limited Contact Recreation	FULL FULL FULL NA			2	NO
Spring Creek SD-CH-R-SPRING_01	S5, T2S, R3E to Sheridan Lake	R44	DENR USGS	Coldwater Permanent Fish Life Fish/Wildlife Prop, Rec, Stock	NON FULL	Temperature	Natural Sources	5*	YES-2
				Immersion Recreation	NON	Fecal Coliform	Urban runoff Livestock On-site Treatment Systems Wildlife		
				Irrigation Waters Limited Contact Recreation	FULL FULL				
Spring Creek SD-CH-R-SPRING_02	Sheridan Lake to SD HWY 79	R45	DENR USGS	Coldwater Marginal Fish Life Fish/Wildlife Prop, Rec, Stock	FULL-TH FULL	Temperature	Natural Sources	5	YES-2
				Immersion Recreation Irrigation Waters Limited Contact Recreation	FULL FULL FULL				
Sunday Gulch SD-CH-R-SUNDAY_GULCH_01_USGS	S18, T2S, T5E to headwaters	R46	USGS	Fish/Wildlife Prop, Rec, Stock Irrigation Waters	FULL FULL			1	NO
Victoria Creek SD-CH-R-VICTORIA_01_USGS	Rapid Creek to S19, T1N, R6E	R47	DENR USGS	Coldwater Permanent Fish Life Fish/Wildlife Prop, Rec, Stock	NON INS	Temperature	Natural Sources	5	YES-2
				Irrigation Waters Limited Contact Recreation	INS NA				

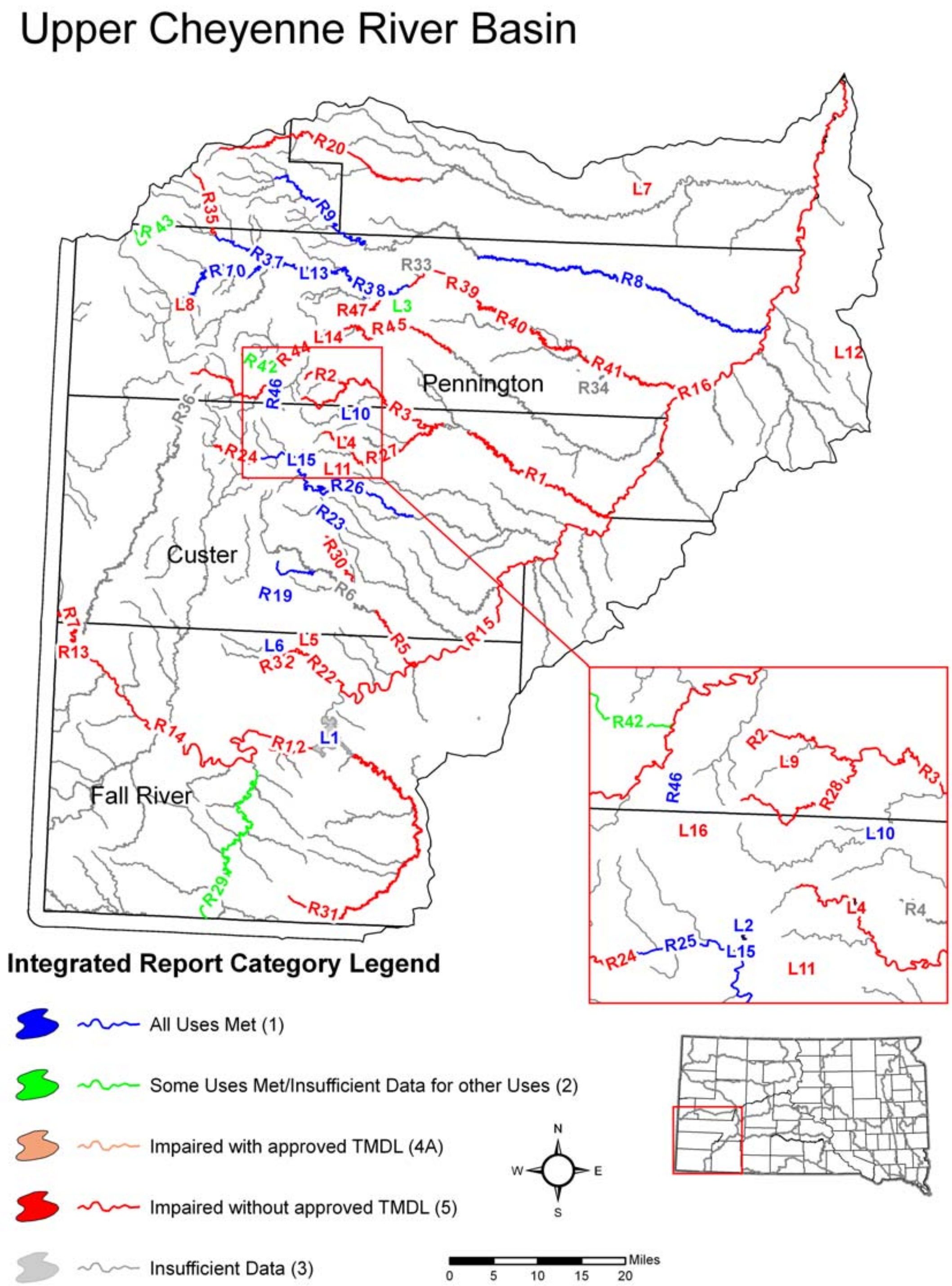

Figure 12: Upper Cheyenne River Basin

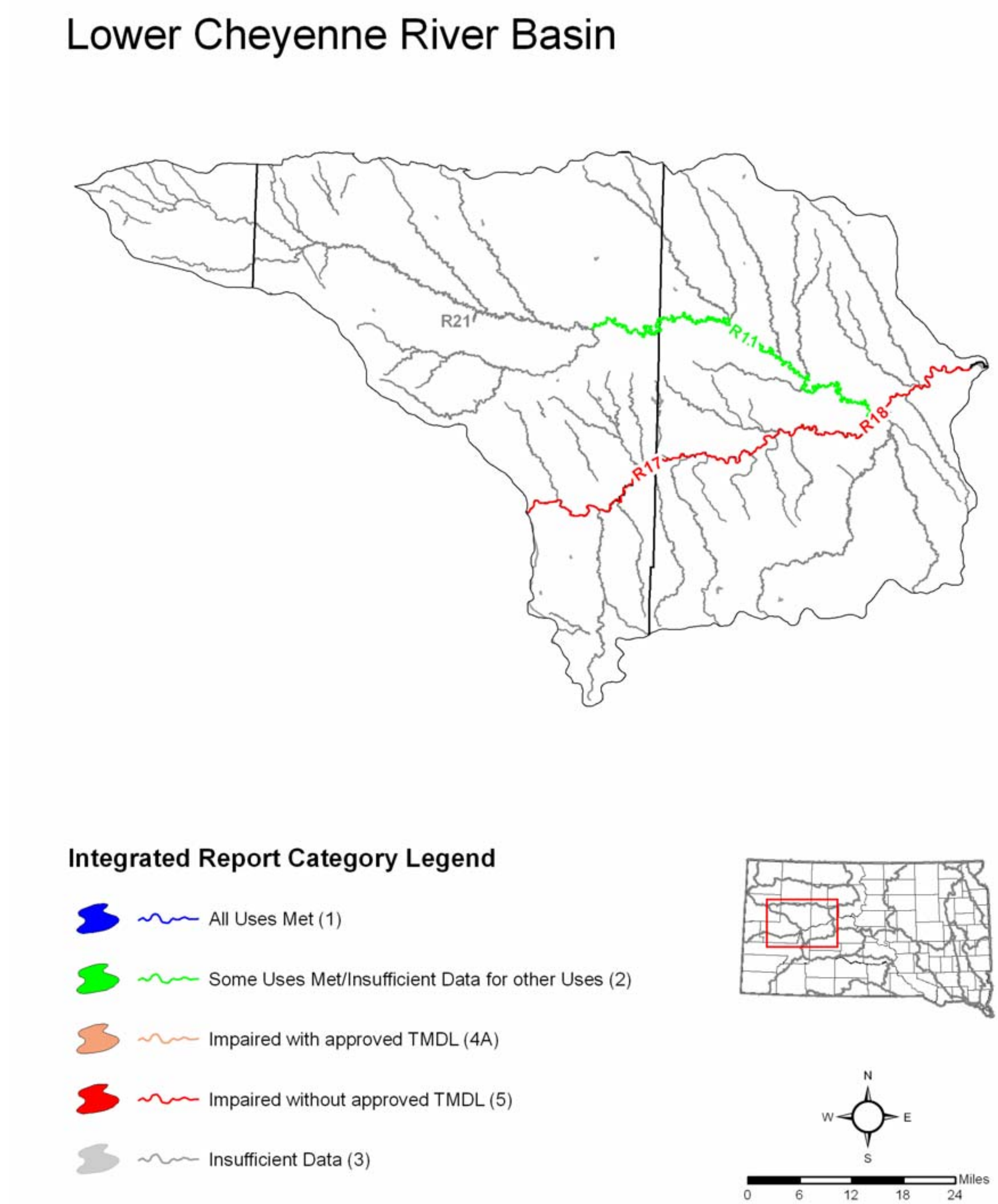

Figure 13: Lower Cheyenne River Basin

Grand River Basin (Figure 14, Table 24)

The Grand River basin covers 4,596 square miles in northwest South Dakota and southwest North Dakota. This is a sparsely populated region with a population density of approximately one person per square mile. The major income is derived from agriculture; however, this basin possesses energy resources in commercial quantities.

DENR has assessed four lakes and maintains nine water quality monitoring sites within the Grand River basin.

The USGS data are limited in the Grand River basin; however, USGS data were used for segments of the Grand River, South Fork Grand River, and North Fork Grand River.

DENR has established additional monitoring sites in the Grand River basin due to historic uranium mining. Three new sites and two existing sites are now monitored for uranium and other associated parameters within the Grand River basin. For this reporting cycle, there are insufficient data to determine support on newly established monitoring sites. Support determinations have been made on previous existing sites based on conventional parameters, but there are insufficient data to report on uranium and other associated parameters. However, there are no surface water quality exceedances for uranium or other parameters associated with uranium mining.

High specific conductance, pH, and TSS concentrations along with high sodium adsorption ratios (SAR) are typical of the entire basin. The North Fork watershed drains the southern periphery of the North Dakota badlands which may be a major source of high levels of specific conductance and SAR. The South Fork drainage contains erosive soils, which contribute sediment and suspended solids that often produce high TSS, pH, and SAR levels in the South Fork. These largely natural sources are aggravated by agricultural and grazing practices.

Shadehill Reservoir and the Grand River are considered impaired for irrigation use due to natural limitations imposed by local soil-water incompatibility. High sodium concentration, combined with the clay characteristics of most soils in this region, significantly reduce the acreages suitable for continuous irrigation. This condition is measured by the sodium adsorption ratio (SAR). A SAR value of 10 or greater indicates that a build up of sodium will break down soil structure and cause serious problems for plant growth.

There are no on-going assessment or implementation projects occurring within the basin at this time. DENR has referred TMDL development for waterbodies under tribal jurisdiction in the Grand River basin to EPA.

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

Table 24: Grand River Basin Information

WATERBODY Lakes/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Flat Creek Dam SD-GR-L-FLAT_CREEK_01	Perkins County	L1	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1	NO
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	FULL				
Lake Gardner SD-GR-L-GARDNER_01	Harding County	L2	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			2	NO
				Immersion Recreation	NA				
				Limited Contact Recreation	NA				
				Warmwater Permanent Fish Life	FULL				
Lake Isabel SD-GR-L-ISABEL_01	Dewey County	L3	DENR	Domestic Water Supply	FULL			5	YES-1
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Immersion Recreation	NON	Chlorophyll-*a*	Unknown		
				Limited Contact Recreation	NON	Chlorophyll-*a*	Unknown		
				Warmwater Permanent Fish Life	NON	Mercury in fish tissue			
						Chlorophyll-*a*	Unknown		
Pudwell Dam SD-GR-L-PUDWELL_01	Corson County	L4	DENR	Fish/Wildlife Prop, Rec, Stock	NON	Mercury in fish tissue		5	YES-1
				Immersion Recreation	NA				
				Limited Contact Recreation	NA				
				Warmwater Permanent Fish Life	NA				
Shadehill Reservoir SD-GR-L-SHADEHILL_01	Perkins County	L5	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-2
				Immersion Recreation	FULL				
				Irrigation Waters	NON	Salinity	Natural Sources		
				Limited Contact Recreation	FULL				
				Warmwater Permanent Fish Life	FULL				
WATERBODY Streams/AUID	**LOCATION**	**MAP ID**	**BASIS**	**USE**	**SUPPORT**	**CAUSE**	**SOURCE**	**EPA Category**	**ON 303(d) & Priority**
Bull Creek SD-GR-R-BULL_01	SF Grand River to S15, T21N, R5E	R1	DENR	Fish/Wildlife Prop, Rec, Stock	INS			3	NO
				Irrigation Waters	INS				
				Limited Contact Recreation	INS				
				Warmwater Marginal Fish Life	INS				
Crooked Creek SD-GR-R-CROOKED_01	ND border to S34, T23N, R5E	R2	DENR	Fish/Wildlife Prop, Rec, Stock	INS			3	NO
				Irrigation Waters	INS				
				Limited Contact Recreation	INS				
				Warmwater Marginal Fish Life	INS				
Grand River SD-GR-R-GRAND_01	Shadehill Reservoir to Corson County line	R3	DENR	Coldwater Marginal Fish Life	NON	Temperature		5	YES-2
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Irrigation Waters	FULL-TH	Salinity	Natural Sources		
				Limited Contact Recreation	FULL				

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Streams/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Grand River	Corson County line to Bullhead	R4	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-2
SD-GR-R-GRAND_02				Irrigation Waters	FULL-TH	Salinity	Natural Sources		
				Limited Contact Recreation	FULL				
				Warmwater Permanent Fish Life	NON	Total Suspended Solids			
Grand River	Bullhead to mouth	R5	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-2
SD-GR-R-GRAND_03			USGS	Irrigation Waters	NON	Salinity			
				Limited Contact Recreation	NON	Escherichia coli			
						Fecal Coliform	Livestock (Grazing or Feeding Operations)		
				Warmwater Permanent Fish Life	NON	Total Suspended Solids	Natural Sources Grazing in Riparian or Shoreline Zones		
Grand River, North Fork	North Dakota border to Shadehill Reservoir	R6	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-2
SD-GR-R-GRAND_N_FORK_01			USGS	Irrigation Waters	NON	Salinity			
						Specific Conductance	Natural Sources		
				Limited Contact Recreation	FULL				
				Warmwater Marginal Fish Life	FULL				
Grand River, South Fork	Jerry Creek to Skull Creek	R7	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-2
SD-GR-R-GRAND_S_FORK_01				Irrigation Waters	FULL-TH	Salinity			
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	NON	Total Suspended Solids	Natural Sources Grazing in Riparian or Shoreline Zones Crop Production (Crop Land or Dry Land)		
Grand River, South Fork	Skull Creek to Shadehill Reservoir	R8	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-2
SD-GR-R-GRAND_S_FORK_02			USGS	Irrigation Waters	FULL-TH	Salinity			
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	NON	Total Suspended Solids	Natural Sources Grazing in Riparian or Shoreline Zones Crop Production (Crop Land or Dry Land)		

Grand River Basin

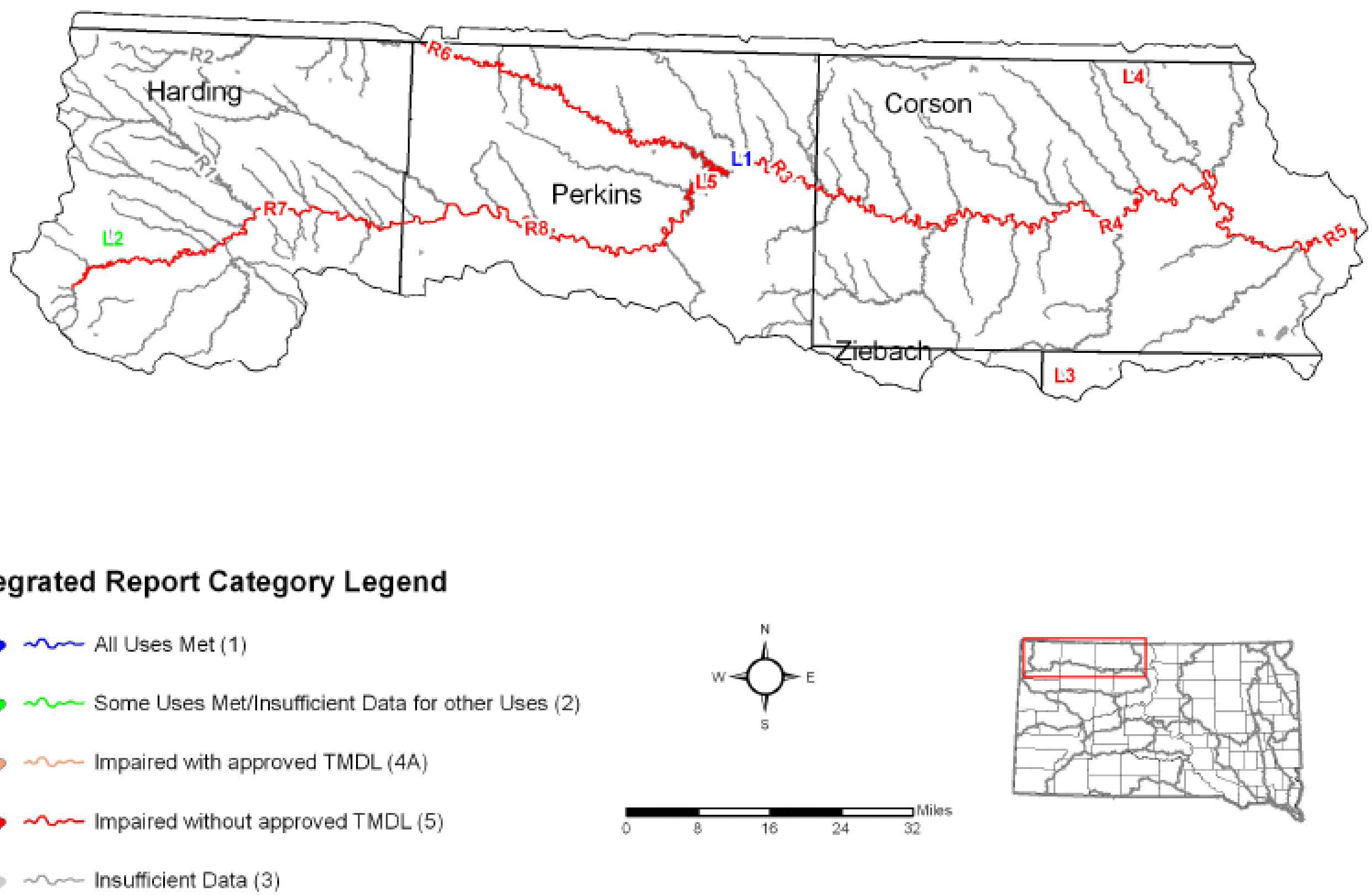

Figure 14: Grand River Basin

James River Basin (Figures 15 and 16, Table 25)

The James River drainage is the second largest river basin in the state. It drains approximately 14,729 square miles stretching from the northern to the southern state borders. It is located in east-central South Dakota. Agriculture and related businesses are the predominant sources of income.

DENR has assessed 33 lakes and maintains 21 water quality monitoring sites within the James basin. Eleven monitoring sites are located on the James River. The other sites are located on various other streams in the basin. In addition, available data from DENR watershed assessment projects were also used to determine waterbody support. All DENR data, including WQM, assessment projects, implementation projects, special assessments, and other DENR funded projects, are all labeled as DENR as the basis in the basin tables.

The USGS has several water quality monitoring sites on the James River and other streams in the James River basin including: Elm River, Firesteel Creek, Moccasin Creek, Turtle Creek, Wolf Creek, Foot Creek, Rock Creek, and several unnamed tributaries in the basin. However, the data are very limited, and for most sites the only parameters that were measured were specific conductance and water temperature. The city of Huron also supplied water quality data for the James River and Stony Run Creek.

Dissolved oxygen (DO), high pH, TSS, and bacteria were the main impairments observed within the James River basin during this reporting cycle. Past reporting cycles have also identified these causes of impairment within the James River basin. Substantial organic loading from nonpoint sources throughout the watershed occurs during run-off events. Decay of this organic matter is attributed to low dissolved oxygen, especially during low or base flow conditions. Agricultural activities such as livestock operations, grazing in riparian zones, lack of riparian vegetation, and row crop production heavily contribute to the amount of suspended sediments and bacteria in the James River basin.

Moccasin Creek (from Section 24, Township 123 North, Range 64 West) has been listed in previous reporting cycles as not supporting for fecal coliform and dissolved oxygen. This segment was classified in the Integrated Report and ADB in error as a (6) Warmwater marginal fish life propagation waters, and (8) Limited contact recreation waters. In the 2010 cycle, the accurate beneficial use designations and associated water quality criteria were assigned. As a result, this reach of Moccasin Creek is fully supporting its designated beneficial uses.

Moccasin Creek (from the James River to Section 24, Township 123 North, Range 64 West) is listed as impaired for ammonia, pH, and DO. The city of Aberdeen was issued a compliance schedule in order to meet ammonia discharge limits due to a change in the designated beneficial use of Moccasin Creek. The city of Aberdeen met their compliance schedule ahead of time on July 1, 2007. Since then, there have been no ammonia violations on Moccasin Creek.

Lakes in the basin are highly eutrophic because of nutrient enrichment and siltation. Agricultural activities such as livestock operations and row crops are considered primary pollution sources.

The Upper James River assessment project is currently in progress. On-going implementation projects include the Lower James basin, Brown County (watersheds of Richmond Lake, Elm Lake-Elm River, Moccasin Creek, Willow Reservoir, and Maple River) Lake Mitchell, and Firesteel Creek.

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

Table 25: James River Basin Information

WATERBODY Lakes/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Amsden Dam	Day County	L1	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1	NO
SD-JA-L-AMSDEN_01				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Permanent Fish Life	FULL				
Beaver Lake	Yankton County	L2	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1	NO
SD-JA-L-BEAVER_01				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Marginal Fish Life	FULL				
Bierman Dam	Spink County	L3	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-2
SD-JA-L-BIERMAN_01				Immersion Recreation	NON	Chlorophyll-*a*	Unknown		
				Limited Contact Recreation	NON	Chlorophyll-*a*	Unknown		
				Warmwater Permanent Fish Life	NON	Chlorophyll-*a*	Unknown		
Bullhead Lake	Marshall County (formerly SD-BS-L-BULLHEAD_02)	L4	DENR	Fish/Wildlife Prop, Rec, Stock	NA			3	NO
				Immersion Recreation	NA				
				Limited Contact Recreation	NA				
SD-JA-L-BULLHEAD_02				Warmwater Semipermanent Fish Life	NA				
Lake Byron	Beadle County	L5	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5*	YES-2
SD-JA-L-BYRON_01				Immersion Recreation	NA				
				Irrigation Waters	FULL				
				Limited Contact Recreation	NA				
				Warmwater Semipermanent Fish Life	NON	pH (high)			
Lake Carthage	Miner County	L6	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-2
SD-JA-L-CARTHAGE_01				Immersion Recreation	NON	Chlorophyll-*a*	Unknown		
				Limited Contact Recreation	NON	Chlorophyll-*a*	Unknown		
				Warmwater Permanent Fish Life	NON	Chlorophyll-*a*	Unknown		
Cattail Lake	Marshall County (formerly SD-BS-L-CATTAIL_01)	L7	DENR	Fish/Wildlife Prop, Rec, Stock	INS			3	NO
				Immersion Recreation	NA				
SD-JA-L-CATTAIL_01				Limited Contact Recreation	NA				
				Warmwater Marginal Fish Life	INS				
Lake Cavour	Beadle County	L8	DENR	Fish/Wildlife Prop, Rec, Stock	INS			3	NO
SD-JA-L-CAVOUR_01				Immersion Recreation	NA				
				Limited Contact Recreation	NA				
				Warmwater Marginal Fish Life	INS				

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Lakes/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Clear Lake SD-JA-L-CLEAR_M_01	Marshall County (formerly SD-BS-L-CLEAR_M_01)	L9	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1	NO
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Permanent Fish Life	FULL				
Cottonwood Lake SD-JA-L-COTTONWOOD_01	Spink County	L10	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1*	NO
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Marginal Fish Life	FULL				
Cottonwood Lake SD-JA-L-COTTONWOOD_M_01	Marshall County (formerly SD-BS-L-COTTONWOOD_01)	L11	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1	NO
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	FULL				
Cresbard Lake SD-JA-L-CRESBARD_01	Faulk County	L12	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5*	YES-2
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	NON	pH (high)			
Elm Lake SD-JA-L-ELM_01	Brown County	L13	DENR	Domestic Water Supply	FULL			1*	NO
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	FULL				
Lake Faulkton SD-JA-L-FAULKTON_01	Faulk County	L14	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5*	YES-2
				Immersion Recreation	NA				
				Limited Contact Recreation	NA				
				Warmwater Semipermanent Fish Life	NON	pH (high)			
Four Mile Lake SD-JA-L-FOUR_MILE_01	Marshall County (formerly SD-BS-L-FOUR_MILE_01)	L15	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1	NO
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Marginal Fish Life	FULL				
Lake Hanson SD-JA-L-HANSON_01	Hanson County	L16	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1*	NO
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	FULL				

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Lakes/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Jones Lake SD-JA-L-JONES_01	Hand County	L17	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5*	YES-2
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	NON	pH (high)			
Lake Louise SD-JA-L-LOUISE_01	Hand County	L18	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5*	YES-2
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	NON	pH (high)			
Loyalton Dam SD-JA-L-LOYALTON_01	Edmunds County	L19	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1*	NO
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	FULL				
Menno, Lake SD-JA-L-MENNO_01	Hutchinson County	L20	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			2	NO
				Immersion Recreation	NA				
				Limited Contact Recreation	NA				
				Warmwater Semipermanent Fish Life	FULL				
Mina Lake SD-JA-L-MINA_01	Edmunds County	L21	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1*	NO
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Permanent Fish Life	FULL				
Lake Mitchell SD-JA-L-MITCHELL_01	Davison County	L22	DENR	Domestic Water Supply	FULL			1*	NO
				Immersion Recreation	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Permanent Fish Life	FULL				
North Buffalo Lake SD-JA-L-N_BUFFALO_01	Marshall County (formerly SD-BS-L-N_BUFFALO_01)	L23	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1	NO
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	FULL				
Nine Mile Lake SD-JA-L-NINE_MILE_01	Marshall County (formerly SD-BS-L-NINE_MILE_01)	L24	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-2
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	NON	pH (high)			

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Lakes/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
North Scatterwood Lake SD-JA-L-NORTH_SCATTERWOOD_01	Edmunds County	L25	DENR	Fish/Wildlife Prop, Rec, Stock	INS			3	NO
				Immersion Recreation	NA				
				Limited Contact Recreation	NA				
				Warmwater Marginal Fish Life	INS				
Pierpont Lake SD-JA-L-PIERPONT_01	Day County	L26	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			2	NO
				Immersion Recreation	NA				
				Limited Contact Recreation	NA				
				Warmwater Permanent Fish Life	FULL				
Ravine Lake SD-JA-L-RAVINE_01	Beadle County	L27	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			2*	NO
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	INS				
Lake Redfield SD-JA-L-REDFIELD_01	Spink County	L28	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5*	YES-2
				Immersion Recreation	NA				
				Limited Contact Recreation	NA				
				Warmwater Marginal Fish Life	NON	Oxygen, Dissolved			
Richmond Lake SD-JA-L-RICHMOND_01	Brown County	L29	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1*	NO
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Permanent Fish Life	FULL				
Rosehill Lake SD-JA-L-ROSEHILL_01	Hand County	L30	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5*	YES-2
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Permanent Fish Life	NON	Oxygen, Dissolved			
Rosette Lake SD-JA-L-ROSETTE_01	Edmunds County	L31	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1	NO
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Marginal Fish Life	FULL				
Roy Lake SD-JA-L-ROY_01	Marshall County (formerly SD-BS-L-ROY_01)	L32	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1	NO
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Permanent Fish Life	FULL				

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Lakes/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
South Red Iron Lake	Marshall County (formerly SD-BS-L-S_RED_IRON_01)	L33	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1	NO
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
SD-JA-L-S_RED_IRON_01				Warmwater Permanent Fish Life	FULL				
South Buffalo Lake	Marshall County (formerly SD-BS-L-SOUTH_BUFFALO_01	L34	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-2
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
SD-JA-L-SOUTH_BUFFALO_01				Warmwater Semipermanent Fish Life	NON	Oxygen, Dissolved			
Twin Lakes SD-JA-L-TWIN_01	Sanborn County	L35	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-2
				Immersion Recreation	NON	Chlorophyll-*a*	Unknown		
				Limited Contact Recreation	NON	Chlorophyll-*a*	Unknown		
				Warmwater Semipermanent Fish Life	NON	Chlorophyll-*a*	Unknown		
Twin Lakes SD-JA-L-TWIN_02	Spink County	L36	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1	NO
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	FULL				
Wilmarth Lake SD-JA-L-WILMARTH_01	Aurora County	L37	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-2
				Immersion Recreation	NON	Chlorophyll-*a*	Unknown		
				Limited Contact Recreation	NON	Chlorophyll-*a*	Unknown		
				Warmwater Permanent Fish Life	NON	Chlorophyll-*a*	Unknown		
Wylie Lake SD-JA-L-WYLIE_01	Brown County	L38	DENR	Fish/Wildlife Prop, Rec, Stock	NA			3	NO
				Immersion Recreation	NA				
				Limited Contact Recreation	NA				
				Warmwater Marginal Fish Life	NA				

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Streams/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Dawson Creek SD-JA-R-DAWSON_01	James River to Lake Henry	R1	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-1
				Irrigation Waters	FULL				
				Limited Contact Recreation	NON	Escherichia coli			
						Fecal Coliform	Livestock (Grazing or Feeding Operations)		
							Animal Feeding Operations (NPS)		
				Warmwater Marginal Fish Life	FULL				
Elm River SD-JA-R-ELM_01	Elm Lake to mouth	R2	DENR	Domestic Water Supply	FULL			1	NO
			USGS	Fish/Wildlife Prop, Rec, Stock	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	FULL				
Firesteel Creek SD-JA-R-FIRESTEEL_01	West Fork Firesteel Creek to mouth	R3	DENR	Domestic Water Supply	NON	Total Dissolved Solids		5*	YES-2
			USGS	Fish/Wildlife Prop, Rec, Stock	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	NON	Escherichia coli			
				Warmwater Permanent Fish Life	FULL				
Foot Creek SD-JA-R-FOOT_01_USGS	Near Aberdeen, SD	R4	DENR	Fish/Wildlife Prop, Rec, Stock	INS			3	NO
			USGS	Irrigation Waters	INS				
				Limited Contact Recreation	INS				
				Warmwater Marginal Fish Life	INS				
Foster Creek Tributary SD-JA-R-FOSTER_TRIB_01_USGS	Near Carpenter, SD	R5	USGS	Fish/Wildlife Prop, Rec, Stock	INS			3	NO
				Irrigation Waters	INS				
Tributary of Howard Creek SD-JA-R-HOWARD_TRIB_01_USGS	Near Leola, SD	R24	USGS	Fish/Wildlife Prop, Rec, Stock	NA			3	NO
				Irrigation Waters	NA				
James River SD-JA-R-JAMES_01	North Dakota border to Mud Lake Reservoir	R6	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-1
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	NON	pH (high)			
James River SD-JA-R-JAMES_02	Mud Lake Reservoir	R9	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-1
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	NON	pH (high)			

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Streams/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
James River SD-JA-R-JAMES_03	Columbia Road Reservoir	R10	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-1
				Irrigation Waters	FULL				
				Limited Contact Recreation	NON	Oxygen, Dissolved			
				Warmwater Semipermanent Fish Life	NON	Oxygen, Dissolved			
James River SD-JA-R-JAMES_04	Columbia Road Reservoir to near US HWY 12	R11	DENR USGS	Fish/Wildlife Prop, Rec, Stock	FULL			1	NO
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	FULL				
James River SD-JA-R-JAMES_05	US HWY 12 to Mud Creek	R12	DENR USGS	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-1
				Irrigation Waters	FULL				
				Limited Contact Recreation	NON	Oxygen, Dissolved			
				Warmwater Semipermanent Fish Life	NON	Oxygen, Dissolved			
James River SD-JA-R-JAMES_06	Mud Creek to James River Diversion Dam	R13	DENR USGS	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-1
				Irrigation Waters	FULL				
				Limited Contact Recreation	NON	Oxygen, Dissolved			
James River SD-JA-R-JAMES_07	James River Diversion Dam to Huron 3rd Street Dam	R14	DENR City of Huron	Domestic Water Supply	FULL			1	NO
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	FULL				
James River SD-JA-R-JAMES_08	Huron 3rd Street Dam to Sand Creek	R15	DENR USGS	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-1
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	NON	Total Suspended Solids			
James River SD-JA-R-JAMES_09	Sand Creek to I-90	R16	DENR USGS	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-1
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	NON	Total Suspended Solids	Livestock (Grazing or Feeding Operations) Crop Production (Crop Land or Dry Land)		

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Streams/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
James River SD-JA-R-JAMES_10	I-90 to Yankton County Line	R7	DENR USGS	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-1
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	NON	Total Suspended Solids			
James River SD-JA-R-JAMES_11	Yankton County line to mouth	R8	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-1
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL-TH	Fecal Coliform			
				Warmwater Semipermanent Fish Life	NON	Total Suspended Solids	Grazing in Riparian or Shoreline Zones; Crop Production (Crop Land or Dry Land)		
Moccasin Creek SD-JA-R-MOCCASIN_01	S24, T123N, R64W to Headwaters	R17	DENR USGS	Fish/Wildlife Prop, Rec, Stock	FULL			1	NO
				Irrigation Waters	FULL				
Moccasin Creek SD-JA-R-MOCCASIN_02	James River to S24, T123N, R64W	R18	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5*	YES-1
				Irrigation Waters	FULL				
				Limited Contact Recreation	NON	Oxygen, Dissolved			
				Warmwater Marginal Fish Life	NON	Ammonia (Total)	Municipal Point Source Discharges		
						Oxygen, Dissolved			
						pH (high)			
Mud Creek SD-JA-R-MUD_01	James River to Hwy 37	R19	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-2
				Irrigation Waters	FULL				
				Limited Contact Recreation	NON	Oxygen, Dissolved			
				Warmwater Marginal Fish Life	NON	Oxygen, Dissolved			
Pierre Creek SD-JA-R-PIERRE_01	James River to S11, T102N, R58W	R20	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5*	YES-1
				Irrigation Waters	FULL				
				Limited Contact Recreation	NON	Escherichia coli			
						Fecal Coliform	Livestock (Grazing or Feeding Operations); Animal Feeding Operations (NPS)		
				Warmwater Semipermanent Fish Life	FULL				

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Streams/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Tributary of Preacher's Run Creek SD-JA-R-PREACHERS_RUN_TRIB_01_USGS	At Ipswich, SD	R25	USGS	Fish/Wildlife Prop, Rec, Stock Irrigation Waters	INS INS			3	NO
Rock Creek SD-JA-R-ROCK_01_USGS	S9, T103N, R59W to headwaters	R21	USGS	Fish/Wildlife Prop, Rec, Stock Irrigation Waters	INS INS			3	NO
Snake Creek SD-JA-R-SNAKE_01	James River to confluence with SF Snake Creek	R22	DENR	Fish/Wildlife Prop, Rec, Stock Irrigation Waters	FULL FULL			5	YES-1
				Limited Contact Recreation	NON	Oxygen, Dissolved			
				Warmwater Semipermanent Fish Life	NON	Oxygen, Dissolved			
Stony Run Creek SD-JA-R-STONYRUN_01_H	headwaters to Stony Run Lake	R23	City of Huron	Fish/Wildlife Prop, Rec, Stock Irrigation Waters	INS NA			3	NO
Turtle Creek SD-JA-R-TURTLE_01	James River to S17, T113N, R65W	R26	DENR USGS	Fish/Wildlife Prop, Rec, Stock Irrigation Waters	FULL FULL			5	YES-1
				Limited Contact Recreation Warmwater Marginal Fish Life	FULL NON	pH (high)			
Wolf Creek SD-JA-R-WOLF_01	Wolf Creek Colony to S5, T103N, R56W	R27	DENR USGS	Fish/Wildlife Prop, Rec, Stock Irrigation Waters	FULL FULL			1	NO
				Limited Contact Recreation Warmwater Marginal Fish Life	FULL FULL				
Wolf Creek SD-JA-R-WOLF_02	Just above Wolf Creek Colony to the mouth.	R29	DENR	Fish/Wildlife Prop, Rec, Stock Irrigation Waters	FULL FULL			5	YES-1
				Limited Contact Recreation Warmwater Marginal Fish Life	FULL NON	Total Suspended Solids	Non-Point Source		
Wolf Creek SD-JA-R-WOLF_SP_01	Turtle Creek to S10, T114N, R66W	R28	DENR	Fish/Wildlife Prop, Rec, Stock Irrigation Waters	INS INS			3	NO
				Limited Contact Recreation Warmwater Marginal Fish Life	INS INS				

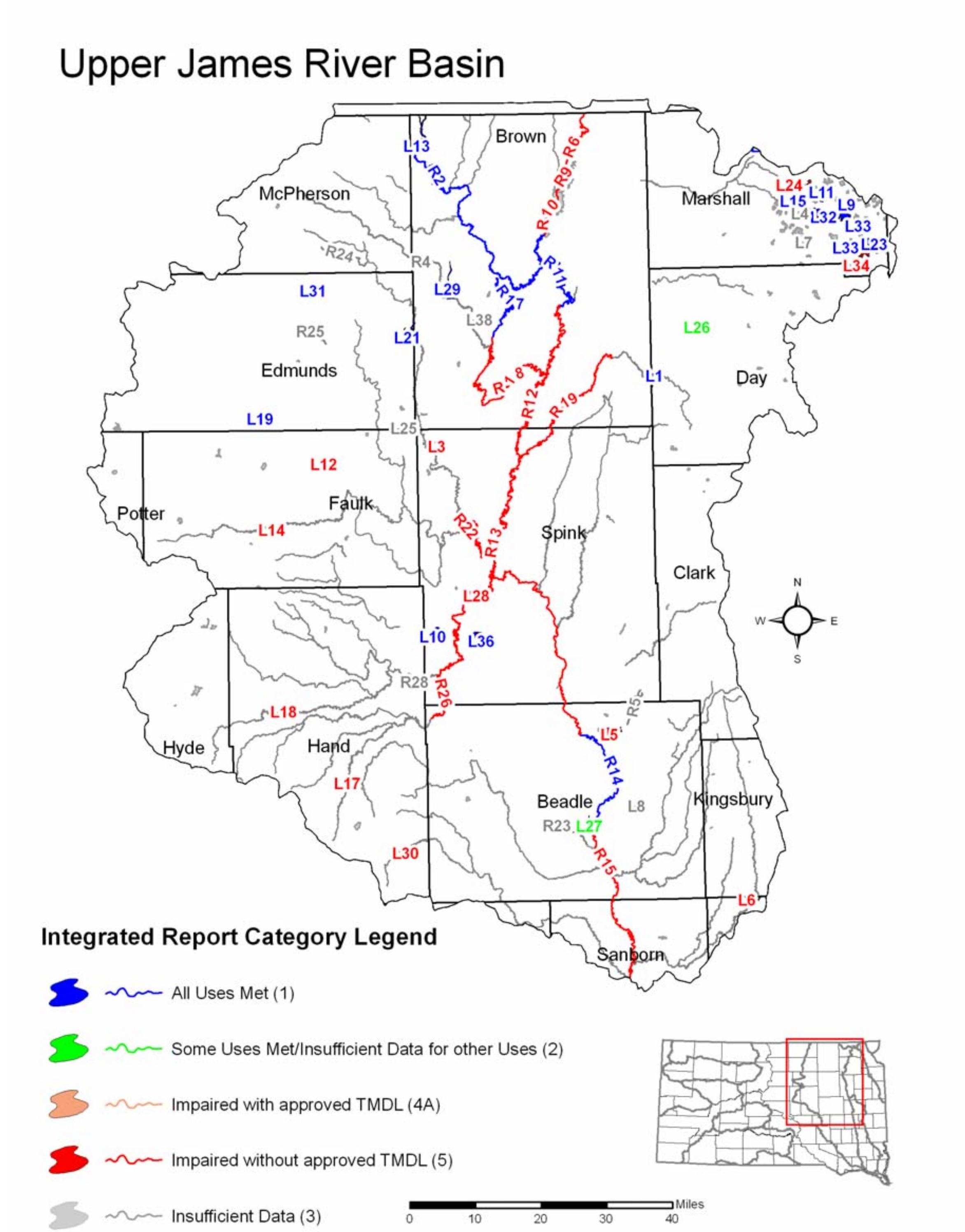

Figure 15: Upper James River Basin

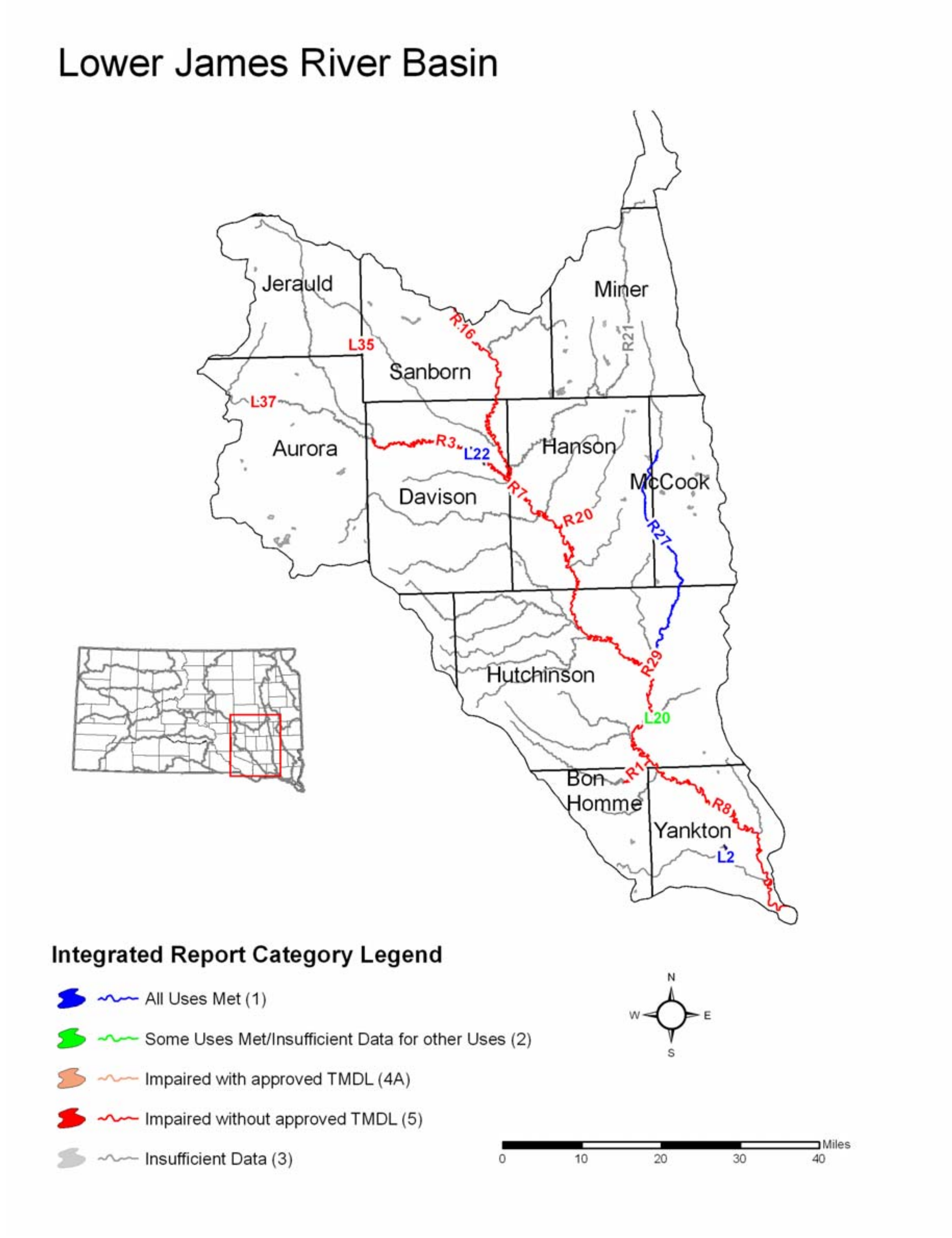

Figure 16: Lower James River Basin

Little Missouri River Basin (Figure 17, Table 26)

The Little Missouri River basin is a small basin located in the northwestern corner of the state. The river enters the state from southeastern Montana and drains 583 square miles before exiting into North Dakota. The basin's economy is dominated by agriculture with approximately 90% of the land being used for agricultural production. The majority of this land is rangeland due to limited rainfall.

There are no monitored lakes within this basin and DENR has one water quality monitoring station located on the Little Missouri River.

The USGS provided water quality data from a station on the Little Missouri River at Camp Crook.

The Little Missouri River is listed as impaired for TSS. There are currently no watershed assessment or implementation projects in the basin.

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

Table 26: Little Missouri River Basin Information

WATERBODY Streams/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Little Missouri River SD-LM-R-LITTLE_MISSOURI_01	Montana border to North Dakota border	R1	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-2
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	NON	Total Suspended Solids			

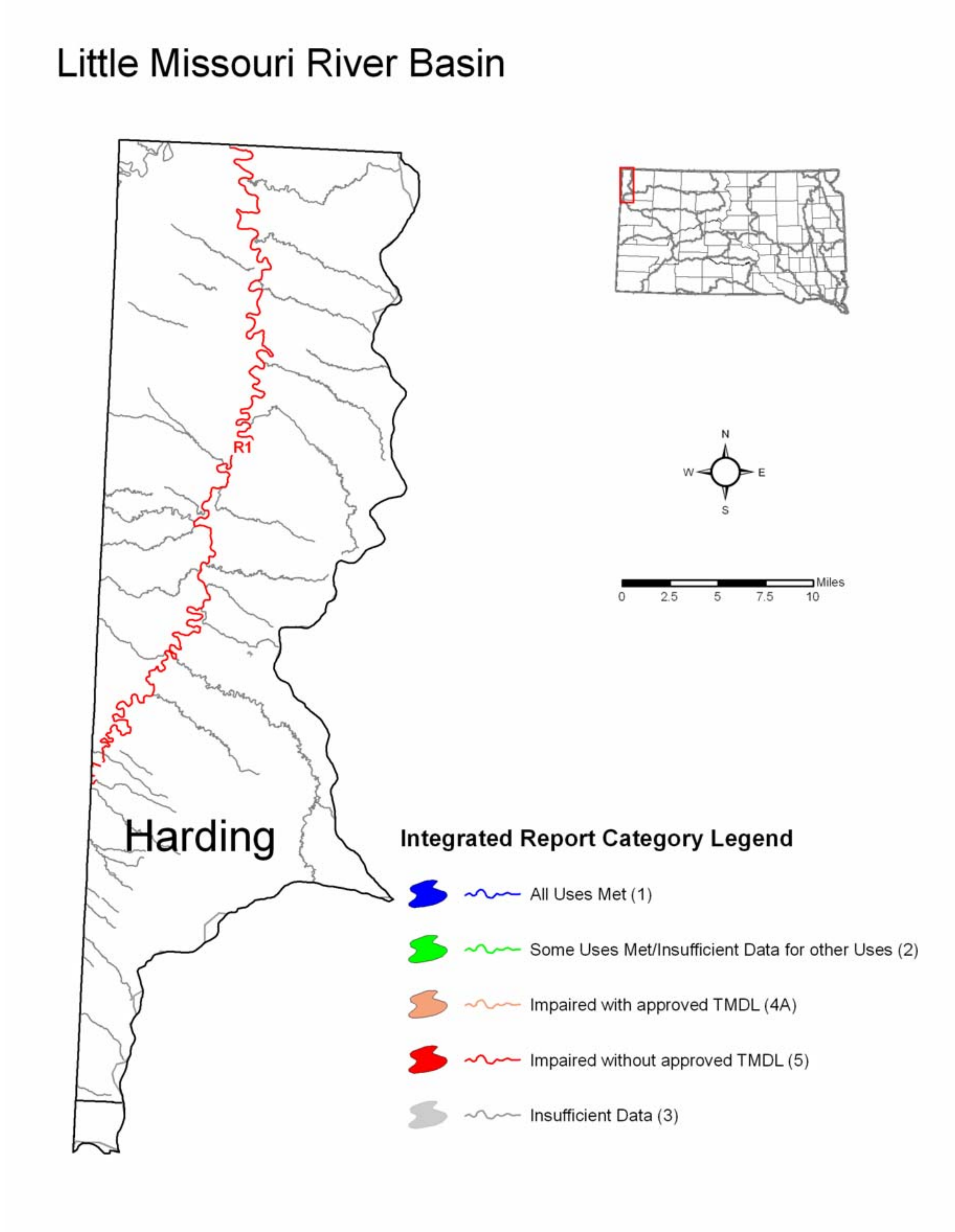

Figure 17: Little Missouri River Basin

Minnesota River Basin (Figure 18, Table 27)

The Minnesota River basin is found in the northeastern corner of the state. The basin is bordered on the north by the Red River tributaries, on the west by the Prairie Coteau Pothole region, on the south by the Big Sioux River, and on the east by the South Dakota/Minnesota border. The basin drains an area of 1,637 square miles within South Dakota.

