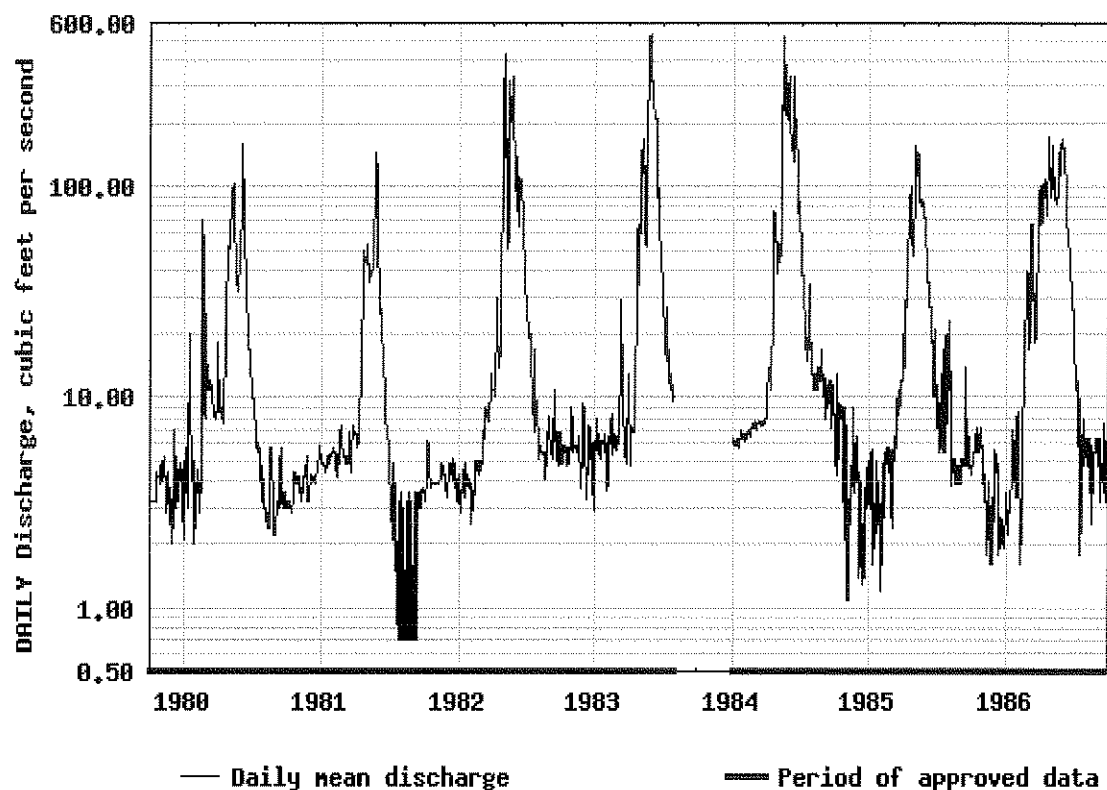




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# Moody Creek Monitoring Report 2003



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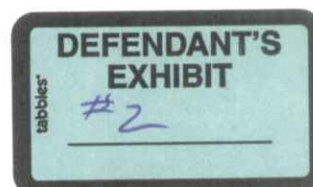
**Madison Soil and Water Conservation District  
Idaho Soil Conservation Commission  
Idaho State Department of Agriculture**

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**January 9, 2004**

**Technical Results Summary CFF-Mdy-01**



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## Acknowledgements

Thanks to the Madison Soil and Water Conservation District, Lloyd Bradshaw and Cleve Bagley with NRCS for providing support and valuable information to the monitoring project. A special thanks to the landowners in the Moody Creek subwatershed for allowing me on their property to conduct the monitoring. A big thanks to Kalissa Copeland and Kelsey Flandro who have aided in field work. I appreciate Kirk Campbell and Gary Bahr, Idaho State Department of Agriculture, with all the help technically, supervisory and support through the project. Thanks to Mark Dallon, Ken Clark and Justin Krajewski for providing technical support.

## **Executive Summary**

Moody Creek is located in the Teton River subbasin, HUC# 17040204, which is a tributary to the Henry's Fork of the Snake River. Several tributaries in the Teton River subbasin are listed on the state of Idaho's §303(d) list for having water quality limited segments. Moody Creek is the only tributary that is listed for nutrients.

Idaho Association of Soil Conservation Districts began water quality monitoring on Moody Creek on April 18, 2001. The data included in this report goes through July 31, 2003. Sampling was performed on three sites during 2001 with an additional site near the headwaters in the spring of 2002. These sites were monitored twice a month, April through October, and once a month November through March. Some of the sites were inaccessible during adverse weather conditions.

All monitoring sites were sampled for total suspended solids, total volatile solids, total phosphorus, ortho-phosphorus, nitrate + nitrite and ammonia. Dissolved oxygen, water temperature, specific conductance, total dissolved solids, pH and stream flow were measured in the field.

Sediment and total phosphorus concentrations appear to increase in the creek during spring runoff. The mean concentration levels for total suspended solids and total phosphorus tend not to exceed the targets set by the Idaho Department of Environmental Quality. There are specific dates that do exceed the targets, but these were primarily during spring runoff.

The mean concentrations for nitrate + nitrite exceed the 0.30 mg/L target at all monitoring sites. During the 2001 sampling year, very little nitrate + nitrite was detected in any samples. Starting in 2002, the concentrations were three times the target. This trend continued in 2003. This needs to be further investigated through monitoring. Meeting with other agencies will be done to determine if some event happened in 2001 or 2002 to change the nitrate + nitrite concentrations drastically.

## **Introduction**

The Idaho Association of Soil Conservation Districts (IASCD) monitored several sites located on Moody Creek in Madison County. Monitoring began April 2001 and will continue through April 2004. The project was to provide water quality data to the Madison Soil and Water Conservation District (SWCD) in determining pollutant loads on Moody Creek based on the Teton River Total Maximum Daily Load (TMDL). The data will be used to plan implementation of voluntary agricultural best management practices (BMP) throughout the Moody Creek subwatershed. IASCD has worked cooperatively with Idaho State Department of Agriculture (ISDA), Madison SWCD and Natural Resources Conservation Service (NRCS) to implement this project. Moody Creek is listed on the state of Idaho's §303(d) list for being water quality limited.

## **Subwatershed Description**

Moody Creek is located in the Teton River subbasin, hydrologic unit code (HUC) #17040204. The subwatershed is located in eastern Idaho and is a tributary to the South Fork of the Teton River. The South Fork of the Teton River enters the Henry's Fork of the Snake River approximately 12 miles below the confluence with Moody Creek. The Moody Creek subwatershed (Figure 1) is located in the western section of the Teton River subbasin. The subbasin follows the Fremont, Madison and Teton county lines.

Moody Creek originates in the Targhee National Forest (TNF), in the Big Hole Mountains. Several tributaries, including North and South Moody, Browning, Garner and Fish creeks flow together to form Moody Creek. Moody Creek, below the TNF boundary, is a third order stream. Several small, unnamed streams and springs enter Moody Creek below the TNF boundary. Below the forest, Moody Creek flows through a few miles of state land before entering private land. Approximately 20 miles after leaving forestland, Moody Creek enters the South Fork of the Teton River. The primary land uses in the subbasin are agriculture and recreation (IDEQ, 2002). Approximately 73% of Madison County and 67% of Teton County is private land. Federally managed land makes up 20% in Madison County and 33% in Teton County. The state of Idaho manages land in seven percent of Madison County, and about one percent of Teton County, approximately.

There is one dam located on Moody Creek. Webster Dam was built around 1900 to aid in irrigation and is located on state land that is managed by Idaho Department of Lands (IDL) (IDEQ, 2002). It is currently filled in with sediment and acts as a fish barrier.

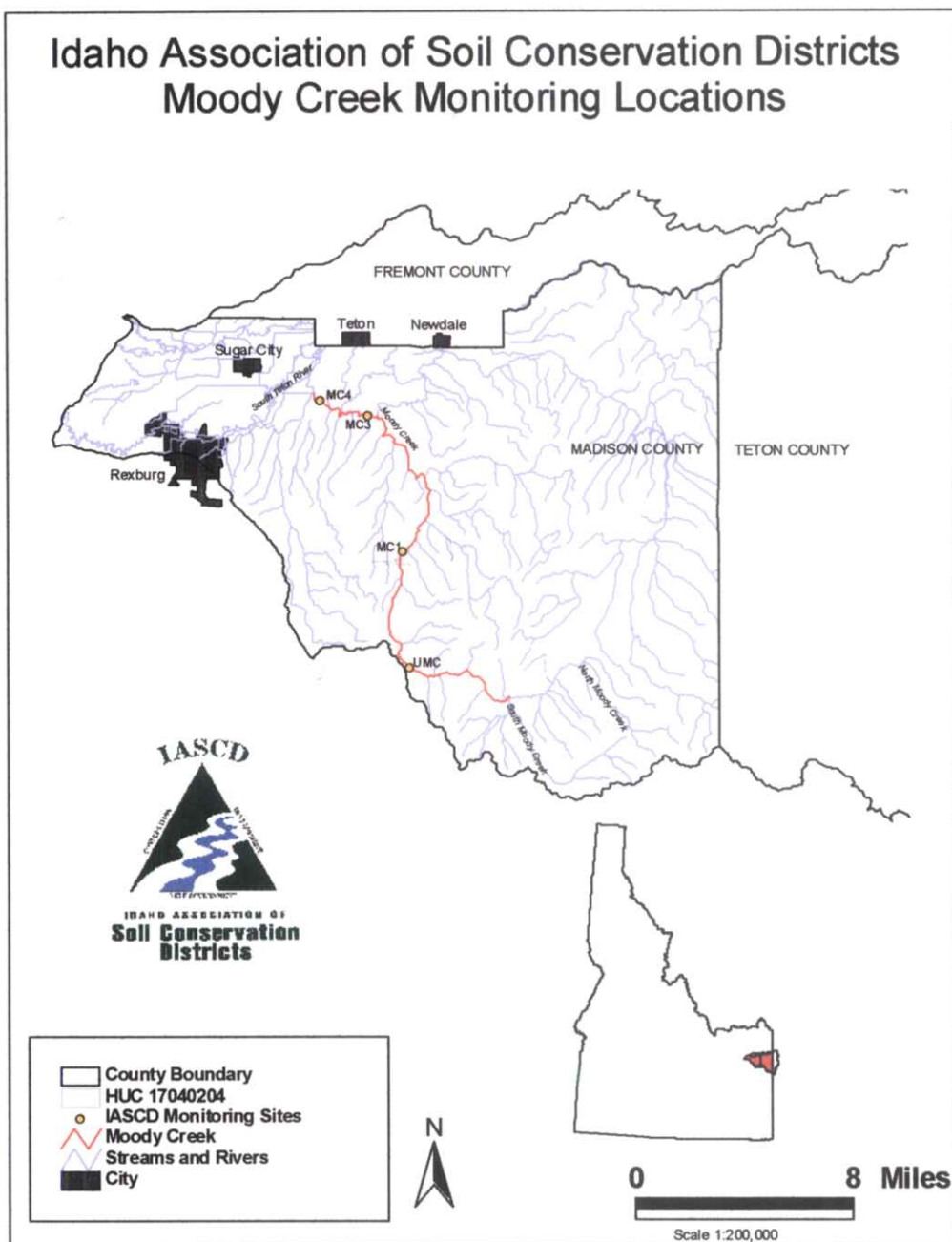


Figure 1. Moody Creek and IASCD monitoring site locations.

## The Teton River TMDL

The Teton River TMDL was written by the Idaho Department of Environmental Quality (IDEQ) and submitted to the Environmental Protection Agency (EPA) in August 2003 for approval. There are 13 water quality limited segments located in the Teton Subbasin. The Teton River is divided into four segments and is listed for nutrients, sediment and habitat alteration (IDEQ, 1998). Moody Creek is the only tributary listed for nutrients. Badger, Spring, South Leigh, Packsaddle, Darby and Fox creeks are listed for sediment. Spring, Packsaddle, Horseshoe, Darby and Fox creeks are listed for flow alteration. Spring and Fox creeks are listed for temperature and North Leigh Creek is on the §303(d) list, but the pollutant is unknown.