DENR has assessed eight lakes and maintains seven water quality monitoring sites within the Minnesota basin. In addition, data from two of DENR's candidate reference sites were used.

The USGS has water quality monitoring sites on Cobb Creek and Big Coulee Creek in the basin. The data are very limited, and the only parameters measured were specific conductance and water temperature.

The upper half of the South Fork Whetstone River fully supports its designated beneficial use. In the downstream half, the river has experienced periodic low dissolved oxygen and occasional fish kills. East Dakota Water Development District has been awarded grant money to conduct watershed assessment activities and identify sources of impairment in the Whetstone River basin, including South Fork Whetstone River.

There is a planned assessment project for the Whetstone and Yellowbank River watersheds. Current implementation projects include Fish Lake and Lake Alice in Deuel County. The Lake Cochrane Improvement Association, with cooperation from DENR, is in the final stages of assessing the water quality of Lake Cochrane.

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

Table 27: Minnesota River Basin Information

WATERBODY Lakes/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Lake Alice	Deuel County	L1	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1*	NO
SD-MN-L-ALICE_01				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	FULL				
Big Stone Lake	Roberts County	L2	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1*	NO
SD-MN-L-BIG_STONE_01				Immersion Recreation	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Permanent Fish Life	FULL				
Lake Cochrane	Deuel County	L3	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1	NO
SD-MN-L-COCHRANE_01				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Permanent Fish Life	FULL				
Lake Drywood North	Roberts County	L8	DENR	Fish/Wildlife Prop, Rec, Stock	INS			3	NO
SD-MN-L-DRYWOOD_NORTH_01	(formerly SD-BS-L-DRYWOOD_NORTH_01)			Immersion Recreation	NA				
				Limited Contact Recreation	NA				
				Warmwater Marginal Fish Life	INS				
Fish Lake	Deuel County	L4	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1*	NO
SD-MN-L-FISH_01				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Marginal Fish Life	FULL				
Lake Hendricks	Brookings County	L5	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5*	YES-2
SD-MN-L-HENDRICKS_01				Immersion Recreation	NA				
				Limited Contact Recreation	NA				
				Warmwater Semipermanent Fish Life	NON	pH (high)			
Oak Lake	Brookings County	L6	DENR	Fish/Wildlife Prop, Rec, Stock	INS			2	NO
SD-MN-L-OAK_01				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Marginal Fish Life	INS				
Lake Oliver	Deuel County	L7	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1*	NO
SD-MN-L-OLIVER_01				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Marginal Fish Life	FULL				
Punished Woman Lake	Codington County	L8	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			2*	NO
SD-MN-L-PUNISHED_WOMAN_01				Immersion Recreation	NA				
				Limited Contact Recreation	NA				
				Warmwater Semipermanent Fish Life	FULL				

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Streams/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Big Coulee Creek SD-MN-R-BIG_COULEE_01_USGS	Near Peever, SD	R1	USGS	Fish/Wildlife Prop, Rec, Stock Irrigation Waters	INS INS			3	NO
Cobb Creek SD-MN-R-COBB_01_USGS	SD/MN border to S19, T115N, R47W	R2	DENR	Fish/Wildlife Prop, Rec, Stock Irrigation Waters Limited Contact Recreation Warmwater Permanent Fish Life	INS INS INS FULL			2	NO
Lac Qui Parle River, West Branch SD-MN-R-LAC_QUI_PARLE_W_BR_01	SD/MN border to S8, T115N, R47W	R3	DENR	Coldwater Marginal Fish Life Fish/Wildlife Prop, Rec, Stock Irrigation Waters Limited Contact Recreation	FULL FULL FULL FULL			1	NO
Little Minnesota River SD-MN-R-LITTLE_MINNESOTA_01	Big Stone Lake to S15, T128N, R52W	R4	DENR	Fish/Wildlife Prop, Rec, Stock Irrigation Waters Limited Contact Recreation Warmwater Semipermanent Fish Life	FULL FULL FULL FULL			1	NO
Whetstone River SD-MN-R-WHETSTONE_01	SD/MN border to confluence with its north and south forks	R9	DENR	Fish/Wildlife Prop, Rec, Stock Irrigation Waters Limited Contact Recreation Warmwater Semipermanent Fish Life	FULL FULL FULL FULL			1	NO
South Fork Whetstone River SD-MN-R-WHETSTONE_S_FORK_01	Headwaters to Lake Farley	R6	DENR USGS	Fish/Wildlife Prop, Rec, Stock Irrigation Waters Limited Contact Recreation Warmwater Marginal Fish Life	FULL FULL FULL FULL			1	NO
South Fork Whetstone River SD-MN-R-WHETSTONE_S_FORK_02	Lake Farley to mouth	R7	DENR	Fish/Wildlife Prop, Rec, Stock Irrigation Waters Limited Contact Recreation Warmwater Marginal Fish Life	FULL FULL FULL-TH FULL-TH	 Oxygen, Dissolved Oxygen, Dissolved		5	YES-1
North Fork Yellow Bank River SD-MN-R-YELLOW_BANK_N_FORK_01	SD/MN border to S27, T120N, R48W	R5	DENR	Fish/Wildlife Prop, Rec, Stock Irrigation Waters Limited Contact Recreation Warmwater Permanent Fish Life	FULL FULL FULL FULL			1	NO

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Streams/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
South Fork Yellow Bank River SD-MN-R-YELLOW_BANK_S_FORK_01	SD/MN border to S33, T118N, R49W	R8	DENR USGS	Coldwater Marginal Fish Life	FULL			1	NO
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				

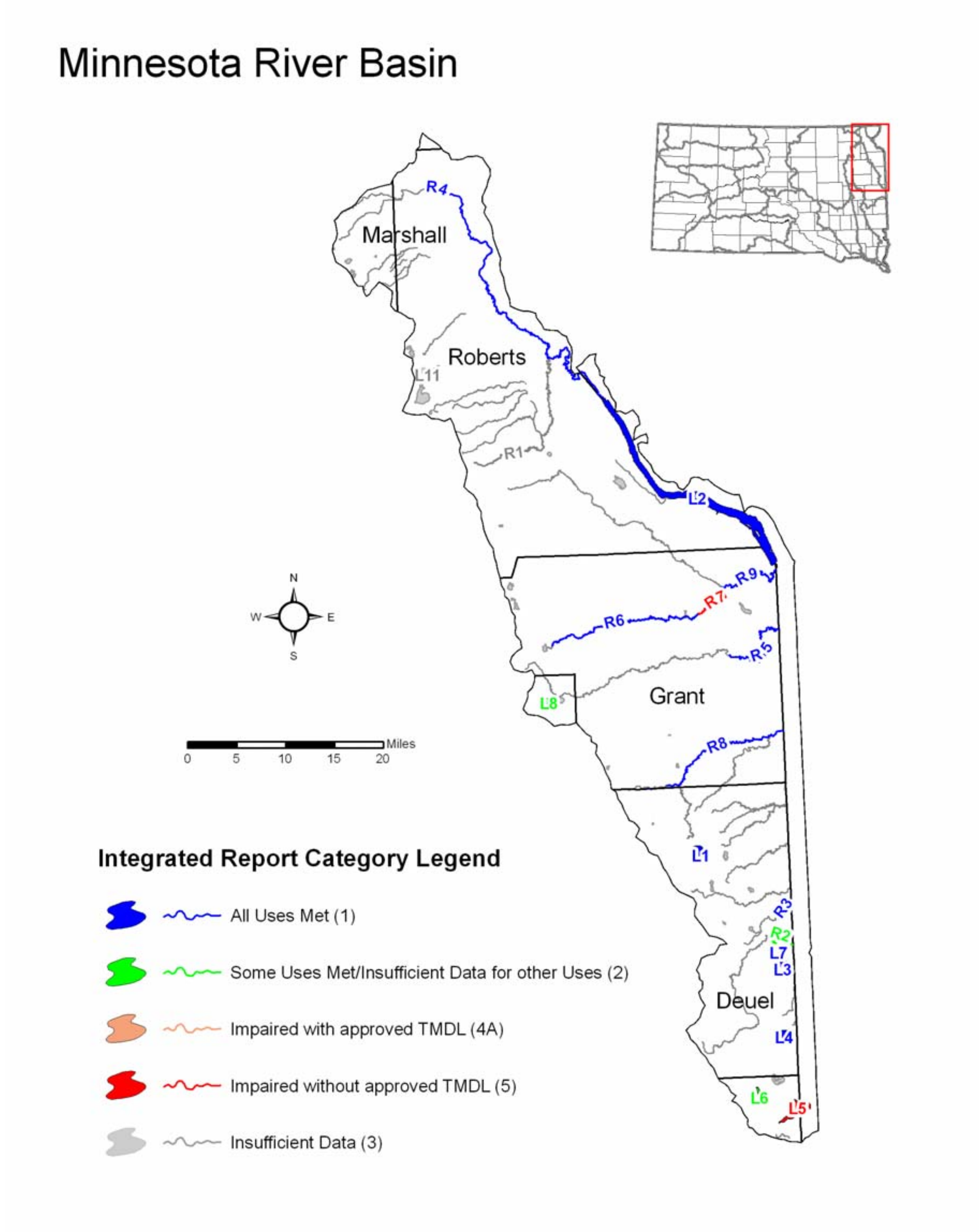

Figure 18: Minnesota River Basin

Missouri River Basin (Figures 19 and 20, Table 28)

The Missouri River is the largest body of water in South Dakota. It flows through the middle of the state to form what is commonly referred to as either “east” or “west” river. The river enters the state on the north from North Dakota and flows south until it reaches the vicinity of Pierre. Along this southern course it receives significant flows from the Grand, Moreau, and Cheyenne River basins. From Pierre, the river flows generally east-southeast until it exits the state on the southeast tip after receiving contributing flows from the Bad, White, James, Vermillion, Niobrara, and Big Sioux River basins. The Missouri River basin is the largest basin in South Dakota and drains approximately 15,865 square miles.

The dominant feature of the Missouri River in South Dakota is the presence of four impoundments: Lake Oahe at Pierre (Oahe Dam), Lake Sharpe at Fort Thompson (Big Bend Dam), Lake Francis Case at Pickstown (Ft. Randall Dam), and Lewis and Clark Lake at Yankton (Gavins Point Dam). The largest of these reservoirs is Lake Oahe with 22,240,000 acre-feet of storage capacity. The impoundments serve for flood control, hydroelectric generation, irrigation, municipal water use, water related recreation, and downstream navigation. The 70-mile reach from the Gavins Point Dam to Sioux City, Iowa is the last major free-flowing segment of the Missouri River in the state.

DENR has assessed 23 lakes and maintains ten water quality monitoring stations within the Missouri River basin. In addition, data from DENR’s 2005-2006 Missouri River Monitoring Project were used. USGS also has several water quality sites located on the mainstem of the Missouri River and several tributaries. USGS data on the Missouri River itself are fairly extensive and include data for dissolved oxygen, pH, water temperature, sodium adsorption ratio, alkalinity, sulfate, nitrates, total dissolved solids, ammonia, and chlorides. USACE summary data from the 2007 Report “Water Quality Conditions in the Missouri River Mainstem System” were also used in determining waterbody support on Lake Oahe and Lake Sharpe.

Lake Sharpe is listed in the Missouri River basin tables as nonsupporting for the (2) Coldwater permanent fish life propagation beneficial use for not meeting coldwater temperature criterion. Only 38% of Lake Sharpe met water temperature criterion during all sampling events. During the summer sampling seasons, there was no coldwater refuge and none of Lake Sharpe met coldwater water quality temperature criterion.

Slaughter Creek was listed as impaired in 2008 for specific conductance and total dissolved solids. In 2009, DENR implemented a change in water quality standards that provides a minimum water flow requirement for low quality fishery and irrigation waters. As a result, the exceedances that were observed in the 2008 cycle were not included in the 2010 data set. Qualifying data met water quality standards and Slaughter Creek was reported as fully supporting its designated beneficial uses.

Most lakes in the Missouri River basin are highly eutrophic because of nutrient enrichment and siltation. Agricultural activities are the primary sources of pollution.

There are currently no on-going assessment projects in the Missouri River basin. On-going implementation projects include the Spring Creek watershed (Lakes Campbell and Pocasse), Medicine Creek watershed, and the Lewis and Clark watershed.

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

Table 28: Missouri River Basin Information

WATERBODY Lakes/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Academy Lake	Charles Mix County	L1	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1	NO
SD-MI-L-ACADEMY_01				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Permanent Fish Life	FULL				
Lake Andes	Charles Mix County	L2	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-2
SD-MI-L-ANDES_01				Immersion Recreation	NON	Oxygen, Dissolved			
				Limited Contact Recreation	NON	Oxygen, Dissolved			
				Warmwater Marginal Fish Life	NON	Oxygen, Dissolved			
Brakke Dam	Lyman County	L3	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1*	NO
SD-MI-L-BRAKKE_01				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Permanent Fish Life	FULL				
Burke Lake	Gregory County	L4	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			4A*	NO
SD-MI-L-BURKE_01				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	NON	Oxygen, Dissolved			
						pH (high)			
Byre Lake	Lyman County	L5	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1*	NO
SD-MI-L-BYRE_01				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Permanent Fish Life	FULL				
Lake Campbell	Campbell County	L6	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-2
SD-MI-L-CAMPBELL_01				Immersion Recreation	NON	Chlorophyll-*a*	Unknown		
				Limited Contact Recreation	NON	Chlorophyll-*a*	Unknown		
				Warmwater Semipermanent Fish Life	NON	pH (high)			
						Chlorophyll-*a*	Unknown		
Corsica Lake	Douglas County	L7	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1*	NO
SD-MI-L-CORSICA_01				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	FULL				
Cottonwood Lake	Sully County	L8	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-2
SD-MI-L-COTTONWOOD_01				Immersion Recreation	NON	Chlorophyll-*a*	Unknown		
				Limited Contact Recreation	NON	Chlorophyll-*a*	Unknown		
				Warmwater Semipermanent Fish Life	NON	Chlorophyll-*a*	Unknown		
Dante Lake	Charles Mix County	L9	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5*	YES-2
SD-MI-L-DANTE_01				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Permanent Fish Life	NON	Oxygen, Dissolved			

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Lakes/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Eureka Lake SD-MI-L-EUREKA_01	McPherson County	L10	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			2	NO
				Immersion Recreation	NA				
				Limited Contact Recreation	NA				
				Warmwater Semipermanent Fish Life	FULL				
Fairfax Lake SD-MI-L-FAIRFAX_01	Gregory County	L11	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			2	NO
				Immersion Recreation	NA				
				Limited Contact Recreation	NA				
				Warmwater Semipermanent Fish Life	FULL				
Fate Dam SD-MI-L-FATE_01	Lyman County	L12	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1*	NO
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Permanent Fish Life	FULL				
Geddes Lake SD-MI-L-GEDDES_01	Charles Mix County	L13	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5*	YES-2
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	NON	Oxygen, Dissolved			
						pH (high)			
Lake Hiddenwood SD-MI-L-HIDDENWOOD_01	Walworth County	L14	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1*	NO
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	FULL				
Lake Hurley SD-MI-L-HURLEY_01	Potter County	L15	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-1
				Immersion Recreation	NA				
				Limited Contact Recreation	NA				
				Warmwater Permanent Fish Life	FULL-TH	Mercury in fish tissue			
McCook Lake SD-MI-L-MCCOOK_01	Union County	L16	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5*	YES-2
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	NON	Temperature			
Platte Lake SD-MI-L-PLATTE_01	Charles Mix County	L17	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1	NO
				Immersion Recreation	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Marginal Fish Life	FULL				
Lake Pocasse SD-MI-L-POCASSE_01	Campbell County	L18	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-2
				Immersion Recreation	NON	Escherichia coli			
						Chlorophyll-*a*	Unknown		
				Limited Contact Recreation	NON	Chlorophyll-*a*	Unknown		
				Warmwater Permanent Fish Life	NON	Chlorophyll-*a*	Unknown		

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Lakes/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Potts Dam SD-MI-L-POTTS_01	Potter County	L19	DENR	Fish/Wildlife Prop, Rec, Stock Immersion Recreation Limited Contact Recreation Warmwater Semipermanent Fish Life	FULL NA NA FULL			2	NO
Roosevelt Lake SD-MI-L-ROOSEVELT_01	Tripp County	L20	DENR	Fish/Wildlife Prop, Rec, Stock Immersion Recreation Limited Contact Recreation Warmwater Permanent Fish Life	FULL FULL FULL NON	 Mercury in fish tissue		5	YES-1
Sully Lake SD-MI-L-SULLY_01	Sully County	L21	DENR	Fish/Wildlife Prop, Rec, Stock Immersion Recreation Limited Contact Recreation Warmwater Marginal Fish Life	FULL FULL FULL FULL			1	NO
Sully Dam SD-MI-L-SULLY_DAM_01	Tripp County	L22	DENR	Fish/Wildlife Prop, Rec, Stock Immersion Recreation Limited Contact Recreation Warmwater Marginal Fish Life	FULL NA NA INS			2	NO
Swan Lake SD-MI-L-SWAN_01	Walworth County	L23	DENR	Fish/Wildlife Prop, Rec, Stock Immersion Recreation Limited Contact Recreation Warmwater Marginal Fish Life	INS NA NA INS			3	NO
Lake Yankton SD-MI-L-YANKTON_01	Yankton County	L24	DENR	Fish/Wildlife Prop, Rec, Stock Immersion Recreation Limited Contact Recreation Warmwater Permanent Fish Life	FULL NA NA FULL			2	NO

WATERBODY Streams/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Andes Creek SD-MI-R-ANDES_01_USGS	Near Armour, SD	R1		Fish/Wildlife Prop, Rec, Stock Irrigation Waters	NA NA			3	NO
Campbell Creek SD-MI-R-CAMPBELL_01_USGS	Near Lee's Corner	R2	USGS	Fish/Wildlife Prop, Rec, Stock Irrigation Waters	INS INS			3	NO
Choteau Creek SD-MI-R-CHOTEAU_01	Lewis & Clark Lake to S34, T96N, R63W	R3	DENR USGS	Fish/Wildlife Prop, Rec, Stock Irrigation Waters Limited Contact Recreation Warmwater Semipermanent Fish Life	FULL FULL FULL FULL-TH	 Total Suspended Solids		5	YES-1

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Streams/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Crow Creek SD-MI-R-CROW_01	Bedashosha Lake to Jerauld County line	R4	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1	NO
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	FULL				
East Fork Platte Creek SD-MI-R-EAST_FORK_PLATTE_01_USGS	Near Aurora Center, SD	R5	USGS	Fish/Wildlife Prop, Rec, Stock	INS			3	NO
				Irrigation Waters	INS				
Elm Creek SD-MI-R-ELM_01_USGS	Near Gann Valley, SD	R6	DENR USGS	Fish/Wildlife Prop, Rec, Stock	NA			3	NO
				Irrigation Waters	NA				
				Limited Contact Recreation	NA				
				Warmwater Marginal Fish Life	NA				
Emanuel Creek SD-MI-R-EMANUEL_01	Lewis and Clark Lake to S20, T94N, R60W	R7	DENR USGS	Fish/Wildlife Prop, Rec, Stock	FULL			5*	YES-1
				Irrigation Waters	FULL				
				Limited Contact Recreation	NON	E. coli			
						Fecal coliform			
				Warmwater Semipermanent Fish Life	NON	Total Suspended Solids			
Missouri River (Lake Francis Case) SD-MI-R-FRANCIS_CASE_01	Big Bend Dam to Fort Randall Dam	R10	DENR USGS	Commerce & Industry	FULL			1	NO
				Domestic Water Supply	FULL				
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Immersion Recreation	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Permanent Fish Life	FULL				
Missouri River (Lewis and Clark Lake) SD-MI-R-LEWIS_AND_CLARK_01	Fort Randall Dam to North Sioux City	R13	DENR USGS	Commerce & Industry	FULL			1	NO
				Domestic Water Supply	FULL				
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Immersion Recreation	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Permanent Fish Life	FULL				
Medicine Creek SD-MI-R-MEDICINE_01	Lake Sharpe to US Hwy 83	R8	DENR USGS	Fish/Wildlife Prop, Rec, Stock	FULL			1*	NO
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Marginal Fish Life	FULL				

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Streams/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Medicine Knoll Creek	Lake Sharpe to confluence with its north and south forks	R9	DENR	Fish/Wildlife Prop, Rec, Stock	INS			3	NO
				Irrigation Waters	INS				
				Limited Contact Recreation	INS				
SD-MI-R-MEDICINE_KNOLL_01				Warmwater Marginal Fish Life	INS				
Missouri River (Lake Oahe)	North Dakota border to Oahe Dam	R11	DENR USACE	Coldwater Permanent Fish Life	FULL			1	NO
SD-MI-R-OAHE_01				Commerce & Industry	FULL				
				Domestic Water Supply	FULL				
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Immersion Recreation	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
Oak Creek	S20, T21N, R28E to Oahe	R14	USGS	Fish/Wildlife Prop, Rec, Stock	INS			3	NO
SD-MI-R-OAK_01_USGS				Irrigation Waters	INS				
				Limited Contact Recreation	NA				
				Warmwater Marginal Fish Life	INS				
Platte Creek	Near Platte, SD	R15	USGS	Fish/Wildlife Prop, Rec, Stock	FULL			2	NO
SD-MI-R-PLATTE_01_USGS				Irrigation Waters	FULL				
				Limited Contact Recreation	NA				
				Warmwater Marginal Fish Life	FULL				
Ponca Creek	SD/NE border to US Hwy 183	R16	DENR USGS	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-1
SD-MI-R-PONCA_01				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL-TH	Fecal Coliform	Livestock (Grazing or Feeding Operations)		
				Warmwater Semipermanent Fish Life	FULL				
Missouri River (Lake Sharpe)	Oahe Dam to Big Bend Dam	R12	DENR USACE	Coldwater Permanent Fish Life	NON	Temperature		5	YES-1
SD-MI-R-SHARPE_01				Commerce & Industry	FULL				
				Domestic Water Supply	FULL				
				Fish/Wildlife Prop, Rec, Stock	FULL				
				Immersion Recreation	FULL				
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Streams/AUID	MAP LOCATION	EPA ID	ON 303(d) BASIS	USE	SUPPORT	CAUSE	SOURCE	Category	& Priority
Slaughter Creek SD-MI-R-SLAUGHTER_01	Missouri River to headwaters	R17	DENR	Fish/Wildlife Prop, Rec, Stock Irrigation Waters	FULL FULL			1	NO
Snake Creek SD-MI-R-SNAKE_01_USGS	Headwaters to Academy Lake	R18	USGS	Fish/Wildlife Prop, Rec, Stock Irrigation Waters	INS INS			3	NO
Spring Creek SD-MI-R-SPRING_01	Lake Pocasse to US HWY 83	R19	DENR	Fish/Wildlife Prop, Rec, Stock Irrigation Waters Limited Contact Recreation Warmwater Semipermanent Fish Life	FULL FULL NON NON	 Oxygen, Dissolved Oxygen, Dissolved		5	YES-2

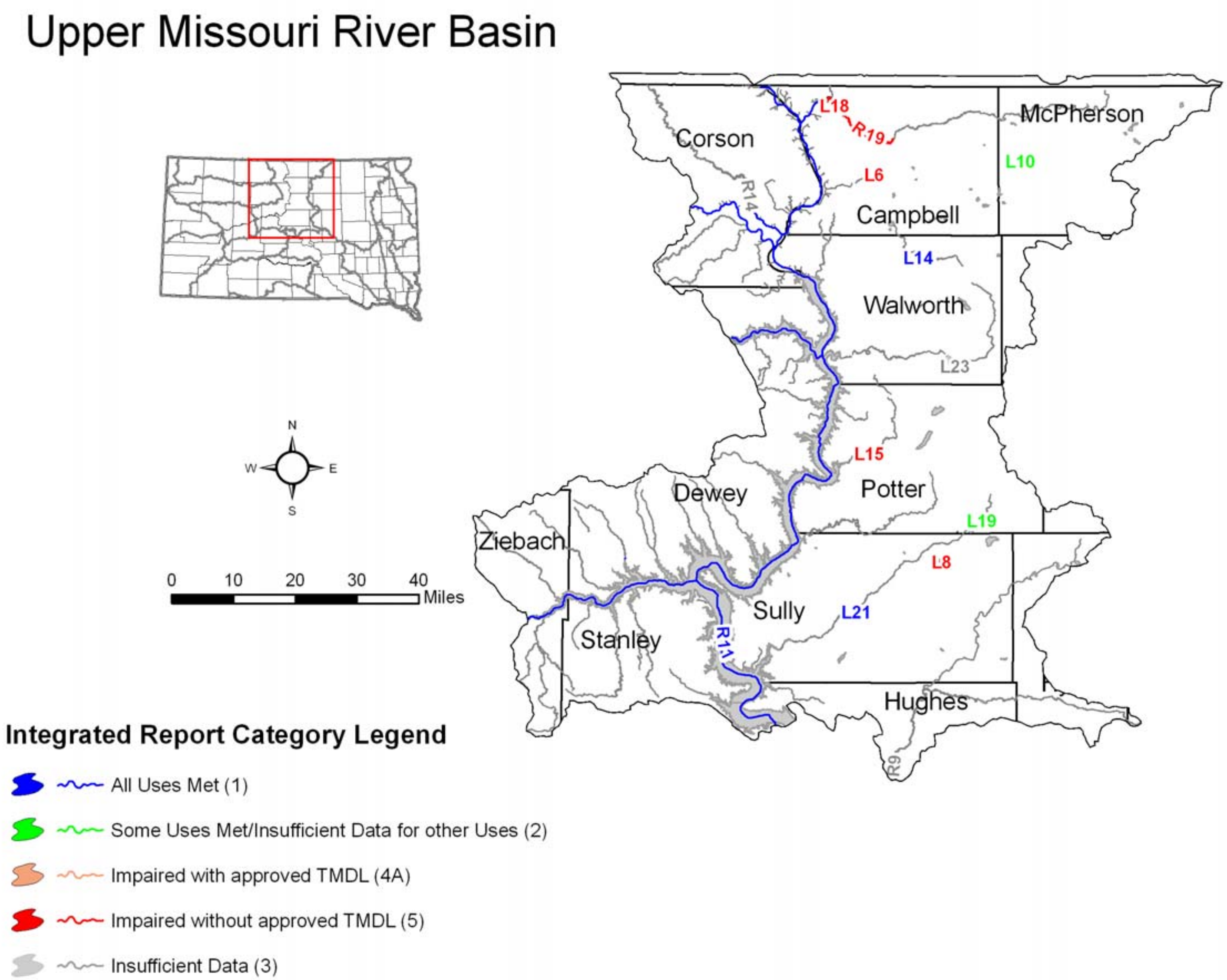

Figure 19: Upper Missouri River Basin

Lower Missouri River Basin

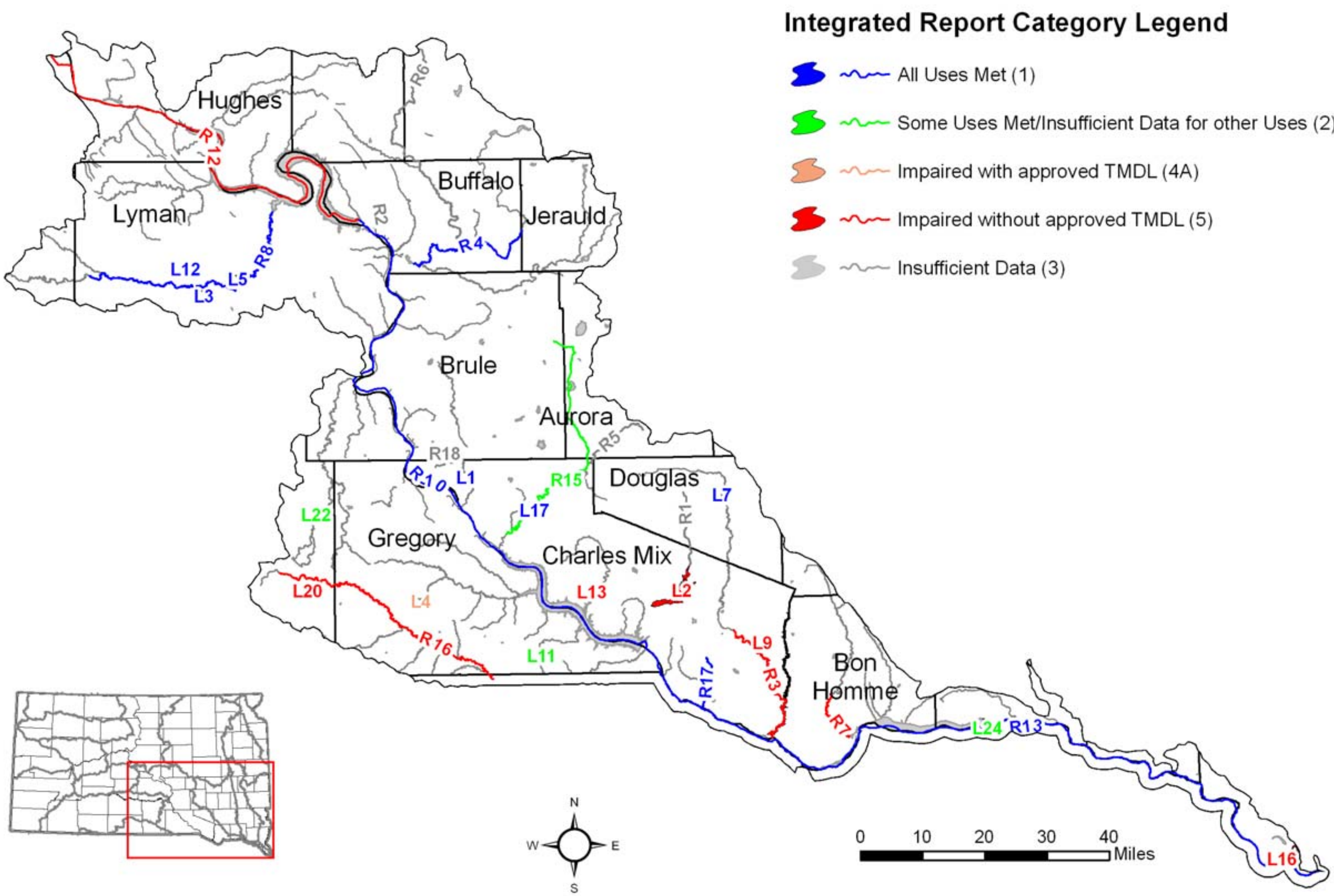

Figure 20: Lower Missouri River Basin

Moreau River Basin (Figure 21, Table 29)

The Moreau River basin is located in the northwest part of South Dakota and drains an area of 4,995 square miles. As with the Grand River basin to the north, agriculture is the mainstay of this sparsely populated basin. Population density is approximately two persons per square mile. A majority of the basin is devoted to ranching operations.

DENR maintains five water quality monitoring sites within this basin. Three of the five monitoring sites are located on the Moreau River, one is located on the South Fork Moreau, and one is located on Thunder Butte Creek.

The USGS has water quality monitoring sites on the Moreau River. The data are limited, and the only parameters measured were specific conductance and water temperature.

Water quality within the basin is marginal to poor. Much of the sediment in the drainage comes from erosive Cretaceous shales that also mineralize the water. As in the adjoining Grand River basin to the north, this leads to high levels of TDS in the water of local streams, primarily sulfate, iron, manganese, sodium, and other minerals. Other pollutants in the basin include TSS, SAR, DO, fecal coliform, and *E. coli.*

The Moreau River is located downstream from historic uranium mining operations and is monitored for parameters associated with historic uranium mining. Waterbody support determination was based on conventional parameters due to limited data on parameters associated with uranium mining; however, there were no water quality standards exceedances for any of the parameters associated with uranium mining.

There are no on-going assessment or implementation projects occurring within the Moreau basin at this time. DENR has referred TMDL development for waterbodies under tribal jurisdiction in the Moreau River basin to EPA.

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

Table 29: Moreau River Basin Information

WATERBODY Lakes/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Coal Springs Reservoir SD-MU-L-COAL_SPRINGS_01	Perkins County	L1	DENR	Fish/Wildlife Prop, Rec, Stock Immersion Recreation Limited Contact Recreation Warmwater Permanent Fish Life	INS NA NA INS			3	NO
Dewberry Dam SD-MU-L-DEWBERRY_01	Dewey County	L2	DENR	Fish/Wildlife Prop, Rec, Stock Immersion Recreation Limited Contact Recreation Warmwater Permanent Fish Life	INS NA NA INS			3	NO
WATERBODY Streams/AUID	**LOCATION**	**MAP ID**	**BASIS**	**USE**	**SUPPORT**	**CAUSE**	**SOURCE**	**EPA Category**	**ON 303(d) & Priority**
Moreau River SD-MU-R-MOREAU_01	North and South Forks to Ziebach/Perkins county line	R1	DENR USGS	Fish/Wildlife Prop, Rec, Stock Irrigation Waters Limited Contact Recreation Warmwater Semipermanent Fish Life	FULL FULL-TH FULL NON	 Salinity Total Suspended Solids	 Natural Sources	5	YES-2
Moreau River SD-MU-R-MOREAU_02	Ziebach/Perkins county line to Green Grass	R2	DENR	Fish/Wildlife Prop, Rec, Stock Irrigation Waters Limited Contact Recreation Warmwater Semipermanent Fish Life	FULL FULL-TH FULL NON	 Salinity Total Suspended Solids	 Natural Sources	5	YES-2
Moreau River SD-MU-R-MOREAU_03	Green Grass to mouth	R3	DENR USGS	Fish/Wildlife Prop, Rec, Stock Irrigation Waters Limited Contact Recreation Warmwater Semipermanent Fish Life	FULL FULL-TH NON NON	 Salinity Escherichia coli Fecal Coliform Total Suspended Solids	Natural Sources Livestock (Grazing or Feeding Operations) Crop Production (Crop Land or Dry Land)	5	YES-2
South Fork Moreau River SD-MU-R-MOREAU_S_FORK_01	Alkali Creek to mouth	R4	DENR	Fish/Wildlife Prop, Rec, Stock Irrigation Waters Limited Contact Recreation Warmwater Marginal Fish Life	NON NON FULL FULL	Total Dissolved Solids Specific Conductance	 Natural Sources	5	YES-2
Thunder Butte Creek SD-MU-R-THUNDER_BUTTE_01	Headwaters to mouth	R5	DENR	Fish/Wildlife Prop, Rec, Stock Irrigation Waters Limited Contact Recreation Warmwater Marginal Fish Life	INS INS INS INS-TH	 Oxygen, Dissolved		5	YES-2

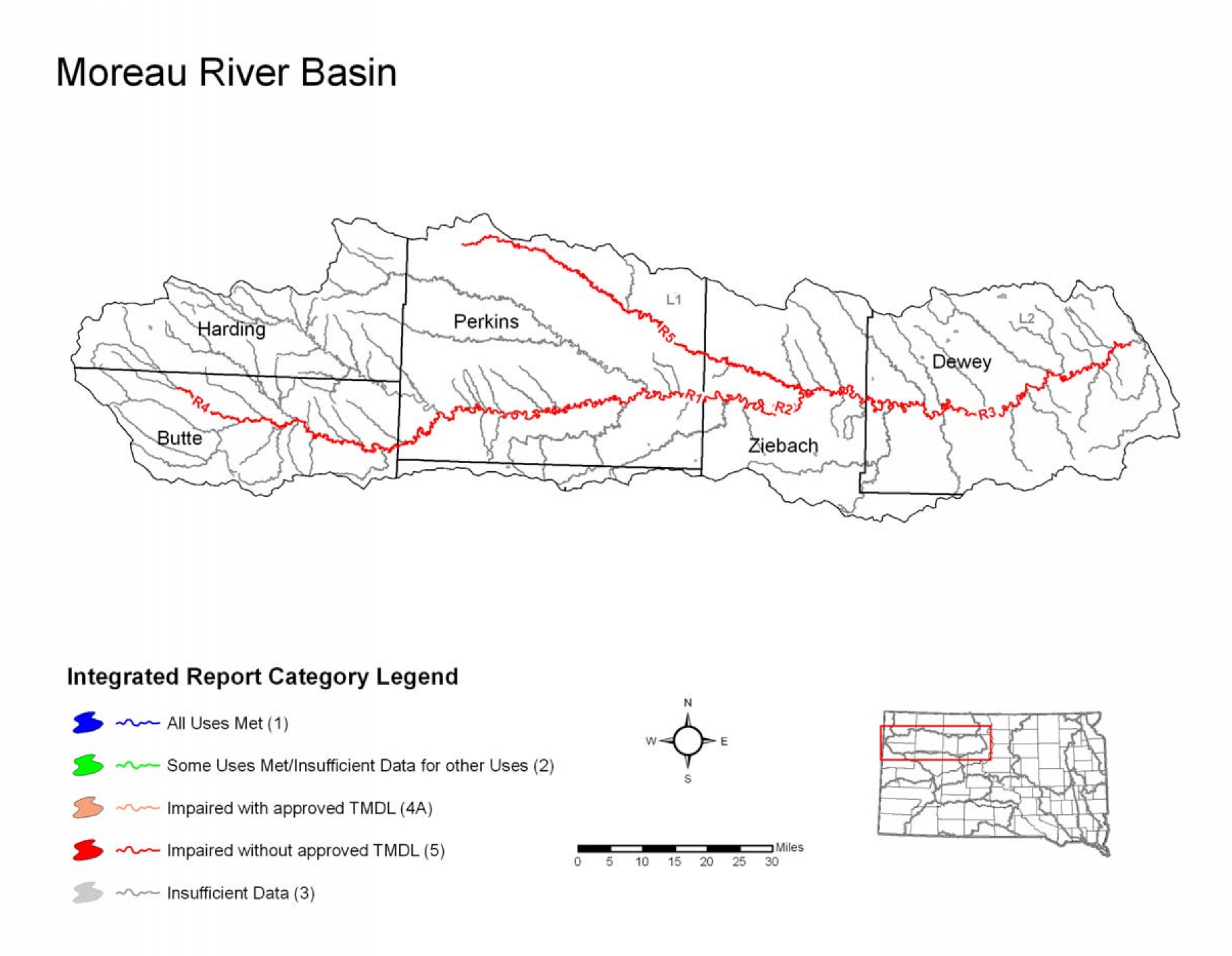

Figure 21: Moreau River Basin

Niobrara River Basin (Figure 22, Table 30)

The tributaries of the Niobrara basin that lie in South Dakota are located in the very south-central part of the state. These tributaries include the Keya Paha River and the Minnechadusa River. These streams drain approximately 1,742 square miles in South Dakota. Agriculture is the leading source of income to the basin.

DENR has assessed Rahn Dam and maintains one water quality monitoring site on the Keya Paha River. USGS sites that had water quality information within this basin are located on Antelope Creek and Sand Creek.

A portion of the Lewis and Clark Project (Missouri River Basin) is located in the Niobrara basin and is in the implementation phase.

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

Table 30: Niobrara River Basin Information

WATERBODY Lakes/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Rahn Lake	Tripp County	L1	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-2
SD-NI-L-RAHN_01				Immersion Recreation	NON	Chlorophyll-*a*	Unknown		
				Limited Contact Recreation	NON	Chlorophyll-*a*	Unknown		
				Warmwater Permanent Fish Life	NON	Chlorophyll-*a*	Unknown		
WATERBODY Streams/AUID	**LOCATION**	**MAP ID**	**BASIS**	**USE**	**SUPPORT**	**CAUSE**	**SOURCE**	**EPA Category**	**ON 303(d) & Priority**
Antelope Creek	Near Mission, SD	R1	USGS	Fish/Wildlife Prop, Rec, Stock	INS			2	NO
SD-NI-R-ANTELOPE_01_USGS				Irrigation Waters	INS				
				Limited Contact Recreation	NA				
				Warmwater Semipermanent Fish Life	FULL				
Keya Paha River	SD/NE border to confluence with Antelope Creek	R2	DENR USGS	Fish/Wildlife Prop, Rec, Stock	FULL			5*	YES
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL-TH	Fecal coliform Escherichia coli			
SD-NI-R-KEYA_PAHA_01				Warmwater Semipermanent Fish Life	NON	Total Suspended Solids	Natural Sources		
Sand Creek	Near Olsonville, SD	R3	USGS	Fish/Wildlife Prop, Rec, Stock	INS			3	NO
SD-NI-R-SAND_01_USGS				Irrigation Waters	INS				

Niobrara River Basin

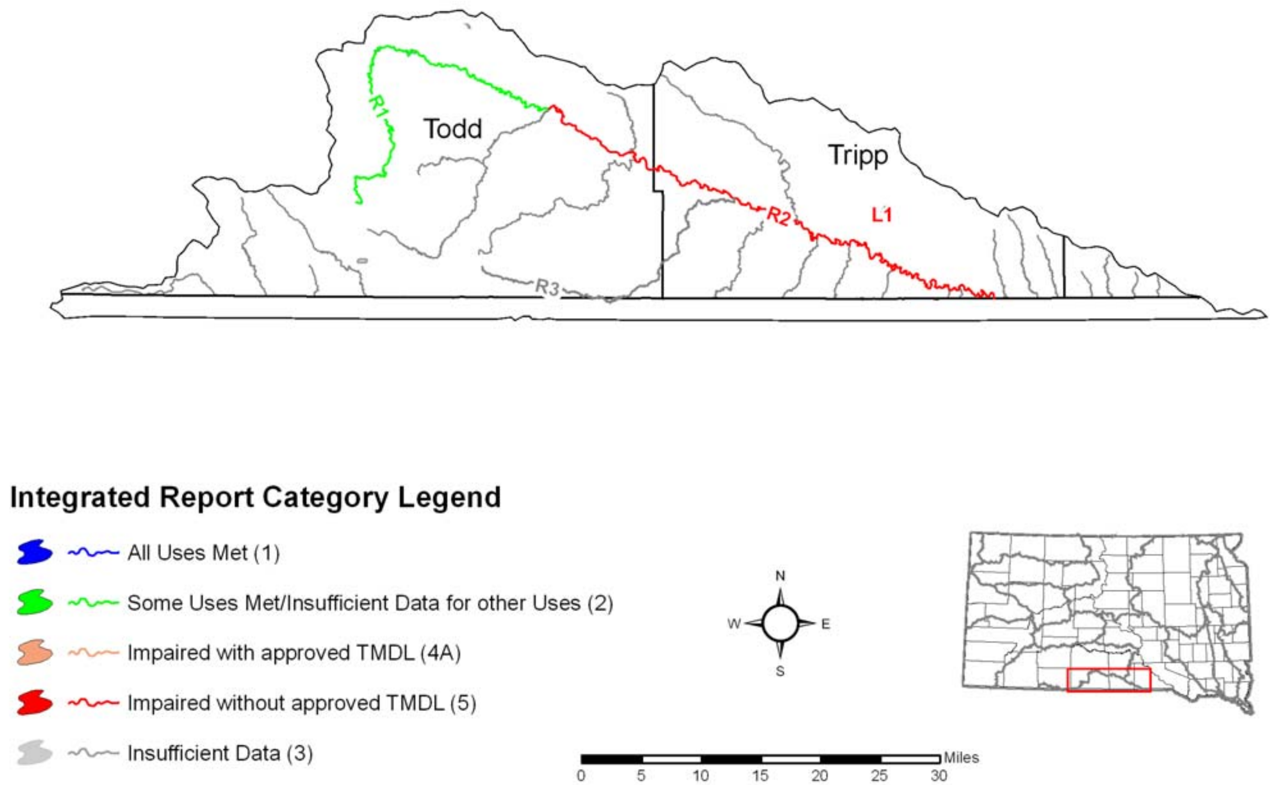

Figure 22: Niobrara River Basin

Red River Basin (Figure 23, Table 31)

The Red River basin covers the extreme northeastern corner of the state. The tributaries of the Red River that are in South Dakota drain a total of 627 square miles. Agriculture is the leading economic industry in the basin.

DENR has assessed two lakes and does not maintain any water quality monitoring sites in the Red River basin. The USGS maintains a monitoring site on La Belle Creek; however, there were insufficient data to make a support determination.

A lake assessment has been completed for Lake Traverse and a comprehensive watershed assessment report is being written.

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

Table 31: Red River Basin Information

WATERBODY Lakes/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Lake Traverse SD-RD-L-TRAVERSE_01	Roberts County	L1	DENR	Fish/Wildlife Prop, Rec, Stock Immersion Recreation Irrigation Waters Limited Contact Recreation Warmwater Permanent Fish Life	FULL FULL FULL FULL FULL			1	NO
White Lake SD-RD-L-WHITE_01	Marshall County	L2	DENR	Fish/Wildlife Prop, Rec, Stock Immersion Recreation Limited Contact Recreation Warmwater Permanent Fish Life	FULL FULL FULL FULL			1*	NO
WATERBODY Streams/AUID	**LOCATION**	**MAP ID**	**BASIS**	**USE**	**SUPPORT**	**CAUSE**	**SOURCE**	**EPA Category**	**ON 303(d) & Priority**
La Belle Creek SD-RD-R-LA_BELLE_01_USGS	Near Veblen, SD	R1	USGS	Fish/Wildlife Prop, Rec, Stock Irrigation Waters	INS INS			3	NO

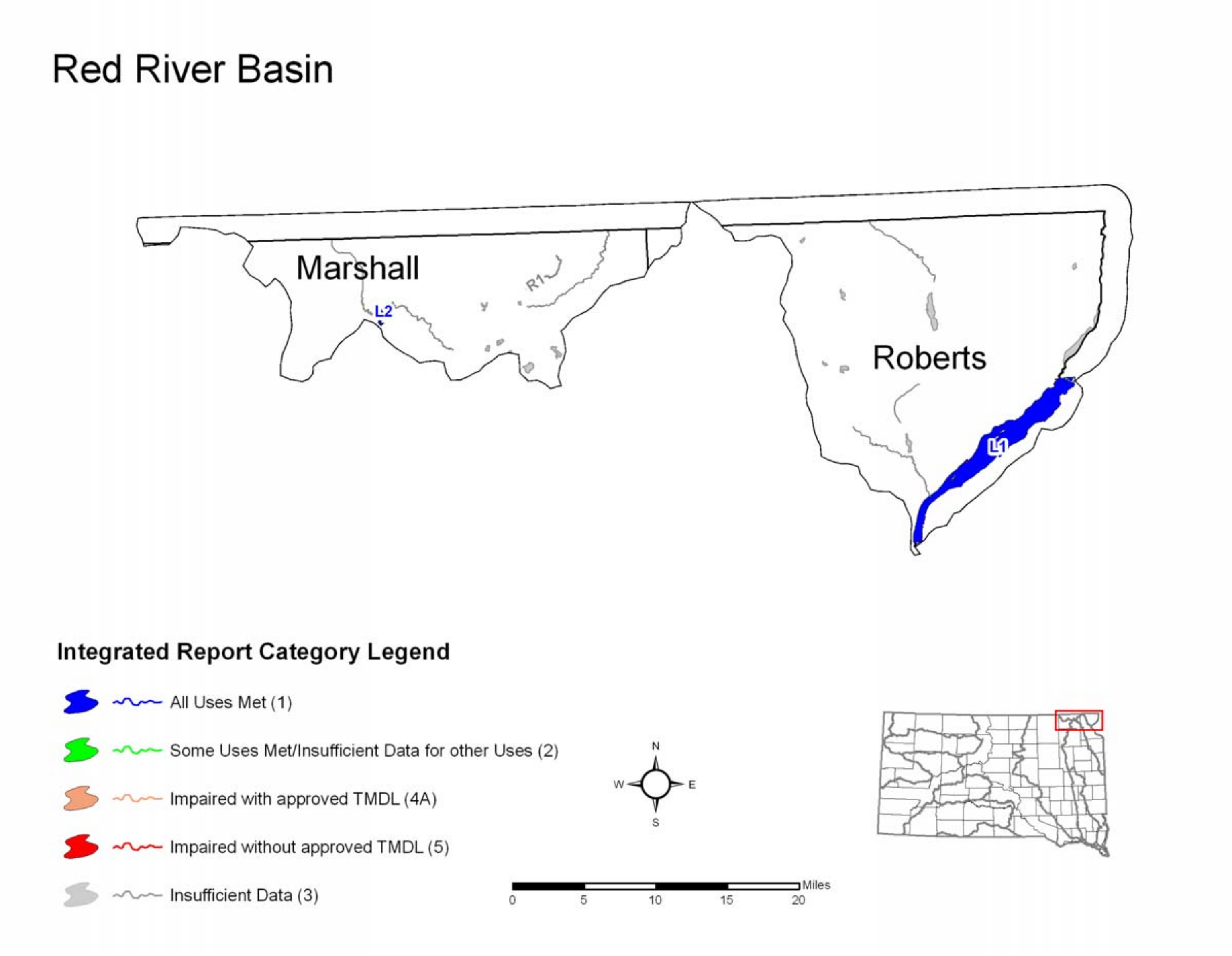

Figure 23: Red River Basin

Vermillion River Basin (Figure 24, Table 32)

The Vermillion River basin covers an area of 2,673 square miles in southeastern South Dakota. The basin is about 150 miles in length and varies in width from 12 miles in the north to 36 miles in the south. Much of the lower 22 miles of the river is channelized. Agriculture is the leading source of income in the basin. It is estimated that 96% of the total surface area is devoted to agriculture. The remaining areas are municipalities, sand and gravel operations, and other uses.

DENR has assessed seven lakes and maintains five water quality monitoring sites within this basin. Three of the five monitoring sites are located on the Vermillion River and the other two are located on the East Fork Vermillion River.

The USGS has water quality monitoring sites in the basin including sites on the Little Vermillion River, the Vermillion River, East Fork Vermillion River, and West Fork Vermillion River. The data are limited and the only parameters measured were specific conductance and water temperature.

On-going implementation projects in the Vermillion River basin include the Vermillion River watershed and Turkey Ridge Creek watershed.

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

Table 32: Vermillion River Basin Information

WATERBODY Lakes/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
East Vermillion Lake SD-VM-L-E_VERMILLION_01	McCook County	L1	DENR	Fish/Wildlife Prop, Rec, Stock Immersion Recreation Limited Contact Recreation Warmwater Permanent Fish Life	FULL NON NON NON	 Chlorophyll-*a* Chlorophyll-*a* Chlorophyll-*a*	 Unknown Unknown Unknown	5	YES-2
Lake Henry SD-VM-L-HENRY_01	Kingsbury County	L2	DENR	Fish/Wildlife Prop, Rec, Stock Immersion Recreation Limited Contact Recreation Warmwater Marginal Fish Life	FULL FULL FULL FULL			1	NO
Marindahl Lake SD-VM-L-MARINDAHL_01	Yankton County	L4	DENR	Fish/Wildlife Prop, Rec, Stock Immersion Recreation Limited Contact Recreation Warmwater Permanent Fish Life	FULL NA NA FULL			2	NO
Silver Lake SD-VM-L-SILVER_01	Hutchinson County	L5	DENR	Fish/Wildlife Prop, Rec, Stock Immersion Recreation Limited Contact Recreation Warmwater Marginal Fish Life	FULL FULL FULL NON	 pH (high)		5	YES-2
Swan Lake SD-VM-L-SWAN_01	Turner County	L6	DENR	Fish/Wildlife Prop, Rec, Stock Immersion Recreation Limited Contact Recreation Warmwater Semipermanent Fish Life	FULL NA NA NON	 pH (high)		5*	YES-2
Lake Thompson SD-VM-L-THOMPSON_01	Kingsbury County	L7	DENR	Fish/Wildlife Prop, Rec, Stock Immersion Recreation Limited Contact Recreation Warmwater Permanent Fish Life	FULL FULL FULL FULL			1	NO
Whitewood Lake SD-VM-L-WHITEWOOD_01	Kingsbury County	L8	DENR	Fish/Wildlife Prop, Rec, Stock Immersion Recreation Limited Contact Recreation Warmwater Marginal Fish Life	FULL FULL FULL FULL			1	NO

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Streams/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Camp Creek SD-VM-R-CAMP_01	Vermillion River to S6, T99N, R52W	R1	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1	NO
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Marginal Fish Life	FULL				
Little Vermillion River SD-VM-R-LITTLE_VERMILLION_01_USGS	Near Salem, SD	R4	DENR USGS	Fish/Wildlife Prop, Rec, Stock	FULL			1	NO
				Irrigation Waters	FULL				
Long Creek SD-VM-R-LONG_01	Vermillion River to Highway 44	R5	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-1
				Irrigation Waters	FULL				
				Limited Contact Recreation	NON	Escherichia coli			
						Fecal Coliform	Livestock (Grazing or Feeding Operations) Animal Feeding Operations (NPS)		
				Warmwater Semipermanent Fish Life	FULL				
Vermillion River SD-VM-R-VERMILLION_01	Headwaters to Turkey Ridge Creek	R6	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			1	NO
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	FULL				
Vermillion River SD-VM-R-VERMILLION_02	Turkey Ridge Creek to Baptist Creek	R7	DENR USGS	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-1
				Irrigation Waters	FULL				
				Limited Contact Recreation	NON	Escherichia coli			
				Warmwater Semipermanent Fish Life	NON	Total Suspended Solids			
Vermillion River SD-VM-R-VERMILLION_03	Baptist Creek to mouth	R8	DENR USGS	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-1
				Irrigation Waters	FULL				
				Limited Contact Recreation	FULL				
				Warmwater Semipermanent Fish Life	NON	Total Suspended Solids	Livestock (Grazing or Feeding Operations) Grazing in Riparian or Shoreline Zones Crop Production (Crop Land or Dry Land)		

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Streams/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
East Fork Vermillion River	McCook/Lake County line to Little Vermillion River	R2	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-1
				Irrigation Waters	FULL				
				Limited Contact Recreation	NON	Fecal Coliform			
SD-VM-R-VERMILLION_E_FORK_01				Warmwater Marginal Fish Life	FULL				
East Fork Vermillion River	Little Vermillion River to mouth	R3	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-1
SD-VM-R-VERMILLION_E_FORK_02			USGS	Irrigation Waters	FULL				
				Limited Contact Recreation	NON	Escherichia coli			
				Warmwater Marginal Fish Life	FULL				
West Fork Vermillion River	Vermillion River to McCook-Miner County Line	R9	DENR	Fish/Wildlife Prop, Rec, Stock	FULL			5	YES-1
			USGS	Irrigation Waters	FULL				
SD-VM-R-VERMILLION_WEST_FORK_01_USGS				Limited Contact Recreation	NON	Escherichia coli			
						Fecal Coliform			
				Warmwater Marginal Fish Life	FULL				

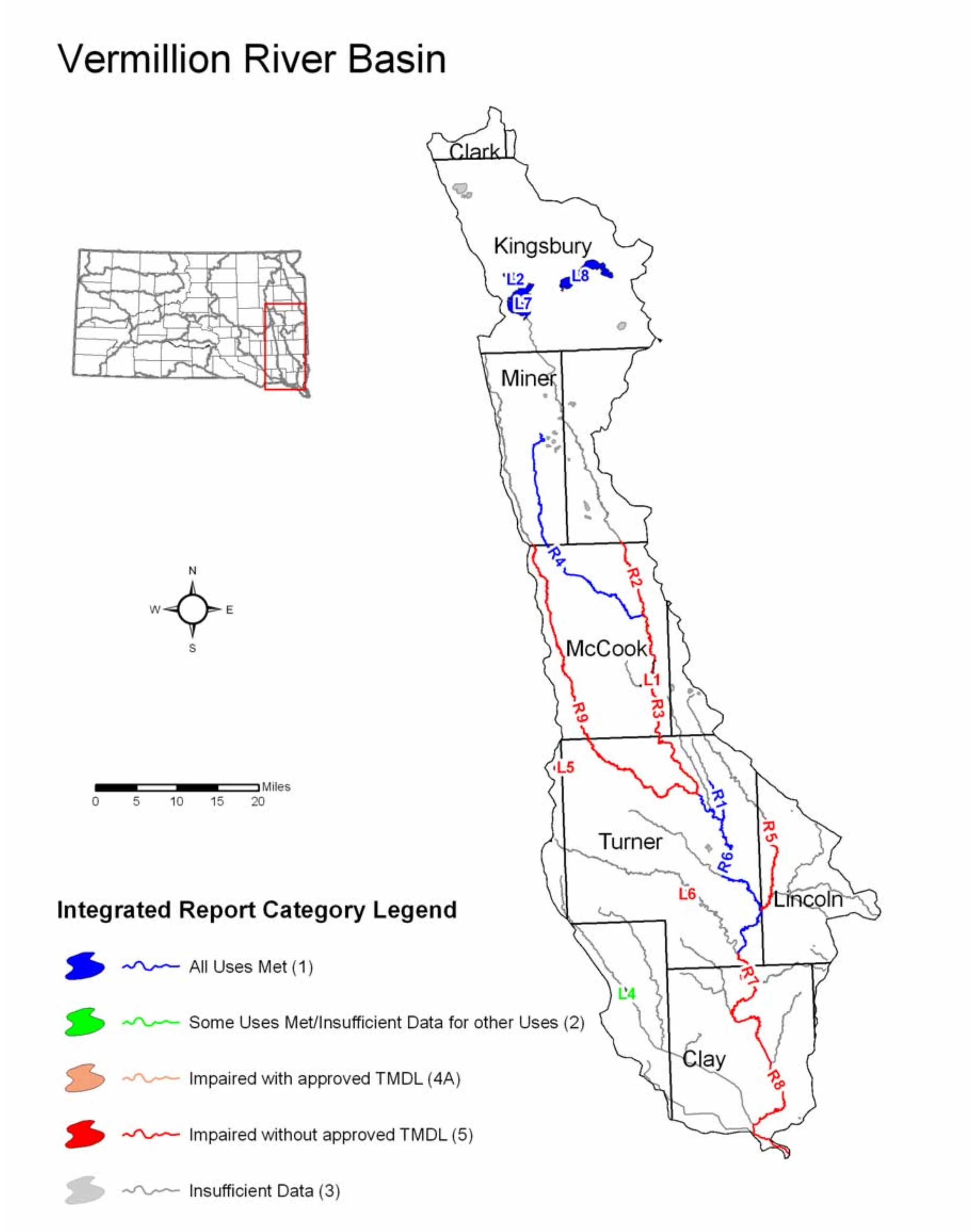

Figure 24: Vermillion River Basin

White River Basin (Figure 25, Table 33)

The White River basin is the most southern of the five major drainages in South Dakota that enters the Missouri River from the west. The total drainage area of the basin in the state is 8,246 square miles. Agriculture dominates the basin's economy, with the majority of the land used as rangeland or cropland.

DENR maintains six water quality monitoring sites within this basin. Four of the six monitoring sites are located on the White River, one is located on Cottonwood Creek, and the other is located on the Little White River.

The USGS has water quality monitoring sites in the basin, including sites on the White river, Little White River, Black Pipe Creek, Lake Creek, Rosebud Creek and others. The data are limited, and the only parameters that were measured were specific conductance and water temperature.

DENR has increased sampling parameters to include uranium, and others associated with uranium mining, at an ambient monitoring location on the White River near Oglala. This location was selected due to in-situ uranium mining upstream in Nebraska and the naturally occurring uranium in the highly erodible soils in the White River basin. For this reporting cycle, there are insufficient data to report on uranium and other associated parameters. Support determinations were based on existing conventional parameters; however, there were no surface water quality exceedances for uranium or other parameters associated with uranium mining.

The White River basin receives the majority of the runoff and drainage from the western Badlands. The exposed Badlands are a major natural source of both suspended and dissolved solids to the river. Severe erosion and leaching of soils occurs in the Badlands and throughout the entire length of the basin. Site specific water quality standards for total suspended solids (TSS) were established by DENR in 2009 for the White River and Little White River. The White River is listed as impaired for SAR, fecal coliform, and *E. coli*.

Assessment projects have been completed for the White River, Little White River and Cottonwood Creek watersheds.

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

Table 33: White River Basin Information

WATERBODY Streams/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Black Pipe Creek SD-WH-R-BLACKPIPE_01_USGS	S25, T42N, R33W to White River	R1	USGS	Fish/Wildlife Prop, Rec, Stock Irrigation Waters Limited Contact Recreation Warmwater Marginal Fish Life	FULL FULL NA FULL			2	NO
Cottonwood Creek SD-WH-R-COTTONWOOD_01	Headwaters to White River	R2	DENR	Fish/Wildlife Prop, Rec, Stock Irrigation Waters	FULL FULL			1	NO
Lake Creek SD-WH-R-LAKE_01_USGS	Above and below refuge near Tuthill, SD	R3	USGS	Fish/Wildlife Prop, Rec, Stock Irrigation Waters Limited Contact Recreation Warmwater Permanent Fish Life	FULL FULL NA NON	 Temperature		5	YES-2
Little White River SD-WH-R-LITTLE_WHITE_01	Rosebud Creek to mouth	R5	DENR USGS	Fish/Wildlife Prop, Rec, Stock Irrigation Waters Limited Contact Recreation Warmwater Semipermanent Fish Life	FULL FULL NON FULL	 Fecal Coliform		5	YES-2
Little White River SD-WH-R-LITTLE_WHITE_02_USGS	S6, T36N, R39W to Rosebud Creek	R4	USGS	Fish/Wildlife Prop, Rec, Stock Irrigation Waters Limited Contact Recreation Warmwater Semipermanent Fish Life	FULL FULL NA FULL			2	NO
Omaha Creek SD-WH-R-OMAHA_01_USGS	Headwaters to Little White River	R6		Fish/Wildlife Prop, Rec, Stock Irrigation Waters	NA NA			3	NO
Rosebud Creek SD-WH-R-ROSEBUD_01_USGS	S34, T38N, R30W to Little White River	R7		Coldwater Marginal Fish Life Fish/Wildlife Prop, Rec, Stock Irrigation Waters Limited Contact Recreation	NA NA NA NA			3	NO
Sawmill Canyon SD-WH-R-SAWMILL_CANYON_01_USGS	Headwaters to Little White River	R8		Fish/Wildlife Prop, Rec, Stock Irrigation Waters	NA NA			3	NO

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Streams/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
White River SD-WH-R-WHITE_01	NE/SD border to Willow Creek	R10	DENR USGS	Fish/Wildlife Prop, Rec, Stock Irrigation Waters Limited Contact Recreation Warmwater Semipermanent Fish Life	FULL FULL NON FULL	 Escherichia coli Fecal Coliform		5	YES-2
White River SD-WH-R-WHITE_02	Willow Creek to Pass Creek	R11	DENR USGS	Fish/Wildlife Prop, Rec, Stock Irrigation Waters Limited Contact Recreation Warmwater Semipermanent Fish Life	FULL NON NON FULL	 Salinity Escherichia coli Fecal Coliform	 Wildlife Other than Waterfowl Livestock (Grazing or Feeding Operations)	5	YES-2
White River SD-WH-R-WHITE_03	Pass Creek to Little White River	R12	DENR USGS	Fish/Wildlife Prop, Rec, Stock Irrigation Waters Limited Contact Recreation Warmwater Semipermanent Fish Life	FULL NON NON FULL	 Salinity Fecal Coliform		5	YES-2
White River SD-WH-R-WHITE_04	Little White River to confluence with Missouri River	R13	DENR USGS	Fish/Wildlife Prop, Rec, Stock Irrigation Waters Limited Contact Recreation Warmwater Semipermanent Fish Life	FULL FULL NON FULL	 Escherichia coli Fecal Coliform	 Wildlife Other than Waterfowl Natural Sources Livestock (Grazing or Feeding Operations) Crop Production (Crop Land or Dry Land)	5	YES-2
White Clay Creek SD-WH-R-WHITECLAY_01_USGS	White Clay Lake to Oglala Lake	R9	USGS	Fish/Wildlife Prop, Rec, Stock Irrigation Waters Limited Contact Recreation Warmwater Permanent Fish Life	INS INS NA INS			3	NO

Category (1) All uses met; (2) Some uses met but insufficient data to determine support of other uses; (3) Insufficient data; (4a) Water impaired but has an approved TMDL; (5) Water impaired/requires a TMDL. * Waterbody has an EPA approved TMDL, refer to Appendix A.

WATERBODY Streams/AUID	LOCATION	MAP ID	BASIS	USE	SUPPORT	CAUSE	SOURCE	EPA Category	ON 303(d) & Priority
Williams Creek SD-WH-R-WILLIAMS_01_USGS	headwaters to mouth	R14	USGS	Fish/Wildlife Prop, Rec, Stock	INS			3	NO
				Irrigation Waters	INS				
Wounded Knee Creek SD-WH-R-WOUNDEDKNEE_01_USGS	Spring Creek to White River	R15	USGS	Fish/Wildlife Prop, Rec, Stock	INS			3	NO
				Irrigation Waters	INS				
				Limited Contact Recreation	NA				
				Warmwater Marginal Fish Life	INS				

White River Basin

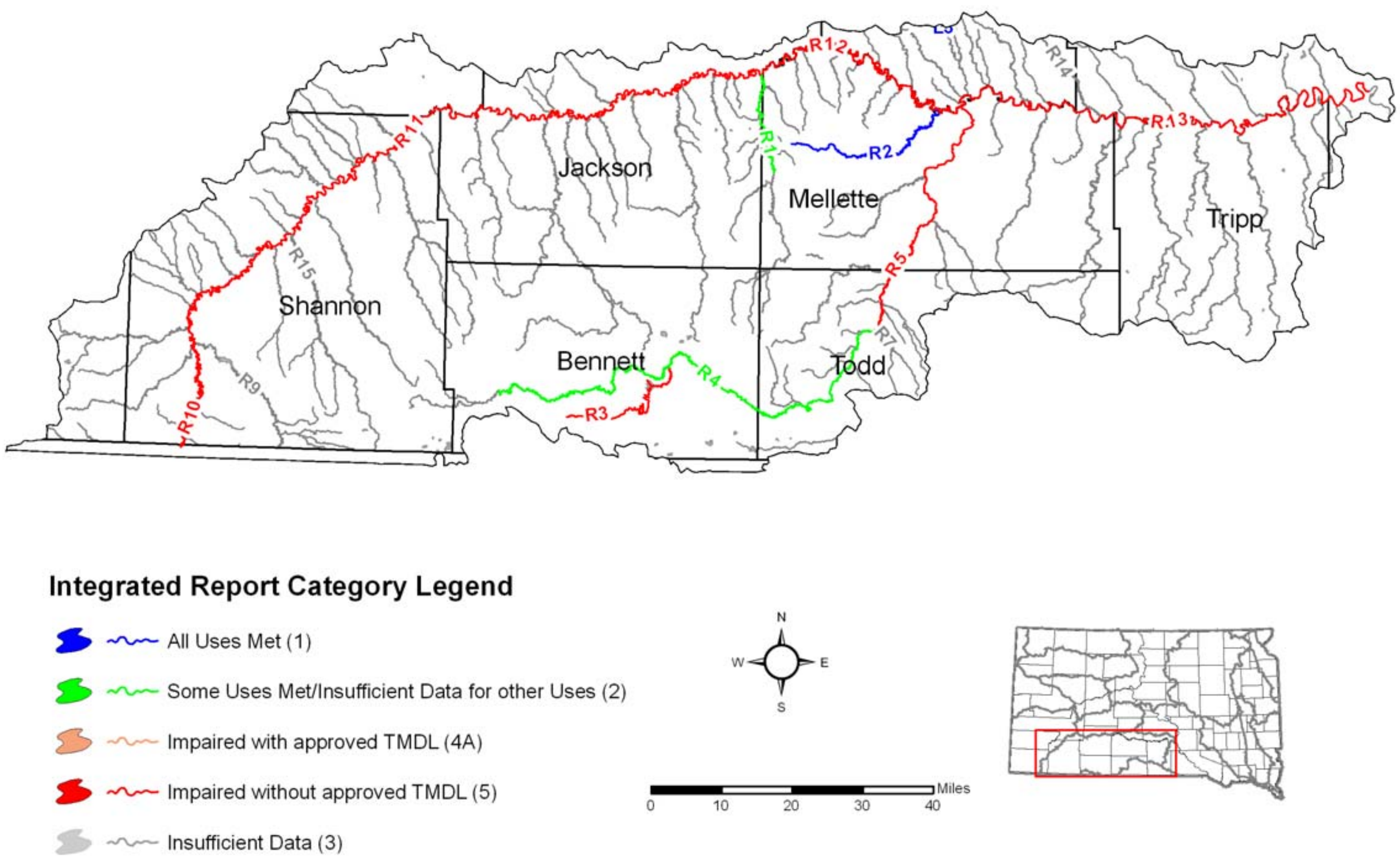

Figure 25: White River Basin

WETLANDS

Wetlands are a common feature in the glaciated prairie pothole region of eastern South Dakota (Figure 26). However, these systems are commonly considered a nuisance with regards to agricultural production and travel (Johnson and Higgins 1997). Upon settlement (1800s), wetland drainage became a common practice across the glaciated plains of eastern South Dakota. Considerable advances were made in the 1940s and 1950s to drain wetlands for increased agricultural production. Several government agencies, including the U.S. Department of Agriculture (USDA), once promoted wetland drainage as a responsible land use practice (Johnson and Higgins 1997). As a result, an estimated 35% of the natural wetland area in South Dakota prior to European settlement has been destroyed by human modification (Dahl 1990). Today, federal legislation and other programs have since decreased the rate of natural wetland destruction in South Dakota (Johnson and Higgins 1997).

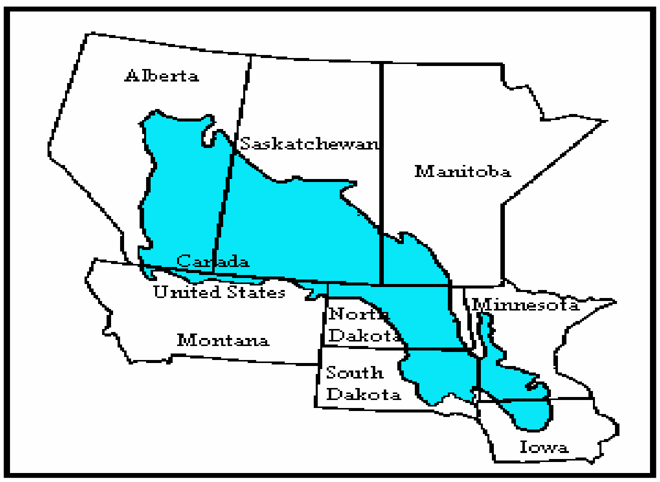

Figure 26: Map Depicting Prairie Pothole Region

Wetland resources across the prairie pothole region of eastern South Dakota provide many ecological services (Rickeral et al. 2000). Wetlands provide hydrologic services such as water and nutrient storage and flood relief. They also enhance waterfowl production and promote biodiversity. Growing awareness of the importance of wetlands prompted the U.S. Fish and Wildlife Service (USFWS) in 1974 to conduct an inventory of U.S. wetlands, also known as the National Wetlands Inventory (NWI). The Cowardin et al. (1982), classification system was adopted by the USFWS to classify wetlands based on hydrologic, geomorphologic, biologic, and chemical characteristics. The NWI efforts conducted in South Dakota provide documentation regarding identity and extent, characteristics and distribution of wetland resources. In short, eastern South Dakota has an estimated 2.2 million acres of wetlands and deep water habitat. Of this total, an estimated 80.1% or 1.8 million acres are palustrine systems. Palustrine wetlands (prairie potholes) represent small depressional wetlands with shallow water habitat. Johnson and Higgins (1997) summarize results of the latest NWI survey conducted in eastern South Dakota.

South Dakota defines wetlands as “those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas" (ARSD 74:51:01). Wetlands are designated the beneficial use of fish and wildlife propagation, recreation and stock watering, which provides protection under existing narrative and numeric water quality standards. The USACE is responsible for the control of activities that place fill in wetlands. The USACE authority stems from Section 404 of the Clean Water Act. For purposes of Federal 404 identification and delineation, wetlands must have each of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes, (2) the substrate is predominantly hydric soil, and (3) the substrate is saturated with water or covered by shallow water at some time during the growing season of each year. Before exercising its authority on a particular action, the USACE issues a public notice, taking into consideration the comments of the EPA, GF&P, DENR, and other resource agencies. Construction projects involving wetlands must receive certification from DENR under Section 401 of the Clean Water Act to certify the action will not violate South Dakota Surface Water Quality Standards. DENR regulates the discharge of pollutants to wetlands under the Surface Water Discharge permitting program.

The USFWS and private entities, such as Ducks Unlimited, work to protect and preserve wetland resources in South Dakota. An estimated 700 US Fish and Wildlife Service Waterfowl Production Areas (WPAs) covering about 183,000 acres of uplands and wetlands were purchased in South Dakota by 1994 (Johnson and Higgins 1997). The USFWS have also obtained easements on an estimated 613,000 acres of eastern South Dakota wetlands through 1994. Approximately 51,000 acres of wetlands are currently owned by GF&P and managed as State Game Production Areas and Public Shooting Areas. Many of these aforementioned entities continue to purchase, obtain easements and manage wetland habitats for the purpose of preservation.

Despite regulatory programs and other protective measures, human impacts on wetland environments (i.e. agriculture) can limit a wetland's ability to provide ecological services. EPA is encouraging states to develop monitoring and assessment tools to determine the ecological integrity of wetland environments. EPA currently promotes three approaches to wetland assessment. A Level-1 assessment is a landscape level screening process using GIS technology and other geo-database information systems to evaluate potential impacts to wetland environments. Level-2 assessments incorporate Level-1 information and rapid, on-site evaluations of wetland attributes for comparison among wetlands. Level-3 assessments require a more rigorous and comprehensive physiochemical and biological assessment of wetland resources.

The Wildlife and Fisheries Department at South Dakota State University, in cooperation with GF&P, developed a Level-1 and Level-2 wetland rapid assessment protocol for prairie pothole wetlands in eastern South Dakota. The assessment method was modified from a protocol developed by the South Florida Water Management District (Miller and Gunsalus 1999) for evaluating wetland condition. The South Dakota wetland rapid assessment protocol was developed for the state's Natural Heritage and Wildlife Habitat Programs (GF&P) for identifying reference wetlands, monitoring randomly selected sites, and evaluating wetland restoration efforts.

A Level-3 wetland assessment was developed within the Prairie Pothole Region of South Dakota. This Level-3 assessment focused on development of an Index of Plant Community Integrity (IPCI) originally developed to assess seasonal wetlands in the Prairie Pothole Region (DeKeyser et al. 2003). The IPCI was modified to evaluate the vegetative composition of wetlands across classification (temporary and semipermanent) and disturbance (native grass to cropland) gradients within the Northern Glaciated Plains and Northwestern Glaciated Plains ecoregions of South Dakota, North Dakota, and Montana. The IPCI method can be used in South Dakota to allow the placement of wetlands into disturbance classes for ecological and mitigation needs (Hargiss et al. 2007). During the course of the IPIC development in South Dakota, researchers noted that the ecological health of eastern South Dakota prairie pothole wetlands decrease from north to south. This was attributed to greater agricultural intensity in southeast South Dakota (Dekeyser, personal communication).

PUBLIC HEALTH/AQUATIC LIFE CONCERNS

The cost of routinely monitoring most toxic pollutants is prohibitive. At present, priority toxins (heavy metals) are routinely monitored at several WQM stream sites located near historic or current mining activities in the northern Black Hills. Ammonia, which is a 307(a) toxic pollutant, is routinely monitored throughout the DENR fixed station monitoring network (Table 33).

Table 34: Total Size Affected by Toxics

WATERBODY	SIZE MONITORED FOR TOXICS*	SIZE WITH ELEVATED LEVELS OF TOXICS**
Rivers (miles)	6,206	46
Lakes (acres)	135,576	55

* Ammonia, cyanide, chlorine, and/or metals including arsenic.

** Elevated levels are defined as exceedances of state water quality standards, 304(a) criteria, and/or FDA action levels, or levels of concern (where numeric criteria do not exist).

<u>Aquatic Life (Fish Kills)</u>

There were 11 separate aquatic life concern incidents investigated from October 1, 2007, to September 30, 2009. Of these incidents, three were the result of a winter kill, two were caused by pollution introduced to the waterbody, and one was due to a bacterial infection in the fish. The remaining fish kills occurred for a variety of other reasons but mostly due to natural conditions and biological processes during the warm weather months.

The USFWS *Field Manual for the Investigation of Fish Kills* offers the following guide for reporting fish kills:

Minor Kill:	Less than 100 fish
Moderate Kill:	100 to 1,000 fish in 1.6 km of stream or equivalent lentic area.
Major Kill:	More than 1,000 fish in 1.6 km of stream or equivalent lentic area.

By these standards, from October 1, 2007 to September 30, 2009, there were 5 minor fish kills in South Dakota. During this same time period, there were 5 moderate fish kills and one major fish kills.

It is extremely important that the initial phases of an investigation be performed at the earliest indication of a fish kill. The need for such urgency is due to the fact that fish degrade rapidly, and the cause of death may become unidentifiable within a very short time. Unfortunately, DENR is often notified days after an incident has occurred. For this reason, the department is occasionally unable to positively identify the event that caused the fish kill.

DENR reviews the cause(s) of a fish kill; the waterbody's designated beneficial uses, and the water quality sample data to determine impairment. Marginal fisheries may experience frequent fish kills, while semipermanent fisheries may experience occasional fish kills due to natural environmental conditions. DENR would consider a waterbody as impaired due to a fish kill if water quality data suggest that the cause of impairment is related to human influence. However, a waterbody that experiences a fish kill due to a single occurrence spill and has been remediated, will not be listed as impaired.

Table 35: Summary of Fish Kill Investigations

Date Reported	Fish Species	Kill Classification	Waterbody	County	Conclusions/Cause of Fish Kill
8/19/2009	black crappie	Minor	Dimock Lake	Hutchinson	Bacterial infection
7/22/2009	All	Minor	South Fork Whetstone River	Grant	Low DO (watershed assessment project planned that includes reach)
7/10/2009	lake herring	Minor	Lake Sharpe	Hughes	Coldwater species in Oahe entrained in powerhouse
6/18/2009	All	Major	Reliance Lake	Lyman	Winter kill
8/02/2008	All	Moderate	South Fork Whetstone River	Grant	Algae bloom - low DO
7/27/2008	All	Moderate	Dry Lake	Codington	Summer kill
7/25/2008	paddlefish, river carpsucker, channel catfish	Minor	White River (reported as Lake Francis Case)	Lyman	Heavy rains cause high flows and solids in the White River flushing dead fish down to Lake Francis Case
6/10/2008	black bullheads, sunfish	Minor	Covell Lake	Minnehaha	BOD spike after hard rain filled Covell Lake
5/20/2008	All	Moderate	Broadland Creek	Beadle	6000 gal ethanol spill from Heartland Grain in Huron
4/04/2008	All	Moderate	Twin Lakes	Jerauld	Winter kill
2/27/2008	All	Moderate	Pelican Lake	Codington	Winter kill

Unsafe Beaches

Recent monitoring data compiled for swimming beaches by the DENR Drinking Water Program appear in Table 36. Monitoring of the approximately 58 designated public beach areas in the state is conducted weekly during the swimming season from May to September. Water quality samples are collected by the municipality or governmental agency charged with managing the given waterbody. GF&P is often the monitoring agency responsible for managing lake swimming beaches in the state. Following analysis of samples by an approved lab, the Drinking Water Program in DENR will close a beach area if fecal bacteria concentrations exceed Beach Closure Standards. Beach closings are controlled by the entity regulating the swimming areas.

A waterbody is listed as impaired if three beach closures per season occurred in a consecutive three-week sampling period. A public beach is recommended for closure if the following fecal coliform levels are exceeded.

(1) Any three consecutive samples exceed 200 fecal coliform per 100 milliliters;
(2) Any two consecutive samples exceed 300 fecal coliform per 100 milliliters; or
(3) Any single sample exceeds 1,000 fecal coliform per 100 milliliters.

Table 36: Waterbodies Affected by Swimming Beach Closures

Waterbody	Sample Date	Closure	Pollutant	Result	Source	# of events
Lake Louise	6/22/09	yes	Fecal coliform	94,000	NPS	1
Lake Mitchell	7/6/09	yes	Fecal coliform	3,700	NPS	1

In 2008 and 2009, there were no waterbody impairments due to beach closures.

Fish Consumption Advisories

During the years 2008 and 2009, the Surface Water Quality Program, in partnership with the South Dakota Department of Game, Fish, and Parks sampled fish from a variety of sites. DENR has been collecting and actively studying fish flesh analysis data since 1994. The purpose of this work is to determine the concentration of various contaminants in fish to protect public health.

In 2008 and 2009, fish were collected from a total of 25 different sites:

Table 37: Waterbodies Sampled for Contaminants in Fish

Waterbody	County	Years Sampled
Piyas Lake	Marshall	2009
Lake Herman	Lake	2009, 1996
Stockade Lake	Custer	2009, 1998
Lake Sinai	Brookings	2009, 1996
Vermillion Lake	McCook	2009, 1996
Clear Lake	Marshall	2009, 1994
Elm Lake	Brown	2009, 1996
Lake Francis Case	Lyman	2009, 1996
Little Moreau #1	Dewey	2009, 2003, 2002, 1998
Newell Lake	Butte	2009, 2004, 2002
Pudwell Dam	Corson	2008, 2007,
Twin Lakes	Minnehaha	2008, 2007
Diamond Lake	Minnehaha	2008, 2004
Beaver Lake	Minnehaha	2008, 2006
Waubay Lake	Day	2008, 2001, 2000, 1999, 1998
Lake Hurley	Potter	2008, 2005, 2003, 2002
Lake Roosevelt	Tripp	2008, 2003, 2002
Pickerel Lake	Day	2008, 1994
Lake Madison	Lake	2008, 1994
Lake Mitchell	Davison	2008, 1994
Lake Albert	Grant	2008
Crooked Lake	Grant	2008
School Lake	Deuel	2008
Bullhead Lake	Roberts	2008
Hurricane Lake	Roberts	2008

Most samples are composites of fillets from five fish. Initial fish analysis for each waterbody typically includes the parameters listed below. Following receipt and study of initial data, intensive sampling for specific parameters may be performed. The parameters sampled are listed below.

Table 38: Contaminants Analyzed in Fish Flesh

PCB's	Pesticides		Metals
Aroclor 1016	DDT	DDD	Total Cadmium
Aroclor 1221	DDE	Aldrin	Total Selenium
Aroclor 1232	BHC-alpha	Dieldrin	Total Mercury
Aroclor 1242	BHC-beta	Endosulfan I	
Aroclor 1248	BHC-delta	Endosulfan II	
Aroclor 1254	BHC-gamma	Endosulfan Sulfate	
Aroclor 1260	Heptachlor	Chlordane	
Total PCBs	Heptachlor Epoxide	Toxaphene	
	Hexachlorobenzene	Endrin	
	Methoxychlor	Endrin Aldehyde	

The Food and Drug Administration (FDA) has set 1 ppm (part per million) total mercury as the action level for commercial fish. In South Dakota, the Department of Health is responsible for issuing fish consumption advisories. Please refer to Table 39 for specific fish consumption guidelines.

Table 39: Waterbodies Affected by Fish and Shellfish Consumption Restrictions

Name of Waterbody	Pollutant of Concern	Size Affected (acres)	Type of Fishing Restrictions				Consumption Guidelines
			Non Consumption		Limited Consumption		
			General Population	Sub-Population	General Population	Sub-Population	
Bitter Lake	mercury	3,228	-	-	1	1	Adults should eat no more than 7 ounces of fish per week. Women who plan to become pregnant, are pregnant, or are breast-feeding, should eat no more than 7 ounces per month. Children under age 7 should eat no more than 4 ounces per month
Lake Hurley	mercury	106	-	-	1	1	
Lake Isabel	mercury	113	-	-	1	1	
Roosevelt Lake	mercury	93	-	-	1	1	
Twin Lakes W. Hwy 81 (Kingsbury)	mercury	303	-	-	1	1	
North Island Lake	mercury	375	-	-	1	1	
Pudwell Dam	mercury	105	-	-	1	1	
Twin Lakes (Minnehaha)	mercury	287	-	-	1	1	

Domestic Water Supply Restrictions

There are currently no water consumption restrictions on waterbodies with the domestic water supply beneficial use. However, Firesteel Creek in the James River basin is listed as impaired for that use due to elevated total dissolved solids. Although Firesteel Creek is designated the domestic water supply beneficial use, the City of Mitchell is on rural water and only uses Firesteel Creek as a public water source in case of emergency. The following tables contain information on reach descriptions, pollutant causes, and pollutant sources.

Table 40: Waterbodies Affected by Domestic Water Supply Restrictions

Name of Waterbody	Waterbody Type	Type of Restriction			Cause(s) (Pollutant(s)) of Concern	Source(s) of Pollutants
		Closure[a] (Y/N)	Advisory[b] (Y/N)	Other (explain)		
None	-	-	-	-	-	-

[a] Closures restrict all consumption from a domestic water supply.
[b] Advisories require that consumers disinfect water (through boiling or chemical treatment before ingestions).

Table 41: Summary of Waterbodies Not Fully Supporting Domestic Water Supply Use

Waterbodies (List)	Source(s) of Data (√)			Characterization	Cause(s)
	Ambient	Finished	Use Restrictions		
River and Streams					
Firesteel Creek	√	√	None	Not Supporting	Total Dissolved Solids
Lakes and Reservoirs					
None	-	-	-	-	-

Table 42: Summary of Domestic Water Supply Use Assessments for Streams

Total Miles Designated for Domestic Water Supply Use 1,820

Total Miles Assessed for Domestic Water Supply Use 813

Miles Fully Supporting Domestic Water Supply Use	766	% Fully Supporting Domestic Water Supply Use	94%	Causes
Miles Fully Supporting but Vulnerable For Domestic Water Supply Use	-	% Fully Supporting but Vulnerable for Domestic Water Supply Use	-	
Miles Not Supporting Domestic Water Supply Use	36	% Not Supporting Domestic Water Supply Use	4%	Total Dissolved Solids
Total Miles Assessed for Domestic Water Supply Use	813			

Table 43: Summary of Domestic Water Supply Use Assessment for Lakes

Total Waterbody Acreage designated for Domestic Water Supply Use 7,995

Total Waterbody Acreage Assessed for Domestic Water Supply Use 7,995

Acres Fully Supporting Domestic Water Supply Use	7,995	% Fully Supporting Domestic Water Supply Use	100%	Causes
Acres Fully Supporting but Vulnerable For Domestic Water Supply Use	-	% Fully Supporting but Vulnerable for Domestic Water Supply Use	-	
Acres Not Supporting Domestic Water Supply Use	0	% Not Supporting Domestic Water Supply Use	0%	Total Dissolved Solids; Sulfates; pH
Total Acres Assessed for Domestic Water Supply Use	7,995			

IV. POLLUTION CONTROL PROGRAMS

POINT SOURCE POLLUTION CONTROL PROGRAM

The state received delegation of the federal National Pollutant Discharge Elimination System (NPDES) program from the United States Environmental Protection Agency (EPA) on December 30, 1993. The NPDES permits issued by the state are referred to as Surface Water Discharge (SWD) permits. EPA continues to issue NPDES permits in South Dakota for facilities over which they retained jurisdiction. As of September 30, 2009, a total of 345 individual NPDES SWD permits have been issued in South Dakota. In addition, DENR has issued coverage to 3,082 facilities under General Storm Water permits, 284 facilities under Multi-Media General permits (Storm Water & Air Quality), and 467 facilities under other General permits.

Technology-based controls are placed in most SWD and NPDES permits. However, technology-based controls alone do not necessarily protect waters of the state from toxic pollutants. Therefore, water quality-based limits and toxicity testing requirements are also placed in many of the permits.

Water quality-based limits are developed when technology-based limits alone are not adequate to protect the beneficial uses of the receiving stream. In these cases, the state develops water quality-based effluent limits to ensure the surface water quality standards are met and maintained.

The state continues to require whole effluent toxicity testing for all major SWD permittees and certain significant minors. The goal of the whole effluent toxicity approach is to ensure that point source discharges do not contain toxics in toxic amounts. If toxicity is found, the discharger is required to conduct an evaluation of the discharge to determine the source of the toxicity and eliminate the toxicity.

The South Dakota Surface Water Quality Standards contain the following provision concerning discharges to lakes:

> ***ARSD 74:51:01:27. Lakes not allowed a zone of mixing.*** *No zone of mixing is allowed for lakes. Discharges to lakes must meet the water quality standards at the point of discharge. No discharge of pollutants is allowed which reaches a lake classified for the beneficial use of coldwater permanent, coldwater marginal, warmwater permanent, warmwater semipermanent, or warmwater marginal fish life propagation or causes impairment of an assigned beneficial use.*

DENR's Surface Water Discharge permitting program regulates the discharge of pollutants from point sources. In most cases, DENR has not allowed discharges to lakes classified for the fish life propagation uses outlined in ARSD 74:51:01:27. However, there have been limited exceptions to this provision.

Many of South Dakota's streams eventually drain into classified lakes. If a point source discharges into a tributary of a lake, DENR takes into account the distance from the lake and the natural attenuation of any pollutants present before the discharge is permitted. During the reissuance of each of these permits, DENR re-evaluates these discharges. If DENR determines that a discharge has a potential to impact a classified lake, DENR has required the point source to cease its discharge to the classified lake. In addition, DENR has permitted discharges of relatively uncontaminated water to lakes.

To date, this approach has protected South Dakota's lakes and has not caused or contributed to a violation of the surface water quality standards from a point source discharge.

To help ensure that wastewater collection and treatment systems in the state are in compliance, the department provides cost share funding for their planning, design, and construction. The department administers the Clean Water State Revolving Fund (CWSRF) Loan Program which provides low interest loans to publicly owned wastewater facilities. The department's CWSRF Intended Use Plan establishes the criteria the department uses for fund awards. The Intended Use Plan can be accessed at:

http://denr.sd.gov/dfta/wwf/dwsrf/09DWSRFIUP.pdf

Between October 1, 2007, and September 30, 2009, the department's Board of Water and Natural Resources awarded a total of 56 CWSRF loans for a total amount of $103,593,538. These funds were used for the design and construction of sanitary sewer collection systems, wastewater treatment facilities, storm sewers, and nonpoint source implementation Best Management Practices (BMPs).

The current CWSRF interest rates are 2.25% for loans with a term of 10 years or less, 3.0% for loans with a term greater than 10 years up to 20 years, and 3.25% for loans with a term greater than 20 years up to a maximum of 30 years. There is also a nonpoint source incentive loan rate for select communities that are sponsoring a nonpoint source implementation project. The loan rate for these projects ranges from 1.25% for up to 10 years and 2.0% for up to 20 years.

CWSRF administrative surcharges have been used to assist in the design of manure management systems for concentrated animal feeding operations (CAFOs) and provide water quality grants for construction of manure management systems for livestock auction markets. EPA issued revised regulations in 2008 for CAFOs. DENR is in the process of making the necessary state changes. In fiscal year 2005, $2.5 million was allocated for grants to assist in the construction of manure management systems at livestock auction markets, since this was not eligible for assistance from the USDA Environmental Quality Incentive Program (EQIP). The grants reimburse 75% of actual construction and construction engineering costs, with the maximum grant amount for any recipient being $162,500. Through September 30, 2009, $2,366,678 was awarded to 18 livestock auction markets.

To encourage responsible and proactive engineering planning, the department also uses CWSRF administrative surcharge funds to cost share engineering planning for small communities (2,500 population and below). Between October 1, 2007, and September 30, 2009, the department awarded a total of $298,324 for 42 engineering studies.

South Dakota has a state water planning process that was established in 1972. This establishes an orderly planning process for water development. In addition, the state also developed a dedicated water funding program in 1993. The dedicated funding totals approximately $8 million annually. Between October 1, 2007, and September 30, 2009, $1,356,500 in state grants was awarded to 8 wastewater collection or treatment projects. Additionally, $1,470,000 in CWSRF administrative surcharge grants was awarded to 6 wastewater collection or treatment projects.

On February 17, 2009, President Obama signed the American Recovery and Reinvestment Act (ARRA) of 2009, commonly referred to as the Stimulus Bill or the Recovery Act. The State of South Dakota received Recovery Act funds totaling $19,239,100 for the CWSRF program. The most significant requirement of the Recovery Act was that at least 50 percent of the ARRA funds were required to be awarded as "additional subsidy." This could be in the form of grants, negative interest rate loans, or principal forgiveness on loans. Thirty-three projects were awarded principal forgiveness accounting for an adjusted total of $16,243,476. Another requirement of the Recovery Act was that at least 20 percent of the ARRA award be used to the extent practical for green infrastructure projects. Sufficient wastewater and storm water projects were identified as Clean Water SRF green infrastructure projects to meet the 20 percent green project reserve of $3,847,820. ARRA funds are included in the total $103,593,538 CWSRF loans awarded.

COST/BENEFIT ASSESSMENT

DENR provides the Governor and Legislature with annual reports summarizing water and wastewater development activities for the preceding calendar year. The 2008 and 2009 annual reports can be accessed at:

http://denr.sd.gov/documents.aspx#Funding

Information on operation and maintenance costs for local units of government is not readily available. Not all benefit data are readily available, but some information has been included in the Statewide Surface Water Quality Summary section of this report.

NONPOINT SOURCE POLLUTION CONTROL PROGRAM

South Dakota's nonpoint source (NPS) pollution management activities are implemented through the South Dakota Nonpoint Source Pollution Management Program. The primary focus of the program is the control of nonpoint source pollution through the use of voluntary implementation of best management practices (BMPs) and holistic resource management plans. The major sources of NPS pollution in South Dakota are summarized in Table 44.

The program coordinates its NPS control activities with local, state, and federal agencies and stakeholder organizations. These agencies and organizations provide BMPs and financial and technical assistance that increase the program's capacity to develop and implement NPS management projects.

The remainder of this section provides a summary that describes the South Dakota Nonpoint Source Pollution Management Program and the types of NPS projects that are being developed and implemented. Additional information concerning the program and projects may be obtained by consulting the South Dakota Nonpoint Source Management Program Plan and annual reports. Copies of these documents are available from the DENR, the South Dakota State Library, or by visiting:

http://denr.sd.gov/dfta/wp/wp.aspx

<u>South Dakota Nonpoint Source Management Program</u>

The South Dakota Nonpoint Source Pollution (NPS) Management Program is housed in DENR Water Resources Assistance Program (WRAP). NPS pollution activities completed by program staff are selected to improve, restore, and maintain the water quality of the state's lakes, streams wetlands, and ground water in partnership with other agencies, organizations, and citizen groups.

Implementation of the NPS Pollution Management Program is guided by the South Dakota Nonpoint Source Management Plan. The most recent revision of South Dakota's NPS Management Plan was submitted to EPA in December 2007. The NPS Management Plan:

- addresses the nine mandated elements required to access Section 319 incremental funds;
- expands on activities included in previous editions of the plan; and
- continues to achieve improved water quality through voluntary actions developed in partnership with the landowners and managers.