Table 1. Pollutant targets for §303(d) listed segments in the Teton River TMDL.

| <b>Pollutant of Concern</b> | <b>Proposed Pollutant Targets for Teton TMDL</b> |
|-----------------------------|--------------------------------------------------|
| Total Suspended Solids      | Not to exceed 80 mg/L, regardless of season      |
| Total Nitrate + Nitrite     | Not to exceed 0.30 mg/L                          |
| Total Phosphorus            | Not to exceed 0.10 mg/L                          |

## Monitoring Site Locations

Starting in April 2001, three locations were established on Moody Creek for water quality monitoring. An additional monitoring site, UMC, was added during April 2002 and was located approximately three miles downstream of TNF boundary and almost one mile downstream of state land (Figure 1). This upper Moody Creek site was monitored four times during the 2002 season with continued monitoring throughout the 2003 monitoring season. Station UMC is not accessible in winter or during adverse weather conditions.

The lowest monitoring site, MC4, is located upstream of Moody Creek Road, directly above where the creek crosses the road. This site is accessible year round if it is not iced over in the winter. MC4 is the only monitoring site that is not located in Moody Creek Canyon. The next site MC3 is located on the upstream side of Pincock Road. It is located on the upstream side of the road. This site is also accessible throughout the year. MC1 is located on the downstream side of the bridge at Wood's Crossing and at times this site is difficult to access due to steep terrain.

## Project Objectives

The project scope of work was discussed and approved by representatives of Madison SWCD, ISDA, NRCS and IDEQ. IASCD worked cooperatively with these agencies in an attempt to complete the following objectives:

- Evaluate the impact of agricultural activities and range land on Moody Creek.
- Evaluate the water quality and discharge rates within Moody Creek below the TNF boundary.
- Identify areas of concern for implementation of best management practices.
- Use this data to increase public awareness.

## Methods

### Sampling Schedule and Parameters

Sampling of Moody Creek began on April 18, 2001. The data included in this report goes through July 31, 2003. Sampling was performed twice a month from April through October and monthly November through March. The sites all freeze over during the winter months, so samples were not collected.

Samples were collected and field measurements taken for the parameters listed in Table 2. Samples were delivered to IAS-EnviroChem Laboratory in Pocatello, Idaho within the appropriate holding times.

Table 2. Water Quality Parameters and Field Measurements

| <b>Water Quality Parameters</b> | <b>Laboratory Method</b>           |
|---------------------------------|------------------------------------|
| Total suspended solids (TSS)    | EPA 160.2                          |
| Total volatile solids (TVS)     | EPA 160.4                          |
| Total phosphorus                | EPA 365.4                          |
| Ortho phosphorus                | EPA 365.2                          |
| Nitrate                         | EPA 300                            |
| Nitrite                         | EPA 300                            |
| Ammonia                         | EPA 350.3                          |
| <b>Field Measurements</b>       | <b>Instrument</b>                  |
| Dissolved oxygen                | YSI Model 55                       |
| Water temperature               | YSI Model 55                       |
| Conductivity                    | Orion Model 115                    |
| Total dissolved solids          | Orion Model 115                    |
| pH                              | Corning 313                        |
| Stream flow                     | Marsh McBirney Flo-Mate Model 2000 |

## **Sampling Methods**

Sample collection techniques followed approved United State Geological Survey (USGS) methods (Shelton, 1994). All analytical testing followed either EPA or Standard Methods for the Examination of Water and Wastewater approved methods. Quality control samples, duplicates and blanks, comprised at least 10% of the sample load during this program. Quality Assurance and Quality Control (QA/QC) results are in Appendix A. Duplicate and blank samples were stored and delivered with the normal sample load for analytical testing. For project tracking, chain-of-custody protocols were followed for all sample handling.

A comparison of the mean and standard deviation for duplicate samples are shown in Appendix A, Table 5. Results from the calculated relative percent difference (RPD) for the duplicates are also in Appendix A, Table 6.

### *Flow Measurements*

Flow measurements were collected with a Marsh McBirney Flo-Mate Model 2000 flow meter. The six-tenth-depth method (0.6 of the total depth below water surface) was used when the depth of water was less than or equal to three feet. When the water was over three feet deep, an average of the two-tenth and eight-tenth-depth method (0.2 and 0.8 of the total depth below water surface) was measured. A transect line was set up perpendicular to flow across the width of each creek and the mid-section method for computing cross-sectional area along with the velocity-area method was used for discharge determination. The discharge was computed by summation of the products of the partial areas of the flow cross-sections and the average velocities for each of those sections.

### *Water Quality*

Samples for water quality analysis were collected by grab sampling directly from the stream on wadable sites. For shallower sites (<1 ft) grab samples were collected by hand using a clean one-liter stainless steel container. A DH-81 integrated sampler was used at wadable sites with water depths greater than 1 foot. For each method, individual samples were collected at equal intervals across the entire width of the stream. Each discrete sample was composited in a 2.5 gallon polyethylene churn sample splitter from which homogenized samples were poured off into sample containers.

### *Field Measurements*

Field measurements for dissolved oxygen, percent saturation and water temperature were taken directly in the streams from well-mixed sections, near mid-stream at approximately mid-depth. Measurements for specific conductance, pH and dissolved solids were taken from the churn splitter composite sample, immediately following collection. Calibration of all field equipment was in accordance with the manufactures specifications. All field

measurements were recorded in a bound logbook along with pertinent observations about the site, including weather conditions, flow rates and personnel on site.

### *Data Handling*

The field data and analytical data generated from each survey were reviewed by IASCD and ISDA personnel. Each batch of data was reviewed to insure that all observations, measurements and analytical results have been properly recorded. The analytical results were evaluated for completeness and accuracy. Any suspected errors were investigated and resolved, if possible. The data was then stored electronically and made available to any interested entity.

## **Results and Discussion**

Moody Creek is listed on the 1998 §303(d) as having nutrients as a pollutant of concern. Nutrients are measured as nitrate + nitrite ( $\text{NO}_3+\text{NO}_2$ ) and total phosphorus (TP). In addition to  $\text{NO}_3+\text{NO}_2$  and TP, ammonia ( $\text{NH}_3$ ) and ortho phosphorus (OP) were measured. Sediment was measured as total suspended solids (TSS). The mean concentrations for TSS,  $\text{NO}_3+\text{NO}_2$ , TP and discharge (Q) are summarized in Table 3.

Table 3. Mean Values from April 2001 through July 2003 Water Quality Data

| Site | TSS<br>mg/L | $\text{NO}_3+\text{NO}_2$<br>mg/L | TP<br>mg/L | Q<br>cfs | n  |
|------|-------------|-----------------------------------|------------|----------|----|
| MC4  | 33.4        | 0.42                              | 0.07       | 14.8     | 39 |
| MC3  | 51.7        | 0.36                              | 0.08       | 13.4     | 33 |
| MC1  | 28.3        | 0.38                              | 0.08       | 10.0     | 31 |
| UMC  | 18.0        | 0.77                              | 0.05       | 16.9     | 10 |

### **Stream Discharge**

During 2001, MC1, MC3 and MC4 all experienced at least one period where there was no discharge. MC4 and MC3 had discharge throughout the 2002 and 2003 sampling seasons. During a tour of the subwatershed in September 2003, the comment was made by a landowner that the creek did dry up completely at least once during the 2003 summer. IASCD did not observe dry stream conditions at sites MC3 and MC4 during the sampling dates. At times; during the 2001, 2002 and 2003 seasons, the discharge rate at MC1 was insufficient to allow sample collection.

When comparing years, there was an increase in the total discharge at MC1 and MC4 during the 2002 sampling season. Total discharge at MC1 for 2001 was 71.2 cfs, 2002 was 166 cfs and 2003 was 59.2 cfs. Total discharge at MC4 for 2001 was 104 cfs, 2002 was 274 cfs and 2003 was 158 cfs (Figure 2). The total discharge was not calculated for the entire 2003 sampling season since the data is only reported through July 31, 2003.

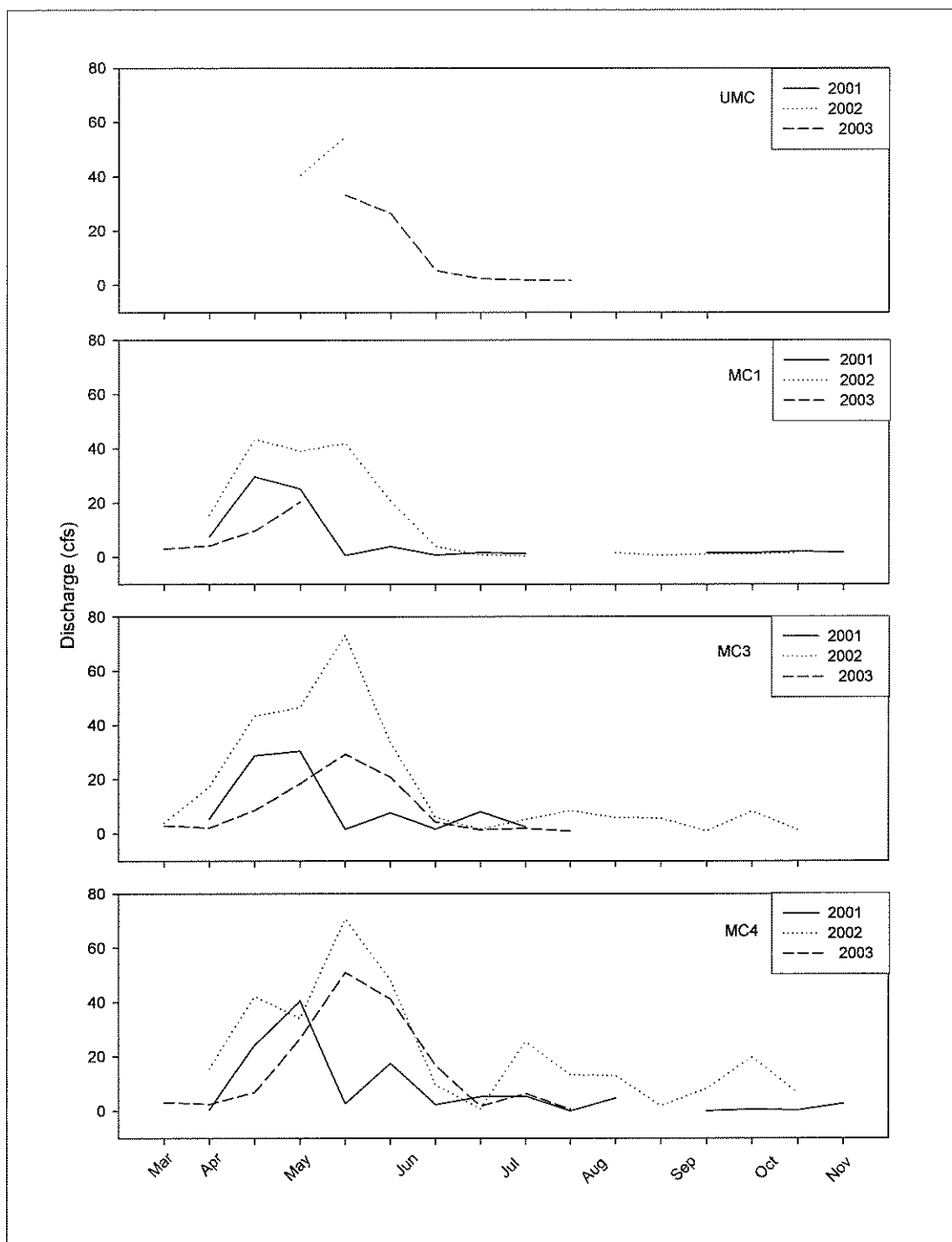


Figure 2. Discharge measurements for Moody Creek monitoring sites.

Flows typically peak in May and then return to a base flow in mid June. The streams are either filled in with snow or are frozen during the winter months. With the exception of station MC4, no samples were collected between mid November and mid March. During January 2003, a rain on snow event occurred where one sample was collected at MC4 to analyze runoff.