The primary tools selected to accomplish the tasks outlined in the plan include:

- technical and financial assistance delivered through program staff and project partnerships; and
- a comprehensive information and education effort.

A copy of the management plan is available upon request or by visiting:

http://denr.sd.gov/dfta/wp/NPSMgmtPlan07.pdf

The water quality assessment and implementation strategy outlined in the management plan directly addresses the development and implementation of TMDLs. The department established a goal of developing 11 TMDLs and implementing five work plans each year to complete the NPS TMDLs for all of the state's impaired waters within 13 years of initial listing.

A key element in implementing the South Dakota NPS Management Plan is the South Dakota Nonpoint Source Task Force. The task force is a citizen's advisory group composed of approximately 30 agencies, organizations, and tribal representatives. The task force:

- provides a forum for the exchange of information on activities that impact nonpoint source pollution control;
- prioritizes waterbodies for NPS control activities;
- provides guidance and application procedures for funding NPS control projects;
- reviews project applications;
- recommends projects to the South Dakota Board of Water and Natural Resources for funding approval;
- serves as the coordinating body for the review and direction of federal, state, and local government programs to ensure that the programs will achieve NPS pollution control efficiently;
- serves as a focal point for the information, education, and public awareness regarding NPS pollution control;
- provides oversight of NPS control activities and prioritize the activities; and
- provides a forum for discussion and resolution of program conflicts.

For additional information about the task force visit:

http://denr.sd.gov/dfta/wp/npstf.aspx

South Dakota Nonpoint Source Projects

Since the reauthorization of the Clean Water Act in 1987, the South Dakota NPS Pollution Management Program has used Section 319, 104(b)(3), 106, and 604(b), Pollution Prevention and state and local funding to support more than 245 NPS projects. During 2009, there were approximately 30 active NPS projects. The total includes 7 watershed assessment/total maximum daily load (TMDL) development, 20 watershed/TMDL implementation, two statewide BMP planning technical assistance, and one information and education (I&E) project. The technical assistance projects provide watershed project and TMDL development project sponsors with technical assistance for planning and arranging funding for livestock feeding and riparian management and other sediment and nutrient reduction BMP installation.

A list of the projects funded is contained in the South Dakota Nonpoint Source Management Program Annual Report. A copy of the report may be obtained from the South Dakota Department of Environment and Natural Resources, the South Dakota State Library, or by visiting:

http://denr.sd.gov/dfta/wp/npsannualreports.aspx

Project implementation plans, reports of project progress/results, and final reports for completed projects are available on the EPA Grants Reporting and Tracking System (GRTS). Copies of final reports are also available by contacting DENR or the South Dakota State Library. Electronic copies of the final report for many of the more recently completed projects are available on the State Library web site or by visiting:

http://denr.sd.gov/dfta/wp/wqinfo.aspx#Project

While the size, target audience, and structure of the projects vary; all share common elements:

- increase awareness of NPS pollution issues;
- identify, quantify, and locate sources of nonpoint source impairment;
- reduce or prevent the delivery of NPS pollutants to waters of the state with emphasis on meeting targets established through total maximum daily loads (TMDLs), and disseminate information about effective solutions to NPS pollution.

Although most of the projects fit into one of the following three categories: assessment/development, information and education (I&E), watershed implementation, most include components of each category.

A portion of the Section 319 funds awarded to the state has also been used to assess major aquifers in the state, and promote and implement practices that prevent ground water contamination.

Historically, the majority of the projects developed and implemented focused on reducing NPS pollution originating from agricultural operation. More recently, increased resources have been directed toward local initiatives that:

- evaluate water quality conditions;
- determine sources and causes of NPS pollution within priority watersheds; and
- develop and implement total maximum daily loads (TMDLs) for impaired waterbodies.

Waterbodies assessed are selected from those on the 303(d) list of impaired waterbodies. Activities included in implementation project work plans are selected to reach the TMDLs developed as part of the assessment process.

The primary purposes of assessment/development projects are:

- identify beneficial use impairments or threats to specific waterbodies; and
- determine the extent to which the threats or impairments are from NPS pollution.

TMDLs are prepared as a part of an assessment project. Activities completed during an assessment project include an inventory of existing data and information and supplemental monitoring, as needed, to allow an accurate assessment of the watershed. Through these efforts, local project sponsors are able to:

- determine the extent to which beneficial uses are impaired;
- identify specific sources and causes of the impairments;
- establish preliminary pollutant reduction goals or TMDL endpoints; and
- identify management practices and alternatives that will reduce the pollution at its source(s) and restore or maintain the beneficial uses of the waterbody.

The project period for assessment/development projects generally ranges from one to three years.

Information and education (I&E) projects are designed to provide information about NPS pollution issues and solutions. Information transfer tools typically used by the department and its project partners include brochures, print and electronic media, workshops, BMP implementation manuals, tours, exhibits, and demonstrations. I&E projects usually range from one to five years in length. During recent years the NPS Program has:

- focused a portion of its I&E efforts on the development of BMPs to improve management of nutrients originating from livestock operations through a partnership with the academic community; and
- formed a partnership with the South Dakota Discovery Center and Aquarium for the implementation of the statewide, coordinated I&E effort that target a wider cross section of the state's population.

Watershed projects are the most comprehensive type of project implemented through the South Dakota NPS Pollution Management Program. Watershed projects are typically long term in duration and designed to implement TMDLs that address NPS pollution sources and beneficial use impairments identified during the completion of an assessment project. Common watershed project objectives include:

- protect/restore impaired beneficial uses through the promotion and voluntary implementation of best management practices (BMPs) that prevent/reduce NPS pollution;
- disseminate information about NPS pollution and effective solutions; and
- evaluate project progress toward use attainment or NPS pollutant reduction goals.

Watershed projects typically range from four to ten years in length with the duration being dependent on the size of the watershed and extent of the NPS pollution impacts that must be addressed.

Nonpoint Source Pollution Control Program Funding Strategy

DENR receives approximately $3.2 million Section 319 funds annually from EPA. Administrative costs total about $680,000. The remaining $2.4 million is made available for project awards. DENR attempts to package the funding for TMDL assessment and implementation projects using a variety of other department, state, federal, or private funding.

Other department funds used for cost share include department fee funds, 604(b) funds, 106 funds, dedicated water development funding, Clean Water SRF administrative surcharge funds, and Clean Water SRF conventional loan funds.

State financial resources from other programs commonly used in implementing NPS projects include the Department of Agriculture's Soil and Water Conservation Grant funds, Game, Fish & Parks funds, and Water Development District funds. Private funds include Ducks Unlimited and Izaac Walton League.

For many TMDL assessment and implementation projects, DENR attempts to fund about half of the 40% nonfederal share needed to match the Section 319 funds.

Other federal funding sources commonly used in completing NPS projects include U.S. Bureau of Reclamation funds (or services), U.S. Department of Agriculture's Environmental Quality Incentive (EQIP), Wildlife Habitat Incentives, Wetlands Reserve, Grasslands Reserve and Conservation Reserve Programs; and EPA Pollution Prevention Program Grants. Local project partners are also encouraged to apply for EPA Region VIII Consolidated Funding Process and Information and Education Grant Program funds.

DENR is on schedule to complete the TMDL assessments for those waterbodies on the 1998, 2002, 2004, 2006, and 2008 303(d) lists. The department typically moves completed TMDLs to implementation within a year after completion.

The implementation projects can be expensive. To ensure that timely progress is made, DENR typically awards funds for an initial two to three year implementation project. A second segment is funded only if sufficient progress is made during the first phase.

Implementation projects funded are typically designed to implement multiple TMDLs in a geographic or river basin area. This practice increases efficiency in the use of limited financial resources and provides the local sponsor and its partners with the opportunity to hire a more highly skilled project staff.

Because the TMDL assessments in eastern South Dakota are showing high numbers of Animal Feeding Operations (AFOs) needing upgrades, DENR is now limiting Section 319 funding to AFOs, riparian areas, shoreline stabilization, and livestock exclusion practices. The department's project partners are urged to seek funding for other BMPs from EQIP and other state and federal programs referenced previously.

Implementation projects typically begin at about $200,000 and can run as high as several million dollars. The cost depends on the size of the watershed and the estimated number and types of BMPs needed to attain the project TMDL goal(s).

For information about specific South Dakota NPS projects funded using Clean Water Act Section 319 funds, contact DENR, or access EPA's Nonpoint Source Grants Reporting and Tracking System (GRTS) database.

Table 44: South Dakota Categories and Subcategories of NPS Pollution Sources

Agriculture	Resource Extraction/Exploration/Development
Crop Production	Surface Mining (historic)
Pasture grazing-riparian and upland	Subsurface Mining
Animal feeding operations	Petroleum activities
Rangeland – riparian and upland	Acid mine drainage
Silviculture	**Habitat Modification**
Harvesting, restoration, residue management	Removal of riparian vegetation
Forest management	Drainage/filling of wetlands
Logging road construction/maintenance	Streambank modification/destabilization
Bank or shoreline modification/destabilization	
Construction Runoff	**Urban Runoff**
<1 acre highway/road/bridge construction projects	Surface Runoff
Land development	Highway/road/bridge runoff
Channelization	
Other	
Dam construction	
Golf courses	
Atmospheric deposition	
Waste storage/storage tank leaks	
Spills	
Erosion and sedimentation	
Drought-related impacts	
Natural Sources	

Future Nonpoint Source Program Directions

NPS pollution originates from diverse sources. Nonpoint source pollution controls must reflect this by using all of the resources available from the various state, federal, and local organizations and in addition, have landowner support and participation. The technical and financial assistance currently available is not sufficient to solve all of the NPS pollution problems in the state. Additional solutions must be tried. Landowners have the capability to accomplish much if they understand the problems and the ways to solve them. Educating the public about NPS pollution issues may prompt landowners to voluntarily implement activities to control NPS pollution. New federal programs must also be developed to supplement existing programs. The continuation of existing activities coupled with the addition of innovative new programs will ensure that South Dakota remains a leader in nonpoint source pollution control. Figure 27 depicts the status of TMDL assessment and implementation projects within South Dakota.

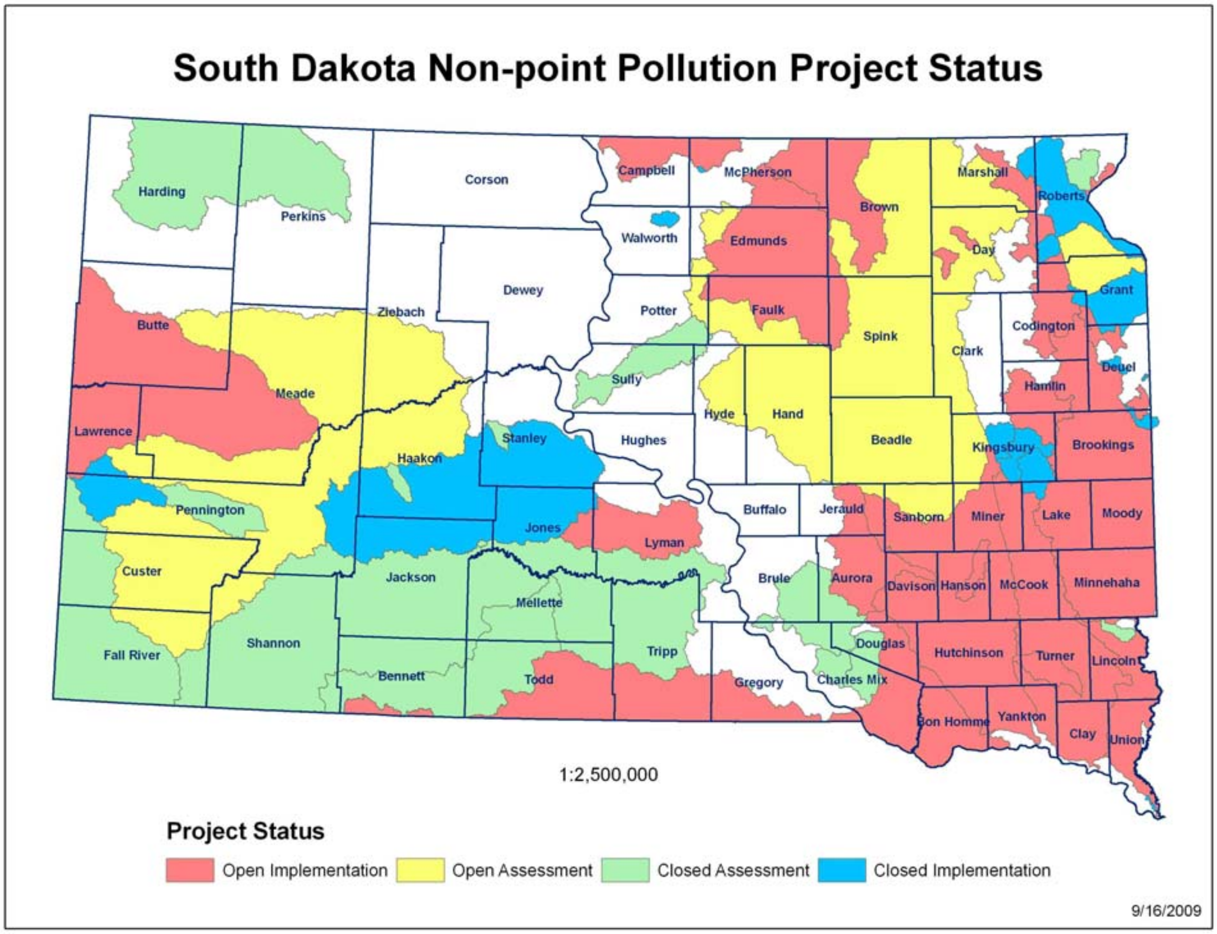

Figure 27: Status of TMDL Assessment Implementation Projects

V. PUBLIC PARTICIPATION PROCESS

To fulfill the requirements of the federal Clean Water Act and involve the affected community and stakeholders in the water quality improvement process, a public participation process is implemented. Summarized below are the procedures employed by DENR to involve the public and affected parties.

Process Description

First Public Review/Input Period
An ad is published in approximately 11 statewide daily newspapers, announcing DENR is developing the Integrated Report and requesting water quality data that will aid in the assessment of South Dakota's waters. This announcement is also sent to approximately 70 individuals and organizations.

Second Public Review Period
Data received after the first public review period and additional data gathered by DENR are reviewed and a draft Integrated Report is developed. The draft report is released for a 30-day public review and comment period. The announcement on the availability of the draft report is again published in the 11 daily newspapers. The draft report is also made available on DENR's web page at: http://denr.sd.gov/draftir2010.pdf. At this time, the draft list is also provided to EPA Region VIII for review and comment.

Personnel from DENR respond to inquiries and are available to meet with interested groups about the list and listing process. Copies of public participation documents and responses to oral and written comments received during the comment period are included in Appendix G.

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VII. KEY TO ABBREVIATIONS

ADB – EPA's Assessment Database (used for IR development)
AGNPS – agricultural nonpoint source computer model
ARSD – Administrative Rules of South Dakota
ARRA – American Recovery and Reinvestment Act
BMP – best management practice
CSO – Combined Sewer Overflow
CWA – Clean Water Act
CWSRF – Clean Water State Revolving Fund
DENR – Department of Environment and Natural Resources
DO – dissolved oxygen
EPA – Environmental Protection Agency
EQIP – Environmental Quality Incentive Program
GF&P – South Dakota Department of Game, Fish and Parks
GRTS – EPA Grants Reporting and Tracking System
I & E – information and education projects
IPCL – Index of Plant Community Integrity
LA – Lake Assessment
NPDES – National Pollutant Discharge Elimination System
NPS – Nonpoint Source
NRCS – Natural Resources Conservation Service (formerly SCS)
NWI – National Wetlands Inventory
QA – quality assurance
QC – quality control
SAR – Sodium adsorption ratio
SDCL – South Dakota Codified Law
SDSWQS – South Dakota Surface Water Quality Standards
SSO – Sanitary sewer overflow
STORET – EPA computer data storage and retrieval system
SWD – Surface Water Discharge
SWLA – Statewide Lakes Assessments
TDS – total dissolved solids
TMDL – Total Maximum Daily Load
TSI – Carlson's (1997) Trophic State Indices
TSS – total suspended solids
USACE – United States Army Corp of Engineers
USDA – United States Department of Agriculture
USGS – United States Geological Survey
WQM – ambient water quality monitoring
WQS – water quality standards
WQX – EPA's Water Quality Exchange database
WRAP – Water Resources Assistance Program
USFWS – United States Fish and Wildlife Service

APPENDICES

APPENDIX A

WATERBODIES WITH EPA APPROVED TMDLS

River Basin	Waterbody	Segment or Lake Location	Impairment	TMDL Approved
Bad	Freeman Lake	Jackson County	Nitrates/Selenium	2/7/01
Bad	Hayes Lake	Stanley County	TSI	9/29/04
Bad	Bad River	Stanley County line to mouth	TSS	2/7/01
Belle Fourche	Bear Butte Cr.	Strawberry Cr. To near Bear Den Mountain	TSS	8/8/07
Belle Fourche	Belle Fourche River	Wyoming to near Fruitdale	TSS	2/2/05
Belle Fourche	Belle Fourche River	Near Fruitdale to Whitewood Creek	TSS	2/2/05
Belle Fourche	Belle Fourche River	Whitewood Creek to Willow Creek	TSS	2/2/05
Belle Fourche	Belle Fourche River	Willow Creek to Alkali Creek	TSS	2/2/05
Belle Fourche	Belle Fourche River	Alkali Creek to mouth	TSS	2/2/05
Belle Fourche	Horse Creek	Indian Creek to mouth	TSS	2/2/05
Big Sioux	Lake Alvin	Lincoln County	TSI/Fecal	11/9/01
Big Sioux	Blue Dog Lake	Day County	TSI/Fecal	2/7/01
Big Sioux	Brant Lake	Lake County	TSI	4/12/99
Big Sioux	Clear Lake	Deuel County	TSI	2/7/01
Big Sioux	East Oakwood Lake	Brookings County	TSI	6/13/08
Big Sioux	Lake Herman	Lake County	TSI	9/29/04
Big Sioux	Lake Madison	Lake County	TSI/fish kill	4/12/99
Big Sioux	Lake Kampeska	Codington County	Nutrients-special approval	12/26/96
Big Sioux	Pelican Lake	Codington County	Nutrients-special approval	12/26/96
Big Sioux	School Lake	Deuel County	TSI	9/2/08
Big Sioux	West Oakwood Lake	Brookings County	TSI	6/13/08
Big Sioux	Lake Poinsett	Hamlin County	Nutrients-special approval	11/26/96
Big Sioux	Beaver Creek	Split Rock Creek to SD-MN border	Fecal/TSS	5/28/08
Big Sioux	Big Sioux River	Willow Creek to Stray Horse Creek	Fecal	6/4/08
Big Sioux	Big Sioux River	I-29 to near Dell Rapids	TSS	5/28/08
Big Sioux	Big Sioux River	Near Dell Rapids to Below Baltic	Fecal	5/28/08
Big Sioux	Big Sioux River	Above Brandon to Nine Mile Creek	Fecal	1/23/08
Big Sioux	Big Sioux River	Nine Mile Creek to near Fairview	Fecal	1/23/08
Big Sioux	Big Sioux River	Fairview to near Alcester	Fecal	1/23/08
Big Sioux	Big Sioux River	Fairview to near Alcester	TSS	2/1/10
Big Sioux	Big Sioux River	Near Alcester to Indian Creek	Fecal	1/23/08
Big Sioux	Big Sioux River	Near Alcester to Indian Creek	TSS	2/1/10
Big Sioux	Big Sioux River	Indian Creek to Mouth	Fecal	1/23/08

River Basin	Waterbody	Segment or Lake Location	Impairment	TMDL Approved
Big Sioux	Big Sioux River	Indian Creek to Mouth	TSS	1/23/08
Big Sioux	Flandreau Creek	Big Sioux River to MN border	Fecal	5/28/08
Big Sioux	Hidewood Creek	Big Sioux River to US Hwy 77	Fecal	6/4/08
Big Sioux	Jack Moore Creek	Big Sioux River to S33, T 107N, R 49W	Fecal	5/28/08
Big Sioux	North Deer Creek	Six Mile Creek to US Hwy 77	Fecal	5/28/08
Big Sioux	Pipestone Creek	Split Rock Creek to MN border	Fecal	5/28/08
Big Sioux	Skunk Creek	Brandt Lake to mouth	Fecal	5/28/08
Big Sioux	Split Rock Creek	At Corson, SD	TSS/Fecal	5/28/08
Big Sioux	Spring Creek	Big Sioux River to S22, T109N, R47W	Fecal	5/28/08
Big Sioux	Stray Horse Creek	Big Sioux River to S26, T116N, R51W	Fecal	6/4/08
Big Sioux	Willow Creek	Big Sioux River to S7, T117N, R50W	Fecal	6/4/08
Cheyenne	Center Lake	Custer County	TSI	8/8/07
Cheyenne	Legion Lake	Custer County	TSI	9/2/08
Cheyenne	Sheridan Lake	Pennington County	TSI	8/30/06
Cheyenne	Sylvan Lake	Custer County	TSI	9/1/05
Cheyenne	Spring Creek	Headwaters to Sheridan Lake	Fecal	12/11/08
James	Cottonwood Lake	Spink County	TSI/pH	11/9/01
James	Cresbard Lake	Faulk County	TSI	12/3/03
James	Elm Lake	Brown County	TSI	4/12/99
James	Lake Faulkton	Faulk County	TSI/Sediment	4/12/99
James	Lake Hanson	Hanson County	TSI/Sediment	6/3/04
James	Jones Lake	Hand County	TSI	4/2/03
James	Lake Louise	Hand County	TSI/Fecal	11/9/01
James	Loyalton Dam	Edmunds County	TSI	4/2/03
James	Mina Lake	Edmunds County	TSI	4/2/03
James	Moccasin Creek	Aberdeen to Warner	Ammonia	3/19/01
James	Ravine Lake	Beadle County	TSI/Fecal	4/12/99
James	Redfield Lake	Spink County	TSI	4/12/99
James	Richmond Lake	Brown County	TSI	8/8/07
James	Rose Hill Lake	Hand County	TSI	4/2/03
James	Lake Byron	Beadle County	Nutrients-special approval	4/12/99
James	Lake Mitchell	Davison County	Nutrients-special approval	4/22/97
James	Lake Redfield	Spink County	Nutrients-special approval	4/12/99
James	Firesteel Creek	West Fork Firesteel to mouth	Nutrients-special approval	4/22/97
James	Pierre Creek	James River to S11, T102N, R58W	Fecal	9/29/09
Minnesota	Lake Alice	Deuel County	TSI	6/3/04
Minnesota	Fish Lake	Deuel County	TSI	9/29/04
Minnesota	Lake Hendricks	Brookings County	TSI	4/12/99
Minnesota	Lake Oliver	Deuel County	TSI	11/9/01
Minnesota	Punished Woman Lake	Codington County	TSI	2/7/01

River Basin	Waterbody	Segment or Lake Location	Impairment	TMDL Approved
Minnesota	Big Stone Lake	Roberts County	Nutrients-special approval	12/26/96
Missouri	Brakke Dam	Lyman County	TSI	9/29/04
Missouri	Burke Lake	Gregory County	DO/pH/TSI	8/8/07
Missouri	Byre Lake	Lyman County	TSI	6/3/04
Missouri	Corsica Lake	Douglas County	TSI	8/30/06
Missouri	Dante Lake	Charles Mix County	TSI/DO	9/27/06
Missouri	Geddes Lake	Charles Mix County	TSI	5/6/08
Missouri	Fate Dam	Lyman County	TSI	1/14/05
Missouri	Hiddenwood Lake	Walworth County	TSI/Sediment	4/12/99
Missouri	McCook Lake	Union County	TSI	4/12/99
Missouri	Medicine Creek	US Hwy 83 to mouth	Fecal/TSS	8/30/06
Missouri	Emanuel Creek	Lewis and Clark Lake to S20, T94N, R60W	Fecal/TSS	9/29/09
Missouri	Lake Sharpe		Sediment	2/7/01
Niobrara	Keya Paha River	Keya Paha to NE border	TSS	9/29/09
Niobrara	Keya Paha River	Keya Paha to NE border	Fecal	2/1/10
Red River	White Lake	Marshall County	DO/TSI	8/20/06
Vermillion	Swan Lake	Turner County	TSI	4/12/99
Vermillion	Turkey Ridge Creek	Vermillion River to S31, T98N, R53W	Fecal	9/27/06

APPENDIX B

DENR 2010 WATERBODY DELISTING REPORT

South Dakota Department of Environment and Natural Resources
2010 Delisting Report

Basin	Waterbody/AUID	Location/2010 Category	Cause	Delisting Reason
Bad River	Freeman Lake SD-BA-L-FREEMAN_01	Jackson County 5	Fecal Coliform	Applicable WQS attained; reason for recovery unspecified
	Freeman Lake SD-BA-L-FREEMAN_01	Jackson County 5	Tropic State Index	Applicable WQS attained; according to new assessment method
	Murdo Dam SD-BA-L-MURDO_01	Jones County 1	Total Dissolved Solids	Applicable WQS attained; due to change in WQS
	Waggoner Lake SD-BA-L-WAGGONER_01	Haakon County 1	Tropic State Index	Applicable WQS attained; according to new assessment method
	Bad River SD-BA-R-BAD_01	Stanley County line to mouth 1	Total Dissolved Solids	Applicable WQS attained; threatened water no longer threatened
Belle Fourche River	Spearfish Creek SD-BF-R-SPEARFISH_02	Annie Creek to McKinley Gulch 1	pH	Applicable WQS attained; threatened water no longer threatened
	Spearfish Creek SD-BF-R-SPEARFISH_03	McKinley Gulch to Cleopatra Creek 1	pH	Applicable WQS attained; threatened water no longer threatened
	Strawberry Creek SD-BF-R-STRAWBERRY_01	Bear Butte Creek to S5, T4N, R4E 5	Copper	Applicable WQS attained; due to restoration activities
	Strawberry Creek SD-BF-R-STRAWBERRY_01	Bear Butte Creek to S5, T4N, R4E 5	pH	Applicable WQS attained; due to restoration activities
	Strawberry Creek SD-BF-R-STRAWBERRY_01	Bear Butte Creek to S5, T4N, R4E 5	Zinc	Applicable WQS attained; due to restoration activities

Basin	Waterbody/AUID	Location	Cause	Delisting Reason
Belle Fourche River	West Strawberry Creek SD-BF-R-W_STRAWBERRY_01	Headwaters to mouth 5	Temperature, water	Applicable WQS attained; reason for recovery unspecified
Big Sioux	Lake Albert SD-BS-L-ALBERT_01	Kingsbury County 1	pH	Applicable WQS attained; reason for recovery unspecified
	Lake Albert SD-BS-L-ALBERT_01	Kingsbury County 1	Tropic State Index	Applicable WQS attained; according to new assessment method
	Bullhead Lake SD-BS-L-BULLHEAD_01	Deuel County 5	Tropic State Index	Applicable WQS attained; according to new assessment method
	Lake Campbell SD-BS-L-CAMPBELL_01	Brookings County 1	Tropic State Index	Applicable WQS attained; according to new assessment method
	Covell Lake SD-BS-L-COVELL_01	Minnehaha County 2	Tropic State Index	Applicable WQS attained; according to new assessment method
	East Oakwood Lake SD-BS-L-E_OAKWOOD_01	Brookings County 1	Tropic State Index	Applicable WQS attained; according to new assessment method
	Lake Norden SD-BS-L-NORDEN_01	Hamlin County 5	Tropic State Index	Applicable WQS attained; according to new assessment method
	School Lake SD-BS-L-SCHOOL_01	Deuel County 1	Tropic State Index	Applicable WQS attained; according to new assessment method
	Lake St. John SD-BS-L-ST_JOHN_01	Hamlin County 1	Tropic State Index	Applicable WQS attained; according to new assessment method
	West Oakwood Lake SD-BS-L-W_OAKWOOD_01	Brookings County 1	Tropic State Index	Applicable WQS attained; according to new assessment method

Basin	Waterbody/AUID	Location/2010 Category	Cause	Delisting Reason
Big Sioux	Beaver Creek SD-BS-R-BEAVER_02	Split Rock Creek to South Dakota -Minnesota border 4a	Fecal Coliform	TMDL approved or established by EPA (4A)
	Beaver Creek SD-BS-R-BEAVER_02	Split Rock Creek to South Dakota -Minnesota border 4a	Total Suspended Solids (TSS)	Applicable WQS attained; reason for recovery unspecified
	Big Sioux River SD-BS-R-BIG_SIOUX_02	Lake Kampeska to Willow Creek 1	Nitrates	Applicable WQS attained; due to change in WQS
	Big Sioux River SD-BS-R-BIG_SIOUX_03	Willow Creek to Stray Horse Creek 5	Fecal Coliform	TMDL approved or established by EPA (4A)
	Big Sioux River SD-BS-R-BIG_SIOUX_03	Willow Creek to Stray Horse Creek 5	Nitrates	Applicable WQS attained; due to change in WQS
	Big Sioux River SD-BS-R-BIG_SIOUX_04	Stray Horse Creek to near Volga 1	Total Suspended Solids (TSS)	Applicable WQS attained; reason for recovery unspecified
	Big Sioux River SD-BS-R-BIG_SIOUX_08	S2, T104N, R49W to I-90 5	Fecal Coliform	TMDL approved or established by EPA (4A)
	Big Sioux River SD-BS-R-BIG_SIOUX_13	Above Brandon to Nine Mile Creek 4a	Fecal Coliform	TMDL approved or established by EPA (4A)
	Big Sioux River SD-BS-R-BIG_SIOUX_14	Nine Mile Creek to near Fairview 5	Fecal Coliform	TMDL approved or established by EPA (4A)
	Big Sioux River SD-BS-R-BIG_SIOUX_15	Fairview to near Alcester 4a	Fecal Coliform	TMDL approved or established by EPA (4A)
	Big Sioux River SD-BS-R-BIG_SIOUX_15	Fairview to near Alcester 4a	Total Suspended Solids (TSS)	TMDL approved or established by EPA (4A)
	Big Sioux River SD-BS-R-BIG_SIOUX_16	Near Alcester to Indian Creek 4a	Fecal Coliform	TMDL approved or established by EPA (4A)

Basin	Waterbody/AUID	Location/2010 Category	Cause	Delisting Reason
Big Sioux River	Big Sioux River SD-BS-R-BIG_SIOUX_16	Near Alcester to Indian Creek 4a	Total Suspended Solids (TSS)	TMDL approved or established by EPA (4A)
	Big Sioux River SD-BS-R-BIG_SIOUX_17	Indian Creek to mouth 4a	Fecal Coliform	TMDL approved or established by EPA (4A)
	Big Sioux River SD-BS-R-BIG_SIOUX_17	Indian Creek to mouth 4a	Total Suspended Solids (TSS)	TMDL approved or established by EPA (4A)
	Flandreau Creek SD-BS-R-FLANDREAU_01	Big Sioux River to Minnesota Border 4a	Fecal Coliform	TMDL approved or established by EPA (4A)
	Hidewood Creek SD-BS-R-HIDEWOOD_01	Big Sioux River to U.S. Highway 77 4a	Fecal Coliform	TMDL approved or established by EPA (4A)
	Jack Moore Creek SD-BS-R-JACK_MOORE_01	Big Sioux River to S33, T107N, R49W 1	Fecal Coliform	Applicable WQS attained; reason for recovery unspecified
	North Deer Creek SD-BS-R-NORTH_DEER_01	Six Mile Creek to U.S. Highway 77 5	Fecal Coliform	Applicable WQS attained; reason for recovery unspecified
	Pipestone Creek SD-BS-R-PIPESTONE_01	Split Rock Creek to Minnesota border 5	Fecal Coliform	TMDL approved or established by EPA (4A)
	Skunk Creek SD-BS-R-SKUNK_01	Brandt Lake to Big Sioux River 1	Fecal Coliform	Applicable WQS attained; reason for recovery unspecified
	Split Rock Creek SD-BS-R-SPLIT_ROCK_01_USGS	At Corson, SD 4a	Fecal Coliform	TMDL approved or established by EPA (4A)
	Spring Creek SD-BS-R-SPRING_01	Big Sioux River to S22, T109, R47W 4a	Fecal Coliform	TMDL approved or established by EPA (4A)
	Stray Horse Creek SD-BS-R-STRAYHORSE_01	Big Sioux River to S26, T116N, R51W 4a	Fecal Coliform	TMDL approved or established by EPA (4A)
	Willow Creek SD-BS-R-WILLOW_01	Big Sioux River to S7, T117N, R50W 4a	Fecal Coliform	TMDL approved or established by EPA (4A)

Basin	Waterbody/AUID	Location/2010 Category	Cause	Delisting Reason
Cheyenne River	Angostura Reservoir SD-CH-L-ANGOSTURA_01	Fall River County 1	Sulfates	Applicable WQS attained; due to change in WQS
	Angostura Reservoir SD-CH-L-ANGOSTURA_01	Fall River County 1	Total Dissolved Solids	Applicable WQS attained; due to change in WQS
	Center Lake SD-CH-L-CENTER_01	Custer County 5	Tropic State Index	Applicable WQS attained; according to new assessment method
	Curlew Lake SD-CH-L-CURLEW_01	Meade County 5	Tropic State Index	Applicable WQS attained; according to new assessment method
	New Wall Lake SD-CH-L-NEW_WALL_01	Pennington County 5	Tropic State Index	Applicable WQS attained; according to new assessment method
	Sheridan Lake SD-CH-L-SHERIDAN_01	Pennington County 5	pH	Applicable WQS attained; reason for recovery unspecified
	Sylvan Lake SD-CH-L-SYLVAN_01	Custer County 5	pH	Applicable WQS attained; according to new assessment method
	Hat Creek SD-CH-R-HAT_01_USGS	Near Edgemont, SD 2	Specific Conductance	Applicable WQS attained; reason for recovery unspecified
	Rapid Creek SD-CH-R-RAPID_02	Pactola Reservoir to Canyon Lake 1	Temperature, water	Applicable WQS attained; reason for recovery unspecified
	Spring Creek SD-CH-R-SPRING_01	S5, T2S, R3E to Sheridan Lake 5	Fecal Coliform	TMDL approved or established by EPA (4A)
Grand River	Flat Creek Dam SD-GR-L-FLAT_CREEK_01	Perkins County 1	Tropic State Index	Applicable WQS attained; according to new assessment method
	Lake Isabel SD-GR-L-ISABEL_01	Dewey County 5	pH	Applicable WQS attained; according to new assessment method

Basin	Waterbody/AUID	Location/2010 Category	Cause	Delisting Reason
Grand River	Lake Isabel SD-GR-L-ISABEL_01	Dewey County 5	Tropic State Index	Applicable WQS attained; according to new assessment method
	Shadehill Reservoir SD-GR-L-SHADEHILL_01	Perkins County 5	Chloride	Applicable WQS attained; original basis for listing was incorrect
	Shadehill Reservoir SD-GR-L-SHADEHILL_01	Perkins County 5	Total Dissolved Solids	Applicable WQS attained; reason for recovery unspecified
	Grand River SD-GR-R-GRAND_01	Shadehill Reservoir to Corson County line 5	pH	Applicable WQS attained; reason for recovery unspecified
	Grand River SD-GR-R-GRAND_03	Bullhead to mouth 5	Temperature, water	Applicable WQS attained; reason for recovery unspecified
James River	Beaver Lake SD-JA-L-BEAVER_01	Yankton County 1	Tropic State Index	Applicable WQS attained; according to new assessment method
	Bierman Dam SD-JA-L-BIERMAN_01	Spink County 1	Tropic State Index	Applicable WQS attained; according to new assessment method
	Lake Carthage SD-JA-L-CARTHAGE_01	Miner County 1	Tropic State Index	Applicable WQS attained; according to new assessment method
	Rosette Lake SD-JA-L-ROSETTE_01	Edmunds County 1	Tropic State Index	Applicable WQS attained; according to new assessment method
	Roy Lake SD-JA-L-ROY_01	Marshall County (formerly SD-BS-L-ROY_01) 1	Tropic State Index	Applicable WQS attained; according to new assessment method
	South Red Iron Lake SD-JA-L-S_RED_IRON_01	Marshall County (formerly SD-BS-L-S_RED_IRON_01) 1	Tropic State Index	Applicable WQS attained; according to new assessment method

Basin	Waterbody/AUID	Location/2010 Category	Cause	Delisting Reason
James River	Twin Lakes SD-JA-L-TWIN_01	Sanborn County 1	Tropic State Index	Applicable WQS attained; according to new assessment method
	Wilmarth Lake SD-JA-L-WILMARTH_01	Aurora County 1	Tropic State Index	Applicable WQS attained; according to new assessment method
	Firesteel Creek SD-JA-R-FIRESTEEL_01	West Fork Firesteel Creek to mouth 5	Temperature, water	Applicable WQS attained; reason for recovery unspecified
	Moccasin Creek SD-JA-R-MOCCASIN_01	S24, T123N, R64W to headwaters 1	Fecal Coliform	Applicable WQS attained; original basis for listing was incorrect
	Pierre Creek SD-JA-R-PIERRE_01	James River to S11, T102N, R58W 5	Fecal Coliform	TMDL approved or established by EPA (4A)
Missouri River	Academy Lake SD-MI-L-ACADEMY_01	Charles Mix County 1	Tropic State Index	Applicable WQS attained; according to new assessment method
	Lake Andes SD-MI-L-ANDES_01	Charles Mix County 5	Tropic State Index	Applicable WQS attained; according to new assessment method
	Lake Campbell SD-MI-L-CAMPBELL_01	Campbell County 5	Tropic State Index	Applicable WQS attained; according to new assessment method
	Corsica Lake SD-MI-L-CORSICA_01	Douglas County 1	Oxygen, Dissolved	Applicable WQS attained; reason for recovery unspecified
	Corsica Lake SD-MI-L-CORSICA_01	Douglas County 1	pH	Applicable WQS attained; reason for recovery unspecified
	Corsica Lake SD-MI-L-CORSICA_01	Douglas County 1	Tropic State Index	Applicable WQS attained; according to new assessment method

Basin	Waterbody/AUID	Location/2010 Category	Cause	Delisting Reason
Missouri River	Cottonwood Lake SD-MI-L-COTTONWOOD_01	Sully County 1	Tropic State Index	Applicable WQS attained; according to new assessment method
	Geddes Lake SD-MI-L-GEDDES_01	Charles Mix County 5	Tropic State Index	Applicable WQS attained; according to new assessment method
	Platte Lake SD-MI-L-PLATTE_01	Charles Mix County 1	Tropic State Index	Applicable WQS attained; according to new assessment method
	Lake Pocasse SD-MI-L-POCASSE_01	Campbell County 5	Tropic State Index	Applicable WQS attained; according to new assessment method
	Sully Dam SD-MI-L-SULLY_DAM_01	Tripp County 2	Tropic State Index	Applicable WQS attained; according to new assessment method
	Emanuel Creek SD-MI-R-EMANUEL_01	Lewis and Clark Lake to S20, T94N, R60W 5	Fecal Coliform	TMDL approved or established by EPA (4A)
	Emanuel Creek SD-MI-R-EMANUEL_01	Lewis and Clark Lake to S20, T94N, R60W 5	Total Suspended Solids (TSS)	TMDL approved or established by EPA (4A)
	Ponca Creek SD-MI-R-PONCA_01	SD/NE border to US Hwy 183 5	Total Suspended Solids (TSS)	Applicable WQS attained; reason for recovery unspecified
	Slaughter Creek SD-MI-R-SLAUGHTER_01	Missouri River to headwaters 1	Specific Conductance	Applicable WQS attained; due to change in WQS
	Slaughter Creek SD-MI-R-SLAUGHTER_01	Missouri River to headwaters 1	Total Dissolved Solids	Applicable WQS attained; due to change in WQS
	Spring Creek SD-MI-R-SPRING_01	Lake Pocasse to US HWY 83 5	Total Suspended Solids (TSS)	Applicable WQS attained; reason for recovery unspecified

Basin	Waterbody/AUID	Location/2010 Category	Cause	Delisting Reason
Moreau River	Dewberry Dam SD-MU-L-DEWBERRY_01	Dewey County 3	Tropic State Index	Applicable WQS attained; according to new assessment method
Niobrara River	Rahn Lake SD-NI-L-RAHN_01	Tripp County 1	Tropic State Index	Applicable WQS attained; according to new assessment method
	Keya Paha River SD-NI-R-KEYA_PAHA_01	SD/NE border to confluence with Antelope Creek 5	Total Suspended Solids (TSS)	TMDL approved or established by EPA (4A)
	Keya Paha River SD-NI-R-KEYA_PAHA_01	SD/NE border to confluence with Antelope Creek 5	Fecal coliform	TMDL approved or established by EPA (4A)
Red River	Lake Traverse SD-RD-L-TRAVERSE_01	Roberts County 1	Tropic State Index	Applicable WQS attained; according to new assessment method
Vermillion River	East Vermillion Lake SD-VM-L-E_VERMILLION_01	McCook County 1	Tropic State Index	Applicable WQS attained; according to new assessment method
	Silver Lake SD-VM-L-SILVER_01	Hutchinson County 5	Tropic State Index	Applicable WQS attained; according to new assessment method
	Whitewood Lake SD-VM-L-WHITEWOOD_01	Kingsbury County 1	Tropic State Index	Applicable WQS attained; according to new assessment method
White River	Little White River SD-WH-R-LITTLE_WHITE_01	Rosebud Creek to mouth 5	Total Suspended Solids (TSS)	Applicable WQS attained; due to change in WQS
	White River SD-WH-R-WHITE_01	NE/SD border to Willow Creek 5	Total Suspended Solids (TSS)	Applicable WQS attained; due to change in WQS
	White River SD-WH-R-WHITE_02	Willow Creek to Pass Creek 5	Total Suspended Solids (TSS)	Applicable WQS attained; due to change in WQS
	White River SD-WH-R-WHITE_03	Pass Creek to Little White River 5	Total Suspended Solids (TSS)	Applicable WQS attained; due to change in WQS

Basin	Waterbody/AUID	Location/2010 Category	Cause	Delisting Reason
White River	White River SD-WH-R-WHITE_04	Little White River to confluence with Missouri River 5	Total Suspended Solids (TSS)	Applicable WQS attained; due to change in WQS

APPENDIX C

SUPPLEMENTAL TSI DELISTING INFORMATION

Since the 1998 listing cycle, DENR Watershed Protection has used three Trophic State Index (TSI) approaches to target lake impairment. The first approach established that all lakes statewide must meet an average growing season TSI of 55.5. The second approach used level III ecoregions as a classification tool for setting region specific TSI targets (Stueven et. al, 2000). The latest approach used the fishery beneficial use classification to set specific TSI targets based on trophic state categories (WRAP, 2005).

The TSI approach was originally administered to address narrative standards (74:51:01:05, 06, 08, 09) that in many ways prohibit the undesired eutrophication of lakes. The primary focus of TSI was to allow South Dakota to focus on nutrient loading, in particular phosphorus, as part of a comprehensive watershed approach with the final endpoint to maintain or improve the trophic state of lakes. Because TSI was not directly associated with a particular beneficial use, it was assigned to all beneficial uses (1998-2002 listing cycles) and most recently the fishery beneficial use (2004-2008 listing cycles) for making support determinations and impairment decisions. No matter what TSI approach was used, many challenges were encountered with respect to trophic state characterization, beneficial use support linkage, and TMDL development.

The TSI concept was originally developed from a subset of Midwestern lakes that primarily displayed phosphorus limitation (Carlson, 1977). Phosphorus limitation was relational to algae biomass, water clarity, and ultimately trophic state of a lake. Carlson (1991) later cautioned water resource managers about the potential to misclassify the trophic state of non-phosphorus limited lakes. In phosphorus-limited waters the indices (phosphorus, chlorophyll and Secchi depth) are expected to be interrelated. However, in non phosphorus-limited waters significant deviation is expected to occur between the phosphorus index and the other indices, in particular, the chlorophyll index.

The majority of assessed lakes and reservoirs in South Dakota are considered non phosphorus-limited. Implications for many of the assessed lakes are that some variable other than phosphorus is limiting algal growth. Water transparency in most of the assessed lakes in South Dakota appears to be driven primarily by non algal turbidity or biological processes like zooplankton grazing. Modeled phosphorus reductions required to meet numeric TSI targets often far exceed attainable levels.

Lakes were often considered in full support based on numeric water quality standards though impaired for TSI. A clear linkage was not often evident to suggest that the beneficial use was impaired due to exceeding the TSI target. Because the TSI approach was developed to address narrative standards associated with eutrophication and not necessarily to derive support of a classified beneficial use, it was deemed necessary to place primary emphasis on the numeric water quality standard criteria to make beneficial use impairment decisions. Because the TSI approach and associated criteria is not a water quality standard in administrative rule (Article 74:51:01-Surface Water Quality Standards), DENR made the decision to not rely on it for the 2010 IR listing methodology. Waterbodies previously listed for TSI in the 2008 reporting cycle were delisted based on this change in listing methodology. The following table lists those lakes being delisted for TSI from the 2008 303(d) listing cycle.

Waterbodies delisted for TSI for the 2010 303(d) reporting cycle

AUID	Parameter	TSI Project Status	Report Status	2010 Support Status	2010 EPA Category
SD-JA-L-Wilmarth_01	TSI	TSI-assessment complete-implementation	complete	Full	1
SD-MI-L-Campbell_01	TSI	TSI-assessment complete-implementation	In progress	Nonsupport, pH	5
SD-MI-L-Pocasse_01	TSI	TSI-assessment complete-implementation	In progress	Nonsupport, E.coli	5
SD-MI-L-Academy_01	TSI	TSI-assessment complete-implementation	In progress	Full	1
SD-MI-L-Andes_01	TSI	TSI-assessment complete-implementation	complete	Nonsupport, DO	5
SD-MI-L-Platte_01	TSI	TSI-assessment complete-implementation	In progress	Full	1
SD-MI-L-Rosette_01	TSI	TSI-assessment complete-implementation	In progress	Full	1
SD-BS-L-Norden_01	TSI	TSI-assessment complete-implementation	In progress	Full	1
SD-VM-L-Silver_01	TSI	TSI-assessment complete-implementation	In progress	Nonsupport, pH	5
SD-VM-L-Whitewood_01	TSI	TSI-assessment complete-implementation	complete	Full	1
SD-VM-L-E_Vermillion_01	TSI	TSI-assessment complete-implementation	In progress	Full	1
SD-BS-L-Roy_01	TSI	TSI-assessment complete-implementation	complete	Full	1
SD-JA-L-Carthage_01	TSI	TSI-assessment complete-implementation	complete	Full	1
SD-JA-L-Twin_01	TSI	TSI-assessment complete-implementation	complete	Full	1
SD-NI-L-Rahn_01	TSI	TSI-assessment complete-implementation	complete	Full	1
SD-JA-L-Beaver_01	TSI	TSI-assessment complete-implementation	complete	Full	1
SD-JA-L-S_Red_Iron_01	TSI	TSI-assessment complete-implementation	complete	Full	1
SD-BS-L-St_John_01	TSI	TSI-assessment complete-implementation	In progress	Full	1
SD-BS-L-Campbell_01	TSI	TSI-assessment complete-implementation	complete	Full	1
SD-BS-L-Albert_01	TSI	TSI-assessment complete-implementation	In progress	Full	1
SD-MI-L-Corsica_01	TSI	TSI-assessment complete-implementation	complete	Full	1
SD-BA-L-Waggoner_01	TSI	TSI-assessment complete	complete	Full	1
SD-RD-L-Traverse_01	TSI	TSI-assessment complete	In progress	Full	1
SD-JA-L-Bierman_01	TSI	TSI-assessment complete	In progress	Full	1
SD-MI-L-Cottonwood_01	TSI	TSI-assessment complete	In progress	Full	1
SD-BS-L-E_Oakwood_01	TSI	TSI-assessment complete	complete	Full	1
SD-BS-L-W_Oakwood_01	TSI	TSI-assessment complete	complete	Full	1
SD-BS-L-Bullhead_01	TSI	TSI-assessment complete	complete	Nonsupport, pH	5
SD-BS-L-School_01	TSI	TSI-assessment complete	complete	Full	1
SD-MU-L-Dewberry_01	TSI	TSI	none	Full	2
SD-GR-L-Isabel_01	TSI	TSI	none	Nonsupport, FCA	5
SD-BA-L-Freeman_01	TSI	TSI	none	Nonsupport, multiple	5
SD-CH-L-Curlew_01	TSI	TSI	none	Nonsupport, Temp	5
SD-GR-L-Flat_Creek_01	TSI	TSI	none	Full	1
SD-MI-L-Sully_Dam_01	TSI	TSI	none	Full	2
SD-BS-L-Covell_01	TSI	TSI	none	Full	2
SD-CH-L-New_Wall_01	TSI	TSI	none	Nonsupport, pH	5

Substantial accomplishments have been made with respect to TSI impairment listings over the past 10 years. Since the 1998 listing cycle, DENR has listed 99 lakes for TSI impairment, equating to 75% of the assessed lakes in the state. DENR initiated TSI assessment projects on 77 of the listed lakes. Project assessments have resulted in 44 approved TSI TMDLs and eight TSI delistings. Fourteen additional lakes were delisted based on new water quality information.