### **Total Suspended Solids**

Moody Creek is one of the water quality limited segments in the Teton River subbasin that is not listed for sediment. TSS samples were collected at the Moody Creek monitoring sites to determine if there was a sediment problem. The proposed TMDL target for TSS shall not exceed 80 mg/L regardless of season (IDEQ, 2002).

None of the sites exceeded 80 mg/L when the TSS concentrations were averaged for the entire sampling period (Table 3). During base flow periods, TSS concentrations were typically below 50 mg/L. During spring runoff, levels of TSS exceeded the 80 mg/L target. Only UMC did not exceed the 80 mg/L target, but this could be due to inaccessibility during spring runoff (Figure 2).

Webster Dam, which is located upstream of station UMC, acts as a fish barrier and has high amounts of sediment located in it. In the event of major runoff from the TNF, some of the sediment trapped behind the dam could be flushed downstream. In addition to Webster Dam, there are several beaver dams in Moody Creek. These dams act as traps for suspended solids traveling downstream. During spring runoff, suspended solids are traveling at a higher velocity and would not typically have time to settle out. Some spring runoff events may even result in such high water velocities that the beaver dams are removed by the force of the water. The dam removal would occur typically during a more normal or above normal water year. The data provided for this report have been taken during drought years.

Moody Creek acts as a transport system for irrigation water. Water from the Teton River is brought into the creek through several canals. Enterprise Canal enters the creek above MC3. East Teton and Teton canals enter Moody Creek between the MC4 and MC3 monitoring sites. Below MC4, the Woodmansee Johnson Canal enters Moody Creek. Approximately two miles downstream, is the confluence of Moody Creek with the South Fork of the Teton River.

There are several steep and cut banks that have the potential to introduce sediment into the creek during a higher water year. Natural processes of stream flow and snow melt have had impact on stream banks in the subwatershed. In some areas where there is no grazing, the stream banks are vertical and vegetated but still are sloughing into the creek. Grazing has impacted Moody Creek in some isolated areas resulting in bank erosion and sloughing. Even with these streambanks eroding and sloughing, TSS levels are relatively low in the subwatershed.

Other sources of sediment in Moody creek could come from roads and recreation. Several roads traveled by IASCD to the monitoring sites are dirt and gravel. Most of

these roads do not directly parallel Moody Creek, but they do cross the creek several times. Fishing, camping and off-road vehicles have the potential to impact the creek on private, state and federal lands. These activities could result in additional sediment being introduced into the creek.

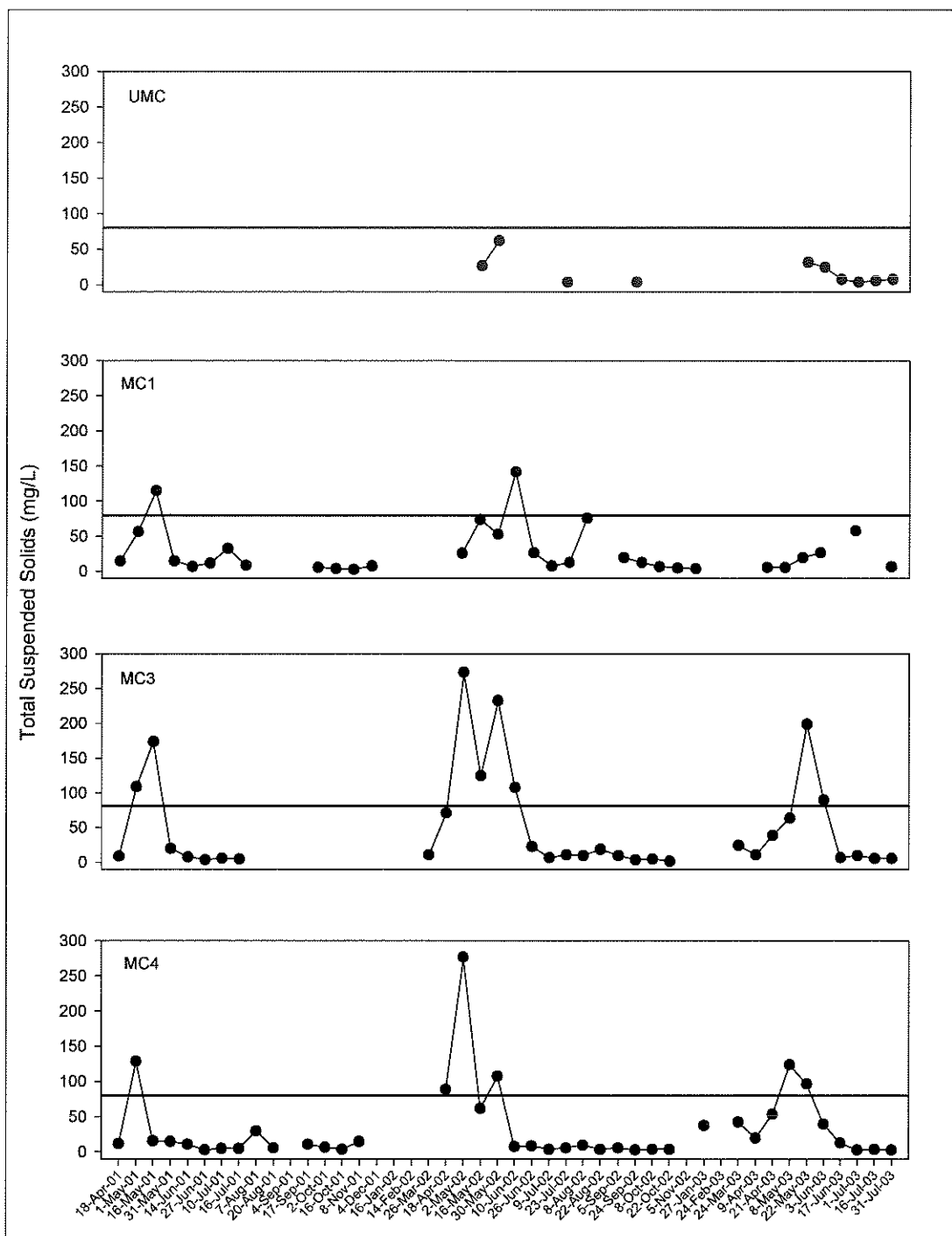


Figure 3. Total suspended solid concentrations for Moody Creek monitoring sites. The red line indicates the 80 mg/L target.

## Nitrate + Nitrite

Nutrients are the only pollutant that Moody Creek is listed for on the state of Idaho's §303(d) list. The mean  $\text{NO}_3+\text{NO}_2$  concentration for all the monitoring sites is over the TMDL target of 0.30 mg/L (Table 3). Monitoring site UMC, which is located below public lands, had the highest concentration of 0.77 mg/L. MC3 and MC1 are above the target with 0.36 and 0.38 mg/L respectively and MC4 exceeds the target at 0.42 mg/L. Refer to Figure 4 for graphs of the seasonal concentrations of  $\text{NO}_3+\text{NO}_2$ .

The mean concentrations in Table 4 are taken over the entire data set. Concentrations of  $\text{NO}_3+\text{NO}_2$  were well below the target, and almost always undetectable in the laboratory, during the first year of monitoring. During 2002, mean concentrations of  $\text{NO}_3+\text{NO}_2$  increased at monitoring sites MC1, MC3 and MC4. The highest mean concentration still remains at the upper most site, UMC.

Table 4. Mean values of  $\text{NO}_3+\text{NO}_2$  during entire data set and excluding 2001 data.

| Site | $\text{NO}_3+\text{NO}_2$<br>mg/L | $\text{NO}_3+\text{NO}_2$ without 2001<br>mg/L |
|------|-----------------------------------|------------------------------------------------|
| MC4  | 0.42                              | 0.61                                           |
| MC3  | 0.36                              | 0.47                                           |
| MC1  | 0.38                              | 0.61                                           |
| UMC  | 0.77                              | 0.77                                           |

The source of nitrogen is difficult to pinpoint. Nitrogen can come from precipitation that has fallen directly onto the stream surface, fixation in the water and sediments and input from surface and groundwater (Wetzel, 1983). Wetzel also notes that snow, rather than rain, contains a higher content of nitrogen, and could contribute up to half the total influx during a year.

Ground water could be a contributor of  $\text{NO}_3+\text{NO}_2$  into the surface water. Moody Creek has several smaller tributaries that flow from springs. Fertilizer and decomposed manure or plant residue can leach into the ground water over time, or runoff directly into the river or creeks during a rainstorm or spring runoff. Some plant residue can cause elevated levels of nutrients in the water. During the winter, aquatic plants may decompose elevating the  $\text{NO}_3+\text{NO}_2$  concentrations.

The concentrations of  $\text{NO}_3+\text{NO}_2$ , on Moody Creek, have no particular pattern throughout the years and sites. UMC, MC1 and MC4 typically have higher amounts of aquatic growth in the stream channel during low flow and summer months. The substrate for UMC and MC4 is more of a gravel and small cobble substrate while MC1 has more silt than the other sites. MC3 has very little algae and its substrate is composed of small gravel and sand that moves more easily than the substrates of the other monitoring sites. This substrate may not be a good anchor for algae and therefore, the growth does not occur. The increased aquatic growth may be a contributor to the higher  $\text{NO}_3+\text{NO}_2$

concentrations. The site with the least amount of algae, MC3 has the lowest  $\text{NO}_3+\text{NO}_2$  concentration.

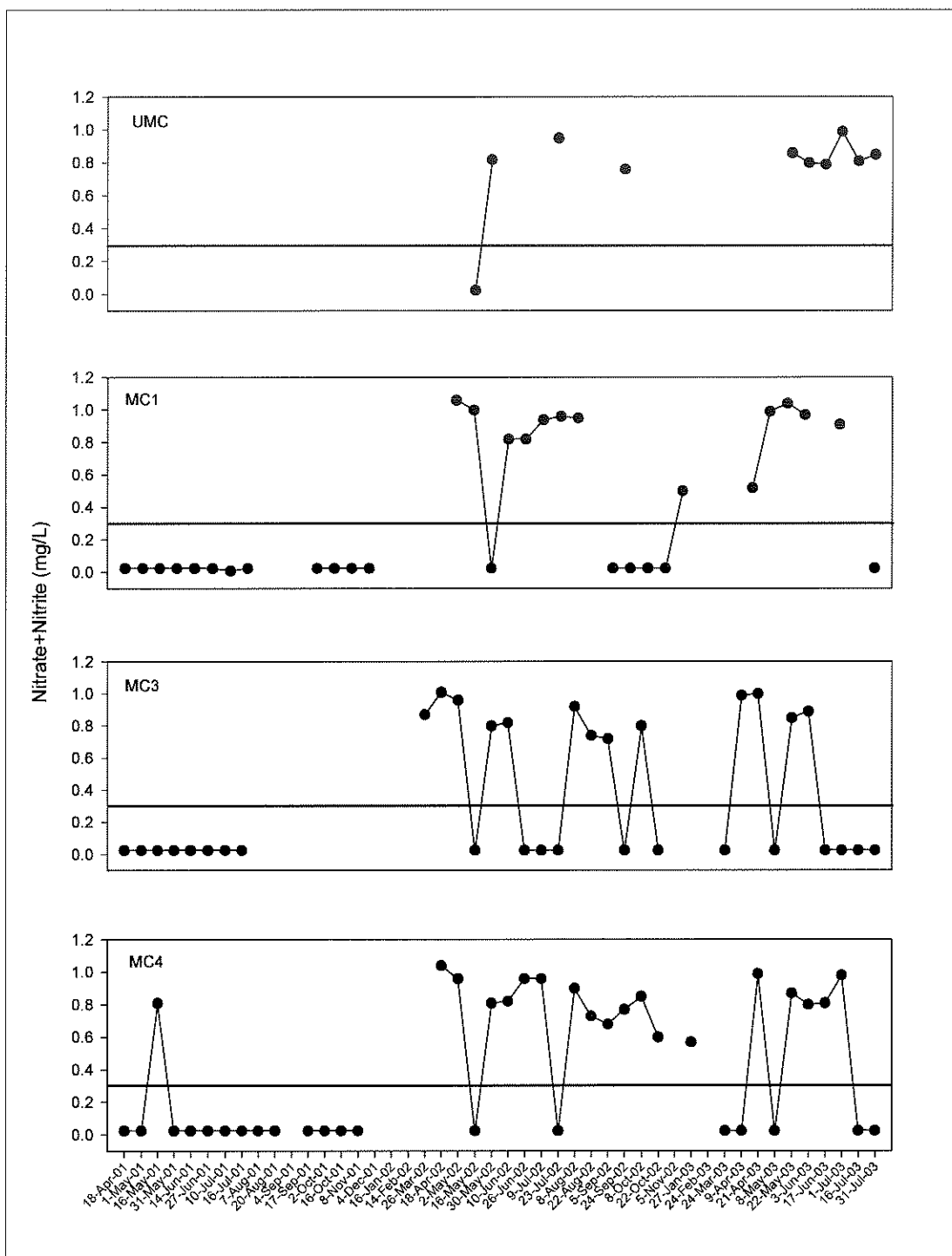


Figure 4. Nitrate + Nitrite concentrations for Moody Creek monitoring sites. The red line indicates the 0.30 mg/L target.