Thirty-seven lakes are being delisted for TSI during the 2010 reporting cycle. Four lakes have obtained TSI TMDL approval since the 2008 IR reporting cycle. Of the remaining 33 lakes, 25 have had comprehensive watershed assessment studies conducted to address TSI through reductions in phosphorus loading. Of these, 12 lakes have final assessment reports documenting phosphorus loading reductions for improvement or maintenance in TSI. DENR also plans to complete similar final assessment reports on the remaining 13 lakes in which a watershed assessment study was conducted. Several of these lakes are within ongoing basin wide or watershed level implementation project boundaries.

Eight lakes are being delisted for TSI despite not having a comprehensive watershed assessment study. Four of these lakes will remain on the 303(d) list for a particular impairment parameter. The following descriptions provide additional rationale for delisting those lakes that have not had an assessment project or final report initiated and are not on the 2010 303(d) list:

SD-MU-L-Dewberry_01: Dewberry Dam was assigned to the Warmwater Permanent Fish Life beneficial use based on a perceived depth of 30 feet. Sampling efforts have reported that Dewberry Dam is a small stock-watering pond with a max depth of 3 feet. Therefore, Dewberry Dam was likely misclassified based on the apparent error in depth and would not likely have been listed for TSI given its characteristics. A future Use Attainability Assessment (UAA) will be conducted on Dewberry Dam to provide information necessary to recommend the appropriate change in beneficial use. Based on the 2010 IR listing methodology Dewberry Dam is fully supporting its assessed beneficial uses.

SD-GR-L-Flat_Creek_01: DENR shows Flat Creek as just above the previously established TSI threshold. The TSI determination for this small reservoir was based on data collected during a dry cycle. The trophic state of Flat Creek is expected to improve in wet to normal years though fluctuate with fluctuating hydrology. No major NPS concerns were identified in the Flat Creek watershed. Based on the 2010 IR listing methodology Flat Creek is fully supporting its assessed beneficial uses.

SD-MI-L-Sully_Dam_01: Sully Dam is a small productive wetland located on private property. Further investigation or a UAA will be required to determine if the current Semipermanent Fish Life beneficial use is appropriate for Sully Dam. Given its physical characteristics it is not realistic to expect Sully Dam to comply with the previously established TSI threshold for this beneficial use. Based on the 2010 IR listing methodology Sully Dam is fully supporting its assessed beneficial uses.

SD-BS-L-Covell_01: Covell Lake is a small storm drainage collection pond for the city of Sioux Falls. The TSI was calculated at just over the previously established threshold. Sioux Falls hired a team of consultants from Rapid City, SD (RESPEC) to conduct a city wide storm sewer drainage TMDL assessment. Results of the 2009 TMDL assessment project will aid city planners in reducing pollution from storm sewers, which will ultimately benefit Covell Lake. Based on the 2010 IR listing methodology, Covell Lake is fully supporting its assessed beneficial uses.

DENR recognized the shortcomings of using a TSI approach to make lake impairment decisions on lakes and reservoirs in SD. One of the most frustrating aspects of using TSI was setting reasonable thresholds across appropriate classification schemes. Both the level III ecoregion and fishery beneficial use classification approaches displayed considerable variation in TSI between lakes in each classification scheme. Non phosphorus limitation displayed by the majority of lakes in SD made it difficult to appropriately characterize the trophic state of lakes within a classification group. Non phosphorus limitation also made it difficult to model attainable phosphorus reductions required for TMDL development.

While SD made the decision to no longer use TSI for the 2010 303(d) listing methodology, the realization exists that many lakes in SD are productive and prone to man-induced nutrient loading, including phosphorus, which leads to excessive growth of plants and algae. Nuisance level growth of plants and algae can directly and indirectly impact the beneficial uses of lakes statewide. Therefore, DENR plans to ultimately develop nutrient and/or nutrient-based criteria that provide attainable protection for the beneficial uses of lakes in SD.

Given the nature of lakes in SD, nutrient and/or nutrient-based standards could be a timely and challenging endeavor, though some first steps have been taken. DENR is cooperating with EPA Region VIII and a North Dakota based consulting firm to develop a classification scheme and nutrient and/or nutrient based criteria for lakes in the northern glaciated plans ecoregion, which includes portions of SD, ND, MT and WY.

APPENDIX D

SURFACE WATER QUALITY MONITORING SCHEDULE

AND SAMPLING SITE DESCRIPTION

Analysis Groups

Analysis Groups	1	2	3	4	5	6	7	8	9	10	11	12
Field Analysis Parameters												
Water Temperature	X	X	X	X	X	X	X	X	X	X	X	X
Air Temperature	X	X	X	X	X	X	X	X	X	X	X	X
Dissolved Oxygen	X	X	X	X	X	X	X	X	X	X	X	X
Conductivity	X	X	X	X	X	X	X	X	X	X	X	X
pH	X	X	X	X	X	X	X	X	X	X	X	X
Waterbody Depth	X	X	X	X	X	X	X	X	X	X	X	X
Waterbody Width	X	X	X	X	X	X	X	X	X	X	X	X
Laboratory Analysis Parameters												
Alkalinity	X	X	X	X	X	X	X	X	X	X	X	X
Hardness	X	X	X	X	X	X	X	X	X	X	X	X
Dissolved Solids	X	X	X	X	X	X	X	X	X	X	X	X
Suspended Solids	X	X	X	X	X	X	X	X	X	X	X	X
Total Phosphorous	X	X	X	X	X	X	X	X	X	X	X	X
Dissolved Phosphorus	X	X	X	X	X	X	X	X	X	X	X	X
Ammonia	X	X	X	X	X	X	X	X	X	X	X	X
Nitrate-Nitrite	X	X	X	X	X	X	X	X	X	X	X	X
TKN X	X	X	X	X	X	X	X	X	X	X	X	
BOD				X				X	X			X
CBOD									X			
E-Coli	M/S	M/S	M/S	M/S	M/S	M/S	M/S	X	M/S	M/S	M/S	M/S
Total Fecal Coliform	M/S	M/S	M/S	M/S	M/S	M/S	M/S	X	M/S	M/S	M/S	M/S
Total Calcium	M/A	M/A		M/A		M/A	X		M/A	M/A	X	M/A
Chloride	X						X	M/A			X	X
Total Magnesium	M/A	M/A		M/A		M/A	X	M/A	M/A	M/A	X	M/A
Total Sodium	M/A	M/A		M/A		M/A	X	X	M/A	M/A	X	M/A
Sulfates	X						X				X	X
Total Cyanide					X	X						X
WAD Cyanide					X	X						X
Total and Dissolved Arsenic					X	X				X	X	X
Total and Dissolved Cadmium					X	X						X
Total and Dissolved Chromium					X	X						X
Total and Dissolved Copper					X	X						X
Total and Dissolved Lead					X	X						X
Total and Dissolved Mercury					X	X						X
Total and Dissolved Nickel					X	X						X
Total and Dissolved Selenium					X	X						X
Total and Dissolved Silver					X	X						X
Total and Dissolved Zinc					X	X						X
Total and Dissolved Barium										X	X	
Total and Dissolved Molybdenum										X	X	
Total and Dissolved Uranium										X	X	
Radium 226										X	X	
Radium 228										X	X	
Total Petroleum Hydrocarbons												X
Volatile Organic Carbons												X

M/A = May through August   M/S = May through September   X = Every visit

Storet Number	WQM #	Waterbody	County	Frequency	Beneficial Uses	Analysis Group	Region
460740	1	Big Sioux River	Codington	Monthly	5,8,9,10	Group 1	Northeast
460702	2	Big Sioux River	Brookings	Monthly	5,8,9,10	Group 1	Southeast
460703	3	Big Sioux River	Minnehaha	Monthly	1,5,7,8,9,10	Group 1	Southeast
460755	4	Vermillion River	Clay	Monthly	5,8,9,10	Group 2	Southeast
460745	5	Vermillion River	Clay	Monthly	5,8,9,10	Group 2	Southeast
460805	6	James River	Brown	Monthly	5,8,9,10	Group 2	Northeast
460707	7	James River	Hanson	Quarterly	5,8,9,10	Group 2	Southeast
460761	8	James River	Yankton	Monthly	5,8,9,10	Group 2	Southeast
460815	10	Keya Paha River	Tripp	Quarterly	5,8,9,10	Group 1	Central
460835	11	White River	Jackson	Monthly	5,8,9,10	Group 2	Central
460825	12	White River	Lyman	Monthly	5,8,9,10	Group 2	Central
460840	13	Little White River	Mellette	Monthly	5,8,9,10	Group 2	Central
460875	14	Cheyenne River	Fall River	Monthly	5,8,9,10	Group 11	Black Hills
460865	15	Cheyenne River	Pennington	Monthly	5,7,8,9,10	Group 2	Central
468860	16	Cheyenne River	Ziebach	Monthly	4,7,8,9,10	Group 2	Central
460905	17	Battle Creek	Pennington	Monthly	2,8,9,10	Group 3	Black Hills
460910	19	Rapid Creek	Pennington	Monthly	4,7,8,9,10	Group 2	Black Hills
460880	21	Belle Fourche River	Meade	Quarterly	4,7,8,9,10	Group 2	Central
460900	22	Spearfish Creek	Lawrence	Monthly	1,2,7,8,9,10	Group 3	Black Hills
460895	23	Redwater River	Butte	Monthly	3,8,9,10	Group 2	Central
460935	24	Moreau River	Dewey	Monthly	5,8,9,10	Group 2	Central
460945	25	Grand River	Corson	Monthly	4,8,9,10	Group 2	Central
460955	26	Little Missouri River	Harding	Quarterly	5,8,9,10	Group 2	Central
460710	27	Little Minnesota River	Roberts	Quarterly	5,8,9,10	Group 3	Northeast
460700	28	Whetstone River	Grant	Quarterly	5,8,9,10	Group 3	Northeast
460850	29	Bad River	Stanley	Quarterly	6,8,9,10	Group 4	Central
460925	30	Box Elder Creek	Lawrence	Monthly	2,8,9,10	Group 3	Black Hills
460831	31	Big Sioux River	Minnehaha	Monthly	5,7,8,9,10	Group 2	Southeast
460832	32	Big Sioux River	Union	Monthly	5,7,8,9,10	Group 3	Southeast
460733	33	James River	Brown	Monthly	5,8,9,10	Group 2	Northeast
460734	34	James River	Brown	Quarterly	5,8,9,10	Group 2	Northeast
460735	35	James River	Beadle	Quarterly	1,5,8,9,10	Group 9	Southeast
460736	36	James River	Beadle	Quarterly	5,8,9,10	Group 9	Southeast
460737	37	James River	Davison	Quarterly	5,8,9,10	Group 2	Southeast
460039	39	Moreau River	Perkins	Quarterly	5,8,9,10	Group 10	Central
460640	40	Grand River	Perkins	Quarterly	3,8,9,10	Group 10	Central
460842	42	White River	Shannon	Quarterly	5,8,9,10	Group 10	Black Hills
460645	45	Lac Qui Parle River, W Branch	Deuel	Quarterly	3,8,9,10	Group 3	Northeast
460646	46	Castle Creek	Pennington	Monthly	2,8,9,10	Group 3	Black Hills
460647	47	Rapid Creek	Pennington	Monthly	1,2,7,8,9,10	Group 1	Black Hills
460649	49	Spring Creek	Pennington	Quarterly	3,7,8,9,10	Group 3	Black Hills
460650	50	Grace Coolidge Creek	Custer	Quarterly	2,8,9,10	Group 3	Black Hills
460651	51	French Creek	Custer	Quarterly	3,8,9,10	Group 3	Black Hills
460652	52	Whitewood Creek	Lawrence	Monthly	4,8,9,10	Group 3	Black Hills

Storet Number	WQM #	Waterbody	County	Frequency	Beneficial Uses	Analysis Group	Region
460653	53	French Creek	Custer	Quarterly	3,8,9,10	Group 3	Black Hills
460654	54	Spring Creek	Pennington	Monthly	3,7,8,9,10	Group 3	Black Hills
460655	55	Big Sioux River	Codington	Monthly	5,8,9,10	Group 2	Northeast
460657	57	Fall River	Fall River	Quarterly	3,8,9,10	Group 1	Black Hills
460661	61	Vermillion River	Turner	Monthly	5,8,9,10	Group 2	Southeast
460662	62	Big Sioux River	Brookings	Monthly	5,8,9,10	Group 1	Southeast
460664	64	Big Sioux River	Minnehaha	Monthly	1,5,7,8,9,10	Group 4	Southeast
460665	65	Big Sioux River	Lincoln	Monthly	5,7,8,9,10	Group 2	Southeast
460666	66	Big Sioux River	Lincoln	Monthly	5,7,8,9,10	Group 2	Southeast
460667	67	Big Sioux River	Union	Monthly	5,7,8,9,10	Group 2	Southeast
460669	69	Rapid Creek	Pennington	Monthly	1,2,7,8,9,10	Group 7	Black Hills
460670	70	Ponca Creek	Gregory	Quarterly	5,8,9,10	Group 1	Central
460671	71	Missouri River	Hughes	Quarterly	1,2,7,8,9,10,11	Group 2	Central
460672	72	Missouri River	Lyman	Quarterly	1,2,7,8,9,10,11	Group 2	Central
460673	73	Missouri River	Charles Mix	Quarterly	1,4,7,8,9,10,11	Group 2	Southeast
460674	74	Missouri River	Yankton	Quarterly	1,4,7,8,9,10,11	Group 2	Southeast
460675	75	West Strawberry Creek	Lawrence	Quarterly	2,8,9,10	Group 3	Black Hills
460676	76	Belle Fourche River	Meade	Monthly	4,7,8,9,10	Group 2	Central
460677	77	Grand River, N Fork	Perkins	Quarterly	6,8,9,10	Group 2	Central
460678	78	Grand River, S Fork	Perkins	Quarterly	5,8,9,10	Group 2	Central
460679	79	Box Elder Creek	Pennington	Quarterly	6,8,9,10	Group 2	Black Hills
460681	81	Belle Fourche River	Butte	Quarterly	4,7,8,9,10	Group 6	Central
460682	82	Whitewood Creek	Butte	Monthly	4,8,9,10	Group 5	Central
460683	83	Belle Fourche River	Butte	Quarterly	4,7,8,9,10	Group 6	Central
460684	84	Whitewood Creek	Lawrence	Monthly	3,7,8,9,10	Group 5	Black Hills
460685	85	Whitewood Creek	Lawrence	Monthly	3,7,8,9,10	Group 5	Black Hills
460686	86	Whitewood Creek	Lawrence	Quarterly	2,7,8,9,10	Group 5	Black Hills
460687	87	Yellow Bank River, S Fork	Grant	Quarterly	3,8,9,10	Group 3	Northeast
460688	88	Yellow Bank River, N Fork	Grant	Quarterly	4,8,9,10	Group 3	Northeast
460689	89	Spearfish Creek	Lawrence	Monthly	1,2,7,8,9,10	Group 3	Black Hills
460690	90	Whetstone River, S Fork	Grant	Quarterly	6,8,9,10	Group 3	Northeast
460691	91	Whetstone River, S Fork	Grant	Quarterly	6,8,9,10	Group 3	Northeast
460692	92	Rapid Creek	Pennington	Monthly	4,7,8,9,10	Group 2	Black Hills
460694	94	Moccasin Creek	Brown	Monthly	9,10	Group 3	Northeast
460695	95	Moccasin Creek	Brown	Monthly	6,8,9,10	Group 3	Northeast
460102	102	French Creek	Custer	Monthly	3,8,9,10	Group 2	Black Hills
460103	103	Battle Creek	Pennington	Seasonal	2,8,9,10	Group 3	Black Hills
460110	110	Rapid Creek	Pennington	Monthly	4,7,8,9,10	Group 7	Black Hills
460111	111	Flynn Creek	Custer	Quarterly	3,8,9,10	Group 3	Black Hills
460112	112	James River	Brown	Monthly	5,8,9,10	Group 2	Northeast
460113	113	James River	Brown	Monthly	5,8,9,10	Group 2	Northeast
460116	116	Strawberry Creek	Lawrence	Monthly	3,8,9,10	Group 5	Black Hills
460117	117	Big Sioux River	Minnehaha	Monthly	5,7,8,9,10	Group 4	Southeast
460118	118	Whitetail Creek	Lawrence	Monthly	2,7,8,9,10	Group 5	Black Hills

Storet Number	WQM #	Waterbody	County	Frequency	Beneficial Uses	Analysis Group	Region
460119	119	Fantail Creek	Lawrence	Quarterly	2,7,8,9,10	Group 5	Black Hills
460121	121	Skunk Creek	Minnehaha	Quarterly	6,8,9,10	Group 4	Southeast
460122	122	Whitewood Creek	Lawrence	Monthly	378910	Group 5	Black Hills
460123	123	Whitewood Creek	Lawrence	Monthly	3,7,8,9,10	Group 5	Black Hills
460125	125	Bear Butte Creek	Lawrence	Monthly	2,8,9,10	Group 5	Black Hills
460126	126	Bear Butte Creek	Lawrence	Monthly	2,8,9,10	Group 5	Black Hills
460127	127	Deadwood Creek	Lawrence	Monthly	3,7,8,9,10	Group 5	Black Hills
460128	128	Beaver Creek	Fall River	Quarterly	3,8,9,10	Group 11	Black Hills
460130	130	Belle Fourche River	Butte	Monthly	4,7,8,9,10	Group 7	Central
460131	131	Cherry Creek	Meade	Quarterly	6,8,9,10	Group 2	Central
460132	132	Cheyenne River	Custer	Monthly	5,7,8,9,10	Group 2	Black Hills
460133	133	Cheyenne River	Haakon	Monthly	4,7,8,9,10	Group 2	Central
460134	134	Choteau Creek	Bon Homme	Quarterly	5,8,9,10	Group 2	Southeast
460135	135	Crow Creek	Buffalo	Quarterly	5,8,9,10	Group 2	Central
460136	136	Elm River	Brown	Monthly	1,5,8,9,10	Group 2	Northeast
460137	137	Firesteel Creek	Davison	Quarterly	1,4,8,9,10	Group 2	Southeast
460138	138	Grand River	Corson	Quarterly	4,8,9,10	Group 2	Central
460139	139	Grand River, S Fork	Harding	Quarterly	5,8,9,10	Group 2	Central
460140	140	James River	Spink	Monthly	5,8,9,10	Group 2	Northeast
460141	141	Medicine Creek	Lyman	Monthly	6,8,9,10	Group 2	Central
460142	142	Medicine Knoll Creek	Hughes	Quarterly	6,8,9,10	Group 2	Central
460143	143	Moreau River	Ziebach	Quarterly	5,8,9,10	Group 2	Central
460144	144	Moreau River, S Fork	Perkins	Quarterly	6,8,9,10	Group 2	Central
460145	145	Mud Creek	Brown	Quarterly	6,8,9,10	Group 2	Northeast
460146	146	Snake Creek	Spink	Quarterly	5,8,9,10	Group 2	Northeast
460147	147	Thunder Butte Creek	Perkins	Quarterly	6,8,9,10	Group 2	Central
460148	148	Turtle Creek	Spink	Quarterly	6,8,9,10	Group 2	Northeast
460150	150	Vermillion River, E Fork	McCook	Quarterly	6,8,9,10	Group 2	Southeast
460151	151	Wolf Creek	Spink	Quarterly	6,8,9,10	Group 2	Northeast
460152	152	White River	Mellette	Monthly	5,8,9,10	Group 2	Central
460153	153	Cottonwood Creek	Mellette	Monthly	9,10	Group 2	Central
460154	154	Vermillion River, E Fork	McCook	Quarterly	6,8,9,10	Group 2	Southeast
460155	155	Spring Creek	Campbell	Monthly	5,8,9,10	Group 2	Central
460156	156	Cheyenne River	Fall River	Monthly	5,8,9,10	Group 11	Black Hills
460157	157	Wolf Creek	Hutchinson	Monthly	6,8,9,10	Group 8	Southeast
460158	158	Wolf Creek	Hutchinson	Monthly	6,8,9,10	Group 8	Southeast
460160	160	Crooked Creek	Harding	Quarterly	6,8,9,10	Group 10	Central
460161	161	Bull Creek	Harding	Quarterly	6,8,9,10	Group 10	Central
460162	162	Grand River, S Fork	Perkins	Quarterly	5,8,9,10	Group 10	Central
460163	163	Cheyenne River	Fall River	Quarterly	5,8,9,10	Group 11	Black Hills
460164	164	Cheyenne River	Fall River	Quarterly	5,8,9,10	Group 11	Black Hills
460165	165	Unnamed tributary to Big Ditch Creek	Union	Quarterly	9,10	Group 12	Southeast
460166	166	Brule Creek	Union	Quarterly	6,8,9,10	Group 12	Southeast
460167	167	Unnamed tributary to Brule Creek	Union	Quarterly	9,10	Group 12	Southeast

Storet Number	WQM #	Waterbody	County	Frequency	Beneficial Uses	Analysis Group	Region
460168	168	Brule Creek	Union	Quarterly	6,8,9,10	Group 12	Southeast
460169	169	Big Ditch Creek	Union	Quarterly	9,10	Group 12	Southeast
460124	120A	Stewart Gulch	Lawrence	Quarterly	2,8,9,10	Group 5	Black Hills
46BS08	BS08	Big Sioux River	Hamlin	Monthly	5,8,9,10	Group 1	Northeast
46BS18	BS18	Big Sioux River	Moody	Monthly	1,5,8,9,10	Group 1	Southeast
46BS23	BS23	Big Sioux River	Minnehaha	Monthly	1,5,7,8,9,10	Group 1	Southeast
46BS29	BS29	Big Sioux River	Minnehaha	Monthly	5,7,8,9,10	Group 4	Southeast
46BS49	BS49	Brule Creek	Union	Quarterly	6,8,9,10	Group 12	Southeast
46BSA1	BSA1	Big Sioux River	Grant	Monthly	5,8,9,10	Group 1	Northeast
46MN31	MN31	Annie Creek	Lawrence	Quarterly	3,8,9,10	Group 5	Black Hills
46MN32	MN32	Spearfish Creek	Lawrence	Quarterly	1,2,7,8,9,10,11	Group 5	Black Hills
46MN33	MN33	Spearfish Creek	Lawrence	Quarterly	1,2,7,8,9,10,11	Group 5	Black Hills
46MN34	MN34	Spearfish Creek	Lawrence	Quarterly	1,2,7,8,9,10,11	Group 5	Black Hills
46MN35	MN35	Spearfish Creek	Lawrence	Quarterly	2,8,9,10	Group 5	Black Hills
46MN38	MN38	False Bottom Creek	Lawrence	Quarterly	3,8,9,10	Group 5	Black Hills
46MN39	MN39	Cleopatra Creek	Lawrence	Quarterly	2,7,8,9,10	Group 5	Black Hills

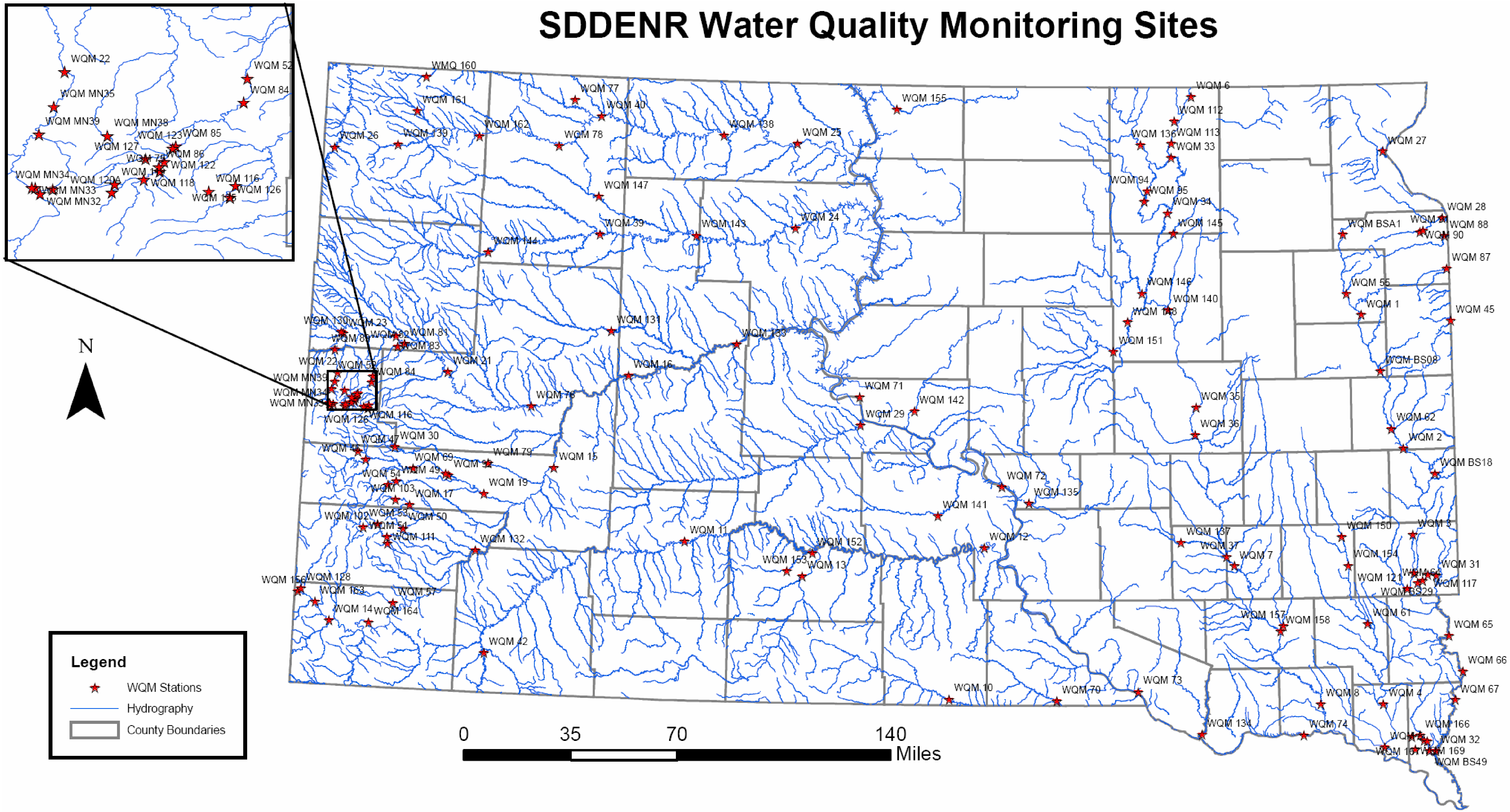


Figure 28: South Dakota DENR Water Quality Monitoring Sites

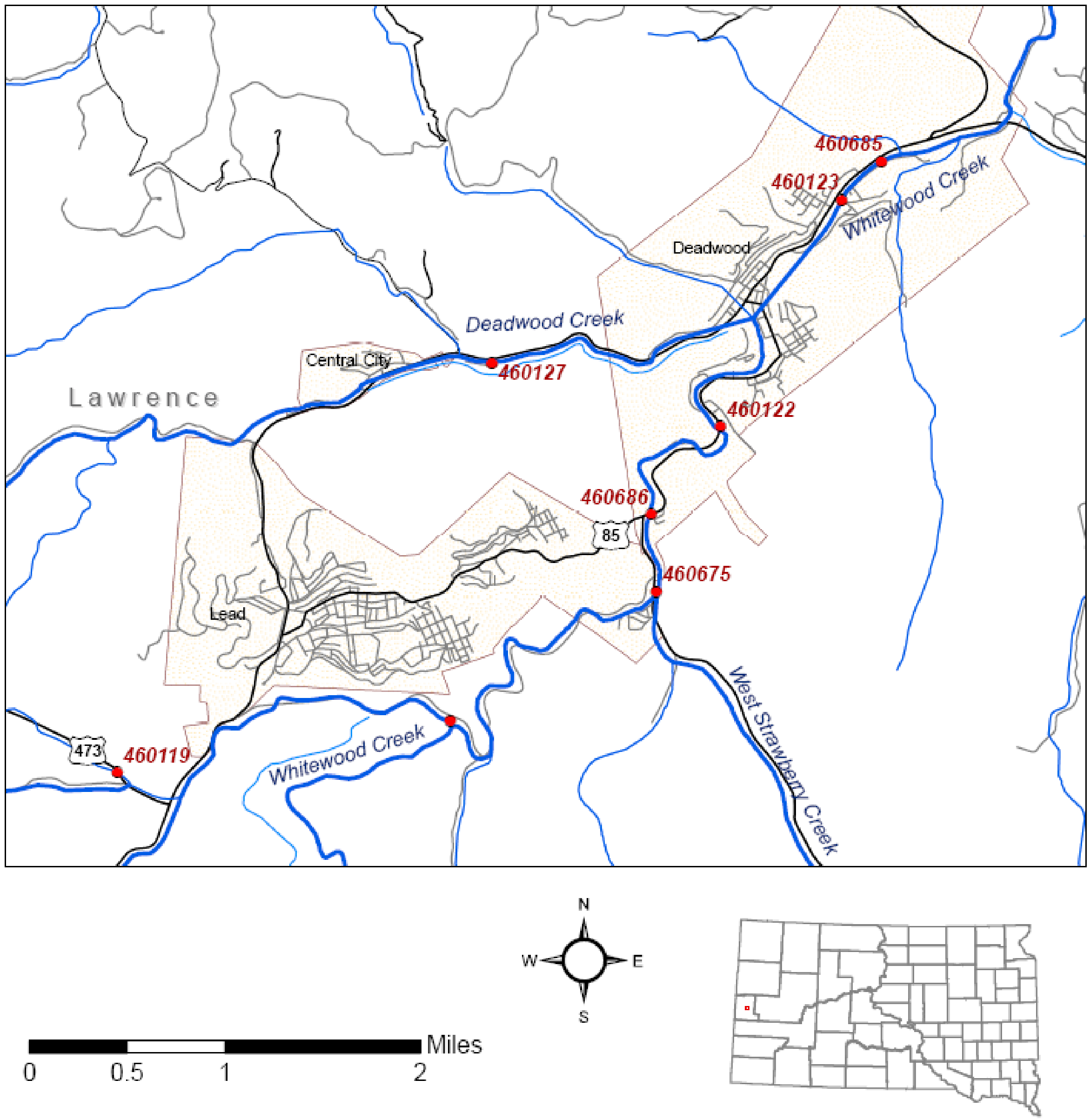


Figure 29: Water Quality Sites on Whitewood Creek and Tributaries in Lead-Deadwood area

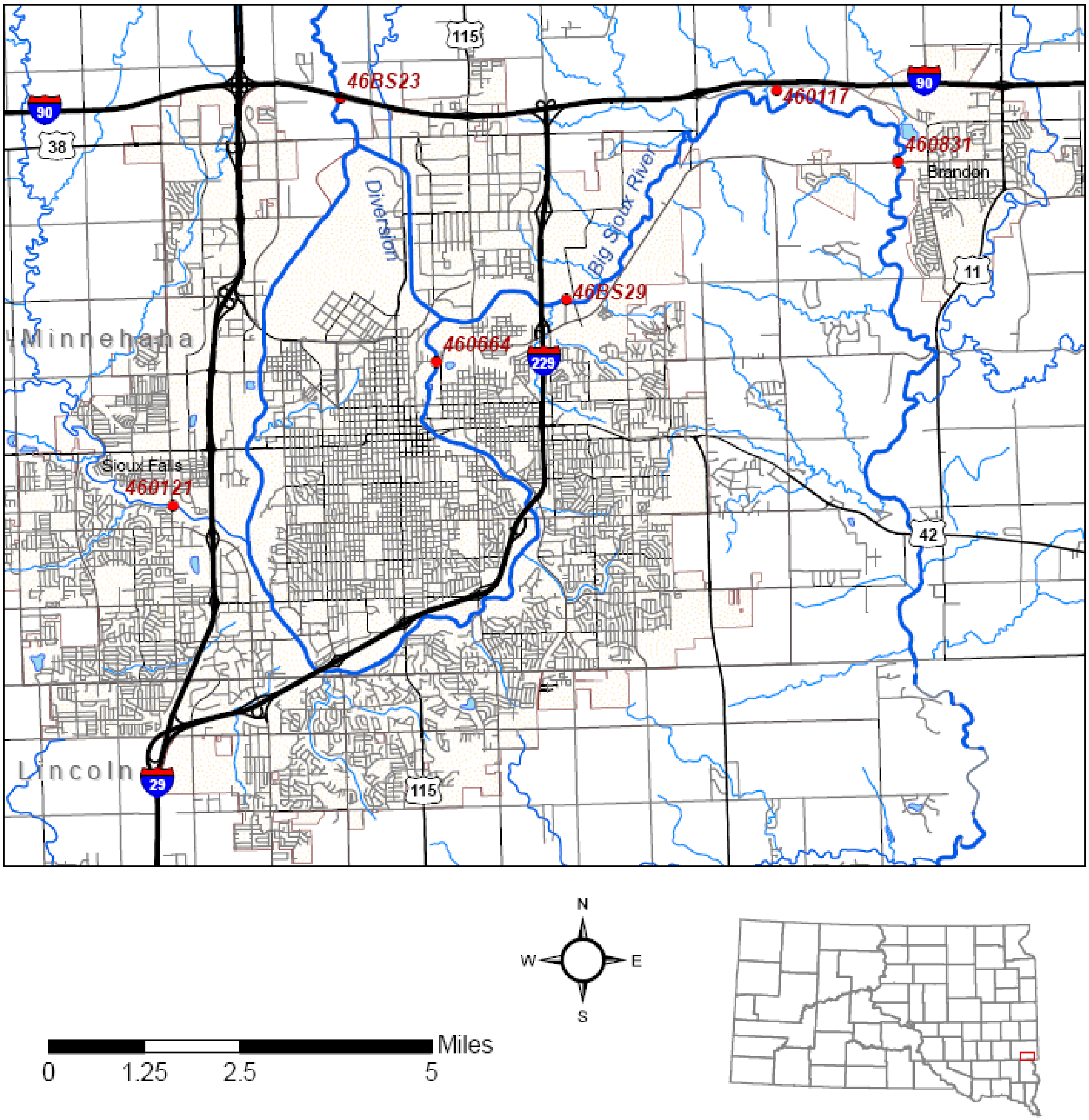


Figure 30: Water Quality Monitoring Sites Located on the Big Sioux River in the Sioux Falls Area

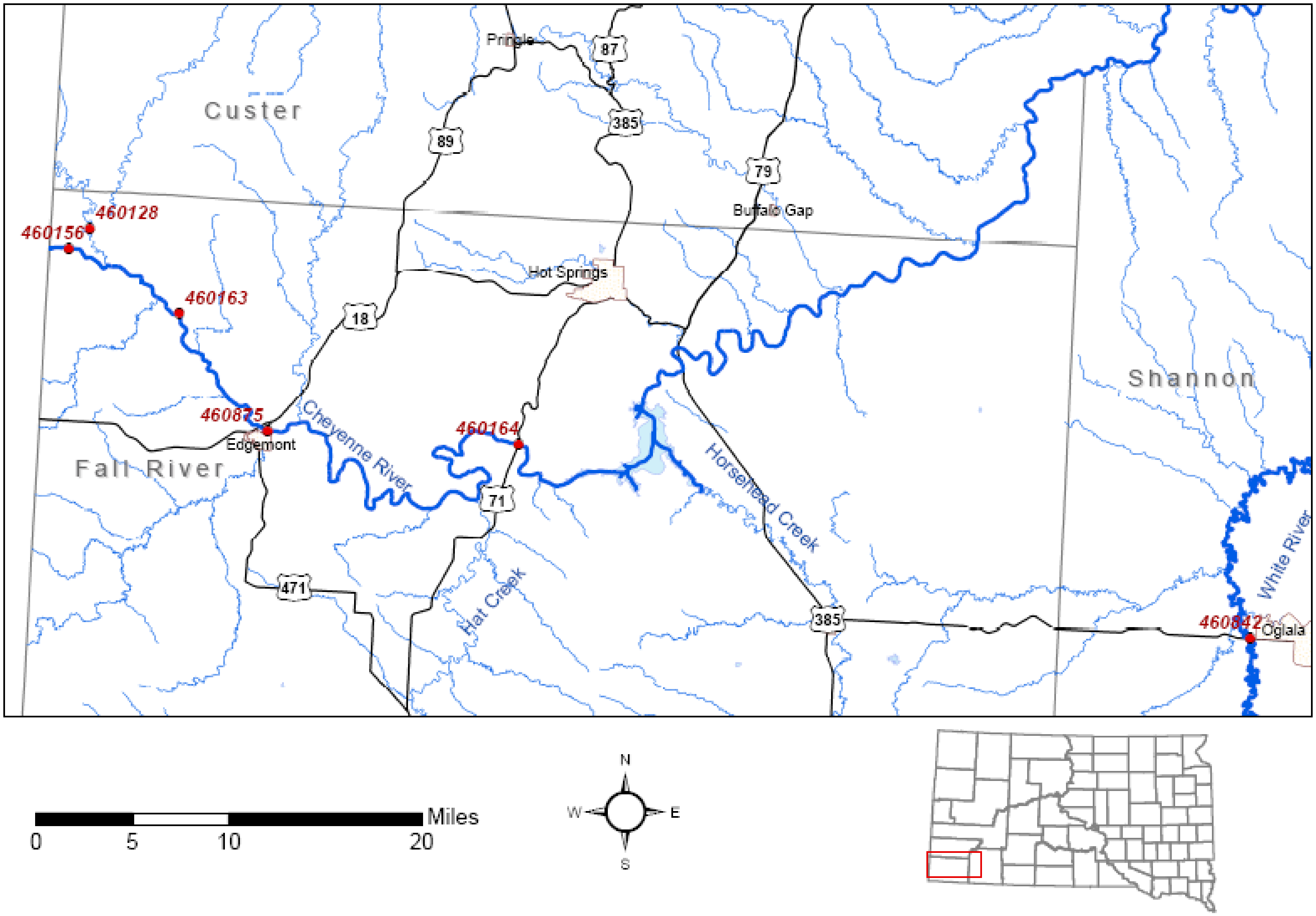


Figure 31: Water Quality Monitoring Sites Located along the Cheyenne River and White River that are Monitored for Uranium

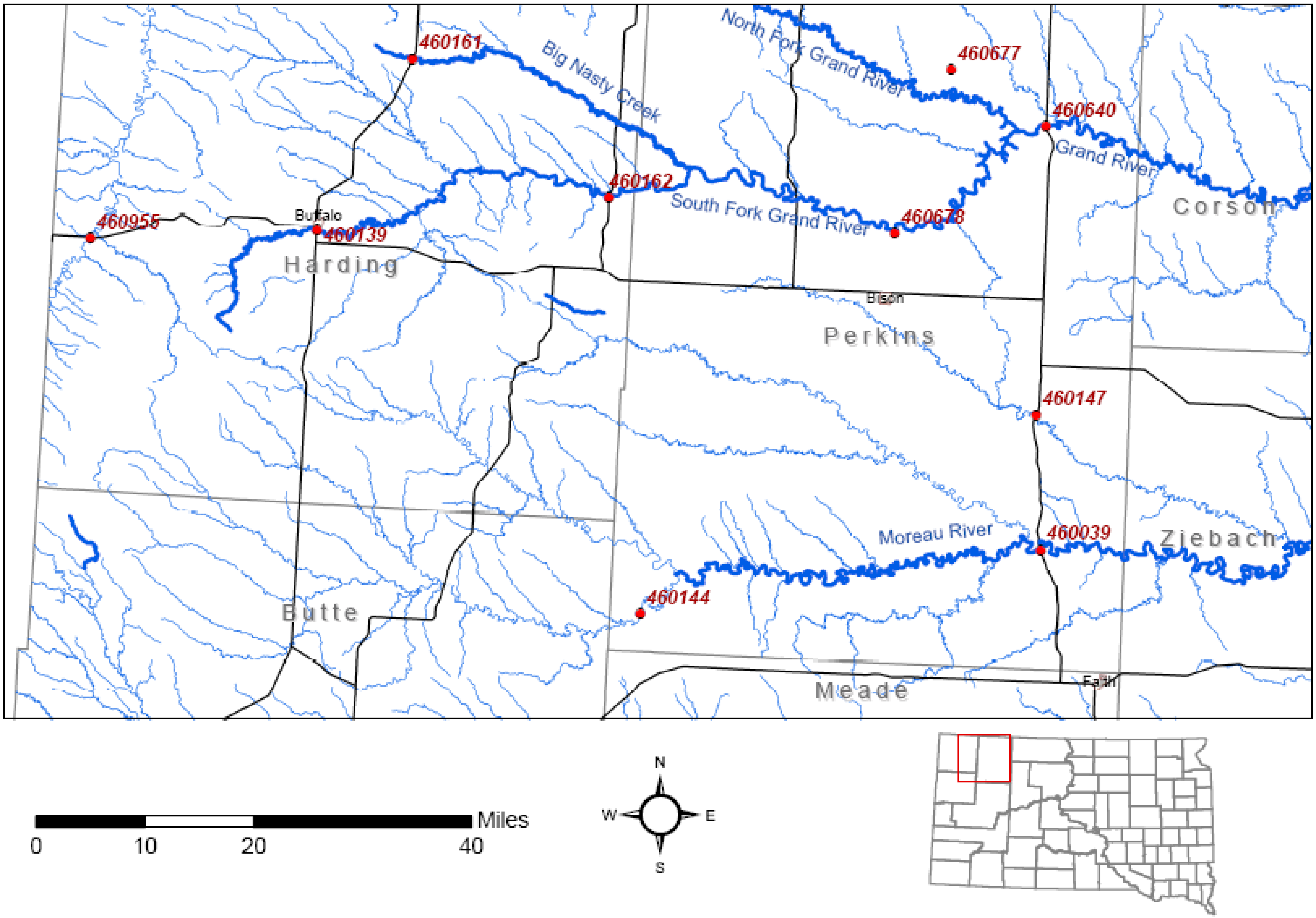


Figure 32: Water Quality Monitoring Sites Located near the Grand River and Moreau River that are Monitored for Uranium

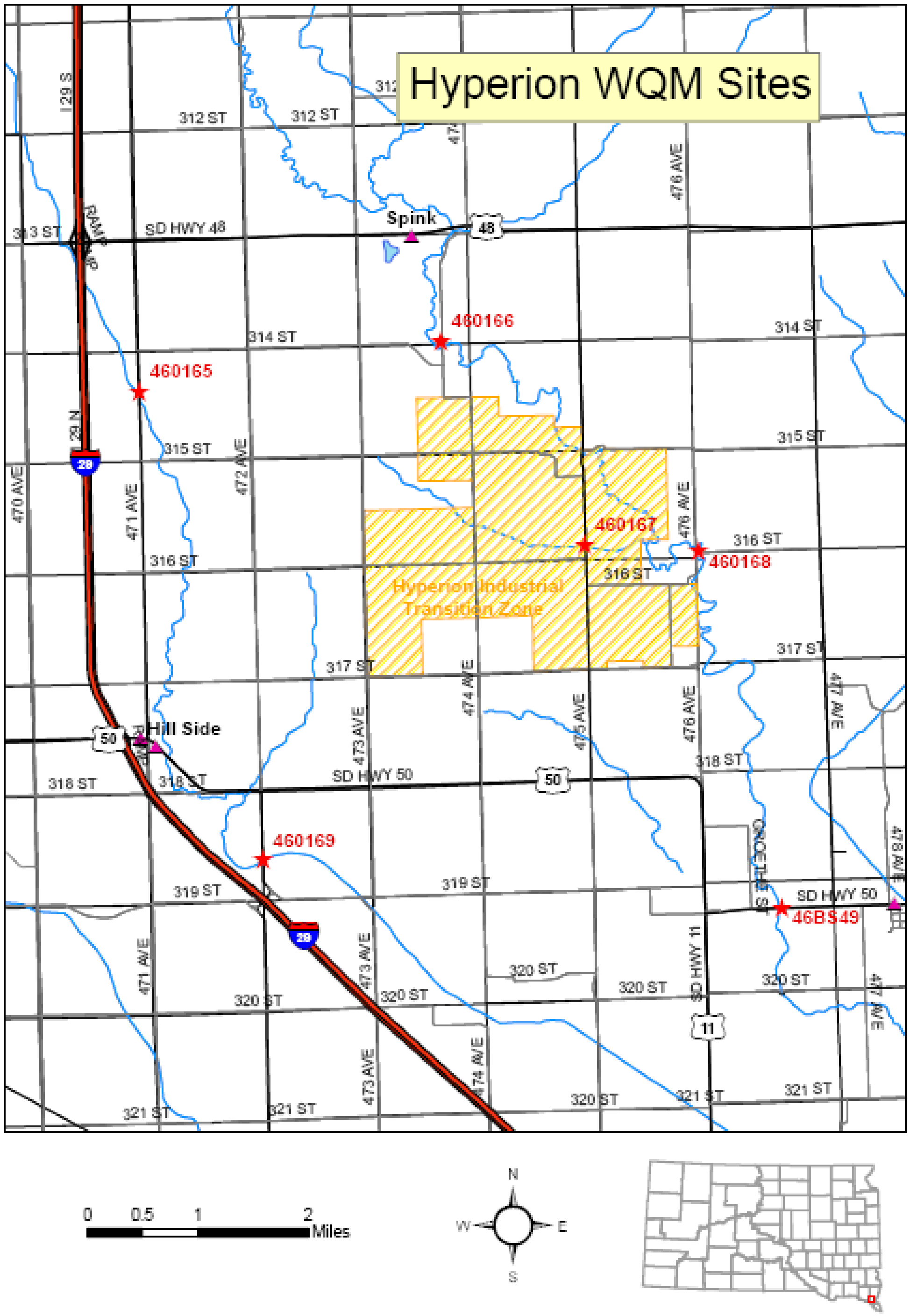


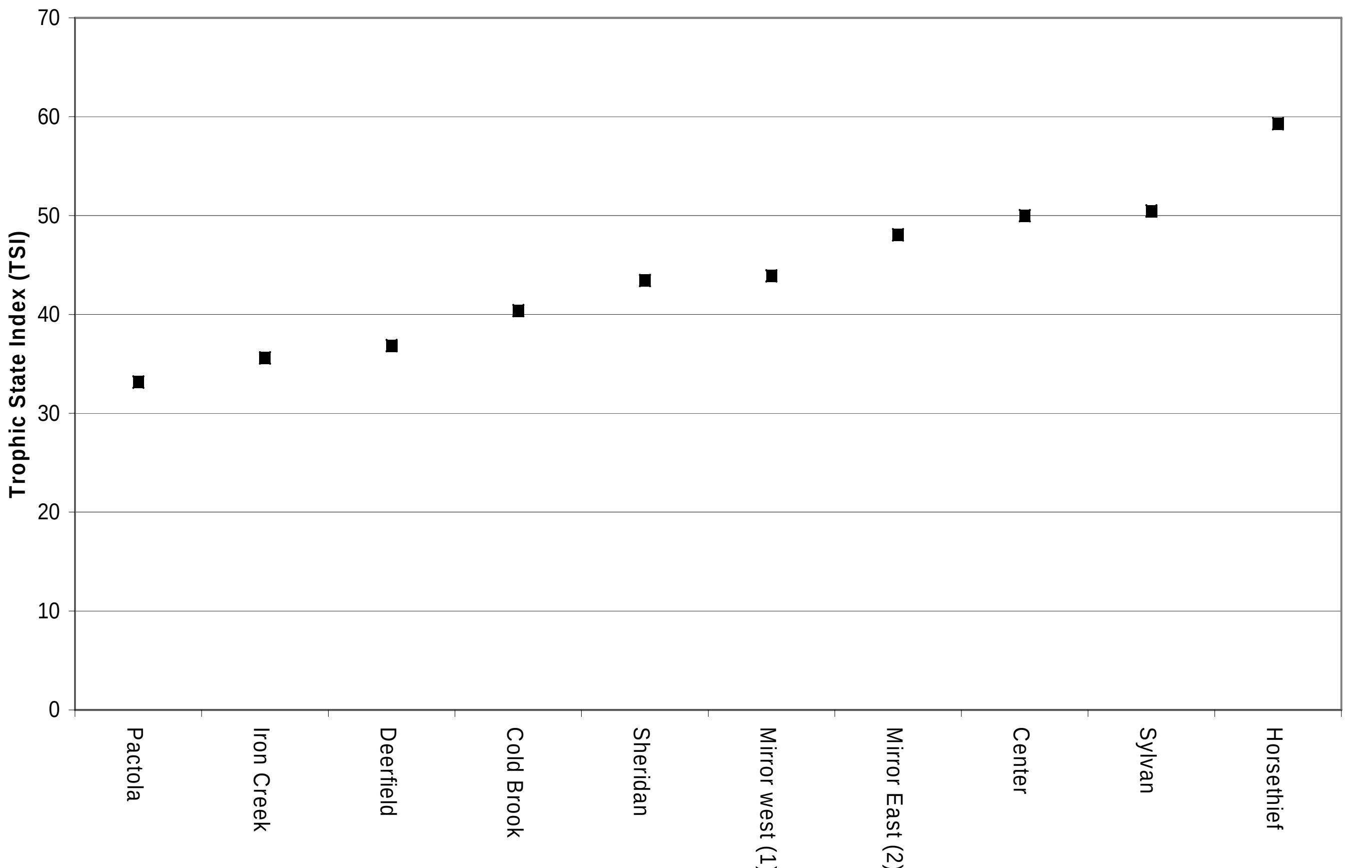
Figure 33: Water Quality Monitoring Sites Located near the Proposed Hyperion Site