## Total Phosphorus

Total phosphorus (TP) is also a nutrient that is listed as a pollutant of concern for Moody Creek. The TMDL target for TP is 0.10 mg/L based on the EPA Gold Book Criteria (USEPA, 1987). All four sites are below the 0.10 mg/L target for the mean concentrations (Table 3). There is a seasonal variation for TP which is illustrated in Figure 5. For monitoring sites MC3 and MC4, TP is transported during spring runoff. MC1 tends to have fluctuations of TP throughout the monitoring season. This could be the result of water being taken out of Moody Creek for irrigation then being turned back into the creek. There is also a beaver dam located upstream of MC1 that could effect TP and sediment concentrations based on activities at the dam.

Phosphorus, in a particulate form, will adhere to sediment particles and travel with the sediment. A good correlation ( $R^2 = 0.85$ ) between TSS and TP was found at MC3 using a simple regression. This correlation indicates that phosphorus is being mobilized with sediment. Two other sites showed weaker correlations; MC1 ( $R^2 = 0.48$ ) and MC4 ( $R^2 = 0.50$ ), and UMC showed no correlation ( $R^2 = 0.27$ ). The poor correlation at UMC could be the result of insufficient data points.

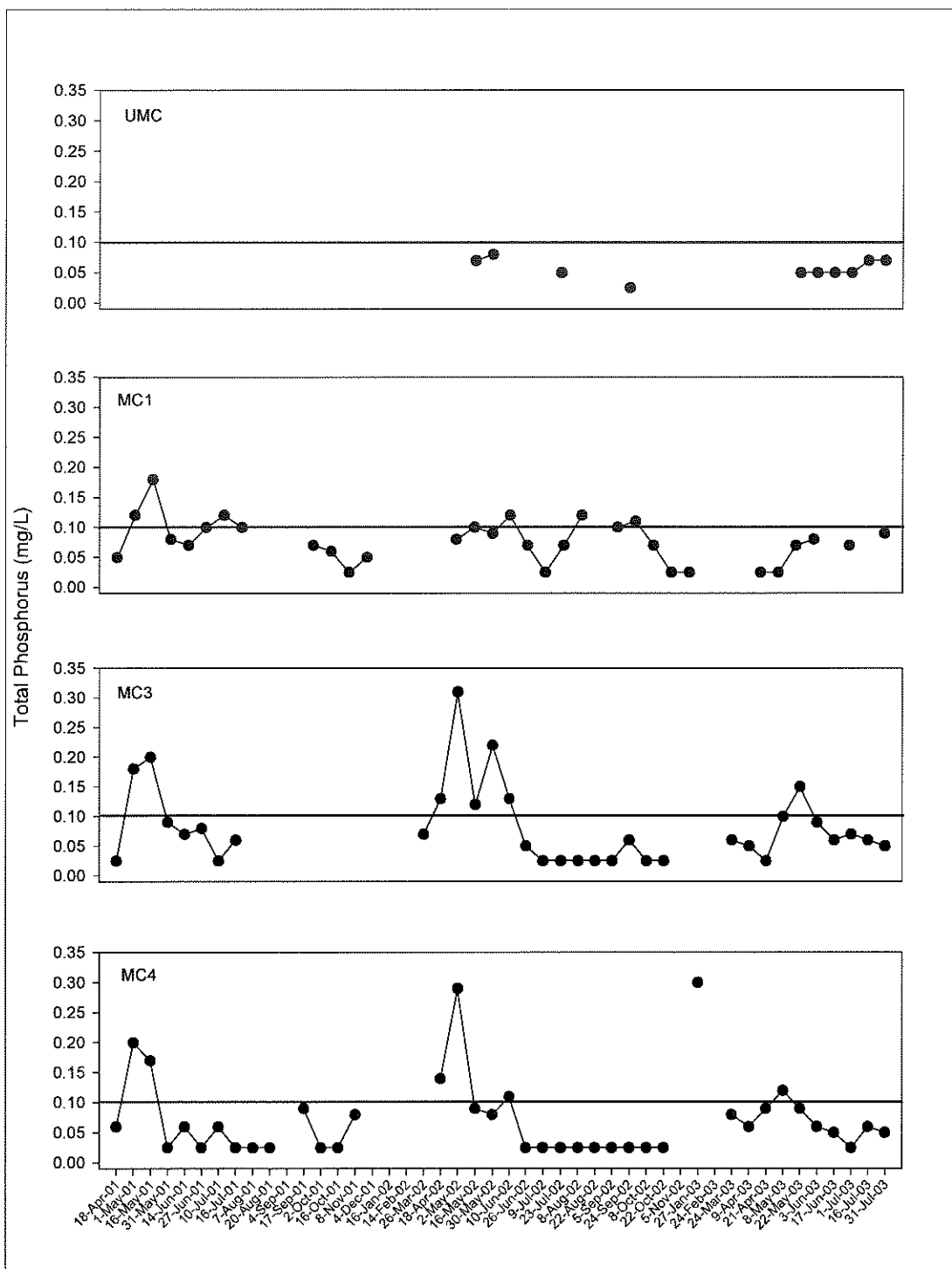


Figure 5. Total phosphorus concentrations for Moody Creek monitoring sites. The red line indicates the 0.10 mg/L target.

## Conclusions

Sediment appears to become mobilized during spring runoff. Peak concentrations of TSS occurred in the spring. Large amounts of TSS (277 mg/L) move during spring runoff events, but the mean concentrations for the sampling period remain below the 80 mg/L. Webster Dam may contribute to the increase of sediment when there is runoff from the TNF.

It is difficult to determine the  $\text{NO}_3+\text{NO}_2$  source. It fluctuates throughout the monitoring season. It may be naturally occurring, in the form of precipitation or transported from runoff or snowmelt. It may also be a result of decomposing organic matter, aquatic vegetation or occur naturally in ground water. The increase in discharge during the 2002 season could have increased the concentration of  $\text{NO}_3+\text{NO}_2$ . This source could also be from an increase in discharge of the springs in the headwaters of Moody Creek.

Mean concentrations for TP, over sampling period, did not exceed the TMDL proposed concentration 0.10 mg/L. Individual sampling events did exceed the 0.10 mg/L level, primarily during runoff events, at all stations except UMC. Beaver activity and irrigation practices may increase the nutrient levels in Moody Creek.

## Recommendations

The following recommendations should be considered:

- Collection of additional data to evaluate the nitrogen concentrations and sources due to the variability in the  $\text{NO}_3+\text{NO}_2$  numbers from 2001 to the 2002 monitoring,
- Monitoring of springs that feed Moody Creek may be valuable in evaluating nitrogen concentrations.
- Evaluation of the TNF and state land above station UMC may reveal sources of nitrogen entering Moody Creek.
- Evaluation of stream bank conditions for severe down cutting, sloughing and loss of riparian function that may contribute phosphorus and sediment during high water conditions.
- Evaluation of irrigation water return systems to determine which ones, if any are causing impacts to the water quality of Moody Creek.
- Assessment of any impact that animal grazing activities may have on the functioning condition of Moody Creek's riparian area.
- Identification of critical areas or critical activities that would best be addressed by implementation of BMPs.
- The SCD, NRCS, IASCD, ISCC and ISDA to work with landowners and cooperators to fund and implement projects that will improve the overall water quality of Moody Creek.

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## **Appendix A**

### **Quality Control Results**

## Quality Assurance/Quality Control (QA/QC)

The QA/QC procedure for this monitoring program conformed to those outlined in the “Water Quality Sampling Plan”, prepared by the IASCD.

Intermountain Analytical Services- EnviroChem utilized EPA approved and validated methods. Method performance evaluations include quality control samples analyzed with a batch to ensure sample data integrity. Internal laboratory spikes and duplicates are all part of EnviroChem’s quality assurance program.

Field QA/QC protocols consisted of duplicate samples and blank samples. The field blanks consisted of laboratory grade deionized water, transported to the field, and poured off into properly prepared sample containers. For filtered constituents, deionized water was transferred into the filtration unit, filtered, and the resultant filtrate was transferred into appropriate sample containers. The blank samples were used to determine the integrity of the field teams sampling handling, the cleanliness of the sample containers, and the accuracy of the laboratory methods. There were no constituents detected (above the method detection limits) for any of the blank samples submitted during this program.

The duplicate samples consisted of two sets of sample containers filled (in the field) with the same composite water from the same sampling site. The duplicate samples were not identified as such and entered the laboratory as blind duplicates. The duplicate samples were used to determine both field and laboratory precision. All of the QC samples were stored on ice and handled with the normal sample load for shipment to the laboratory.

Table 5. Duplicate Comparison, Mean and Standard Deviation

| Parameters       | MC4 Mean | Duplicate Mean | MC4 Standard Deviation | Duplicate Standard Deviation |
|------------------|----------|----------------|------------------------|------------------------------|
| TSS              | 35.2     | 35.1           | 53.3                   | 52.8                         |
| TVS              | 4.26     | 4.11           | 4.71                   | 4.30                         |
| Nitrate+Nitrite  | 0.42     | 0.42           | 0.42                   | 0.42                         |
| Ammonia          | 0.04     | 0.04           | 0.03                   | 0.03                         |
| Total Phosphorus | 0.08     | 0.08           | 0.06                   | 0.07                         |
| Ortho-Phosphorus | 0.04     | 0.04           | 0.04                   | 0.04                         |

## Precision

Relative percent difference (RPD) is the normal measure of precision when calculated from duplicate sample. As previously mentioned, the duplicates were collected in the field. The calculation for RPD is as follows:

$$RPD = \frac{(C_1 - C_2) * 100}{(C_1 + C_2) / 2}$$

Where: RPD = relative percent difference  
C<sub>1</sub> = Larger of the two observed values  
C<sub>2</sub> = Smaller of the two observed values

Minnesota Pollution Control Agency (1998) recommends an RPD should have a value of less than 25% for water samples.