APPENDIX E

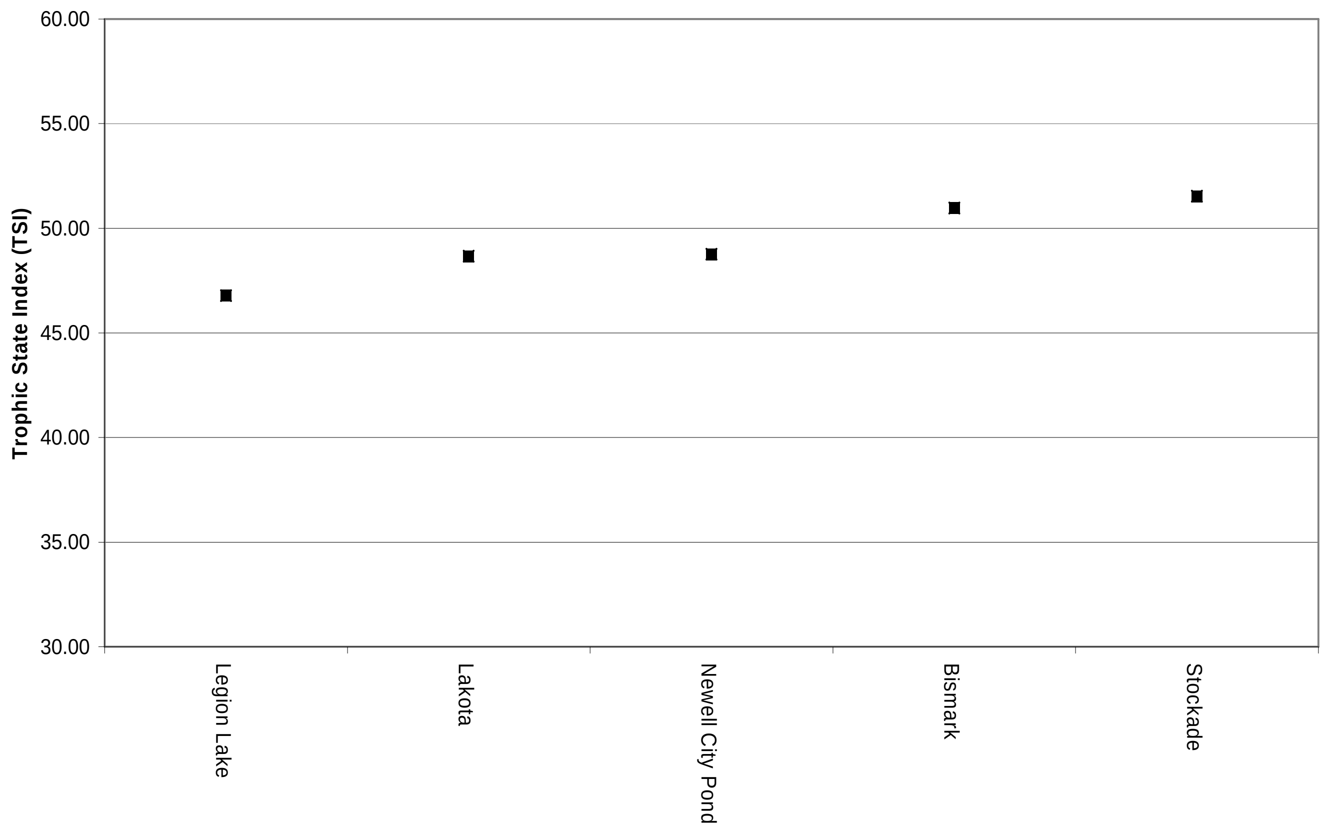
MEDIAN TSI SECCHI-CHLOROPHYLL FOR ASSESSED LAKES BY FISHERY BENEFICIAL USE

2000-2009

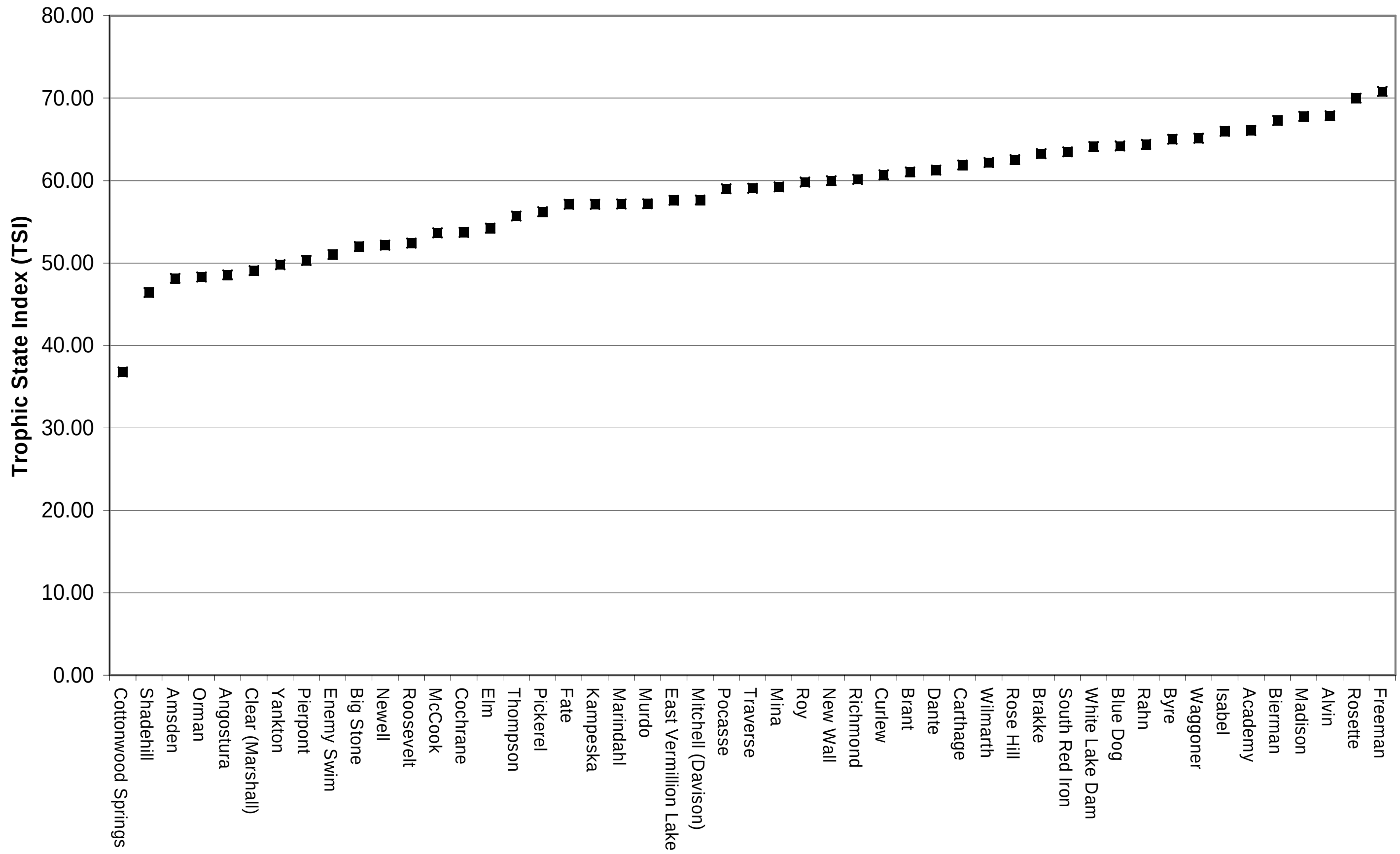
Median Secchi-Chlorophyll-*a* Trophic State Index (TSI) for Assessed Lakes Designated for Coldwater Permanent Fish Life Propagation: 2000-2009



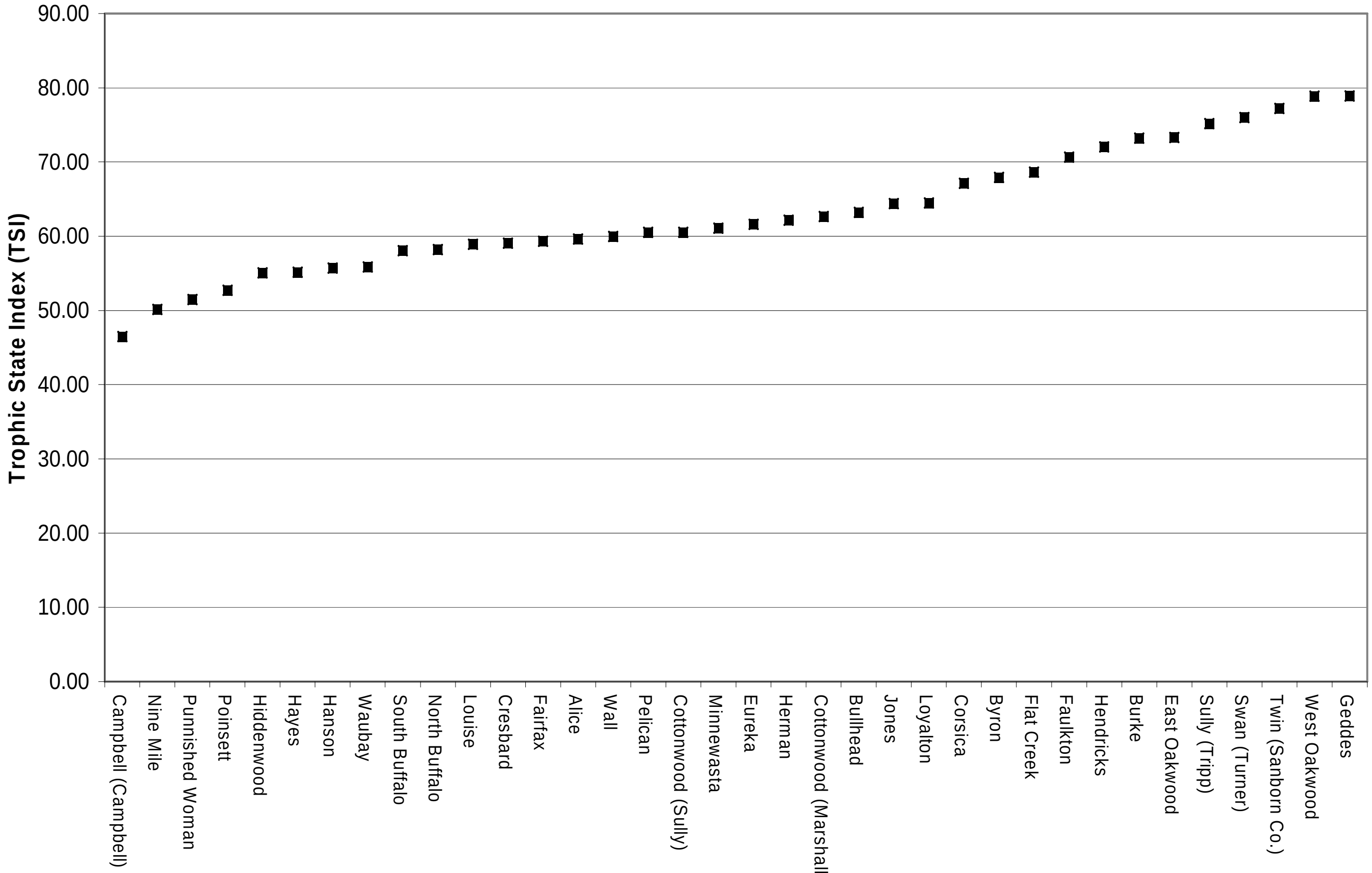
Median Secchi-Chlorophyll-*a* Trophic State Index (TSI) for Assessed Lakes Designated for Coldwater Marginal Fish Life Propagation: 2000-2009



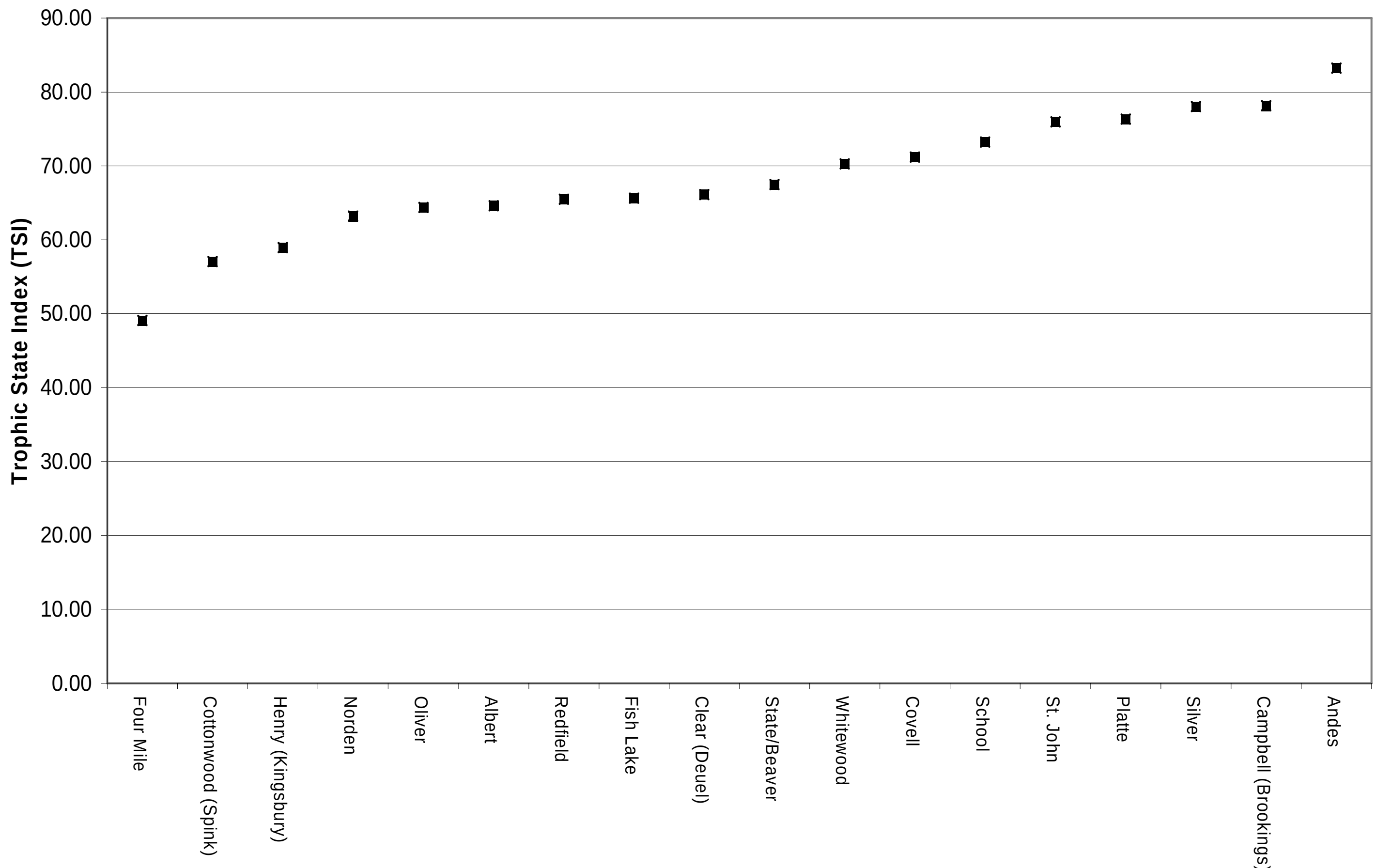
Median Secchi-Chlorophyll-*a* Trophic State Index (TSI) for Assessed Lakes Designated for Warmwater Permanent Fish Life Propagation: 2000-2009



Median Secchi-Chlorophyll-*a* Trophic State Index (TSI) for Assessed Lakes Designated for Warmwater Semi-Permanent Fish Life Propagation: 2000-2009



Median Secchi-Chlorophyll-*a* Trophic State Index (TSI) for Assessed Lakes Designated for Warmwater Marginal Fish Life Propagation: 2000-2009



APPENDIX F

303(D) SUMMARY

Assessment Unit ID (AUID)	Waterbody	Location	Cause	First Listed	TMDL Priority	TMDL Schedule
SD-BA-L-FREEMAN_01	Freeman Lake	Jackson County	Dissolved Oxygen	2010	2	2018
SD-BA-L-FREEMAN_01	Freeman Lake	Jackson County	Specific Conductance	2006	2	2018
SD-BA-L-FREEMAN_01	Freeman Lake	Jackson County	Total Dissolved Solids	2006	2	2018
SD-BA-L-WAGGONER_01	Waggoner Lake	Haakon County	Chlorophyll-*a*	2010	2	2022
SD-BF-L-IRON_CREEK_01	Iron Creek Lake	Lawrence County	Temperature, water	2010	2	2022
SD-BF-L-MIRROR_EAST_01	Mirror Lake East	Lawrence County	Temperature, water	2006	2	2018
SD-BF-L-MIRROR_WEST_01	Mirror Lake West	Lawrence County	Temperature, water	2008	2	2020
SD-BF-L-NEWELL_CITY_01	Newell City Pond	Butte County	Temperature, water	2010	2	2022
SD-BF-R-BEAR_BUTTE_01	Bear Butte Creek	Headwaters to Strawberry Creek	Temperature, water	1998	2	2011
SD-BF-R-BEAR_BUTTE_02	Bear Butte Creek	Strawberry Creek to S2, T4N, R4E	Temperature, water	2008	2	2020
SD-BF-R-BELLE_FOURCHE_01	Belle Fourche River	Wyoming border to Redwater River	Fecal Coliform	2004	1	2015
SD-BF-R-BELLE_FOURCHE_05	Belle Fourche River	Alkali Creek to mouth	Fecal Coliform	2010	1	2015
SD-BF-R-HORSE_01_USGS	Horse Creek	Indian Creek to mouth	Specific Conductance	2004	2	2011
SD-BF-R-REDWATER_01_USGS	Redwater River	WY border to Hwy 85	Temperature, water	2008	2	2020
SD-BF-R-STRAWBERRY_01	Strawberry Creek	Bear Butte Creek to S5, T4N, R4E	Cadmium	2004	1	2010
SD-BF-R-W_STRAWBERRY_01	W Strawberry Creek	Headwaters to mouth	Fecal Coliform	2008	2	2020
SD-BF-R-WHITEWOOD_01	Whitewood Creek	Whitetail Summit to Gold Run Creek	Temperature, water	2006	2	2018

Assessment Unit ID (AUID)	Waterbody	Location	Cause	First Listed	TMDL Priority	TMDL Schedule
SD-BF-R-WHITEWOOD_03	Whitewood Creek	Deadwood Creek to Spruce Gulch	*E. coli*	2010	2	2022
SD-BF-R-WHITEWOOD_03	Whitewood Creek	Deadwood Creek to Spruce Gulch	Fecal Coliform	2004	2	2011
SD-BF-R-WHITEWOOD_05	Whitewood Creek	Sandy Creek to I-90	pH	2006	2	2018
SD-BF-R-WHITEWOOD_06	Whitewood Creek	I-90 to Crow Creek	pH	2008	2	2020
SD-BF-R-WHITEWOOD_07	Whitewood Creek	Crow Creek to mouth	TSS	2010	2	2022
SD-BF-R-WILLOW_01_USGS	Willow Creek	Near Vale, SD	Specific Conductance	2006	2	2018
SD-BS-L-ALVIN_01	Lake Alvin	Lincoln County	Temperature, water	2010	2	2022
SD-BS-L-BITTER_01	Bitter Lake	Day County	pH	2010	1	2022
SD-BS-L-BITTER_01	Bitter Lake	Day County	Mercury	2006	1	2018
SD-BS-L-BLUE_DOG_01	Blue Dog Lake	Day County	*E. coli*	2010	2	2022
SD-BS-L-BLUE_DOG_01	Blue Dog Lake	Day County	*pH*	2010	2	2022
SD-BS-L-BULLHEAD_01	Bullhead Lake	Deuel County	pH	2008	2	2020
SD-BS-L-BULLHEAD_01	Bullhead Lake	Deuel County	Chlorophyll-*a*	2010	2	2022
SD-BS-L-PELICAN_01	Pelican Lake	Codington County	pH	2008	2	2020
SD-BS-L-TWIN_01	Twin Lakes/W. Hwy 81	Kingsbury County	Mercury	2006	1	2018
SD-BS-L-TWIN_02	Twin Lakes	Minnehaha County	Mercury	2010	1	2018
SD-BS-R-BEAVER_01	Beaver Creek	Big Sioux River to S9, T98N, R49W	Fecal Coliform	2008	1	2010
SD-BS-R-BIG_SIOUX_01	Big Sioux River	S28, T121N, R52W to Lake Kampeska	*E. coli*	2010	2	2022
SD-BS-R-BIG_SIOUX_01	Big Sioux River	S28, T121N, R52W to Lake Kampeska	Dissolved Oxygen	2004	2	2015
SD-BS-R-BIG_SIOUX_03	Big Sioux River	Willow Creek to Stray Horse Creek	*E. coli*	2010	2	2022
SD-BS-R-BIG_SIOUX_06	Big Sioux River	Brookings to Brookings/Moody County Line	TSS	2004	2	2016

Assessment Unit ID (AUID)	Waterbody	Location	Cause	First Listed	TMDL Priority	TMDL Schedule
SD-BS-R-BIG_SIOUX_08	Big Sioux River	S2, T104N, R49W to I-90	*E. coli*	2010	1	2022
SD-BS-R-BIG_SIOUX_08	Big Sioux River	S2, T104N, R49W to I-90	TSS	2010	1	2022
SD-BS-R-BIG_SIOUX_10	Big Sioux River	I-90 to diversion return	TSS	2010	1	2022
SD-BS-R-BIG_SIOUX_10	Big Sioux River	I-90 to diversion return	*E. coli*	2010	1	2022
SD-BS-R-BIG_SIOUX_10	Big Sioux River	I-90 to diversion return	Fecal Coliform	2004	1	2011
SD-BS-R-BIG_SIOUX_11	Big Sioux River	Diversion return to SF WWTF	*E. coli*	2010	1	2022
SD-BS-R-BIG_SIOUX_11	Big Sioux River	Diversion return to SF WWTF	Fecal Coliform	2004	1	2011
SD-BS-R-BIG_SIOUX_11	Big Sioux River	Diversion return to SF WWTF	TSS	2004	1	2011
SD-BS-R-BIG_SIOUX_12	Big Sioux River	SF WWTF to above Brandon	*E. coli*	2010	1	2022
SD-BS-R-BIG_SIOUX_12	Big Sioux River	SF WWTF to above Brandon	Fecal Coliform	2004	1	2011
SD-BS-R-BIG_SIOUX_12	Big Sioux River	SF WWTF to above Brandon	TSS	2004	1	2011
SD-BS-R-BIG_SIOUX_13	Big Sioux River	Above Brandon to Nine Mile Creek	TSS	2010	1	2022
SD-BS-R-BIG_SIOUX_14	Big Sioux River	Nine Mile Creek to near Fairview	TSS	2004	1	2011
SD-BS-R-BRULE_01	Brule Creek	Big Sioux River to confluence of its east and west forks	Fecal Coliform	2008	1	2010
SD-BS-R-BRULE_01	Brule Creek	Big Sioux River to confluence of its east and west forks	TSS	2008	1	2010
SD-BS-R-EAST_BRULE_01	East Brule Creek	confluence with Brule Creek to S3, T95N, R49W	Fecal Coliform	2008	1	2010
SD-BS-R-EAST_BRULE_01	East Brule Creek	confluence with Brule Creek to S3, T95N, R49W	TSS	2008	1	2010
SD-BS-R-NORTH_DEER_01	North Deer Creek	Six Mile Creek to U.S. Highway 77	Dissolved Oxygen	2010	1	2011

Assessment Unit ID (AUID)	Waterbody	Location	Cause	First Listed	TMDL Priority	TMDL Schedule
SD-BS-R-PEG_MUNKY_RUN_01	Peg Munky Run	Big Sioux River to S17, T113N, R50W	Fecal Coliform	2010	2	2022
SD-BS-R-PIPESTONE_01	Pipestone Creek	Split Rock Creek to Minnesota border	*E. coli*	2010	1	2011
SD-BS-R-SIXMILE_01	Six Mile Creek	Big Sioux River to S30, T112N, R48W	Fecal Coliform	2010	2	2022
SD-BS-R-UNION_01	Union Creek	Big Sioux River to confluence with East and West Forks	Fecal Coliform	2008	2	2010
SD-BS-R-UNION_01	Union Creek	Big Sioux River to confluence with East and West Forks	TSS	2008	2	2010
SD-CH-L-CENTER_01	Center Lake	Custer County	Temperature, water	2008	2	2020
SD-CH-L-CENTER_01	Center Lake	Custer County	pH	2006	2	2018
SD-CH-L-COLD_BROOK_01	Cold Brook Reservoir	Fall River County	Temperature, water	2006	2	2018
SD-CH-L-CURLEW_01	Curlew Lake	Meade County	Temperature, water	2010	2	2022
SD-CH-L-DEERFIELD_01	Deerfield Lake	Pennington County	Temperature, water	2010	2	2022
SD-CH-L-HORSETHIEF_01	Horsethief Lake	Pennington County	pH	2006	2	2018
SD-CH-L-HORSETHIEF_01	Horsethief Lake	Pennington County	Temperature, water	2006	2	2018
SD-CH-L-LEGION_01	Legion Lake	Custer County	Dissolved Oxygen	2010	2	2022
SD-CH-L-LEGION_01	Legion Lake	Custer County	pH	1998	2	2011
SD-CH-L-NEW_WALL_01	New Wall Lake	Pennington County	pH	2010	2	2022
SD-CH-L-SHERIDAN_01	Sheridan Lake	Pennington County	Dissolved Oxygen	2006	2	2018
SD-CH-L-SHERIDAN_01	Sheridan Lake	Pennington County	Temperature, water	2006	2	2018
SD-CH-L-SYLVAN_01	Sylvan Lake	Custer County	Temperature, water	2008	2	2020

Assessment Unit ID (AUID)	Waterbody	Location	Cause	First Listed	TMDL Priority	TMDL Schedule
SD-CH-R-BATTLE_01	Battle Creek	Near Horsethief Lake to Teepee Gulch Creek	Temperature, water	2004	2	2011
SD-CH-R-BATTLE_01_USGS	Battle Creek	Hwy 79 to mouth	Dissolved Oxygen	2010	2	2022
SD-CH-R-BATTLE_01_USGS	Battle Creek	Hwy 79 to mouth	Fecal Coliform	2010	2	2022
SD-CH-R-BATTLE_01_USGS	Battle Creek	Hwy 79 to mouth	TSS	2010	2	2022
SD-CH-R-BATTLE_02	Battle Creek	Teepee Gulch Creek to SD HWY 79	Temperature, water	2004	2	2016
SD-CH-R-BEAVER_01	Beaver Creek	WY border to Cheyenne River	Fecal Coliform	1998	1	2010
SD-CH-R-BEAVER_01	Beaver Creek	WY border to Cheyenne River	Salinity	2006	1	2010
SD-CH-R-BEAVER_01	Beaver Creek	WY border to Cheyenne River	Specific Conductance	2004	1	2010
SD-CH-R-BEAVER_01	Beaver Creek	WY border to Cheyenne River	Total Dissolved Solids	2004	1	2010
SD-CH-R-BEAVER_01	Beaver Creek	WY border to Cheyenne River	TSS	2004	1	2010
SD-CH-R-BEAVER_01_USGS	Beaver Creek	Near Buffalo Gap	Fecal Coliform	2010	2	2022
SD-CH-R-CHEYENNE_01	Cheyenne River	WY border to Beaver Creek	Salinity	2004	1	2013
SD-CH-R-CHEYENNE_01	Cheyenne River	WY border to Beaver Creek	Specific Conductance	2004	1	2013
SD-CH-R-CHEYENNE_01	Cheyenne River	WY border to Beaver Creek	Total Dissolved Solids	2004	1	2013
SD-CH-R-CHEYENNE_02	Cheyenne River	Beaver Creek to Cascade Creek	Salinity	2008	1	2013
SD-CH-R-CHEYENNE_02	Cheyenne River	Beaver Creek to Cascade Creek	Specific Conductance	2004	1	2013
SD-CH-R-CHEYENNE_02	Cheyenne River	Beaver Creek to Cascade Creek	Total Dissolved Solids	2004	1	2013
SD-CH-R-CHEYENNE_02	Cheyenne River	Beaver Creek to Cascade Creek	TSS	2004	1	2013
SD-CH-R-CHEYENNE_02B	Cheyenne River	Cascade Creek to Angostura Reservoir	TSS	2010	1	2022

Assessment Unit ID (AUID)	Waterbody	Location	Cause	First Listed	TMDL Priority	TMDL Schedule
SD-CH-R-CHEYENNE_03	Cheyenne River	Fall River to Cedar Creek	Fecal Coliform	2010	1	2013
SD-CH-R-CHEYENNE_03	Cheyenne River	Fall River to Cedar Creek	TSS	2004	1	2013
SD-CH-R-CHEYENNE_04	Cheyenne River	Cedar Creek to Belle Fourche River	Alkalinity	2010	1	2022
SD-CH-R-CHEYENNE_04	Cheyenne River	Cedar Creek to Belle Fourche River	Total Dissolved Solids	2010	1	2022
SD-CH-R-CHEYENNE_04	Cheyenne River	Cedar Creek to Belle Fourche River	Fecal Coliform	2004	1	2013
SD-CH-R-CHEYENNE_04	Cheyenne River	Cedar Creek to Belle Fourche River	TSS	2004	1	2013
SD-CH-R-CHEYENNE_05	Cheyenne River	Belle Fourche River to Bull Creek	*E. coli*	2010	1	2022
SD-CH-R-CHEYENNE_05	Cheyenne River	Belle Fourche River to Bull Creek	Fecal Coliform	2004	1	2013
SD-CH-R-CHEYENNE_05	Cheyenne River	Belle Fourche River to Bull Creek	TSS	2004	1	2013
SD-CH-R-CHEYENNE_06	Cheyenne River	Bull Creek to Lake Oahe	Fecal Coliform	2004	1	2013
SD-CH-R-CHEYENNE_06	Cheyenne River	Bull Creek to Lake Oahe	TSS	2004	1	2013
SD-CH-R-ELK_01_USGS	Elk Creek	S9, T3N, R7E to S27, T4N, R3E	Temperature, water	2008	2	2020
SD-CH-R-FALL_01	Fall River	Hot Springs to mouth	Temperature, water	2004	2	2017
SD-CH-R-FRENCH_01	French Creek	S23, T3S, R3E to Custer	Dissolved Oxygen	2006	1	2018
SD-CH-R-GRACE_COOLIDGE_01	Grace Coolidge Creek	S12, T3S, R5E to Battle Creek	Temperature, water	2004	2	2015
SD-CH-R-GRIZZLY_BEAR_01_USGS	Grizzly Bear Creek	Near Keystone, SD	Temperature, water	2006	2	2018
SD-CH-R-HIGHLAND_01_USGS	Highland Creek	Wind Cave Natl Park and near Pringle, SD	pH	2006	2	2018
SD-CH-R-HIGHLAND_01_USGS	Highland Creek	Wind Cave Natl Park and near Pringle, SD	Temperature, water	2006	2	2018
SD-CH-R-HORSEHEAD_01_USGS	Horsehead Creek	At Oelrichs	Specific conductance	2006	2	2018

Assessment Unit ID (AUID)	Waterbody	Location	Cause	First Listed	TMDL Priority	TMDL Schedule
SD-CH-R-HOT_BROOK_01	Hot Brook Creek	Fall River to S19, T7S, R5E	Temperature, water	2006	2	2018
SD-CH-R-RAPID_03	Rapid Creek	Canyon Lake to S15, T1N, R8E	Temperature, water	2010	1	2022
SD-CH-R-RAPID_03	Rapid Creek	Canyon Lake to S15, T1N, R8E	Fecal Coliform	2004	1	2016
SD-CH-R-RAPID_04	Rapid Creek	S15, T1N, R8E to above Farmingdale	Fecal Coliform	2004	1	2016
SD-CH-R-RAPID_05	Rapid Creek	Above Farmingdale to Cheyenne River	*E. coli*	2010	1	2022
SD-CH-R-RAPID_05	Rapid Creek	Above Farmingdale to Cheyenne River	Fecal Coliform	2004	1	2016
SD-CH-R-RAPID_05	Rapid Creek	Above Farmingdale to Cheyenne River	TSS	2004	1	2016
SD-CH-R-RAPID_N_FORK_01	North Fork Rapid Creek	From confluence with Rapid Creek to S8, T3N, R3E	Temperature, water	2004	1	2017
SD-CH-R-SPRING_01	Spring Creek	S5, T2S, R3E to Sheridan Lake	Temperature, water	2008	2	2020
SD-CH-R-SPRING_02	Spring Creek	Sheridan Lake to SD HWY 79	Temperature, water	2008	2	2020
SD-CH-R-VICTORIA_01_USGS	Victoria Creek	Rapid Creek to S19, T1N, R6E	Temperature, water	1998	2	2011
SD-GR-L-ISABEL_01	Lake Isabel	Dewey County	Mercury	2006	1	2018
SD-GR-L-ISABEL_01	Lake Isabel	Dewey County	Chlorophyll-*a*	2010	2	2022
SD-GR-L-PUDWELL_01	Pudwell Dam	Corson County	Mercury	2010	1	2018
SD-GR-L-SHADEHILL_01	Shadehill Reservoir	Perkins County	Salinity	2004	2	2015
SD-GR-R-GRAND_01	Grand River	Shadehill Reservoir to Corson County line	Temperature, water	2004	2	2017
SD-GR-R-GRAND_01	Grand River	Shadehill Reservoir to Corson County line	Salinity	1998	2	2011
SD-GR-R-GRAND_02	Grand River	Corson County line to Bullhead	Salinity	2004	2	2017

Assessment Unit ID (AUID)	Waterbody	Location	Cause	First Listed	TMDL Priority	TMDL Schedule
SD-GR-R-GRAND_02	Grand River	Corson County line to Bullhead	TSS	2004	2	2017
SD-GR-R-GRAND_03	Grand River	Bullhead to mouth	*E. coli*	2010	2	2022
SD-GR-R-GRAND_03	Grand River	Bullhead to mouth	Fecal Coliform	2004	2	2017
SD-GR-R-GRAND_03	Grand River	Bullhead to mouth	Salinity	2004	2	2017
SD-GR-R-GRAND_03	Grand River	Bullhead to mouth	TSS	2004	2	2017
SD-GR-R-GRAND_N_FORK_01	NF Grand River	North Dakota border to Shadehill Reservoir	Salinity	2004	2	2017
SD-GR-R-GRAND_N_FORK_01	NF Grand River	North Dakota border to Shadehill Reservoir	Specific Conductance	2004	2	2017
SD-GR-R-GRAND_S_FORK_01	SF Grand River	Jerry Creek to Skull Creek	Salinity	2006	2	2018
SD-GR-R-GRAND_S_FORK_01	SF Grand River	Jerry Creek to Skull Creek	TSS	2004	2	2017
SD-GR-R-GRAND_S_FORK_02	SF Grand River	Skull Creek to Shadehill Reservoir	Salinity	2004	2	2011
SD-GR-R-GRAND_S_FORK_02	SF Grand River	Skull Creek to Shadehill Reservoir	TSS	2004	2	2011
SD-JA-L-BIERMAN_01	Bierman Dam	Spink County	Chlorophyll-*a*	2010	2	2022
SD-JA-L-BYRON_01	Lake Byron	Beadle County	pH	2010	2	2022
SD-JA-L-CARTHAGE_01	Lake Carthage	Miner County	Chlorophyll-*a*	2010	2	2022
SD-JA-L-CRESBARD_01	Cresbard Lake	Faulk County	pH	2010	2	2022
SD-JA-L-FAULKTON_01	Lake Faulkton	Faulk County	pH	2008	2	2020
SD-JA-L-JONES_01	Jones Lake	Hand County	pH	2006	2	2018
SD-JA-L-LOUISE_01	Lake Louise	Hand County	pH	2008	2	2020
SD-JA-L-NINE_MILE_01	Nine Mile Lake	Marshall County (formerly SD-BS-L-NINE_MILE_01)	pH	2010	2	2022
SD-JA-L-REDFIELD_01	Lake Redfield	Spink County	Dissolved Oxygen	2010	2	2022
SD-JA-L-ROSEHILL_01	Rosehill Lake	Hand County	Dissolved Oxygen	2010	2	2022
SD-JA-L-SOUTH_BUFFALO_01	South Buffalo Lake	Marshall County (formerly SD-BS-L-SOUTH_BUFFALO_01)	Dissolved Oxygen	2010	2	2022
SD-JA-L-TWIN_01	Twin Lakes	Sanborn County	Chlorophyll-*a*	2010	2	2022
SD-JA-L-WILMARTH_01	Wilmarth Lake	Aurora County	Chlorophyll-*a*	2010	2	2022

Assessment Unit ID (AUID)	Waterbody	Location	Cause	First Listed	TMDL Priority	TMDL Schedule
SD-JA-R-DAWSON_01	Dawson Creek	James River to Lake Henry	*E. coli*	2010	1	2012
SD-JA-R-DAWSON_01	Dawson Creek	James River to Lake Henry	Fecal Coliform	2008	1	2010
SD-JA-R-FIRESTEEL_01	Firesteel Creek	West Fork Firesteel Creek to mouth	*E. coli*	2010	2	2022
SD-JA-R-FIRESTEEL_01	Firesteel Creek	West Fork Firesteel Creek to mouth	Total Dissolved Solids	2004	2	2017
SD-JA-R-JAMES_01	James River	North Dakota border to Mud Lake Reservoir	pH	2006	1	2018
SD-JA-R-JAMES_02	James River	Mud Lake Reservoir	pH	2006	1	2018
SD-JA-R-JAMES_03	James River	Columbia Road Reservoir	Dissolved Oxygen	2008	1	2020
SD-JA-R-JAMES_05	James River	US HWY 12 to Mud Creek	Dissolved Oxygen	2006	1	2018
SD-JA-R-JAMES_06	James River	Mud Creek to James River Diversion Dam	Dissolved Oxygen	2010	1	2022
SD-JA-R-JAMES_08	James River	Huron 3rd Street Dam to Sand Creek	TSS	2010	1	2022
SD-JA-R-JAMES_09	James River	Sand Creek to I-90	TSS	2004	1	2010
SD-JA-R-JAMES_10	James River	I-90 to Yankton County line	TSS	1998	1	2010
SD-JA-R-JAMES_11	James River	Yankton County line to mouth	Fecal Coliform	1998	1	2010
SD-JA-R-JAMES_11	James River	Yankton County line to mouth	TSS	2004	1	2010
SD-JA-R-MOCCASIN_02	Moccasin Creek	James River to S24, T123N, R64W	Dissolved Oxygen	2008	1	2020
SD-JA-R-MOCCASIN_02	Moccasin Creek	James River to S24, T123N, R64W	pH	2008	1	2020
SD-JA-R-MUD_01	Mud Creek	James River to Hwy 37	Dissolved Oxygen	2006	2	2018
SD-JA-R-PIERRE_01	Pierre Creek	James River to S11, T102N, R58W	*E. coli*	2010	1	2020
SD-JA-R-SNAKE_01	Snake Creek	James River to confluence with SF Snake Creek	Dissolved Oxygen	2006	1	2018
SD-JA-R-TURTLE_01	Turtle Creek	James River to S17, T113N, R65W	pH	2008	1	2020

Assessment Unit ID (AUID)	Waterbody	Location	Cause	First Listed	TMDL Priority	TMDL Schedule
SD-JA-R-WOLF_02	Wolf Creek	Just above Wolf Creek Colony to the mouth.	TSS	2008	1	2010
SD-LM-R-LITTLE_MISSOURI_01	Little Missouri River	Montana border to North Dakota border	TSS	2010	2	2022
SD-MI-L-ANDES_01	Lake Andes	Charles Mix County	Dissolved Oxygen	2006	2	2011
SD-MI-L-CAMPBELL_01	Lake Campbell	Campbell County	pH	2010	2	2022
SD-MI-L-CAMPBELL_01	Lake Campbell	Campbell County	Chlorophyll-*a*	2010	2	2022
SD-MI-L-COTTONWOOD_01	Cottonwood Lake	Sully County	Chlorophyll-*a*	2010	2	2022
SD-MI-L-DANTE_01	Dante Lake	Charles Mix County	Dissolved Oxygen	2010	2	2022
SD-MI-L-GEDDES_01	Geddes Lake	Charles Mix County	Dissolved Oxygen	2010	2	2022
SD-MI-L-GEDDES_01	Geddes Lake	Charles Mix County	pH	2010	2	2022
SD-MI-L-HURLEY_01	Lake Hurley	Potter County	Mercury	2006	1	2018
SD-MI-L-MCCOOK_01	McCook Lake	Union County	Temperature, water	2010	2	2022
SD-MI-L-POCASSE_01	Lake Pocasse	Campbell County	*E. coli*	2010	2	2022
SD-MI-L-POCASSE_01	Lake Pocasse	Campbell County	Chlorophyll-*a*	2010	2	2022
SD-MI-L-ROOSEVELT_01	Roosevelt Lake	Tripp County	Mercury	2006	1	2018
SD-MI-R-CHOTEAU_01	Choteau Creek	Lewis & Clark Lake to S34, T96N, R63W	TSS	1998	1	2010
SD-MI-R-EMANUEL_01	Emanuel Creek	Lewis and Clark Lake to S20, T94N, R60W	E. coli	2010	1	2022
SD-MI-R-PONCA_01	Ponca Creek	SD/NE border to US Hwy 183	Fecal Coliform	2008	1	2010
SD-MI-R-SHARPE_01	Missouri River (Lake Sharpe)	Oahe Dam to Big Bend Dam	Temperature, water	2010	1	2022
SD-MI-R-SPRING_01	Spring Creek	Lake Pocasse to US HWY 83	Dissolved Oxygen	2006	2	2018
SD-MN-L-HENDRICKS_01	Lake Hendricks	Brookings County	pH	2010	2	2022
SD-MN-R-WHETSTONE_S_FORK_02	SF Whetstone River	Lake Farley to mouth	Dissolved Oxygen	2010	1	2020
SD-MU-R-MOREAU_01	Moreau River	North and South Forks to Ziebach/Perkins county line	TSS	2006	2	2018

Assessment Unit ID (AUID)	Waterbody	Location	Cause	First Listed	TMDL Priority	TMDL Schedule
SD-MU-R-MOREAU_01	Moreau River	North and South Forks to Ziebach/Perkins county line	Salinity	1998	2	2011
SD-MU-R-MOREAU_02	Moreau River	Ziebach/Perkins county line to Green Grass	TSS	1998	2	2011
SD-MU-R-MOREAU_02	Moreau River	Ziebach/Perkins county line to Green Grass	Salinity	1998	2	2011
SD-MU-R-MOREAU_03	Moreau River	Green Grass to mouth	*E. coli*	2010	2	2022
SD-MU-R-MOREAU_03	Moreau River	Green Grass to mouth	Fecal Coliform	2006	2	2018
SD-MU-R-MOREAU_03	Moreau River	Green Grass to mouth	Salinity	1998	2	2011
SD-MU-R-MOREAU_03	Moreau River	Green Grass to mouth	TSS	2004	2	2011
SD-MU-R-MOREAU_S_FORK_01	SF Moreau River	Alkali Creek to mouth	Total Dissolved Solids	2004	2	2017
SD-MU-R-MOREAU_S_FORK_01	SF Moreau River	Alkali Creek to mouth	Specific Conductance	1998	2	2011
SD-MU-R-THUNDER_BUTTE_01	Thunder Butte Creek	Headwaters to mouth	Dissolved Oxygen	1998	2	2011
SD-NI-L-RAHN_01	Rahn Lake	Tripp County	Chlorophyll-*a*	2010	2	2022
SD-NI-R-KEYA_PAHA_01	Keya Paha River	SD/NE border to confluence with Antelope Creek	*E. coli*	2010	2	2022
SD-BS-L-ISLAND_N_01	North Island Lake	Minnehaha/McCook counties	Mercury	2008	1	2018
SD-VM-L-E_VERMILLION_01	East Vermillion Lake	McCook County	Chlorophyll-*a*	2010	2	2022
SD-VM-L-SILVER_01	Silver Lake	Hutchinson County	pH	2010	2	2022
SD-VM-L-SWAN_01	Swan Lake	Turner County	pH	2010	2	2022
SD-VM-R-LONG_01	Long Creek	Vermillion River to Highway 44	*E. coli*	2010	1	2022
SD-VM-R-LONG_01	Long Creek	Vermillion River to Highway 44	Fecal Coliform	2008	1	2010
SD-VM-R-VERMILLION_02	Vermillion River	Turkey Ridge Creek to Baptist Creek	*E. coli*	2010	1	2022

Assessment Unit ID (AUID)	Waterbody	Location	Cause	First Listed	TMDL Priority	TMDL Schedule
SD-VM-R-VERMILLION_02	Vermillion River	Turkey Ridge Creek to Baptist Creek	TSS	2004	1	2010
SD-VM-R-VERMILLION_03	Vermillion River	Baptist Creek to mouth	TSS	2004	1	2010
SD-VM-R-VERMILLION_E_FORK_01	EF Vermillion River	McCook/Lake County line to Little Vermillion River	Fecal Coliform	2010	1	2022
SD-VM-R-VERMILLION_E_FORK_02	EF Vermillion River	Little Vermillion River to mouth	*E. coli*	2010	1	2022
SD-VM-R-VERMILLION_WEST_FORK_01_USGS	WF Vermillion River	Vermillion River to McCook-Miner County Line	*E. coli*	2010	1	2022
SD-VM-R-VERMILLION_WEST_FORK_01_USGS	WF Vermillion River	Vermillion River to McCook-Miner County Line	Fecal Coliform	2010	1	2022
SD-WH-R-LAKE_01_USGS	Lake Creek	Above and below refuge near Tuthill, SD	Temperature, water	2006	2	2018
SD-WH-R-LITTLE_WHITE_01	Little White River	Rosebud Creek to mouth	Fecal Coliform	2010	2	2022
SD-WH-R-WHITE_01	White River	NE/SD border to Willow Creek	*E. coli*	2010	1	2022
SD-WH-R-WHITE_01	White River	NE/SD border to Willow Creek	Fecal Coliform	2010	1	2022
SD-WH-R-WHITE_02	White River	Willow Creek to Pass Creek	*E. coli*	2010	1	2022
SD-WH-R-WHITE_02	White River	Willow Creek to Pass Creek	Salinity	2010	1	2022
SD-WH-R-WHITE_02	White River	Willow Creek to Pass Creek	Fecal Coliform	2004	1	2011
SD-WH-R-WHITE_03	White River	Pass Creek to Little White River	Salinity	2010	1	2022
SD-WH-R-WHITE_03	White River	Pass Creek to Little White River	Fecal Coliform	2004	1	2017
SD-WH-R-WHITE_04	White River	Little White River to confluence with Missouri River	*E. coli*	2010	1	2022
SD-WH-R-WHITE_04	White River	Little White River to confluence with Missouri R	Fecal Coliform	2004	1	2017

APPENDIX G

PUBLIC COMMENTS

Comment from George Woodhouse, Yankton, SD

I won't try to write a long letter. I'd just like to let you know that the cleanest future of our U.S. and the world is very important.

Please continue doing all that is possible to maintain our rivers, lakes, and natural soil conservation for the next generations. I moved back to this area after retirement so I could enjoy natural habitat and clean air in the midwest.

A good example that your department has probably done are the signs along the river stating that boat owners need to clean their boats to keep the rivers clean. Thanks.

Wish you the best for the future.

Respectfully,

George Woodhouse
glycowood@vyn.midco.net

DENR response to George Woodhouse:

Thank you for your comments on South Dakota's draft 2010 Integrated Report.

Comment from Reverend James T. Pearson:

Greetings Shannon - Thank you for allowing me an opportunity to share a few thoughts with you and with the DENR. I apologize for not getting back to you sooner but due to the nature of my work as a pastor, sometimes things come up that take me away from the task at hand.

May I begin by saying "thank you" for the work that you and the SD DENR do in protecting our environment.

My comments to you and to the DENR are broad and perhaps philosophical in nature. As I life long South Dakotan who has lived in various regions of the state, I am greatly concerned at the overall lack of leadership and vision concerning our environment and natural resources. Having grown up the Glacial Lakes Region of northeast SD, I have literally cried at the degradation of these precious prairie jewels. My family has had a small cabin on Pickerel for sixty years and we have watched developer after developer destroy what nature had so wonderfully made over the eons. Lake shore and adjoining areas can be grossly altered and/or destroyed with impunity. We have watched with horror, sediments and other pollutants come into the lake as a result.

One of the worst examples of this was the development at the northwest end of the lake in which the DENR and others allowed a swamp to be drained into the lake, causing a flood of mud, pollutants, and sediments. As you may know, the phosphorus levels in the lake rose to levels as to cause serious algae and water quality problems. This kind of development (so called) should never have been allowed to happen! The small penalty that developers, contractors, cabin owners etc. have to pay when they do such acts becomes just a small "cost of doing business."

Shouldn't the SD DENR be the agency with the mission, the leadership and the vision to protect our precious natural environment? Just as the SD Dept. of Game and Fish and Parks takes a proactive role in lobbying law makers and the executive branch, the DENR should be that agency that has environmental protection and sustainable development at the heart of its mission....am I missing something here?

Thank you so much for giving my thoughts your time and consideration.

Sincerely,
The Reverend James T. Pearson

DENR response to Reverend James T. Pearson:

Thank you for your comments and concerns regarding Pickerel Lake and other natural resources in northeast South Dakota. The northeast region of South Dakota has many high quality water resources. Pickerel Lake has been reported as fully supporting all beneficial uses and meeting water quality standards through all Integrated Report cycles. DENR considers Pickerel Lake one of the highest quality natural lakes in South Dakota. Pickerel Lake and many other water resources in northeast South Dakota provide exceptional recreation opportunities with relatively low human pressure. These are reasons why Pickerel Lake, and many other lakes in northeast South Dakota, have become popular residential destinations. Unfortunately, as you mention, residential development can have adverse effects that may impact shoreline esthetics and water quality.

Protection of natural resources in South Dakota is a collaborative effort that involves many government agencies at the federal, state, and local level. DENR contributes by regulating surface water discharges, establishing water quality standards, and monitoring water quality in South Dakota rivers and lakes. In addition, DENR provides financial and technical support to *local conservation groups for nonpoint source pollution control. DENR formed a partnership with the Day County Conservation District to identify and document watershed-scale pollution sources and provide cost-share opportunities for conservation practices in the northeast glacial lakes region. The local project coordinator also provides technical assistance to local interest groups or lake associations. For example, the local project coordinator is encouraging lake shore property owners on Pickerel Lake to establish a natural grass-tree buffer between the shoreline and ordinary high water mark to reduce erosion and potential pollutant run-off to the lake. The local coordinator also provides technical support to encourage local ordinances that help protect lake esthetics and water quality.*

The South Dakota Legislature has given the authority for land use decisions to local units of government, primarily counties. DENR does not have the authority to promote or limit lakeshore development. The county is responsible for making land use decisions through appropriate planning and zoning.

Citizen involvement is critical to the effective implementation of DENR's environmental programs. Citizens may voice their concerns through DENR's complaint process. Pursuant to SDCL 34A-2-111, *DENR must receive a signed complaint form before responding to a water quality complaint. The complaint form is available online at:* *http://denr.sd.gov/des/sw/Complaint.aspx or by contacting the department.*

Comment from the City of Sioux Falls, Bob Kappel:

Sioux Falls Public Comment on 2010 Integrated Report:

The City of Sioux Falls respectfully requests that the SDDENR allows our City to work as a team to review the dataset and procedures used by the SDDENR to change the classification of the following reaches of the Big Sioux River from supportive to non-supportive status before finalizing 2010 Integrated Report:

Big Sioux River:

2010 Reach Number	Designated Use	Parameter
19	Warmwater Semipermanent Fish Life	Total Suspended Solids
6	Warmwater Semipermanent Fish Life	Total Suspended Solids
7	Warmwater Semipermanent Fish Life	Total Suspended Solids

Rationale for Comment and Request:
The City of Sioux Falls has reviewed the DENR Draft 2010 Integrated Report. This report has changed the classification of several reaches of the Big Sioux River in the Sioux Falls watershed from supportive to a non-supportive for the parameter of total suspended solids. As you know the City of Sioux Falls is acting as a third party lead on the TMDL project on the Big Sioux River in the Sioux Falls watershed. The City and our contractor have performed an initial review of the data set that is being used to develop the TMDL in this watershed. From this initial review our draft un-scrubbed data gives an indication that the reaches of the Big Sioux River in this area are supportive based upon the acute water quality criteria for total suspended solids. It is our understanding that your department may be evaluating these reaches on the states acute and chronic total suspended water quality criteria.

Therefore the City of Sioux Falls would like to have the opportunity to work as a team with your staff during March to review your data set and procedures to verify your non-supportive status of these reaches of the Big Sioux River. We believe that it is extremely important that the Integrated Report and the TMDL are using the same data set and parameters to prevent any future challenge of the TMDL or its implementation. This review has greater importance since this will be the first TMDL in the state that will have regulatory impacts on a permitted Municipal Separate Storm Sewer System.

If you have any comments or would like to discuss this comment and request, please contact the following:

Robert J. Kappel
Environmental Manager
City of Sioux Falls
(605) 367-8277

Thanks

Robert J. Kappel
Environmental Manager

City of Sioux Falls
Public Works
Environmental Division
1203 N. Western Avenue
Sioux Falls, SD 57104-1201
bkappel@siouxfalls.org
(605) 367-8277

DENR response to the City of Sioux Falls:

Thank you for providing comments to South Dakota's draft 2010 Integrated Report. As requested, DENR has worked with the City of Sioux Falls and RESPEC to review the datasets and procedures used by DENR to list reaches of the Big Sioux River as impaired for total suspended solids. DENR has re-analyzed the datasets and has determined that the Big Sioux River reaches 8, 11, and 12 are not supporting the chronic total suspended solids criteria as outlined in the Methodology chapter of this document. Therefore, the reaches in question will remain on the 303(d) list. After further review, DENR determined that the chronic standard for total suspended solids was not being met on two additional reaches on the Big Sioux River, reaches 10 and 13. These two reaches are listed as impaired for TSS and are included on the 303(d) list. RESPEC prepared the following report for the City of Sioux Falls:

RSI(RCO)-1929/3-10/15

External Memorandum

To: Mr. Robert Kappel
Environmental Manager
City of Sioux Falls
1203 N. Western Avenue
Sioux Falls, SD 57104-1201

cc: Project Central File 1929 — Category A

From: Mr. Jared K. Oswald
Manager, Watershed Planning and Implementation
RESPEC
P.O. Box 725
Rapid City, SD 57709-0725

Date: March 24, 2010

Subject: Big Sioux River Impairment Analysis (Review of Draft Integrated Report)

BACKGROUND

The city of Sioux Falls retained RESPEC to review and verify the findings made in the draft 2010 Integrated Report for the reaches of Big Sioux River near Sioux Falls, South Dakota. A project was conducted by RESPEC to better understand the rational for placing three of four Big Sioux River reaches within the Sioux Falls area on the 2010 draft Integrated Report as impaired for semipermanent fish life propagation. This process included understanding South Dakota Department of Environment and Natural Resources' (SD DENR's) listing methodology, SD DENR to RESPEC cross data comparison/reverification, and verification of impairment. The area of interest includes four reach segments, BS8, 10, 11, and 12, listed in the draft 2010 Integrated Report (Figure 1). The reference to these reaches in the draft 2010 Integrated Report is shown in Table 1. The total suspended solids (TSS) data used for the draft 2010 Integrated Report were collected from SD DENR to compare to the TSS data from the RESPEC database. Several different methods for filtering the data and calculating the acute and chronic exceedance percentages were applied to both datasets. The beneficial use assigned to all the stream segments is warm-water semipermanent fish life propagation which has assigned numeric standards for TSS of 158 milligrams per liter (mg/L) for acute instantaneous samples and 90 mg/L for chronic averaging based on the calendar month. The stream segments in this area have all been fully supportive of the assigned beneficial use of semipermanent fish life propagation during the last two integrated reports.

3824 Jet Drive, PO Box 725, Rapid City, South Dakota 57709-0725 Phone: 605.394.6400 Fax: 605.394.6456 www.respec.com

RSI-1929-10-001

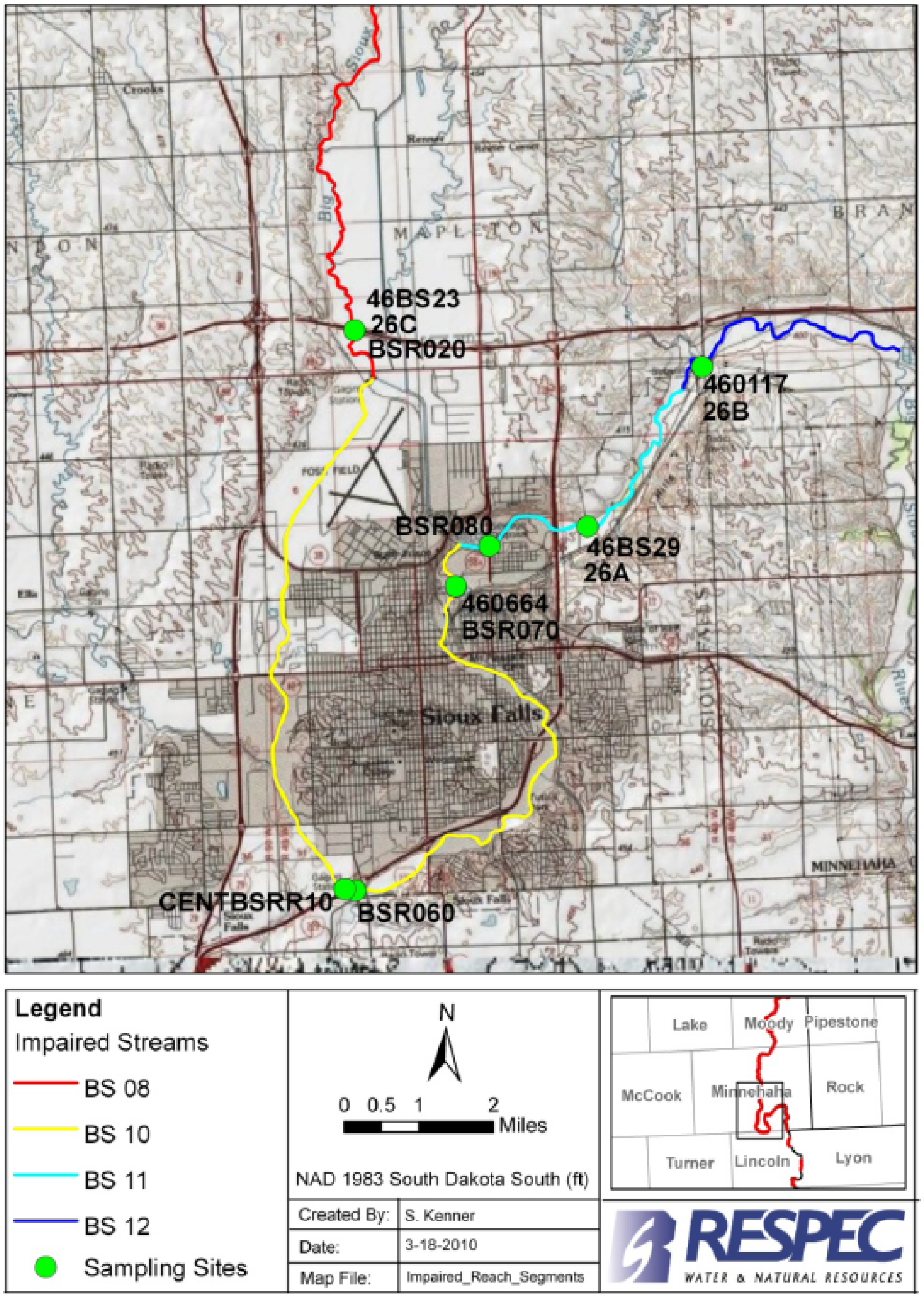


Figure 1. Big Sioux River Area of Interest Showing Impaired Stream Segments.

Table 1. Draft 2010 Integrated Report Map Identification Associated With Impaired Reaches

2010 Draft Integrated Report Reach Map I.D.	Total Maximum Daily Load (TMDL) Reach
R19	R8
R5	R10
R6	R11
R7	R12

DATA

Table 2 is a summary of TSS data available from SD DENR and RESPEC from October 1, 2004, to September 30, 2009. Analyzed data represent the number of samples for each site without replicates, duplicates, or blanks. Replicates and duplicates were previously removed from the SD DENR dataset for water-quality monitoring (WQM) sites. One sample in October 2005 from three WQM sites was missing from the SD DENR dataset but was included in the RESPEC dataset. The SD DENR dataset did not include composite samples or data from June 2007–February 2009 collected by the city of Sioux Falls at sites 26A, 26B, and 26C. The number of samples missing at these sites in the SD DENR dataset is 37, 46, and 29, respectively. Data from Site CENTBSRR10 was given a location identification of BSR050 in the RESPEC dataset. RESPEC has BSR050 located at the I-229 Bridge. For this analysis, the samples for this site were given a location identification of BSR060 because of the proximity of BSR050 to BSR060.

METHODS

There were six different methods used during the analysis. All methods were applied to the RESPEC dataset to compare the methods to each other. The first two methods were applied to the SD DENR dataset to compare the different datasets. Each method applied different combinations of sample filters and averaging method for chronic exceedance percentage calculations (Table 3). All other procedures were consistent between methods. Data for all sites on a reach segment were combined when calculating an overall exceedance percentage for that reach. Duplicate, replicate, and blank samples were removed before analysis. Duplicate samples are one sample separated into two separate samples and have the same sample time, date, site, and sample type. Replicate samples are two samples taken at different times on the same day having the same date, site, and sample type. A blank sample is a sample of clean water.

Table 2. Summary of Number of Samples Available at Each Site for Each Dataset

Site Name	Location I.D.	SD DENR		RESPEC	
		All Data	Analyzed Data	All Data	Analyzed Data
Reach Segment					
BS 08			266		296
460703	BSR010	57	57	58	58
46BS23	BSR020	58	58	59	58
BSR020	BSR020	57	49	52	49
26C	BSR020	102	102	143	131
BS 10			152		153
460664	BSR070	58	58	69	59
BSR060	BSR060	60	49	56	49
BSR070	BSR070	20	17	19	17
CENTBSRR10	BSR060	40	28	34	28
BS 11			245		293
46BS29	BSR090	58	58	60	59
BSR080	BSR080	58	47	52	47
26A	BSR090	140	140	187	187
BS 12			205		260
460117	BSR100	59	59	61	59
26B	BSR100	146	146	201	201

The acute standard of 158 mg/L was applied to the instantaneous samples and the chronic standard of 90 mg/L was applied to the averaged samples to calculate the exceedance percentages. A minimum of 20 samples is needed to analyze the exceedance percentage for listing purposes. Otherwise, if there are less than 20 samples, at least two exceedances are needed to determine impairment. Two methods were used to calculate sample averages for analyzing the chronic exceedance percentages. The SD DENR currently averages samples based on the calendar month. A 30-day average was also used to calculate sample averages. The 30-day average is an average of all samples in any 30-day period. Three samples from three separate weeks within the calendar month or 30-day period are required to calculate an average value.

Table 3. Schematic of Procedures Applied for Each Analysis Method

Method	Samples Types Used			Chronic Calculation Method	
	All Samples	Only Grab	Event Mean Concentration for Grab	Calendar Month	30-Day Average
Method 1	X			X	
Method 2		X		X	
Method 3		X[a]		X	
Method 4			X	X	
Method 5		X			X
Method 6			X		X

(a) Method 3 allows only one sample per reach segment per day while all other methods allow one sample per site per day.

Four methods for filtering the sample type were also applied in combination with the averaging method. Method 1 involved the use of all samples, disregarding sample type, but duplicate and replicate samples were still removed for records with the same site, date, and sample type. Method 2 applied a filter to select only grab samples which allowed only one sample per site per day. Method 3 took this filter further and allowed only one sample per reach per day. The furthest downstream sample on the reach was used in Method 3 when replicate samples occurred on the same reach during the same day. Method 4 started with the filter for only grab samples but then replaced the grab sample with a composite sample when there was a composite sample taken on the same date at the same site.

CONCLUSIONS

The datasets from SD DENR and RESPEC were compared to ensure the validity of any conclusions that may be drawn. The only major difference in the datasets is that the SD DENR dataset did not include samples collected by the city of Sioux Falls from June 2007–February 2009.

The percent exceedance was calculated based on an acute standard of 158 mg/L and a chronic standard of 90 mg/L. The acute and chronic exceedance percentages for each dataset were graphed for each reach segment using Methods 1 and 2 described below (Figure 2 and Figure 3). Impairment is determined if the exceedance percentage is greater than 10 percent. Each reach shows no impairment based on the acute standard and all reaches show impairment based on the chronic standard. There is no change in impairment determination between datasets or methods.

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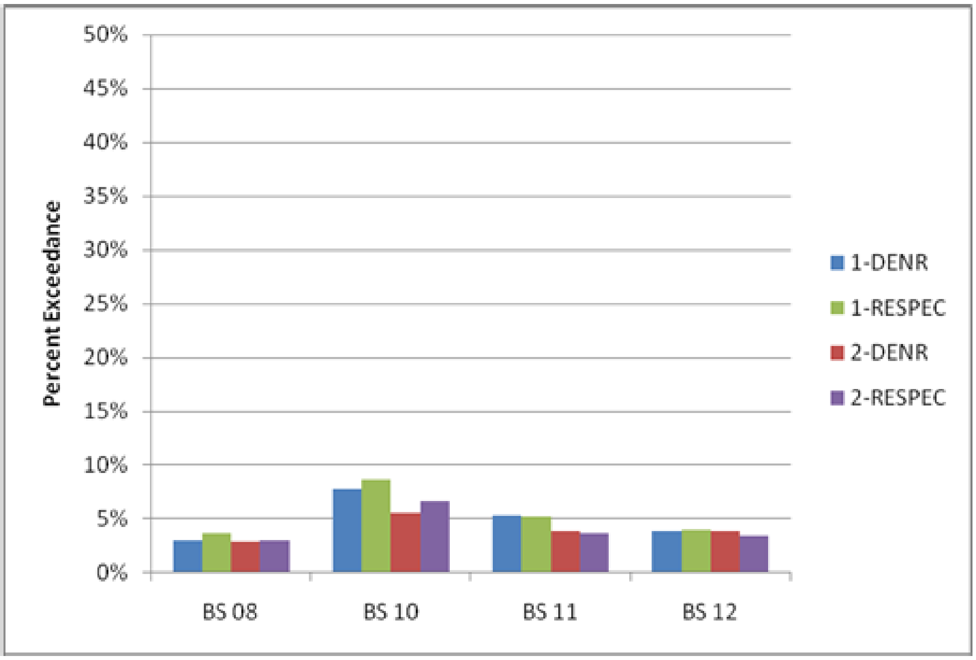

Figure 2. Acute Exceedance Percentages Comparing Datasets Using Methods 1 and 2.

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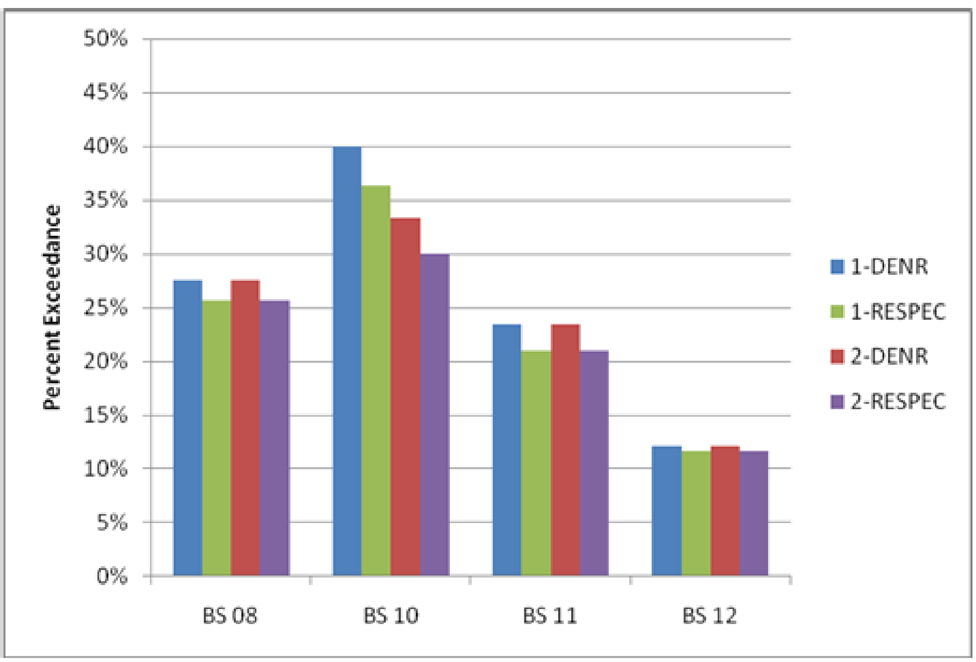

Figure 3. Chronic Exceedance Percentages Comparing Datasets Using Methods 1 and 2.

The acute exceedance percentages for Methods 1 through 4 were graphed to compare differences in methodology using the RESPEC dataset (Figure 4). The chronic exceedance percentages were graphed for Methods 3 through 6 for the RESPEC dataset (Figure 5). The results show the same conclusions as the comparisons between datasets. The acute exceedance percentages show no impairment while the chronic exceedance percentages show impairment for each reach segment. Again, there is no change in impairment determination between datasets or methods.

RSI-1929-10-004

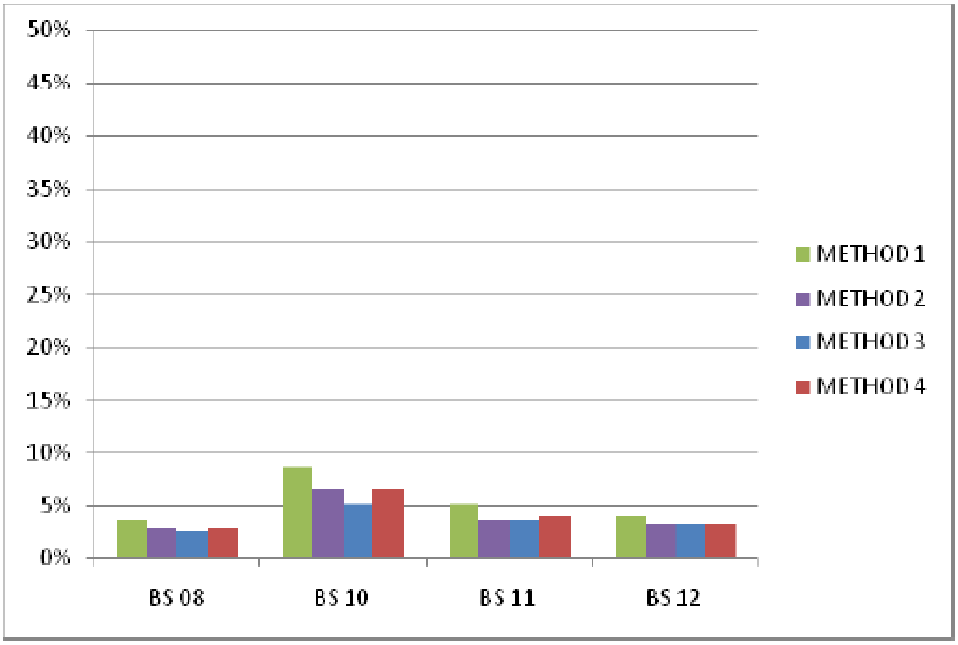

Figure 4. Acute Exceedance Percentages Comparing Methods 1–4 of the RESPEC Dataset.

Reach segment BS10 was listed in the draft 2010 Integrated Report as fully supporting its assigned beneficial use for TSS. According to our analysis, BS10 should be listed as nonsupporting for its assigned beneficial use since there are sufficient data to analyze use the chronic water-quality standard of 90 mg/L. A table sent by the SD DENR to RESPEC on March 22, 2010, with the SD DENR exceedance percentages by reach is shown in Table 4. BS10 is the only reach that was recalculated after the issuance of the draft 2010 Integrated Report. As a result of this joint review by the city of Sioux Falls and SD DENR, the SD DENR has reevaluated the impairment status of this reach and the reach will be listed as nonsupportive in the final 2010 Integrated Report.

RECOMMENDATIONS

Four reach segments (BS 8, 10, 11, and 12) of the Big Sioux River in proximity to the city of Sioux Falls that were previously in "full" support of the TSS standard for their assigned beneficial use of semipermanent fish life propagation, will be listed in the draft 2010 Integrated Report as "nonsupporting." This is the result of the SD DENR using the chronic water-quality standard (90 mg/L) to analyze sample averages based on the calendar month rather than using the acute standard (158 mg/L) to analyze instantaneous samples.

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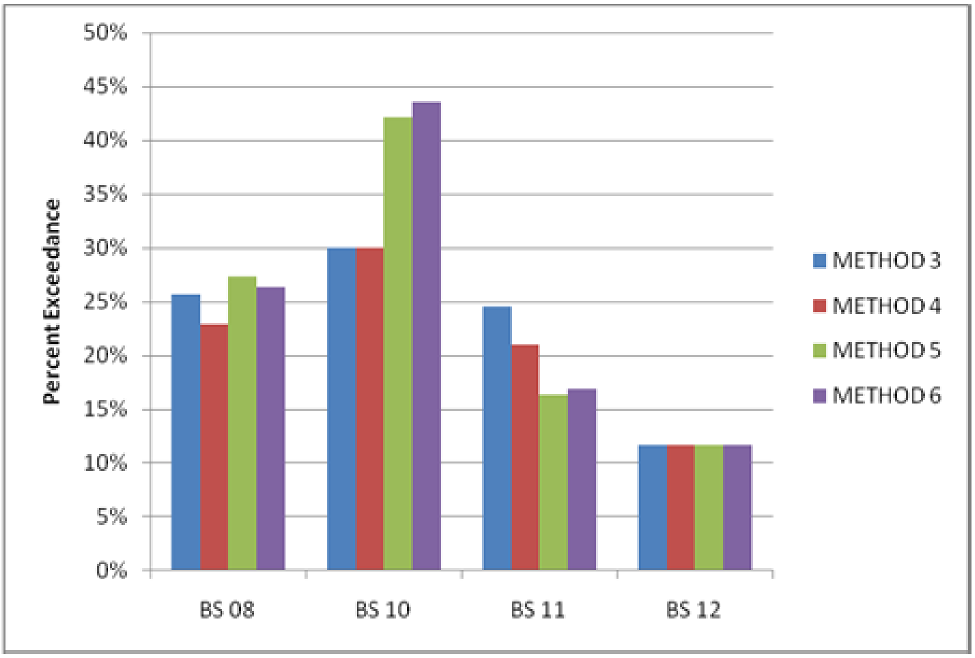


Figure 5. Chronic Exceedance Percentages Comparing Methods 3–6 of the RESPEC Dataset.

Table 4. South Dakota Department of Environment and Natural Resources Chronic and Acute Exceedance Percentages Sent to RESPEC on March 22, 2010

Reach	Chronic Exceedance (%)	Acute Exceedance (%)
BS8	22.73	2.54
BS10	36.36	6.47
BS11	15.15	3.35
BS12	18.18	3.90

It is RESPEC's recommendation that the city of Sioux Falls start an open conversation with the SD DENR to:

1. Understand the reasons for and implications of using the chronic instead of acute criteria to determine impairment status for TSS concentrations in South Dakota streams.
2. Determine if the beneficial uses of the stream segments are being met currently and if a site-specific criteria for TSS is applicable for the Big Sioux River.
3. Understand the impact Skunk Creek has on water quality (in this case, TSS) in the Big Sioux River.
4. Ensure all the data collected by the city of Sioux Falls are included in the dataset used to develop the 2010 Integrated Report.

We believe these activities should occur before developing a TSS TMDL for these reaches of the Big Sioux River. Furthermore, we recommend an approach be developed to bring the current Skunk Creek TMDL and implementation plan into alignment with the water-quality standards for the Big Sioux River based on findings in items 2 and 3 above.

JKO:llf

Conference call discussion summary:

Staff from the City of Sioux Falls, RESPEC, and DENR had a conference call to discuss RESPEC's report. DENR clarified that both the acute and chronic water quality standards apply. The group discussed options to determine if the beneficial uses of the Big Sioux River are being met based on biological indicators. In addition, the group discussed the defensibility of the existing TSS standards and the possibility of developing site specific TSS standards for the Big Sioux River in the Sioux Falls area. RESPEC will continue to work on the TSS TMDLs for the Big Sioux River. DENR will make a decision on TMDL direction based on recommendations from RESPEC and best professional judgment.

Comment from Wharf Resources:

WHARF RESOURCES (U.S.A.), INC.

A wholly owned subsidiary of Goldcorp Inc.

February 24, 2010

Ms. Shannan Minerich
SD DENR
Joe Foss Building
523 East Capitol
Pierre, SD 57501

RE: 2010 South Dakota Integrated Report for Surface Water Quality Assessment.

Dear Ms Minerich:

I wish to make comments on the above referenced report on behalf of Wharf Resources (USA) Inc. My comments are specific to the assessment of the section of False Bottom Creek located between S23, T7N, R3E to S26, T5N, R2E (Map ID R12).

The report indicates that data provided by Wharf Resources was used for water bodies located near mining areas. The reference to Wharf in Table 21 is associated with the basis column for False Bottom Creek at the above mentioned location. The DENR and the USGS is also listed in the basis column. Please provide me with the data from Wharf, the DENR and the USGS that was used to provide the basis for the assessment of False Bottom Creek. I believe the Wharf data to be accurate but am not sure if it has been generated to meet the standards consistent with the DENR Quality Assurance/Quality Control objectives required for this report.

Table 21 indicates that low pH is the cause for the water quality to be non-supportive of the beneficial use. I am not sure if you had our field pH data or were looking at the pH measured at the laboratory. Over the years there has been a significant discrepancy between field pH and laboratory pH at the FB-2 sample location. Because of a number of issues relating to time and water chemistry, the appropriate measurement is the field measurement when assessing water quality. I have attached a table with the field pH measurements taken at sample site FB-2 for the period between October 1, 2004 and September 30, 2009. Wharf field measurement data shows periodically low pH as early as November 1996. Did the 2006 or 2008 Integrated Report identify this segment of False Bottom Creek impaired?

Of the beneficial uses assigned to this segment of False Bottom Creek pH is a criteria for two uses. Coldwater marginal fish life propagation waters has a criteria of ≥ 6.5 - ≤ 9.0 standard units. Fish and wildlife propagation, recreation, and stock waters has a criteria of ≥ 6.0 - ≤ 9.5 standard units. According to the attached FB-2 pH table six of the twenty measurements were lower than the coldwater marginal fish life standard but only 3 of the twenty measurements were below the fish/wildlife propagation standard. There were no measurements lower than 6.5 standard units for the past three years. There were no field pH measurements below 6.0 for the past four years.

10928 Wharf Road • Lead, South Dakota 57754-9710
Telephone (605) 584-1441 • Fax (605) 584-4188

The definition of *"Coldwater Marginal fish life propagation," is a beneficial use assigned to surface waters of the state which support aquatic life and are suitable for stocked catchable-size coldwater fish during portions of the year, but which, because of critical natural conditions including low flows, siltation, or warm temperatures, are not suitable for a permanent coldwater fish population. Warm water fish may also be present.* Flows at sample site FB-2 were naturally low during 2004 and 2005 because of reduced precipitation. I have attached a graph showing the last fourteen years of flow measurements compared to field pH measurements. Flows ranged from less than 2 gallons per minute to almost 2000 gallons per minute. I have also attached a graph showing the annual precipitation at Wharf for the past nine years. The low field pH measurements occurred during 2004 and 2005. Those were the years with the lowest annual precipitation and the lowest measured flows at the FB-2 sample location. Wharf contends that the criteria for coldwater marginal fish life should not be used at the FB-2 sample location during these natural critical low flow periods. In-stream flows do increase further downstream where the coldwater marginal fish life criteria may be more applicable.

The source of these low pH measurements is most likely naturally occurring geochemical impacts during periods of low flow not mining activities related to Wharf. Wharf has recorded low field pH measurements at FB-2 as early as 1996. The nearest mining activity conducted by Wharf, the Trojan Rock Facility, does not drain to the FB-2 sample location of False Bottom Creek. Additionally, the Trojan Rock Facility was started in February 2001 and reclaimed by October 2003 but low field pH measurements were recorded much earlier.

You may respond to these comments by sending an e-mail to:

ron.waterland@goldcorp.com.

Sincerely,

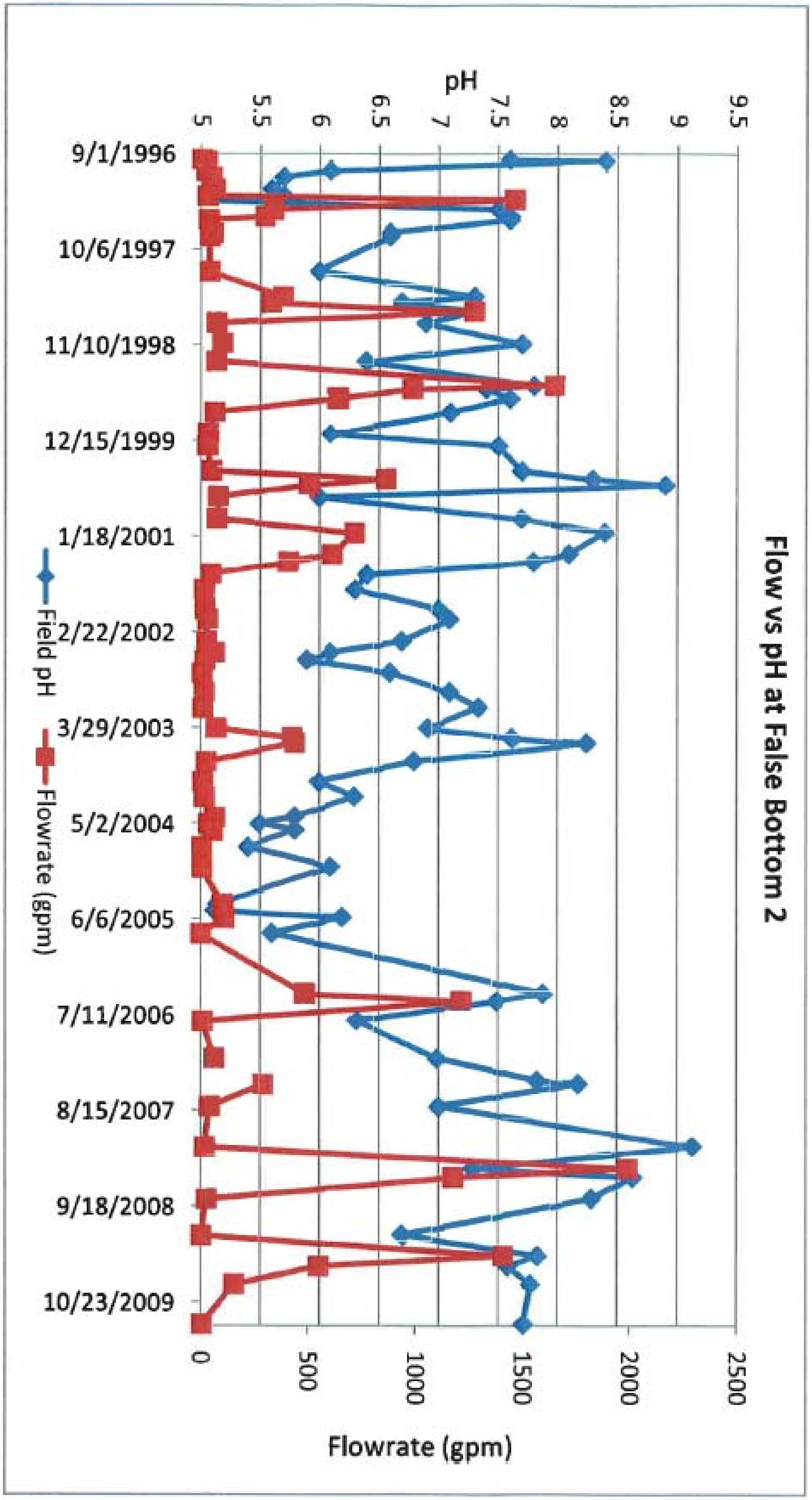
Ron Waterland

Ron Waterland
Environmental Manager

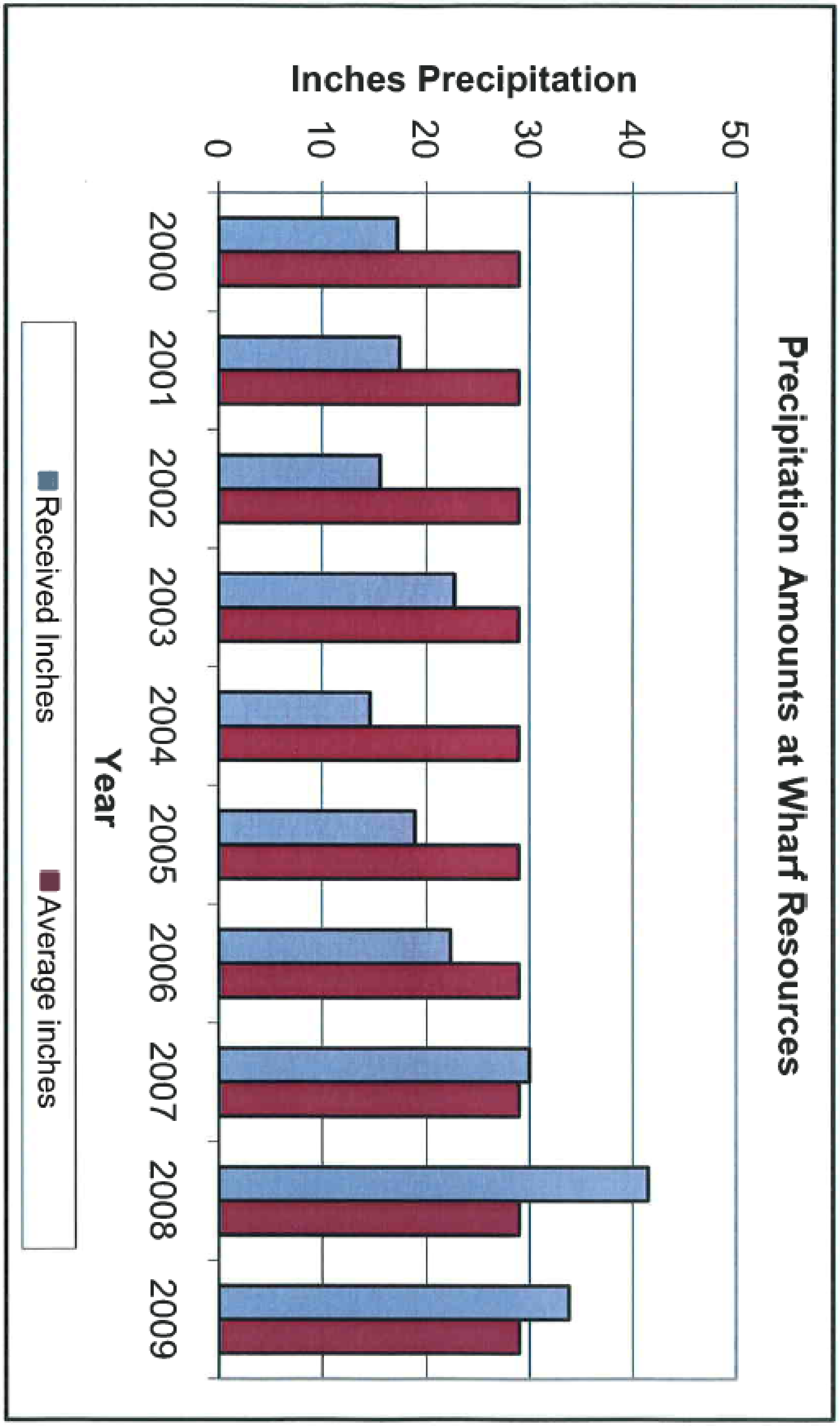
xc: Bill Shand, Wharf Resources

FALSE BOTTOM CREEK FB2

Date Sampled	Field pH
11/4/2004	6.10
4/7/2005	5.14
5/3/2005	5.12
6/3/2005	6.20
8/9/2005	5.61
4/17/2006	7.88
5/17/2006	7.49
8/8/2006	6.32
1/11/2007	6.99
4/17/2007	7.83
5/1/2007	8.18
8/1/2007	7.00
1/17/2008	9.13
4/15/2008	7.29
5/22/2008	8.63
8/22/2008	8.29
1/21/2009	6.70
4/14/2009	7.83
5/27/2009	7.58
8/11/2009	7.77



Flow vs pH at False Botom 2
pH
5
5.5
6
6.5
7
7.5
8
8.5
9
9.5
9/1/1996
10/6/1997
11/10/1998
12/15/1999
1/18/2001
2/22/2002
3/29/2003
5/2/2004
6/6/2005
7/11/2006
8/15/2007
9/18/2008
10/23/2009
0
500
1000
1500
2000
2500
Flowrate (gpm)
Field pH
Flowrate (gpm)



Precipitation Amounts at Wharf Resources
Inches Precipitation
0
10
20
30
40
50
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
Year
Received Inches
Average inches

DENR response to Wharf Resources:

Thank you for providing comments to South Dakota's draft 2010 Integrated Report. After discussions with Wharf Resources and Homestake Mining Company regarding pH data on False Bottom Creek, the decision was made to remove Wharf Resources' data from the dataset used to determine waterbody support. Wharf Resources could not document that pH data was generated in a manner that meets quality control criteria for the Integrated Report. In addition, pH data supplied by Homestake Mining Company (see next comment), and pH data collected by DENR do not indicate impairment. DENR will report False bottom Creek as fully supporting all beneficial uses.

Comment from Homestake Mining Company:

Homestake Mining Company (Homestake) and LAC Minerals (USA) LLC (collectively Homestake) appreciate your discussing the 2010 *South Dakota Integrated Report for Surface Water Quality Assessment* with us on February 24th and the opportunity to submit comments.

Homestake's comments are limited to five stream segments in False Bottom Creek and Whitewood Creek as listed on Table 21 of the Belle Fourche River Basin Water Quality Assessment. The segments are listed below with our comments:

- False Bottom Creek, SD-BF-R-FALSE_BOTTOM_01: This segment of False Bottom Creek was listed in 2010 as non-supporting for low pH based on data from the DENR, USGS and Wharf Resources. Homestake has reviewed the relevant data (as supplemented by information from its database for sites located on False Bottom Creek). As we discussed, the DENR, USGS and Homestake data available to us unequivocally indicate that False Bottom Creek is fully supporting its beneficial uses. We believe the Wharf Resources data may be erroneous. As such, there is no basis to list this segment as non-supporting for low pH. The Homestake monitoring locations are located in Section 12, T5N, R2E and Section 18, T5N, R3E; the corresponding Homestake pH records for the period (October 1, 2004 to September 30, 2009) are attached.

- Whitewood Creek, SD-BF-R-WHITEWOOD_01: This segment of Whitewood Creek was listed in 2006 as threatened for temperature based on the DENR monitoring data. Homestake has reviewed its database for sites located within this segment of Whitewood Creek (for the above referenced period). The data available to us from our monitoring locations show the Whitewood Creek temperature data fully supporting the creek's beneficial uses. Because the percentage of the DENR's samples that exceed the temperature standard is less than 10% and because our data also indicates that the beneficial uses are fully supported, we believe there is no basis to list this segment as non-supporting for temperature. The Homestake monitoring locations are located in Section 4, T4N, R3E and Section 34, T5N, R3E; the corresponding Homestake temperature records for the period (October 1, 2004 to September 30, 2009) are attached.

- Whitewood Creek, SD-BF-R-WHITEWOOD_05 and 06: These segments of Whitewood Creek were listed in 2006 and 2008, respectively, as non-supporting for high pH based on the DENR and USGS monitoring data. As we discussed, Homestake has concerns regarding these listings that we would like to discuss further with you.

- Whitewood Creek, SD-BF-R-WHITEWOOD_07: This segment of Whitewood Creek was listed in 2010 as non-supporting for TSS based on data from the DENR. It appears from reviewing the data you provided that many of the samples were collected during the spring season when high precipitation and runoff events are likely to occur. We believe that collecting TSS data during high precipitation and/or runoff events would significantly skew the statistical results and would not be representative of the TSS levels during most days of the year. It is Homestake's view that it is very unlikely that the stream actually exceeds the TSS standard more than 10% of the time. Therefore, until additional data can be gathered and assessed for this segment, Homestake would recommend that the stream segment be listed as an EPA Category 3.

Thank you again for the opportunity to provide these comments on the Surface Water Body Report. Please feel free to call me with any questions.