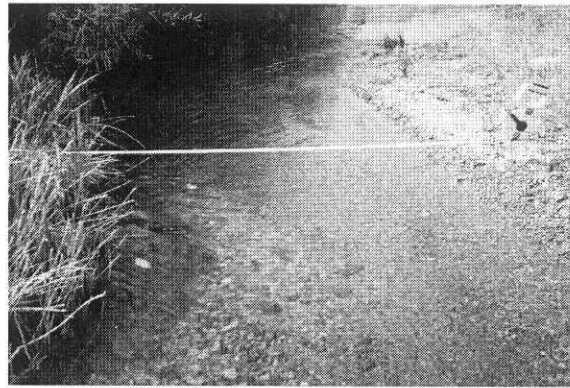
Table 6. Relative Percent Differences (duplicates)

| Date      | Original<br>NO <sub>3</sub> +NO <sub>2</sub> | Duplicate<br>NO <sub>3</sub> +NO <sub>2</sub> | RPD | Original<br>TSS | Duplicate<br>TSS | RPD | Original<br>TVS | Duplicate<br>TVS | RPD |
|-----------|----------------------------------------------|-----------------------------------------------|-----|-----------------|------------------|-----|-----------------|------------------|-----|
| 18-Apr-01 | 0.025                                        | 0.025                                         | 0   | 15              | 13               | 14  | 2               | 3                | 40  |
| 1-May-01  | 0.025                                        | 0.025                                         | 0   | 57              | 57               | 0   | 8               | 8                | 0   |
| 16-May-01 | 0.025                                        | 0.025                                         | 0   | 115             | 123              | 7   | 15              | 16               | 6   |
| 31-May-01 | 0.025                                        | 0.025                                         | 0   | 15              | 17               | 13  | 4               | 4                | 0   |
| 14-Jun-01 | 0.025                                        | 0.025                                         | 0   | 7               | 7                | 0   | 1               | 1                | 0   |
| 27-Jun-01 | 0.025                                        | 0.025                                         | 0   | 12              | 13               | 8   | 2               | 1                | 67  |
| 10-Jul-01 | 0.01                                         | 0.025                                         | 85  | 33              | 29               | 13  | 5               | 6                | 18  |
| 16-Jul-01 | 0.025                                        | 0.025                                         | 0   | 9               | 10               | 11  | 2               | 1                | 67  |
| 7-Aug-01  |                                              |                                               |     |                 |                  |     |                 |                  |     |
| 20-Aug-01 | 0.025                                        | 0.025                                         | 0   | 6               | 5                | 18  | 2               | 2                | 0   |
| 4-Sep-01  |                                              |                                               |     |                 |                  |     |                 |                  |     |
| 17-Sep-01 | 0.025                                        | 0.025                                         | 0   | 11              | 12               | 9   | 2               | 3                | 40  |
| 2-Oct-01  | 0.025                                        | 0.025                                         | 0   | 7               | 8                | 13  | 1               | 1                | 0   |
| 16-Oct-01 | 0.025                                        | 0.025                                         | 0   | 4               | 4                | 0   | 1               | 1                | 0   |
| 8-Nov-01  | 0.025                                        | 0.025                                         | 0   | 15              | 15               | 0   | 3               | 3                | 0   |
| 4-Dec-01  |                                              |                                               |     |                 |                  |     |                 |                  |     |
| 16-Jan-02 | 0.83                                         | 0.79                                          | 5.7 |                 |                  |     |                 |                  |     |
| 14-Feb-02 |                                              |                                               |     |                 |                  |     |                 |                  |     |
| 26-Mar-02 |                                              |                                               |     |                 |                  |     |                 |                  |     |
| 18-Apr-02 | 1.04                                         | 1.03                                          | 1   | 89              | 82               | 8   | 8               | 8                | 0   |
| 2-May-02  | 0.96                                         | 0.97                                          | 1   | 277             | 270              | 3   | 24              | 20               | 18  |
| 16-May-02 | 0.025                                        | 0.025                                         | 0   | 62              | 62               | 0   | 6               | 6                | 0   |
| 30-May-02 | 0.81                                         | 0.81                                          | 0   | 108             | 107              | 1   | 11              | 10               | 10  |
| 10-Jun-02 | 0.82                                         | 0.83                                          | 1   | 8               | 8                | 0   | 8               | 7                | 13  |
| 26-Jun-02 | 0.96                                         | 0.96                                          | 0   | 9               | 9                | 0   | 1               | 1                | 0   |
| 9-Jul-02  | 0.96                                         | 0.97                                          | 1   | 4               | 4                | 0   | 1               | 1                | 0   |
| 23-Jul-02 | 0.025                                        | 0.025                                         | 0   | 6               | 7                | 15  | 2               | 1                | 67  |
| 8-Aug-02  | 0.9                                          | 0.91                                          | 1   | 10              | 9                | 11  | 2               | 2                | 0   |
| 22-Aug-02 | 0.73                                         | 0.73                                          | 0   | 4               | 4                | 0   | 1               | 1                | 0   |
| 5-Sep-02  | 0.68                                         | 0.68                                          | 0   | 6               | 6                | 0   | 1               | 1                | 0   |
| 24-Sep-02 | 0.77                                         | 0.77                                          | 0   | 3               | 3                | 0   | 1               | 1                | 0   |
| 8-Oct-02  | 0.85                                         | 0.83                                          | 2   | 4               | 3                | 29  | 1               | 1                | 0   |
| 22-Oct-02 | 0.6                                          | 0.59                                          | 2   | 4               | 4                | 0   | 1               | 1                | 0   |
| 5-Nov-02  |                                              |                                               |     |                 |                  |     |                 |                  |     |
| 27-Jan-03 | 0.57                                         | 0.58                                          | 2   | 38              | 39               | 2   | 6               | 6                | 0   |
| 24-Feb-03 |                                              |                                               |     |                 |                  |     |                 |                  |     |
| 24-Mar-03 | 0.025                                        | 0.025                                         | 0   | 43              | 44               | 2   | 5               | 5                | 0   |
| 9-Apr-03  | 0.025                                        | 0.025                                         | 0   | 20              | 20               | 0   | 3               | 3                | 0   |
| 21-Apr-03 | 0.99                                         | 1                                             | 1   | 54              | 53               | 2   | 5               | 5                | 0   |
| 8-May-03  | 0.025                                        | 0.025                                         | 0   | 124             | 131              | 5   | 9               | 8                | 12  |
| 22-May-03 | 0.87                                         | 0.87                                          | 0   | 97              | 92               | 5   | 8               | 8                | 0   |
| 3-Jun-03  | 0.8                                          | 0.79                                          | 1   | 40              | 40               | 0   | 5               | 5                | 0   |
| 17-Jun-03 | 0.81                                         | 0.79                                          | 03  | 13              | 14               | 7   | 2               | 2                | 0   |
| 1-Jul-03  | 0.98                                         | 0.98                                          | 0   | 3               | 3                | 0   | 1               | 1                | 0   |
| 16-Jul-03 | 0.025                                        | 0.025                                         | 0   | 4               | 5                | 22  | 1               | 1                | 0   |
| 31-Jul-03 | 0.025                                        | 0.025                                         | 0   | 3               | 3                | 0   | 1               | 1                | 0   |

Table 6 con't. Relative Percent Differences (duplicates)

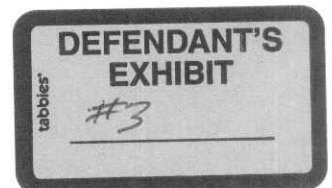
| Date      | Original TP | Duplicate TP | RPD | Original OP | Duplicate OP | RPD | Original NH <sub>3</sub> | Duplicate NH <sub>3</sub> | RPD |
|-----------|-------------|--------------|-----|-------------|--------------|-----|--------------------------|---------------------------|-----|
| 18-Apr-01 | 0.05        | 0.06         | 18  | 0.025       | 0.025        | 0   | 0.025                    | 0.06                      | 82  |
| 1-May-01  | 0.12        | 0.13         | 8   | 0.025       | 0.025        | 0   | 0.025                    | 0.025                     | 0   |
| 16-May-01 | 0.18        | 0.18         | 0   | 0.025       | 0.025        | 0   | 0.06                     | 0.1                       | 50  |
| 31-May-01 | 0.08        | 0.09         | 12  | 0.025       | 0.025        | 0   | 0.06                     | 0.08                      | 28  |
| 14-Jun-01 | 0.07        | 0.07         | 0   | 0.025       | 0.025        | 0   | 0.025                    | 0.025                     | 0   |
| 27-Jun-01 | 0.1         | 0.1          | 0   | 0.06        | 0.06         | 0   | 0.025                    | 0.06                      | 82  |
| 10-Jul-01 | 0.12        | 0.13         | 8   | 0.09        | 0.09         | 0   | 0.07                     | 0.1                       | 35  |
| 16-Jul-01 | 0.1         | 0.1          | 0   | 0.07        | 0.07         | 0   | 0.025                    | 0.025                     | 0   |
| 7-Aug-01  |             |              |     |             |              |     |                          |                           |     |
| 20-Aug-01 | 0.025       | 0.025        | 0   | 0.025       | 0.025        | 0   | 0.025                    | 0.025                     | 0   |
| 4-Sep-01  |             |              |     |             |              |     |                          |                           |     |
| 17-Sep-01 | 0.09        | 0.07         | 25  | 0.025       | 0.025        | 0   | 0.1                      | 0.1                       | 0   |
| 2-Oct-01  | 0.025       | 0.06         | 82  | 0.025       | 0.025        | 0   | 0.025                    | 0.025                     | 0   |
| 16-Oct-01 | 0.025       | 0.025        | 0   | 0.025       | 0.025        | 0   | 0.025                    | 0.025                     | 0   |
| 8-Nov-01  | 0.08        | 0.08         | 0   | 0.025       | 0.025        | 0   | 0.025                    | 0.025                     | 0   |
| 4-Dec-01  |             |              |     |             |              |     |                          |                           |     |
| 16-Jan-02 |             |              |     |             |              |     |                          |                           |     |
| 14-Feb-02 |             |              |     |             |              |     |                          |                           |     |
| 26-Mar-02 |             |              |     |             |              |     |                          |                           |     |
| 18-Apr-02 | 0.14        | 0.15         | 7   | 0.025       | 0.025        | 0   | 0.05                     | 0.025                     | 67  |
| 2-May-02  | 0.29        | 0.31         | 7   | 0.025       | 0.025        | 0   | 0.05                     | 0.05                      | 0   |
| 16-May-02 | 0.09        | 0.1          | 11  | 0.025       | 0.025        | 0   | 0.025                    | 0.025                     | 0   |
| 30-May-02 | 0.08        | 0.1          | 22  | 0.025       | 0.025        | 0   | 0.025                    | 0.025                     | 0   |
| 10-Jun-02 | 0.11        | 0.11         | 0   | 0.025       | 0.025        | 0   | 0.025                    | 0.025                     | 0   |
| 26-Jun-02 | 0.025       | 0.025        | 0   | 0.025       | 0.025        | 0   | 0.025                    | 0.025                     | 0   |
| 9-Jul-02  | 0.025       | 0.025        | 0   | 0.025       | 0.025        | 0   | 0.025                    | 0.025                     | 0   |
| 23-Jul-02 | 0.025       | 0.025        | 0   | 0.025       | 0.025        | 0   | 0.025                    | 0.025                     | 0   |
| 8-Aug-02  | 0.025       | 0.025        | 0   | 0.025       | 0.025        | 0   | 0.025                    | 0.025                     | 0   |
| 22-Aug-02 | 0.025       | 0.025        | 0   | 0.025       | 0.025        | 0   | 0.025                    | 0.025                     | 0   |
| 5-Sep-02  | 0.025       | 0.05         | 67  | 0.025       | 0.025        | 0   | 0.025                    | 0.025                     | 0   |
| 24-Sep-02 | 0.025       | 0.025        | 0   | 0.025       | 0.025        | 0   | 0.025                    | 0.025                     | 0   |
| 8-Oct-02  | 0.025       | 0.025        | 0   | 0.025       | 0.025        | 0   | 0.025                    | 0.025                     | 0   |
| 22-Oct-02 | 0.025       | 0.025        | 0   | 0.025       | 0.025        | 0   | 0.025                    | 0.025                     | 0   |
| 5-Nov-02  |             |              |     |             |              |     |                          |                           |     |
| 27-Jan-03 | 0.30        | 0.32         | 6   | 0.26        | 0.26         | 0   | 0.08                     | 0.07                      | 13  |
| 24-Feb-03 |             |              |     |             |              |     |                          |                           |     |
| 24-Mar-03 | 0.08        | 0.08         | 0   | 0.025       | 0.025        | 0   | 0.025                    | 0.025                     | 0   |
| 9-Apr-03  | 0.06        | 0.05         | 18  | 0.025       | 0.025        | 0   | 0.025                    | 0.025                     | 0   |
| 21-Apr-03 | 0.09        | 0.08         | 12  | 0.025       | 0.025        | 0   | 0.13                     | 0.13                      | 0   |
| 8-May-03  | 0.12        | 0.12         | 0   | 0.025       | 0.025        | 0   | 0.025                    | 0.025                     | 0   |
| 22-May-03 | 0.09        | 0.09         | 0   | 0.025       | 0.025        | 0   | 0.09                     | 0.09                      | 0   |
| 3-Jun-03  | 0.06        | 0.06         | 0   | 0.025       | 0.025        | 0   | 0.025                    | 0.025                     | 0   |
| 17-Jun-03 | 0.05        | 0.05         | 0   | 0.025       | 0.025        | 0   | 0.025                    | 0.025                     | 0   |
| 1-Jul-03  | 0.025       | 0.025        | 0   | 0.025       | 0.025        | 0   | 0.025                    | 0.025                     | 0   |
| 16-Jul-03 | 0.06        | 0.05         | 18  | 0.025       | 0.025        | 0   | 0.025                    | 0.025                     | 0   |
| 31-Jul-03 | 0.05        | 0.05         | 0   | 0.025       | 0.025        | 0   | 0.025                    | 0.025                     | 0   |

***Discharge Monitoring to  
Estimate the "Normal"  
Hydrologic Regime of  
Moody Creek***



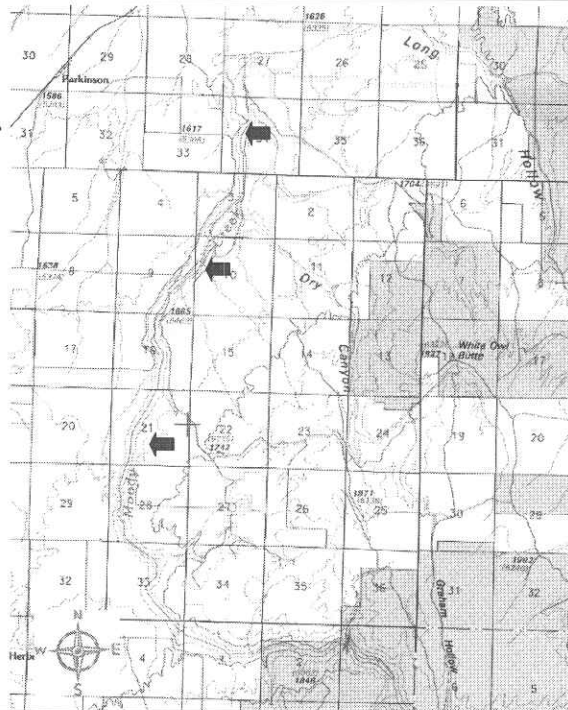
**Objective of the Project**

***To collect discharge data in  
upper Moody Creek to  
a) characterize current flow  
regime and b) evaluate the  
effect of a surface-water  
diversion on discharge  
downstream of the diversion***



## Discharge Measurement Sites

- Upstream  
(Above Diversion)
- Midstream  
(Wood's Crossing/  
USGS Staff Gage)
- Downstream  
(Elbow of Moody  
Creek)

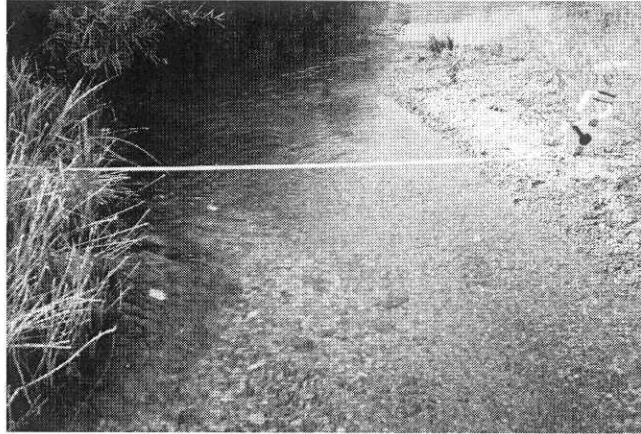


## The Process of Measuring Discharge

- Swoffer  
Model 2100  
“Current  
Velocity  
Meter”



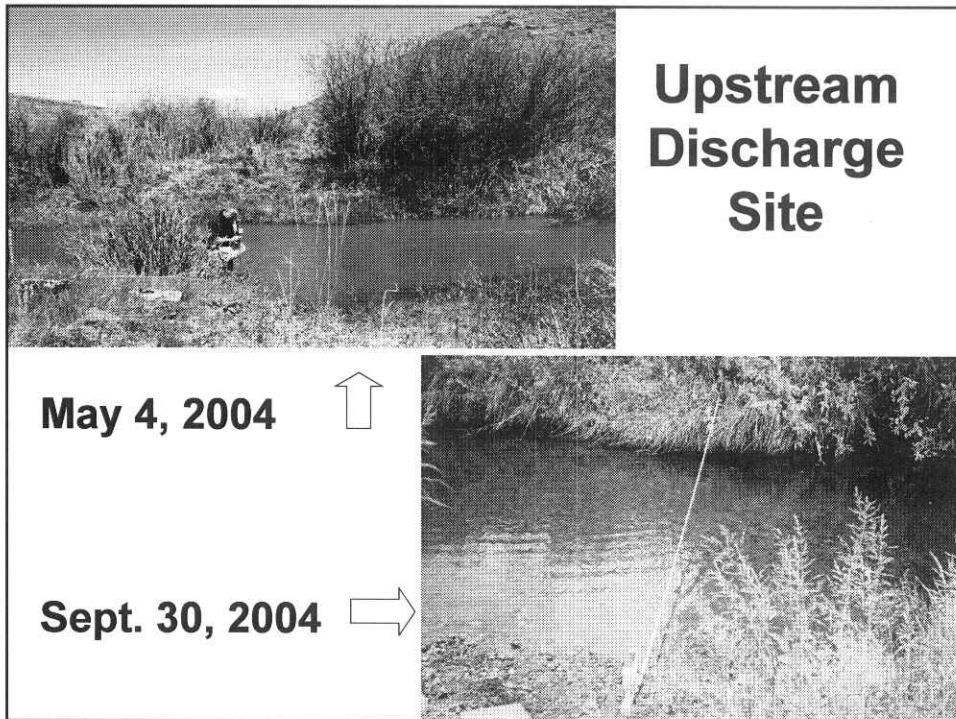
## **Measuring Discharge in CFS**



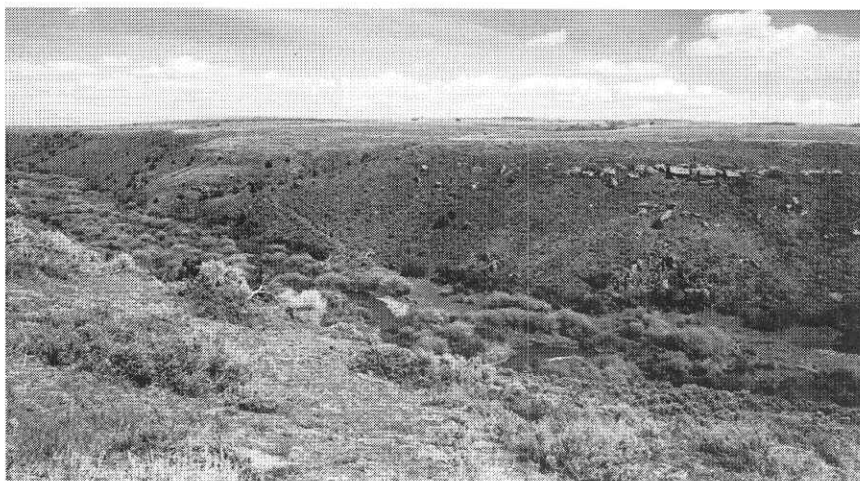
**Cubic Feet per Second= Width X Depth X Velocity**

## **Time Spent Gathering Discharge Data**

- **Measured discharge 23 times at each location (average 3 ½ hours each)**
- **Read the USGS Staff gage 33 times (average ½ hour each reading)**



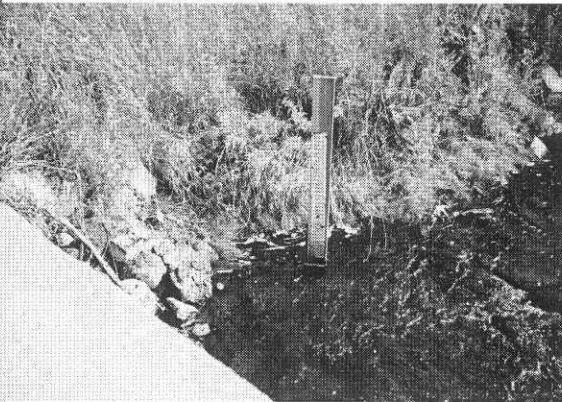
## **Canyon View of Moody Creek at Upstream Site**



## USGS Staff Gage



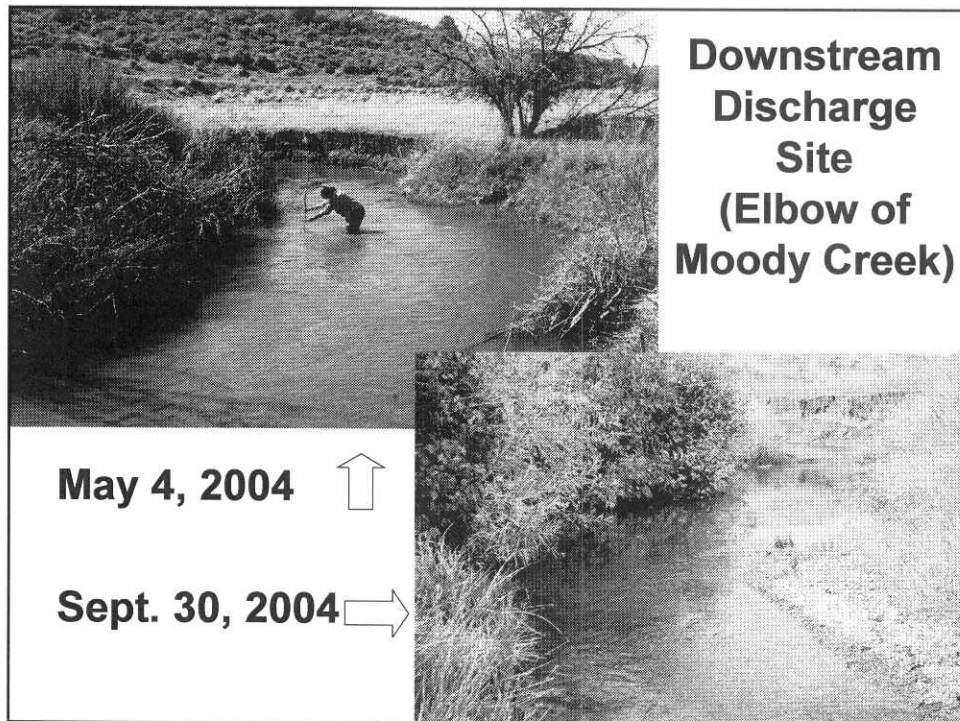
May 4, 2004 ↑



Sept. 30, 2004 →

## View of Moody Creek at Wood's Crossing/USGS Gage Site



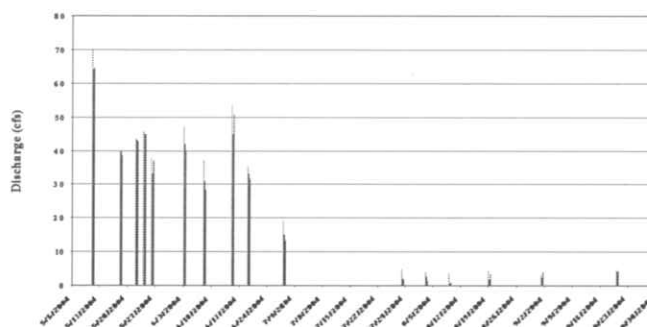


## **View of Moody Creek at Elbow**



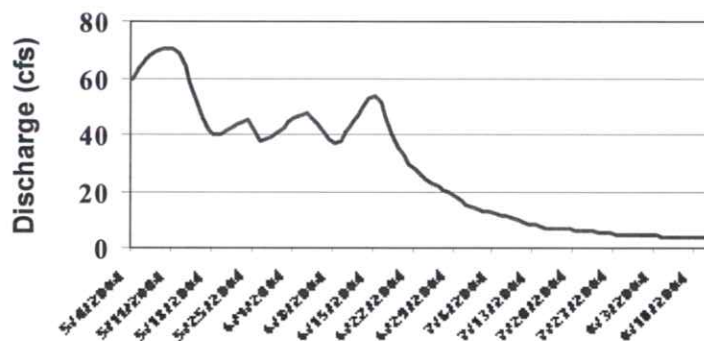
# Data Analysis

- 33 discharge measurements were recorded at the USGS gage; only 23 were recorded at the upstream and downstream sites