__Homestake Mining Company's temperature and pH data__.

Homestake Mining Company		
Monitoring Site 13 - False Bottom Creek		
SiteNbr	SampleDate	pH, Field su
13	12/06/2004	7.57
13	03/24/2005	7.72
13	06/27/2005	8.24
13	09/14/2005	8.13
13	12/08/2005	7.66
13	03/22/2006	7.69
13	06/08/2006	7.58
13	09/06/2006	7.82
13	12/14/2006	7.4
13	03/20/2007	7.53
13	06/13/2007	7.88
13	09/05/2007	8.03
13	12/11/2007	7.51
13	03/05/2008	7.33
13	06/25/2008	7.79
13	09/24/2008	8.1
13	11/12/2008	7.68
13	03/04/2009	7.46
13	06/19/2009	7.83
13	09/17/2009	8.39

Homestake Mining Company		
Monitoring Site M-16 - False Bottom Creek		
SiteNbr	SampleDate	pH, Field su
M-16	12/06/2004	7.16
M-16	03/24/2005	7.14
M-16	06/27/2005	7.61
M-16	09/14/2005	7.67
M-16	12/08/2005	7.39
M-16	03/22/2006	7.02
M-16	06/08/2006	7.02
M-16	09/06/2006	7.77
M-16	12/14/2006	6.94
M-16	03/20/2007	7.05
M-16	06/13/2007	7.27
M-16	09/05/2007	7.51
M-16	12/11/2007	7.08
M-16	03/05/2008	6.93
M-16	06/25/2008	7.12
M-16	09/24/2008	7.56
M-16	11/12/2008	7.25
M-16	03/04/2009	7.08
M-16	06/19/2009	7.33
M-16	09/17/2009	7.9

Homestake Mining Company		
Monitoring Site 6 - Whitewood Creek		
SiteNbr	SampleDate	Water Temp, F
6	10/05/2004	47.7
6	12/08/2004	34.5
6	03/23/2005	37.9
6	06/27/2005	61.3
6	09/14/2005	52.3
6	12/09/2005	35.1
6	03/23/2006	39.7
6	06/08/2006	61.7
6	09/06/2006	58.3
6	12/14/2006	35.8
6	03/22/2007	38.7
6	06/13/2007	52.3
6	09/04/2007	66.6
6	12/12/2007	35.1
6	03/13/2008	36.5
6	06/18/2008	52.5
6	09/23/2008	52.3
6	11/20/2008	34.5
6	03/05/2009	39.2
6	06/22/2009	59.5
6	09/23/2009	45.9

Homestake Mining Company		
Monitoring Site 44 - Whitewood Creek		
SiteNbr	SampleDate	Water Temp, F
44	12/08/2004	33.6
44	03/23/2005	36.7
44	06/27/2005	66.7
44	09/14/2005	51.1
44	12/09/2005	33.8
44	03/23/2006	34.2
44	06/08/2006	64.2
44	09/06/2006	57.7
44	12/14/2006	34.2
44	03/22/2007	40.1
44	06/13/2007	52.9
44	09/04/2007	64.8
44	12/12/2007	34.2
44	03/13/2008	36.9
44	06/18/2008	53.6
44	09/23/2008	50.7
44	11/20/2008	35.1
44	03/05/2009	39.4
44	06/22/2009	63.7
44	09/23/2009	46.4

DENR response to Homestake Mining Company:

Thank you for providing comments on South Dakota's draft 2010 Integrated Report and supplemental water quality information. As mentioned in DENR's response to Wharf Resources, the data from Wharf Resources was removed from the dataset used to determine waterbody support on False Bottom Creek. Based on data supplied by Homestake, USGS, and data collected by DENR, False Bottom Creek is meeting all beneficial uses.

Whitewood Creek, SD-BF-R-WHITEWOOD_01, is listed as "threatened" for temperature. This segment of Whitewood Creek is a (2) Coldwater permanent fishery with a water quality standard maximum temperature of 65 degrees Fahrenheit. In 2008, DENR staff placed a temperature data logger in this reach of Whitewood Creek from July through the end of October. The data logger recorded 488 temperature exceedances out of 5,042 total data points, equating to 9.68% exceedances. Due to the fact that this reach was listed as impaired for temperature in South Dakota's 2006 and 2008 Integrated Reports, and the close proximity to 10% violation, DENR made the decision to list this segment of Whitewood Creek as "threatened" and place the waterbody in Category 5.

Homestake Mining Company has discussed their concerns regarding SD-BF-R-WHITEWOOD_05 and 06 with DENR. These two reaches will remain on the 303(d) list.

Whitewood Creek, SD-BF-R-WHITEWOOD_07, is listed as nonsupporting the (4) Warmwater permanent fish life propagation beneficial use caused by elevated total suspended solids (TSS). Elevated TSS were observed in samples taken in spring and summer months in 2005 through 2009. DENR acknowledges that Whitewood Creek is not likely to exceed the TSS standard more *than 10% of the time, however, precipitation events contribute sizeable amounts of water in relation to the stream hydrograph and have the potential to carry a large percent of the stream's annual flow and annual pollutant loading. In addition, DENR does not currently have an exception to water quality standards during periods of high flows.*

Comment from Black Hills National Forest:

United States Department of Agriculture | Forest Service | Black Hills National Forest Supervisor's Office | 1019 N. 5th Street
Custer SD 57730-8214
Tel. 605/673-9200
TTY 605/673-9227
www.fs.fed.us/r2/blackhills | FAX 605/673-9350

File Code: 2530
Date: February 22, 2010

Shannon Minerich
Department of Environment and Natural Resources
Surface Water Quality Program
523 East Capitol Avenue
Joe Foss Building
Pierre, SD 57501-3181

Dear Ms. Minerich:

Thank you for the opportunity to review and comment on the Draft 2010 Integrated Report for Surface Water Quality Assessment Report. As identified in the Memorandum of Understanding between the United States Forest Service, Rocky Mountain and Northern Regions and the South Dakota Department of Environment and Natural Resources (SD DENR), the Black Hills National Forest continues to be interested in working with the State in understanding water quality issues and improving water quality on National Forest System (NFS) lands. Various personnel took the opportunity to review the draft report and would like to commend SD DENR on the information presented and the quality of the document.

Waterbodies that have been classified as "Not Supporting or Impaired Waters" where impairment sources are attributed to natural causes: A number of waterbodies within the Black Hills Ecoregion (located both on NFS land as well as in areas administered by other agencies or managed by private entities) are classified as being in non-support of their beneficial uses, with the source of the impairment being identified as natural sources (such as for temperature or pH). An impairment classification indicates that a system could be improved or repaired to attain the currently assigned beneficial use category. However, where temperature is associated with a natural cause(s) it would seem that it may be difficult or undesirable to reduce temperatures below the capability of the natural ecosystem. If temperature issues with the current beneficial use designation are based on natural sources of the system the Forest requests that during the next triennial review of surface water quality standards and waterbody beneficial uses that the State consider 1) reviewing and potentially reclassifying the beneficial use designation of the water bodies to reflect the natural ecosystem conditions of Black Hills systems, and 2) reassessing temperature requirements for attaining beneficial uses for which temperature is a requirement.

Location clarification: The Forest completes environmental analyses for a number of projects on the Forest and information in the integrated report are used for those analyses. The following specific comments are primarily focused on clarifying location descriptions for the various surface water systems that are identified in the document:

False Bottom Creek (Page 65): The upper boundary in the document is the headwaters of False Bottom Creek, however the lower boundary currently provided downstream of where False Bottom Creek has gone through the loss zone and becomes intermittent. The request is that the reach of the actual impairment designation be more specifically described.

Little Spearfish Creek (Page 65): Based on some confusion a recommendation would be that the current description be adjusted to potentially indicate that this is near Savoy, Roughlock Falls or even the confluence with Spearfish Creek (since Little Spearfish Creek flows into that system) rather than using Lead as a location. Lead looks to be at a much greater distance from where the map information displays that the water monitoring occurs for the system than the suggested description sites.

Crow Creek (Page 65): Currently, the town of Beulah is listed as location information in the table; however that is a location that is approximately 8-10 miles west of the South Dakota state line. Can more specific location information be provided for the Crow Creek system that was assessed in South Dakota? A recommended suggestion is to use Township, Range Section location information for upper and lower sections of the designation or where the system is monitored in South Dakota.

Strawberry Creek (Page 67): The current description provided in the table is currently limited when obtaining specific information for Forest Service projects and identifying actions within the watershed. Would it be possible to provide additional location information included for the Strawberry Creek reach that is identified as not supporting the beneficial uses? The Forest is also interested in obtaining information on whether the major tributary to this system (Boomer Gulch in T4N, R4E, Section 8) is also considered to be impaired. If it is not possible to clarify locations in this document, the Forest would like to receive specific GIS shape files for that specific area, or would be interested in meeting with the State to work together to identify some of the specific reach locations.

North Fork Rapid Creek (Page 95): Based on the review, it is a tributary of North Fork Rapid Creek (probably intermittent) that is located within T4N, R3E Section 8, and not North Fork Rapid Creek as currently indicated in the draft document table. The Forest would like to have more clarification on the location of the upper bounds of the impaired reach (such as specifically identifying Dumont Pond or perhaps listing Section 7). This request is based on the amount of private land located downstream of Forest administered land with activities that have resulted in or could have activities contributing to the impairment. In addition, the draft assessment had no sampling identified to have occurred at the Dumont Pond springs area.

Elk Creek (Page 92): The current location description on this page of the draft document is for a tributary to Elk Creek and not the main Elk Creek stream channel. A suggestion would be to clarify the location description.

Spring Creek Sources of Impairment (page 96): The Forest supports the current active process for targeting water quality improvement in Spring Creek. While it is recognized that there are various contributors to the bacteria load for the impairment, a recent proposal to SD DENR had the primary source contributions originating from: 1) livestock and other agricultural land uses; 2) urban runoff (storm water issues); and 3) other human sources, including failing septic and leaking sanitary sewer systems (Reference: Spring Creek 319 Watershed Project

Proposal, October 2009). Since a top listing generally lends a greater significance to a feature, a recommendation is to remove wildlife from the top of the list under source of impairment. The Forest would ask the State to consider adjusting the list to reflect consistency with the proposal document in order to continue focusing on those primary issues and limit potential future confusion as Pennington County and the cooperators continue to implement the actions associated with the education and project process.

If you have any questions or need more clarification regarding these comments, please contact Deanna Reyher at (605) 673-9348 or by e-mail at dreyher@fs.fed.us.

Sincerely,

/s/ Dennis L. Jaeger (for)
CRAIG BOBZIEN
Forest Supervisor

cc: Joan Y Carlson
Steven R Hirtzel

DENR response to Black Hills National Forest:

Thank you for providing comments to South Dakota's draft 2010 Integrated Report. As indicated in your comments, some of the waterbodies that are not supporting their designated beneficial uses due to natural sources of impairment is an issue that DENR needs to resolve by 1) appropriately classifying waterbodies, and 2) reassessing temperature criterion. DENR will graciously accept any information that will assist DENR to more appropriately designate waterbody beneficial uses for the next triennial review. In addition, DENR plans to reassess water quality standard temperature criterion during the next triennial review.

False Bottom Creek – The reach description of the assessed segment of False Bottom Creek is from S23, T7N, R3E to S26, T5N, R2E. This reach begins near the headwaters of False Bottom Creek and ends at the beneficial use change north of St. Onge. Due to issues with the quality of pH data on False Bottom Creek, DENR has changed the support determination to fully supporting. DENR acknowledges the loss zone in False Bottom Creek and will consider changing the reach endpoint (with the assistance of the Forest Service) to the loss zone area in the 2012 Integrated Report.

Little Spearfish Creek –The reach description has been changed to "S16, T4N, R1E to Spearfish Creek."

Crow Creek – The reach description has been changed to "S22, T6N, R1E to Redwater River."

Strawberry Creek – The Strawberry Creek reach description is "Bear Butte Creek to S5, T4N, R4E." This is a short reach, measuring approximately 1.58 miles from Bear Butte Creek to S5, T4N, R4E, which is near the wastewater treatment outfall for the Gilt Edge Mine Superfund Site. Boomer Gulch is not monitored by DENR and is not included in the Integrated Report. GIS shape files for all reaches included in the 2010 Integrated Report are available at:
ftp://ftp.state.sd.us/DENR/IntegratedReport/GIS/.

North Fork Rapid Creek – The reach description (Rapid Creek to S8, T3N, R3E) is accurate. In ARSD 74:51:03:03, segment boundaries using section, township, range, are described as follows: "When section, range, and township are used in chapter 74:51:03 to describe the beginning or end point of a stream segment, the boundary of the segment is that point where the most downstream portion of the stream crosses the boundary of that section." Therefore, in the reach description for North Fork Rapid Creek, the segment ends at the most downstream point of Section 8 and does not include the stream in Sections 7 and/or 8.

The Dumont Pond springs area is located in Section 7, Township 3 North, Range 3 East. The assessed reach and (2) Coldwater fish life propagation waters beneficial use does not extend into Section 7 or 8; therefore, the Dumont Pond springs area was not sampled and not included in this assessment of North Fork Rapid Creek.

Elk Creek – The Elk Creek reach has been changed to "S9, T3N, R7E to S27, T4N, R3E."

Spring Creek – Wildlife was identified as a source of fecal coliform contamination in Spring Creek in the 2008 TMDL, "Fecal Coliform Bacteria Total Maximum Daily Load (TMDL) for Spring Creek, Pennington County, South Dakota," along with other sources including: urban runoff, livestock, and human (septic). In the basin tables, sources are not listed in any particular order and the reader should not assume the source list order lends greater significance. A statement on source order has been added to page 42.

Comment from East Dakota Water Development District, Jay Gilbertson:

East Dakota Water Development District
132B Airport Avenue
Brookings, SD 57006

605-688-6741 605-688-6744 Fax

March 1, 2010

RECEIVED
MAR 03 2010
SURFACE WATER PROGRAM

Shannon Minerich
SD DENR Surface Water Quality Program
523 East Capitol Avenue
Pierre, South Dakota 57006

Dear Ms. Minerich:

I am writing to offer commentary on the DRAFT 2010 South Dakota Integrated Report for Surface Water Quality Assessment. In general, I am quite pleased with the document, and have found it to be easy to use when seeking information on the condition of surface water bodies in the District. I do however have a few comments/questions I would like to raise.

1. On page 72 of the DRAFT document, Blue Dog Lake is listed as not supporting the Warmwater Permanent Fish Life beneficial use. Unfortunately, no cause for this impairment is presented.

2. For the 2010 report, trophic state index (TSI) was removed from DENR's listing methodology for impairments to beneficial uses. This is a significant change, and one that results in the de-listing of numerous lakes in the District and across the State. Nine of thirty lakes listed in the Big Sioux River basin were considered impaired due to TSI in 2008. These lakes are now considered fully supporting. Three other lakes were considered impaired for TSI in 2008, and remain listed but for other reasons.

   Unfortunately, although it impacts a large number of important lakes, the notice of this change, and the rational behind it, are buried in the text. This major change is not mentioned in the Executive Summary. The first reference I can find is a passing comment in the final paragraph on page 23. Later on (pages 45-53) there is a discussion of how TSI is calculated, and the rational for not using the phosphorus component. However, I am at a loss to find any written explanation for why a key criteria that has been used for many years is being dropped.

3. As noted in the Executive Summary, water quality standards and the criteria used to assess the condition of water bodies can and do vary from state to state. As a consequence, the support status of border lakes, or rivers and streams that start in on

state and flow into another, often changes when the border is crossed. This is not a new issue with the District, and one I have raised in the past. However, the fact remains that there are several lakes that straddle the South Dakota-Minnesota border in the District, and numerous streams that have their headwaters in one state and flow into the other. I would continue to encourage the Department to work more closely with all neighboring states, and Minnesota in particular, to reach mutually agreeable standards for these waters. At the local level, it is difficult to promote and support sound, water-quality friendly practices when support status changes across arbitrary boundaries.

If you have any questions about my comments, please let me know.

Sincerely,

Jay P. Gilbertson
Manager/Treasurer

DENR response to East Dakota Water Development District:

Thank you for providing comments to South Dakota's draft 2010 Integrated Report.

1) Blue Dog Lake was intended to be listed for pH as the cause for not supporting the Warmwater Permanent Fish Life beneficial use. This cause (pH) has been added to the Big Sioux River basin table.

2) The rationale for not using the TSI approach as a 303(d) listing criteria is first introduced at the end of the lake listing methodology section on the bottom of page 32. The paragraph provides reference to Appendix C, which provides supplemental information regarding background and delisting rationale for the TSI approach. All other aspects concerning TSI throughout the document (i.e., pages 45-53) pertain to the structure and use of TSI as a 305(b) reporting element.

3) Not only may support status of a waterbody change, so do the beneficial uses and water quality criteria. These changes occur at a state border, not because the boundaries are arbitrary, but because borders are established by a combination of state and federal laws. As such, they are a very real boundary when it comes to states enacting laws and regulations.

When it comes to dealing with surface water quality standards, each state (and authorized tribe) has its own procedure for developing and adopting surface water quality standards. These procedures include drafting a set of standards, seeking public comment, and holding a public hearing. As such, the beneficial uses and the criteria to protect those uses that are part of any state's water quality standards are the reflection of the values and opinions of the people of that particular state.

South Dakota, located within EPA's Region VIII, works with EPA to develop and adopt mutually acceptable beneficial uses and water quality criteria for the state's waters. Minnesota works with EPA Region V to achieve the same. Where appropriate the two states and regions discuss boundary waters to ensure the beneficial uses of each state are protected and standards maintained.

Comment from the United States Environmental Protection Agency, Region 8:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
1595 Wynkoop Street
Denver, CO 80202-1129
Phone 800-227-8917
http://www.epa.gov/region08

Ref: 8EPR-EP

March 1, 2010

Shannon Minerich
Surface Water Quality Program
Department of Environment and Natural Resources
Joe Foss Building
523 East Capitol Avenue
Pierre, SD 57501-3181

Re: Year 2010 South Dakota Integrated Report

Dear Ms. Minerich:

We have reviewed the Department's draft 2010 Integrated Report (IR) for Surface Water Quality Assessment and appreciate the opportunity to provide comments. We commend the Department of Environment and Natural Resources (DENR) for using the integrated report format, the Assessment Database (ADB), and associated GIS files for reporting both the Section 305(b) Water Quality Report to Congress and the Section 303(d) list of impaired or threatened waterbodies. DENR's draft IR is well-organized, comprehensive, and detailed.

We have some individual comments that should be addressed prior to finalizing the document. The specific comments can be found in Attachment A. The positions described in our comments regarding lakes proposed for delisting, are preliminary in nature and should not be interpreted as final decisions under CWA § 303(d). EPA approval/disapproval decisions will be made after the submittal of the final Integrated Report to EPA and will consider all pertinent information submitted in the process.

Please contact me at 303-312-6226, if you have any questions with regard to our comments. Again, we appreciate your diligent work on this report.

Sincerely,

Thomas R. Johnson

Thomas R. Johnson
Monitoring and Assessment Team
Water Quality Unit
Ecosystems Protection Program

Attachment

Printed on Recycled Paper

Attachment A

Specific Comments on South Dakota's 2010 Draft Integrated Report

General

EPA commends SDDENR for adding sites in the Cheyenne, Grand, Moreau, and White River Basins to monitor for the effects of uranium mining. This monitoring will fill very important data gaps.

We also commend SDDENR for the excellent alignment of waterbody assessments between the Integrated Report, the Assessment Database and the GIS files. Clearly, a large amount of effort was put into this assessment. The discrepancies found (discussed below) were few in number.

Additionally, SDDENR continues to be a leader in EPA Region 8 by adding lakes with fish consumption advisories to the list of impaired waters.

SDDENR is also to be commended for including wetlands and headwater streams in the 2010 IR. A good summary was provided of recent and current projects to develop tools to assess the condition of both wetlands and headwater streams.

Assessment Methodology for Lakes

While EPA is concerned that only the numeric criteria were used to assess lakes, the new assessment methodology presents a much clearer and more understandable means to assess lakes. In the past, it was not always obvious how data were used to declare a lake impaired or not for compliance with numeric criteria. However, EPA continues to encourage SDDENR to develop methods to assess for narrative criteria, especially eutrophication, while nutrient numeric criteria are developed. Nutrient criteria development could take considerable time, and in the interim, there are numerous indicators that could be used to assess whether lakes are meeting narrative criteria. Any combination of chlorophyll-a concentration, secchi depth, nutrient concentrations, visual analysis, user surveys, cyanobacteria levels, etc. could be used to assess the condition of lakes. Until nutrient criteria are developed and adopted, a method using a suite of indicators exceeding defined thresholds to demonstrate impairment would be a valuable addition to the State's assessment program

Given the revisions to the assessment methodology, EPA strongly encourages the State to consider modifying sampling protocols to ensure that dissolved oxygen is collected at the most critical time of day or to develop a screening process that would trigger the collection of more robust dissolved oxygen samples. Dissolved oxygen and pH concentrations vary throughout the day and sampling that collects a single grab sample may not be representative of the full range of conditions, and often fails to capture exceedances of the water quality standard. EPA encourages SDDENR to either measure dissolved oxygen at dawn (a method used by some states) or to deploy meters which can measure dissolved oxygen and pH over a 24-hour period. This will provide a more robust dataset to compare with numeric water quality criteria.

DENR response to EPA Region 8:

Selecting nutrient based indicators, defining impairment thresholds, and establishing linkage to beneficial use attainment in order to address narrative standards (eutrophication), would require equal effort as the development of numeric nutrient criteria. DENR believes developing criteria to address narrative standards, while also developing numeric nutrient criteria, would not be the best use of department resources. Future numeric nutrient criteria will ultimately address impairment associated with eutrophication. In the interim, DENR believes the proposed 2010 IR lake listing methodology provides a valid means for making beneficial use support determinations and impairment decisions for lakes in South Dakota.

DENR focuses statewide lake assessment sampling efforts to summer months during the peak recreation season. Lakes are sampled in June and August to account for early and late summer variability. This lake sampling scheme is dictated by limited resources and time restraints associated with sampling a large number of lakes across the state. Lake sampling associated with individual lake assessment projects is generally conducted monthly to bimonthly when conditions permit. DENR will consider options for increasing the level of effort to provide a robust dataset for comparison with 303(d) impairment listing criteria. Diurnal monitoring may be considered for individual lake assessment projects but is not currently viable for our statewide lake assessment effort.

Delisting of Lakes Previously Listed for Trophic State Index (TSI) as Cause

EPA is concerned about the delisting of a number of lakes without more information demonstrating that the uses for these lakes are being fully attained. While DENR described in detail the rationale for delisting these lakes, existing information was not taken into account regarding relatively high levels of nutrients and chlorophyll-a that presently exist. Specifically, the levels of chlorophyll-a create doubt about the ability of the lakes to meet Administrative Rules of South Dakota Articles 74:51:01:05 (Materials causing pollutants to form in waters), 74:51:01:06 (Visible pollutants prohibited), and 74:51:01:09 (Nuisance aquatic life).

EPA staff reviewed thoroughly the lakes DENR proposed for delisting. In the review, we first evaluated the information for lakes classified as warmwater marginal. For these waters, we recommend that DENR evaluate lakes classified as warmwater marginal and determine if they are appropriately classified or warrant a separate use class designation. For example, some warmwater marginal lakes may be more appropriately classified as wetlands or may constitute a unique class of lakes.

EPA examined the available data and information for lakes delisted by SDDENR which were also classified as warmwater permanent or warmwater semipermanent and evaluated each based on the following parameters:

- the waters are not listed in the 2010 cycle for dissolved oxygen;
- the available data show that >25% of samples collected between 2000-2009 were above 25 µg/L chlorophyll-a (corrected for pheophytin); and
- total phosphorus and nitrogen results were considered as additional information, but no thresholds were used.

EPA defined a threshold of 25 µg/L chlorophyll-a (corrected for pheophytin) for the purposes of determining which waterbodies are of the most concern. Chlorophyll-a values in the range of 20-25 µg/L are used for assessment purposes by Iowa (proposed) and Kansas (KSDHE, 2008; IDNR, 2010). EPA's National Lake Survey used a chlorophyll-a value of 30 µg/L in defining hypereutrophic and a range of 7 to 30 µg/L for eutrophic. For these reasons, a value of 25 µg/L appears to be a reasonable starting point as an indicator. Additionally, all of the lakes proposed for delisting have at least some samples above the World Health Organization's level of high risk for exposure to cyanotoxins (chlorophyll-a concentrations greater than 50 µg/L) (WHO, 1999). This risk results from the possibility of high cyanobacteria numbers which in turn can result in high cyanotoxin levels. This may be especially true for Twin Lakes (Sanborn County), with several samples showing cyanobacteria counts in the millions. Direct cyanobacteria counts greater than 100,000 cells/ml constitute a high risk of exposure to cyanotoxins (WHO, 1999). The process used by EPA in this analysis is certainly not the only possible way to determine risk to lakes and SDDENR is encouraged to develop its own method to address these issues.

Based on EPA's analysis, many of the lakes proposed for delisting for TSI should remain on the list of impaired waters. We strongly urge SDDENR to retain the following 13 lakes in Category 5: Waggoner Lake, Bierman Dam, Lake Carthage, Lake Isabel, Twin Lakes (Sanborn County), Wilmarth Lake, Rahn Lake, Cottonwood Lake (Sully County), Lake Traverse, East Vermillion Lake, Bullhead Lake (Deuel County), Lake Campbell (Campbell County), and Lake Pocasse. Other lakes on the list may also need more justification for delisting; however, this subset of lakes appears to be most at risk. One lake (Dewberry Dam), although classified as warmwater permanent, cannot be assessed due to its inaccessibility. EPA is not contesting the decision to delist this lake.

In addition, for many of the lakes for which we have concerns, phosphorus may not be the limiting factor and many years of phosphorus loading may have created a situation where some of the lakes are saturated with phosphorus. Many, but not all, of these lakes are also relatively shallow and may have a lower potential for maintaining designated uses. However, if reducing phosphorus to an acceptable level is unattainable due to physical factors or other conditions, then a use attainability analysis should be done, and other options should be pursued (see Region 8 Q& A document: "Water Quality Standards Based on Natural and Irreversible Water Quality Conditions").

As a result of this review and based on 40 CFR 130.7(b)(6)(iv), EPA requests that DENR provide a more detailed delisting rationale for each waterbody that demonstrates there is "good cause" for not considering these waters impaired. EPA asks SDDENR to consider revising and re-public noticing the TMDLs for both Waggoner Lake and Bullhead Lake with the targets consistent with the chlorophyll-a thresholds mentioned above and DENR's revised assessment methodology thresholds. Once approved, these actions would allow these lakes to be delisted.

DENR response to EPA Region 8:

1. EPA commented about DENR delisting a number of lakes without more information demonstrating that the uses for these lakes are being fully attained. EPA believed existing information about chlorophyll-a (an indicator of algae) and nutrients was not taken into account and this information may be applicable under South Dakota's "narrative" standards.

DENR has tried in the past to incorporate nutrients and chlorophyll-a into the 303(d) lakes listing methodology (TSI approach) and Total Maximum Daily Load (TMDL) assessments. However, DENR has recognized that relationships between nutrients and chlorophyll-a are not often strong and in many cases no statistical relationship is observed between the variables. This often resulted in additional 303(d) listings and subsequent difficulties with TMDL development. A nutrient based TMDL was often unattainable regardless of what pollution remedies were modeled in the TMDL analysis. In addition, no clear relationships were typically evident between nutrients/chlorophyll-a and attainment of the assigned beneficial uses. For these reasons, DENR decided to stop using nutrients or chlorophyll-a in the listing methodology. Setting unattainable listing criteria or standards is not in the best interests of the public or the State of South Dakota.

DENR understands EPA's push for nutrient or nutrient based standards, but believes that more information is needed before using nutrients or other nutrient related parameters as listing criteria or as numeric water quality standards. South Dakota has waterbodies that range from having relatively low nutrient concentrations (i.e. Lake Oahe, Pactola Reservoir, Rapid Creek, etc.) to very high nutrient concentrations (i.e. Mina Lake). Such diversity in waterbodies and their respective nutrient levels suggest that nutrient or related criteria must be based on sound science that reflects a wide range of limnological dynamics found in waterbodies in South Dakota. DENR will explore the possibility of using nutrient or related listing criteria or standards, but until clear linkages are established with the assigned beneficial uses, it would be premature to adopt anything new for the 2010 IR reporting cycle. DENR is currently involved with an EPA funded initiative to classify lakes and determine nutrient levels that may be considered for adoption into water quality standards or used as 303(d) listing criteria. This further supports DENR's contention that more information is needed and that it is too early to incorporate or use any nutrient or nutrient related standard as a 303(d) listing criteria.

2. EPA reviewed the lakes DENR proposed for delisting and examined the chlorophyll-a and nutrient data from those lakes. EPA suggested DENR re-evaluate lakes assigned the warmwater *marginal fish life beneficial use and consider whether they are appropriately classified. EPA further suggested South Dakota might consider chlorophyll-a levels used in other states or studies as listing or delisting criteria. Toxic algae was also an EPA concern and EPA noted some lakes had chlorophyll-a levels above the World Health Organization's (WHO) level of high risk for exposure to algae toxins.*

Lakes designated a warmwater marginal fish life beneficial use represent a unique class of lakes. These systems differ physically in comparison to wetlands or lakes designated warmwater permanent and semipermanent fish life uses. In general, warmwater marginal fisheries are large, relatively shallow, highly productive systems that often provide exceptional fishing opportunities. Beneficial use support of these lakes is dictated more by climate and hydrology than eutrophication. DENR believes other options need to be pursued to address use attainment of lakes designated a warmwater marginal fish life beneficial use.

Chlorophyll-a values greater than 25 µg/L may be pertinent to water resources in Iowa and Kansas, but DENR is reluctant to rely on this numeric criterion to determine impairment of lakes in South Dakota. This information may be used in future determinations of what nutrient and chlorophyll-a levels are meaningful to the beneficial uses of South Dakota lakes and may eventually be used for reclassification decisions.

South Dakota lakes are frequently dominated by blue-green algae that may have the capability of producing toxins. DENR is aware of only one documented case of death (3 dogs) resulting from ingestion of algal toxins. The event occurred at Richmond Lake in Brown County back in 1985. At this time, toxins associated with blue-green algae are not well documented in South Dakota assessed lakes.

3. EPA strongly urges DENR to retain 13 lakes in Category 5. Placement in Category 5 means a waterbody is impaired and needs TMDL development. EPA further suggested that DENR consider a Use Attainability Study (UAA) if reducing phosphorus to an acceptable level is unattainable due to physical factors or other conditions. A UAA determines if the assigned uses of a waterbody are appropriate.

Many lakes in South Dakota contain saturated phosphorus levels that can contribute to lower potential for maintaining their designated beneficial uses. As stated previously, DENR is currently exploring the possibility of incorporating nutrient or nutrient related 303(d) listing criteria or standards and may also explore other options such as changes to the state's Water Quality Standards.

4. EPA requests that DENR provide a more detailed delisting rationale for each waterbody that demonstrates there is "good cause" for not considering these waters impaired. EPA asks DENR to revise and re-public notice the TMDLs for Waggoner Lake and Bullhead Lake using the EPA recommended chlorophyll-a concentration (25 µg/L) as a TMDL target.

DENR believes that impairment is best determined by applying DENR's proposed 303(d) listing methodology. Water quality standards and associated listing criteria serve as the only reasonable "good cause" for determining impairment. This rationale is based on DENR's current lack of nutrient criteria capable of making linkage based beneficial use support determinations and impairment decisions with meaningful and attainable TMDL endpoints.

DENR conducted a preliminary TMDL analysis for Lake Waggoner and Bullhead Lake using EPA's recommended chlorophyll-a concentration (25µg/L). The new analysis did not make a significant difference in the TMDL results and the lakes would still require unattainable watershed phosphorus reductions in order to achieve chlorophyll-a concentrations of 25 µg/L. DENR also reviewed similar TMDL documents from Twin Lakes (Sanborn County) and Wilmarth Lake, which were included in EPA's list of concerned lakes. A potential TMDL revision for these lakes using the EPA *recommended chlorophyll concentration would yield similar unattainable results as encountered with Lake Waggoner and Bullhead Lake.*

Most, if not all lakes identified by EPA would require unattainable watershed phosphorus reductions in order to achieve chlorophyll-a concentrations of 25µg/L. This supports DENR's position that more information about the linkage between nutrients and chlorophyll-a is needed to establish reasonable impairment criteria. In addition, linkages need to be established regarding the relationship between the nutrient based stressor (chlorophyll-a) and support of a lakes assigned beneficial uses.

A significant amount of resources (see table below) have been expended by DENR and local sponsors to conduct nutrient related TMDL assessments on 12 of the 13 lakes identified by EPA. DENR has stopped further TMDL development on all of these lakes because of the issues previously described regarding nutrient/chlorophyll relationships and the inability to determine linkages with attainment of the assigned beneficial uses. These issues have also contributed to EPA's reluctance to grant lake nutrient based TMDL approvals.

Using EPA's recommended chlorophyll-a threshold (25 µg/L) will continue to result in unattainable TMDLs with no reasonable linkage between chlorophyll-a and support of the beneficial uses. DENR believes that until reasonable nutrient or nutrient related criteria are adopted, lake impairment and delisting decisions are best determined by the proposed 2010 Integrated Report lake listing methodology. Using EPA's proposed chlorophyll-a listing methodology for lakes will only continue the pattern of EPA delays in achieving TMDL approvals.

EPA concerned lakes with comprehensive watershed assessments complete	**Total federal contribution $$**	**Total local contribution $$**	**Total assessment cost $$**
Waggoner Lake	$20,300	$6,900	$27,200
Bierman Dam	$6,000	$4,000	$10,000
Lake Carthage	$18,000	$12,000	$30,000
Twin Lakes (Sanborn County) Wilmarth Lake	$33,500	$35,550	$69,050
Rahn Lake	$18,000	$12,000	$30,000
Cottonwood Lake	$15,700	$11,300	$27,000
Lake Traverse	$32,150	$15,000	$47,150
East Vermillion Lake	$120,000	$80,000	
Bullhead Lake	$45,000	$15,000	$60,000
Lake Campbell (Campbell County)- Lake Pocasse	$53,000	$70,100	$123,000
Total Spent	$361,650	$261,850	**$623,500**

Monetary values are a rounded estimate based on direct project costs.

<u>Other Listing / Delisting Issues</u>

1) Horsehead Creek (Cheyenne) was listed as Category 5 in the 2008 IR for conductivity, but for 2010 it has been placed in Category 3. This waterbody should remain in Category 5 until there is enough data to determine whether this waterbody is supporting uses.

2) Firesteel Creek (James) was delisted for temperature this cycle. This information should be included in the delisting table in Appendix B.

DENR response to EPA Region 8:

1) Horsehead Creek has been placed in Category 5 and included in the 303(d) Summary Appendix F.

2) The Firesteel Creek temperature delisting has been included in Appendix B.

Discrepancies between the Draft Integrated Report and the Assessment Database (ADB)

1) The James River (Segment 03) is listed in the IR for both dissolved oxygen and pH in the 303(d) summary table on page 223 of Appendix F. However, only dissolved oxygen is listed as a cause in the ADB and in the James River Basin summary on page 110.

2) Emanuel Creek (Missouri) is missing water type and stream length information in the ADB, which causes this waterbody to not be counted by ADB in the total length of waters listed in Category 5.

DENR response to EPA Region 8:

1) SD-JA-R-JAMES_03 should only be listed for dissolved oxygen. pH has been removed from Appendix F.

2) Water type and stream length for Emanuel Creek have been added to ADB.

Discrepancies between ADB and GIS

1) Both Omaha Creek and Sawmill Canyon (Missouri) are missing length information in both the ADB and GIS. In the 2008 IR a stream length had been assigned to these waters.

2) The lengths represented by the Missouri River reservoirs differ in the GIS files from the ADB. Which is correct?

3

DENR response to EPA Region 8:

1) Length information has been added to ADB and the GIS files for Omaha Creek and Sawmill Canyon Creek.

2) The lengths for the Missouri River reservoirs have been reconciled between ADB and the GIS files.

Comments on Appendix A (List of Approved TMDLs)

1) All of the approved TMDLs for the Belle Fourche Basin have approval dates listed as 2/5/05. These dates should be 2/2/05.

2) The Belle Fourche segment (Bear Butte Creek) without a date was approved on 8/8/07.

3) The following approved TMDLs are missing from the list: Lake Sharpe, sediment, 2/7/01; Lake Redfield, nutrients - special approval, 4/12/99; and Turkey Ridge Creek, fecal coliform, 9/27/06.

4) The following TMDLs were recently approved and should be shown as delisted on the final IR: 3 Segments of the Lower Big Sioux River, TSS, 2/1/10; Keya Paha River, fecal coliform, 2/1/10. If TMDLs have been completed for all parameters, these segments could be moved to Category 4a in the IR, the ADB, and the GIS files.

DENR response to EPA Region 8:

1) The approval dates have been corrected.
2) The approval date has been included
3) The approved TMDLs have been included in Appendix A.
4) The approved TMDLs have been delisted and moved to the appropriate category.

Other comments on the IR

1) The source information for lakes is unclear. It is stated on page 42 that 375 lake acres are impaired by non-point sources. The lake this applies to (North Island Lake) is listed for mercury in fish tissue. By this reasoning, all lakes listed for mercury in fish tissue should have non-point as the source. Additionally, throughout the basin descriptions in the IR, it is stated that lakes are impaired by agriculture, yet the few lakes with sources attached to them are listed as impaired by natural sources. It appears that impairment sources for these lakes should be listed as a combination of natural and anthropogenic agricultural non-point sources.

2) In order for the general public to have a better understanding of why certain waters are now considered to be meeting standards, several individual basin descriptions could include more information. For example, the removal of the domestic water supply use (and associated water quality criteria) for a number of waterbodies could be explained more fully as the reason for delistings for Angostura Reservoir, Murdo Dam and two segments of the Big Sioux River. Other examples of delistings that could benefit from more explanation include the Bad River, West Strawberry Creek, Jack Moore Creek, Skunk Creek, Hat Creek, Slaughter Creek, and Moccasin Creek.

3) It appears that the Belle Fourche River (Segment 02) could actually be placed in Category 1 as opposed to Category 2 since all uses have been assessed and are attaining.

4) The first sentence of the second paragraph on page 158 refers to the FDA action level for mercury of 1 ppm. EPA considers this level to not be fully protective of human health and recommends that states move toward using a lower level of 0.3 mg/Kg in fish tissue. In fact, South Dakota's water quality criterion for human health protection from mercury of 0.051 µg/L equates to a value of 0.37 mg/Kg in fish tissue (See Mercury presentation from the Water Quality Standards/NPDES meeting in Denver on April 15, 2009).

5) The last sentences on page 99 and page 132 describing that all aspects of TMDL

development are being referred to EPA in the Grand and Moreau Basins need to be clarified. This applies only to streams due to Tribal jurisdictional issues. Any presently listed lakes or lakes that may be listed in the future in these basins are not necessarily included in this statement.

6) Wetlands and headwater streams are important aquatic resources, representing more than 90% of the total surface waters in South Dakota. However, current SDDENR CWA programs focus mainly on the remaining 10% (perennial waters). SDDENR is encouraged to form a more formal wetland science partnership with the SD Game and Fish Department, the state heritage program and South Dakota State University. This partnership would aid SDDENR in participating in the 2011 National Wetland Condition Assessment. SDDENR, along with wetland science partners, is also encouraged to submit project proposals for EPA Region 8 competitive WPDG program funding. Example projects could be a survey of wetland quality and quantity in a watershed with known runoff-related water quality issues or a survey to assess the condition of depressional wetlands using nutrient-related water quality indicators. The wetland assessment program in the State of Iowa provides a good example for states in the Midwest (see the Wetlands Section in Iowa's Comprehensive Monitoring Strategy at http://www.igsb.uiowa.edu/wqm/Reports/Strategy2006.pdf). The Iowa DNR wetland monitoring web page is located at http://www.igsb.uiowa.edu/wqm/publications/TOCWetlandMonitoring.htm.

7) In many South Dakota watersheds, wetland and headwater stream protection and restoration are part of the solution for successfully achieving water quality and watershed goals. EPA would like to see SDDENR increase their support for watershed scale monitoring and assessment of wetland and headwater streams quality and quantity (i.e., abundance, distribution and condition by type) and reporting results in the 305(b) portion of the IR. Such information could then be incorporated, as appropriate, into future NPS pollution control programs, TMDLs, 401 Water Quality Certifications, and watershed plans.

References

Iowa Department of Natural Resources. 2010. Water Quality Standards Notice of Intended Action. http://www.iowadnr.gov/water/standards/nutrients.html.

Kansas Department of Health and Environment. 2008. Methodology for the Evaluation and Development of the 2008 Section 303(d) List of Impaired Water Bodies for Kansas. Watershed Planning Section/Bureau of Water/Division of Environment. February 1, 2008.

World Health Organization. 1999. Toxic Cyanobacteria in Water: A guide to their public health consequences, monitoring and management. Ingrid Chorus and Jamie Bartram, Eds. 400 pp.

DENR response to EPA Region 8:

1) DENR believes the best source description for lake impairments in South Dakota is a combination of natural and agricultural nonpoint sources. Unless other sources are identified, DENR believes it would be redundant to assign the same sources to the majority of impaired lakes in the basin tables. As a result, the source information was removed from the basin tables, unless something other than natural sources or agricultural nonpoint source pollution was identified as the source of impairment. This rationale was inserted on page 42. All lakes listed for mercury in fish tissue were labeled strictly nonpoint source pollution because agriculture is not expected to be a major contributing source of impairment. This source was added to all lakes listed for mercury in fish tissue in the ADB database and the appropriate corrections were made to Table 14 on page 42.

2) Additional information has been added to the basin descriptions regarding specific waterbodies that were previously listed as impaired and are now meeting water quality standards.
3) SD-BF-R-BELLE_FOURCHE_02 has been changed to Category 1.
4) DENR acknowledges that EPA does not consider FDA's 1.0 mg/kg action level of mercury in fish tissue to be fully protective of human health and would urge EPA and FDA to work together to narrow the differences between rationales and mutually develop guidance that is fully protective of human health.
5) The sentence has been clarified to only include waterbodies under tribal jurisdiction.
6) DENR focuses monitoring efforts on perennial systems because they provide the best indication of the cumulative impacts of upstream waters (wetlands and headwater streams) on downstream receiving waters. In addition, limited resources are available to incorporate the large number of wetland and headwater streams into current monitoring programs. DENR supports a formal wetland science partnership with the entities mentioned. Initial communication with these potential partners has been made and significant interest was expressed. DENR has and will continue to support EPA research opportunities through partnerships focused on wetland and headwater stream ecosystem health. DENR has also participated in EPA sponsored wetland workshops to gain information on wetland assessment and monitoring tools used by other states in the region.
7) DENR will continue to support research activities through appropriate partnerships that provide monitoring and assessment tools required to interpret the health of wetland and headwater stream environments. Results gained from future research activities can serve as a 305(b) reporting element. Future application of watershed scale wetland monitoring and assessment for incorporation in other CWA programs will depend on resource availability.

DEPARTMENT of ENVIRONMENT and NATURAL RESOURCES

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3181
www.state.sd.us/denr

June 1, 2009

RE: Request for Water Quality Data

Dear Interested Party:

It is time for the department to begin preparation of the 2010 Integrated Report. The Integrated Report combines the 305(b) report and the 303(d) list into one report, which provides an assessment of the quality of South Dakota's surface water resources and identifies the impaired waters that require Total Maximum Daily Loads (TMDLs). Total Maximum Daily Loads calculate the amount of pollution a water body can receive and still meet water quality standards along with supporting assigned beneficial uses. Once TMDLs are determined, local, state, and federal activities can be directed toward improving the quality of the water body.

To develop an accurate, defensible, and comprehensive list, the department is soliciting water quality data or other information you may have to help us determine the quality of South Dakota's waters. Chemical, physical, or biological data will be considered. Data that represent the condition of a specific water body will be used to update the 303(d) list. Only data less than eight years old and in electronic format will be considered. Please provide any quality assurance/quality control measures that were used in collecting the data you submit. Specific water quality reports that explain and interpret the data are also requested.

We need to have this information for the 2010 Integrated Report by August 1, 2009. South Dakota's most recent Integrated Report is available at the department's website: http://denr.sd.gov/des/sw/documents/08IRFinal.pdf. If you have questions or water quality data for our list, contact either Shannon Minerich or Paul Lorenzen at (605) 773-3351, or email an electronic version of the data to Shannon.Minerich@state.sd.us or Paul.Lorenzen@state.sd.us. Thank you for your help.

Sincerely,

Steven M. Pirner
Secretary

NOTICE OF THE 2010 SOUTH DAKOTA INTEGRATED REPORT FOR SURFACE WATER QUALITY ASSESSMENT AND OPPORTUNITY FOR COMMENT

The Department of Environment and Natural Resources (DENR) is announcing the availability of the draft 2010 South Dakota Integrated Report for Surface Water Quality Assessment (Integrated Report) and the opportunity for public comment on the draft report.

The Integrated Report combines the 305(b) Water Quality Report to Congress and the 303(d) Impaired Waterbodies list into one document for the purpose of reporting on South Dakota's surface water quality. The Integrated Report also lists those waterbodies that require the completion of a Total Maximum Daily Load (TMDL). This final Integrated Report must be submitted to the U.S. Environmental Protection Agency (EPA) on or before April 1, 2010.

The 2010 Integrated Report contains the following information:

1. An assessment of the surface water quality of South Dakota's waters;
2. A description of South Dakota's water quality monitoring programs;
3. Pollutants causing or expected to cause violations of the applicable water quality standards; and
4. Identification of waters targeted for TMDL development.

The department is providing a public participation process in which the members of the general public, affected organizations, and other interested parties can review and comment on the content of the draft 2010 Integrated Report. A copy of the draft 2010 Integrated Report is available on DENR's web site at: http://denr.sd.gov/draftir2010.pdf**.**

Copies of the draft may also be obtained by writing to Shannon Minerich at the address below, emailing Shannon.Minerich@state.sd.us or by calling her at 1-800-438-3367.

Any person desiring to comment on the list should submit comments to the address below. Persons are encouraged to comment electronically by emailing comments to Shannon.Minerich@state.sd.us. The department must receive public comments by March 1, 2010.

At the conclusion of the public comment period, the department will prepare a written response to each comment received and post the response to the department web site or, if requested, by written response to each person who provided comments or requested a copy of the department's response.

The department will finalize the 2010 Integrated Report after consideration of the comments received during the public participation process. The final 2010 Integrated Report will then be sent to EPA for approval. Once EPA approves the list, the Integrated Report will be made available on the department's web site and will be sent to persons who request a copy. Published at the approximate cost of _____.

Department of Environment and Natural Resources
Water Resources Assistance Program
523 East Capitol Avenue – Joe Foss Building
Pierre, South Dakota 57501-3181

Steven M. Pirner
Secretary

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FOR IMMEDIATE RELEASE: Monday, January 25, 2010
FOR MORE INFORMATION: Shannon Minerich or Paul Lorenzen, 1-800-438-3367

DENR Seeks Comments on Waterbody Report

PIERRE – The state Department of Environment and Natural Resources (DENR) is seeking public comments on the draft Integrated Report, a report the state uses to identify impaired waterbodies in the state. Public comments from the general public and other interested parties and organizations will be accepted through March 1, 2010. Comments can be emailed to Shannon Minerich at *Shannon.Minerich@state.sd.us* or by writing:

Department of Environment and Natural Resources
Surface Water Quality Program
523 East Capitol Avenue – Joe Foss Building
Pierre, South Dakota 57501-3181

A copy of the draft 2010 Integrated Report is available by contacting DENR at the above address, by phone at 1-800-438-3367, or by visiting DENR's website at: http://denr.sd.gov/draftir2010.pdf.

The draft 2010 Integrated Report contains an assessment of the surface water quality of South Dakota's waters, a description of South Dakota's water quality monitoring programs, pollutants causing impairments of the water bodies, and identification of waters targeted for total maximum daily load development. A total maximum daily load is a determination of the amount of pollution a waterbody can receive and still maintain water quality standards.

"Because this list drives state water quality programs, it is important that people in South Dakota see the draft report and provide us comments before it is finalized and sent to EPA for approval," said DENR Secretary Steve Pirner.

The draft 2010 report lists 152 waterbodies or waterbody segments needing a total maximum daily load. Of those listed, 107 (or 70%) are stream and river segments and 45 (or 30%) are lakes that periodically exceed water quality standards.

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Pollutant reductions to meet total maximum daily loads can be achieved through many different ways, depending on the type and source of pollutants. For example, if the pollutant comes from runoff, DENR can help local sponsors of water quality improvement projects seek cost share funding to help landowners install best management practices that will reduce the pollutant in runoff.

Since the last biennial report in 2008, 102 total maximum daily loads have been completed or determined to be unnecessary, 64 are in progress and 66 are planned.

The South Dakota Department of Environment and Natural Resources printed 35 copies of this document on recycled paper at a cost of $8.12 per copy.