# Data Analysis

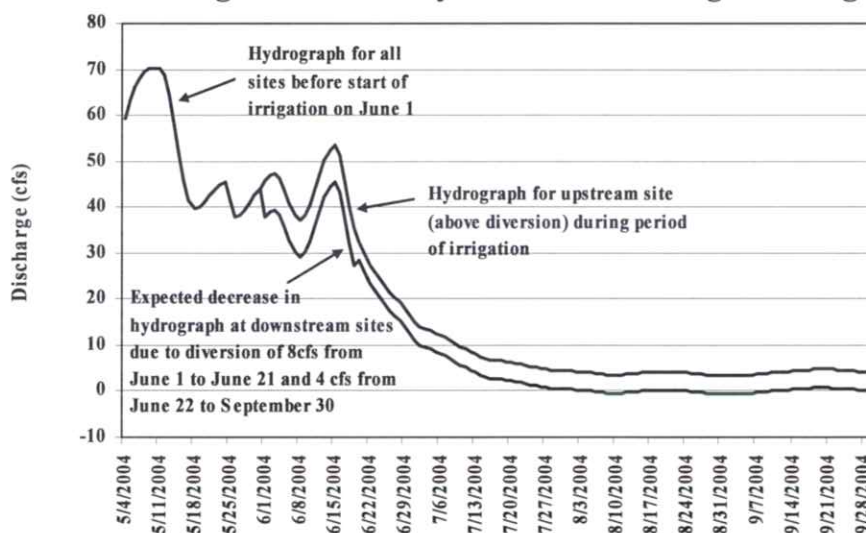
- Individual discharge measurements were interpolated to produce continuous values that could be plotted as hydrographs



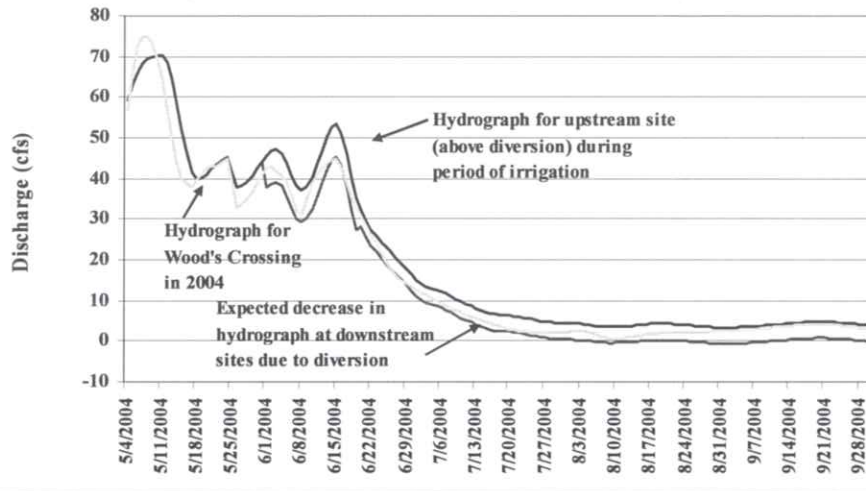
# Assumptions

- Only one surface water diversion exists within this stream reach
- This diversion is located immediately below the upstream site
- If water is not diverted for irrigation, stream discharges measured at all sites should be equal

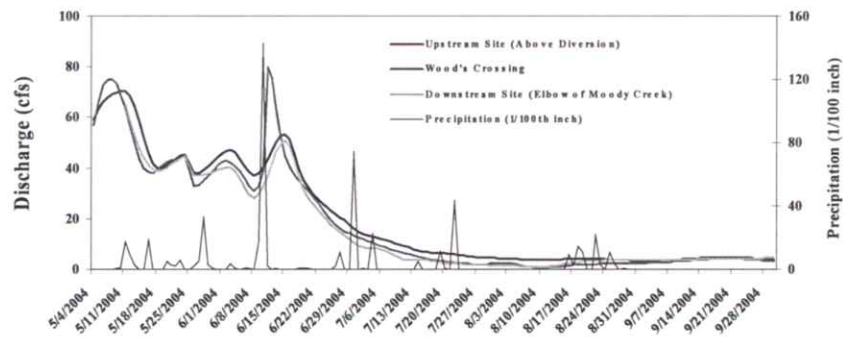
**Expected Hydrographs for All Sites, Assuming Water Diverted for Irrigation is the only Factor Influencing Discharge**



### Actual Hydrographs for the Upstream Site and Wood's Crossing



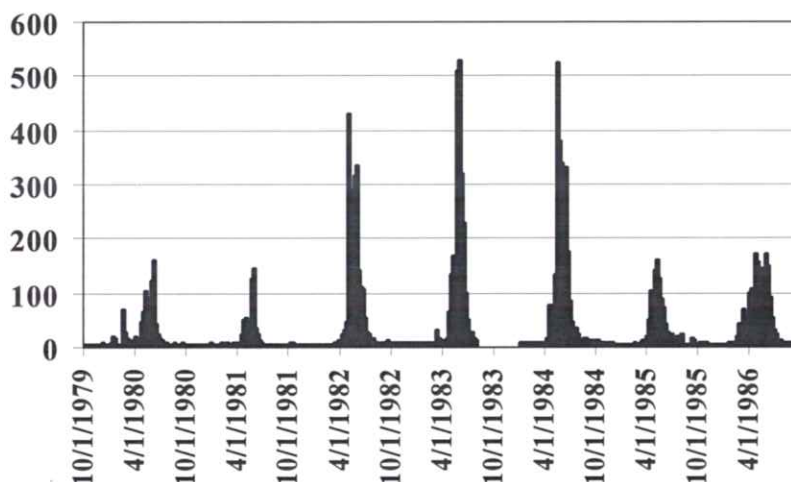
### Hydrographs for Three Sites on Moody Creek Based on 2004 Discharge Data



## Was 2004 Representative?

- Peak discharge in 2004 (~ 80 cfs) was approximately 1/2 of historic low peak values (160 cfs) and 1/8<sup>th</sup> of historic high peak values (520 cfs)
- 2004 may not be representative of “normal” conditions because of drought combined with high precipitation and cool temperatures

Historic Discharge Data for Moody Creek,  
as Measured at the Wood's Crossing USGS Gage



## **Conclusions**

---

- **Discharge in May (during peak runoff) was greater at the upstream site than at the downstream sites, indicating that water was retained in riparian areas, beaver ponds, and/or in a near-surface aquifer.**
- **Discharges at all sites were approximately equal throughout September, following the end of diversion for irrigation**

## **Conclusions**

---

- **Water remained in the entire segment of Moody Creek monitored in 2004, indicating that water diverted for irrigation is not solely responsible for the absence of water below the Elbow of Moody Creek in most years**
- **Factors controlling discharge in Moody Creek are more complicated than expected and MORE STUDY IS NEEDED!**

Close

IDAHO DEPARTMENT OF WATER RESOURCES  
Adjudication Recommended Right Report

06/04/2007

WATER RIGHT NO. 22-594

| <b>Owner Type</b> | <b>Name and Address</b>                                                                                        |
|-------------------|----------------------------------------------------------------------------------------------------------------|
| Current Owner     | WOODMANSEE JOHNSON CANAL CO<br>C/O O RUSSELL WILDING<br>3560 E 3000 N<br>SUGAR CITY, ID 83448<br>(208)356-6184 |
| Attorney          | RIGBY THATCHER ANDRUS RIGBY & MOELLER CHARTERED<br>PO BOX 250<br>REXBURG, ID 83440<br>(208)356-3633            |

Priority Date: 03/15/1881

Basis: Decreed

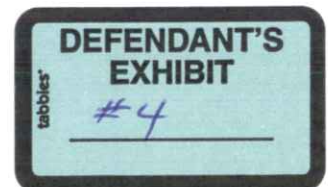
Status: Active

| <b>Source</b> | <b>Tributary</b> |
|---------------|------------------|
| MOODY CREEK   | TETON RIVER      |

| <b>Beneficial Use</b> | <b>From</b> | <b>To</b> | <b>Diversion Rate</b> | <b>Volume</b> |
|-----------------------|-------------|-----------|-----------------------|---------------|
| IRRIGATION            | 04/01       | 10/31     | 6.4 CFS               |               |
| Total Diversion       |             |           | 6.4 CFS               |               |

Location of Point(s) of Diversion:

|             |        |         |              |           |                |
|-------------|--------|---------|--------------|-----------|----------------|
| MOODY CREEK | NESENW | Sec. 21 | Township 05N | Range 41E | MADISON County |
| MOODY CREEK | NESESE | Sec. 11 | Township 06N | Range 40E | MADISON County |



IRRIGATION Use:

Acre Limit: 320

Place(s) of use: Large POU Info

Conditions of Approval:

|    |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | 135 | The boundary encompassing the place of use for this water right is described with a digital boundary as defined by I.C. Section 42-202B(2) and authorized pursuant to I.C. Section 42-1411(2)(h). The data comprising the digital boundary are incorporated herein by reference and are stored on a CD-ROM disk issued in duplicate originals on file with the SRBA District Court and the Idaho Department of Water Resources. A map depicting the place of use is attached hereto to illustrate the place of use described by the digital boundary. |
| 2. | C18 | This partial decree is subject to such general provisions necessary for the definition of the rights or for the efficient administration of the water rights as may be ultimately determined by the Court at a point in time no later than the entry of a final unified decree. Section 42-1412(6), Idaho Code.                                                                                                                                                                                                                                       |
| 3. |     | 2.0 cfs of this right is delivered at the point of diversion in T5N, R41E, Sec. 21 NESENW, known as the Jeppesen Pump.                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 4. | 129 | Place of use is within the area served by Woodmansee Johnson Canal Company.                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 5. | F01 | Water is delivered through Woodmansee Johnson canal.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 6. |     | This water right is subject to the delivery provision contained in Rexburg Irrigation Co. et al v. Teton Irrigation Canal Co. et al, (D. Id. Dec. 16, 1910) ("Rexburg Decree"). "To be reduced to 20 inches after June 20 of each year".                                                                                                                                                                                                                                                                                                              |
| 7. | E56 | The rights listed below are limited to the irrigation of a combined total of 1781 acres in a single irrigation season. Combined Right Nos.: 22-354, 22-421, 22-476, 22-591, 22-592, 22-593, 22-594. The rights listed below are limited to the irrigation of a combined total of 2017 acres in a single irrigation season. Combined Right Nos.: 22-205, 22-235, 22-344, 22-354, 22-421, 22-422, 22-476, 22-477, 22-591, 22-592, 22-593, 22-594, 22-11259, 22-11260.                                                                                   |

Dates:

Other Information:

State or Federal: S

Owner Name Connector: OR

Water District Number: 01

Generic Max Rate per Acre:

Generic Max Volume per Acre:

Swan Falls Trust or Nontrust:

Swan Falls Dismissed:

DLE Act Number:

Cary Act Number:

Mitigation Plan: False

Close

[Close](#)IDAHO DEPARTMENT OF WATER RESOURCES  
Adjudication Recommended Right Report

06/04/2007

WATER RIGHT NO. 22-4195

| <b>Owner Type</b> | <b>Name and Address</b>                                                       |
|-------------------|-------------------------------------------------------------------------------|
| Current Owner     | DKJ FARMS LLC<br>665 CENTENNIAL LOOP<br>REXBURG, ID 83440<br>(208)356-7433    |
| Original Owner    | K MERLE JEPPESEN<br>665 CENTENNIAL LOOP<br>REXBURG, ID 83440<br>(208)356-3638 |

Priority Date: 05/01/1969

Basis: Beneficial Use

Status: Active

| <b>Source</b> | <b>Tributary</b> |
|---------------|------------------|
| MOODY CREEK   | TETON RIVER      |

| <b>Beneficial Use</b> | <b>From</b> | <b>To</b> | <b>Diversion Rate</b> | <b>Volume</b> |
|-----------------------|-------------|-----------|-----------------------|---------------|
| IRRIGATION            | 04/01       | 10/31     | 3.85 CFS              |               |
| Total Diversion       |             |           | 3.85 CFS              |               |

Location of Point(s) of Diversion:

|             |        |         |              |           |                |
|-------------|--------|---------|--------------|-----------|----------------|
| MOODY CREEK | NESENW | Sec. 21 | Township 05N | Range 41E | MADISON County |
|-------------|--------|---------|--------------|-----------|----------------|

IRRIGATION Use:

Acre Limit: 192.7

Place(s) of use:

Place of Use Legal Description: IRRIGATION MADISON County

| Township | Range | Section | Lot | Tract | Acres | Lot | Tract | Acres | Lot | Tract | Acres | Lot | Tract | Acres |
|----------|-------|---------|-----|-------|-------|-----|-------|-------|-----|-------|-------|-----|-------|-------|
| 05N      | 41E   | 16      |     | SESW  | 31    |     |       |       |     |       |       |     |       |       |
|          |       | 20      |     | NENE  | 40    |     | NWNE  | 40    |     | SWNE  | 40    |     | SENE  | 40    |
|          |       |         |     | SWNW  | 40    |     | SENE  | 40    |     |       |       |     |       |       |
|          |       |         |     | NESW  | 40    |     | NWSW  | 36    |     |       |       |     |       |       |
|          |       |         |     | NESE  | 40    |     | NWSE  | 40    |     |       |       |     |       |       |
|          |       | 21      |     | NENW  | 23    |     | NWNW  | 39    |     | SWNW  | 36    |     | SENE  | 2.7   |
|          |       |         |     | NWSW  | 20    |     |       |       |     |       |       |     |       |       |

Total Acres: 547.7

Conditions of Approval:

|    |     |                                                                                                                                                                                                                                                                                                                 |
|----|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | C18 | This partial decree is subject to such general provisions necessary for the definition of the rights or for the efficient administration of the water rights as may be ultimately determined by the Court at a point in time no later than the entry of a final unified decree. Section 42-1412(6), Idaho Code. |
| 2. | K06 | This right is limited to the irrigation of 192.7 acres within the place of use described above in a single irrigation season.                                                                                                                                                                                   |
| 3. | E51 | Right Nos. 22-265E, 22-4195, and 22-13479 are limited to a total combined diversion rate of 11.85 cfs.                                                                                                                                                                                                          |
| 4. | C05 | Right includes accomplished change in place of use pursuant to Section 42-1425, Idaho Code.                                                                                                                                                                                                                     |
| 5. | E56 | The rights listed below are limited to the irrigation of a combined total of 547.7 acres in a single irrigation season. Combined Right Nos.: 22-265E, 22-4195, and 22-13479.                                                                                                                                    |

Dates:

Other Information:

State or Federal: S

Owner Name Connector:

Water District Number: 01

Generic Max Rate per Acre:

Generic Max Volume per Acre:

Swan Falls Trust or Nontrust:

Swan Falls Dismissed:

DLE Act Number:

Cary Act Number:

Mitigation Plan: False

Close

[Close](#)IDAHO DEPARTMENT OF WATER RESOURCES  
Adjudication Recommended Right Report

06/04/2007

WATER RIGHT NO. 22-13479

| <u>Owner Type</u> | <u>Name and Address</u>                                                       |
|-------------------|-------------------------------------------------------------------------------|
| Current Owner     | DKJ FARMS LLC<br>665 CENTENNIAL LOOP<br>REXBURG, ID 83440<br>(208)356-7433    |
| Original Owner    | K MERLE JEPPESEN<br>665 CENTENNIAL LOOP<br>REXBURG, ID 83440<br>(208)356-3638 |

Priority Date: 05/01/1980

Basis: Beneficial Use

Status: Active

| <u>Source</u> | <u>Tributary</u> |
|---------------|------------------|
| MOODY CREEK   | TETON RIVER      |

| <u>Beneficial Use</u> | <u>From</u> | <u>To</u> | <u>Diversion Rate</u> | <u>Volume</u> |
|-----------------------|-------------|-----------|-----------------------|---------------|
| IRRIGATION            | 04/01       | 10/31     | 3.1 CFS               | 542.5 AFA     |
| Total Diversion       |             |           | 3.1 CFS               |               |

Location of Point(s) of Diversion:

|             |        |         |              |           |                |
|-------------|--------|---------|--------------|-----------|----------------|
| MOODY CREEK | NESENW | Sec. 21 | Township 05N | Range 41E | MADISON County |
|-------------|--------|---------|--------------|-----------|----------------|

IRRIGATION Use:

Acre Limit: 155

Place(s) of use:

Place of Use Legal Description: IRRIGATION MADISON County

| Township | Range | Section | Lot | Tract | Acres | Lot | Tract | Acres | Lot | Tract | Acres | Lot | Tract | Acres |
|----------|-------|---------|-----|-------|-------|-----|-------|-------|-----|-------|-------|-----|-------|-------|
| 05N      | 41E   | 16      |     | SESW  | 31    |     |       |       |     |       |       |     |       |       |
|          |       | 20      |     | NENE  | 40    |     | NWNE  | 40    |     | SWNE  | 40    |     | SENE  | 40    |
|          |       |         |     | SWNW  | 40    |     | SENE  | 40    |     |       |       |     |       |       |
|          |       |         |     | NESW  | 40    |     | NWSW  | 36    |     |       |       |     |       |       |
|          |       |         |     | NESE  | 40    |     | NWSE  | 40    |     |       |       |     |       |       |
|          |       | 21      |     | NENW  | 23    |     | NWNW  | 39    |     | SWNW  | 36    |     | SENE  | 2.7   |
|          |       |         |     | NWSW  | 20    |     |       |       |     |       |       |     |       |       |

Total Acres: 547.7

Conditions of Approval:

|    |     |                                                                                                                                                                                                                                                                                                                                |
|----|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | C11 | This water right is subordinate to all water rights with a priority date earlier than April 12, 1994, that are not decreed as enlargements pursuant to Section 42-1426, Idaho Code. As between water rights decreed as enlargements pursuant to Section 42-1426, Idaho Code, the earlier priority right is the superior right. |
| 2. | K02 | This right is based upon an enlargement of Right No. 22-0265E pursuant to Section 42-1426, Idaho Code.                                                                                                                                                                                                                         |
| 3. | C18 | This partial decree is subject to such general provisions necessary for the definition of the rights or for the efficient administration of the water rights as may be ultimately determined by the Court at a point in time no later than the entry of a final unified decree. Section 42-1412(6), Idaho Code.                |
| 4. | E51 | Right Nos. 22-265E, 22-4195, and 22-13479 are limited to a total combined diversion rate of 11.85 cfs.                                                                                                                                                                                                                         |
| 5. | E56 | The rights listed below are limited to the irrigation of a combined total of 547.7 acres in a single irrigation season. Combined Right Nos.: 22-265E, 22-4195, and 22-13479.                                                                                                                                                   |
| 6. | K09 | This right is for an enlargement of 155 acres within the place of use described for this right.                                                                                                                                                                                                                                |

Dates:

Other Information:

State or Federal:

Owner Name Connector:

Water District Number:

Generic Max Rate per Acre:

Generic Max Volume per Acre:

Swan Falls Trust or Nontrust:

Swan Falls Dismissed:

DLE Act Number:

Cary Act Number:

Mitigation Plan: False

Close

[Close](#)IDAHO DEPARTMENT OF WATER RESOURCES  
Adjudication Recommended Right Report

06/04/2007

WATER RIGHT NO. 22-265E

| <b>Owner Type</b> | <b>Name and Address</b>                                                       |
|-------------------|-------------------------------------------------------------------------------|
| Current Owner     | DKJ FARMS LLC<br>665 CENTENNIAL LOOP<br>REXBURG, ID 83440<br>(208)356-7433    |
| Original Owner    | K MERLE JEPPESEN<br>665 CENTENNIAL LOOP<br>REXBURG, ID 83440<br>(208)356-3638 |

Priority Date: 03/15/1879

Basis: Decreed

Status: Active

| <b>Source</b> | <b>Tributary</b> |
|---------------|------------------|
| MOODY CREEK   | TETON RIVER      |

| <b>Beneficial Use</b> | <b>From</b> | <b>To</b> | <b>Diversion Rate</b> | <b>Volume</b> |
|-----------------------|-------------|-----------|-----------------------|---------------|
| IRRIGATION            | 04/01       | 06/20     | 8 CFS                 |               |
| IRRIGATION            | 06/20       | 10/31     | 4 CFS                 |               |
| Total Diversion       |             |           | 8 CFS                 |               |

Location of Point(s) of Diversion:

|             |        |         |              |           |                |
|-------------|--------|---------|--------------|-----------|----------------|
| MOODY CREEK | NESENW | Sec. 21 | Township 05N | Range 41E | MADISON County |
|-------------|--------|---------|--------------|-----------|----------------|

IRRIGATION Use:

Acre Limit: 200

IRRIGATION Use:

Acre Limit: 200

Place(s) of use:

Place of Use Legal Description: IRRIGATION MADISON County

| Township | Range | Section | Lot | Tract | Acres | Lot | Tract | Acres | Lot | Tract | Acres | Lot | Tract | Acres |
|----------|-------|---------|-----|-------|-------|-----|-------|-------|-----|-------|-------|-----|-------|-------|
| 05N      | 41E   | 16      |     | SESW  | 31    |     |       |       |     |       |       |     |       |       |
|          |       | 20      |     | NENE  | 40    |     | NWNE  | 40    |     | SWNE  | 40    |     | SENE  | 40    |
|          |       |         |     | SWNW  | 40    |     | SENE  | 40    |     |       |       |     |       |       |
|          |       |         |     | NESW  | 40    |     | NWSW  | 36    |     |       |       |     |       |       |
|          |       |         |     | NESE  | 40    |     | NWSE  | 40    |     |       |       |     |       |       |
|          |       | 21      |     | NENW  | 23    |     | NWNW  | 39    |     | SWNW  | 36    |     | SENE  | 2.7   |
|          |       |         |     | NWSW  | 20    |     |       |       |     |       |       |     |       |       |

Place of Use Legal Description: IRRIGATION MADISON County

| Township | Range | Section | Lot | Tract | Acres | Lot | Tract | Acres | Lot | Tract | Acres | Lot | Tract | Acres |
|----------|-------|---------|-----|-------|-------|-----|-------|-------|-----|-------|-------|-----|-------|-------|
| 05N      | 41E   | 16      |     | SESW  | 31    |     |       |       |     |       |       |     |       |       |
|          |       | 20      |     | NENE  | 40    |     | NWNE  | 40    |     | SWNE  | 40    |     | SENE  | 40    |
|          |       |         |     | SWNW  | 40    |     | SENE  | 40    |     |       |       |     |       |       |
|          |       |         |     | NESW  | 40    |     | NWSW  | 36    |     |       |       |     |       |       |
|          |       |         |     | NESE  | 40    |     | NWSE  | 40    |     |       |       |     |       |       |
|          |       | 21      |     | NENW  | 23    |     | NWNW  | 39    |     | SWNW  | 36    |     | SENE  | 2.7   |
|          |       |         |     | NWSW  | 20    |     |       |       |     |       |       |     |       |       |

Total Acres: 1095.4

Conditions of Approval:

|    |     |                                                                                                                                                                                                                                                                                                                 |
|----|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | C18 | This partial decree is subject to such general provisions necessary for the definition of the rights or for the efficient administration of the water rights as may be ultimately determined by the Court at a point in time no later than the entry of a final unified decree. Section 42-1412(6), Idaho Code. |
| 2. | K06 | This right is limited to the irrigation of 200 acres within the place of use described above in a single irrigation season.                                                                                                                                                                                     |
| 3. | E51 | Right Nos. 22-265E, 22-4195, and 22-13479 are limited to a total combined diversion rate of 11.85 cfs.                                                                                                                                                                                                          |
| 4. | K01 | Right No. 22-13479 is an enlargement of this right pursuant to Section 42-1426, Idaho Code.                                                                                                                                                                                                                     |
| 5. | C05 | Right includes accomplished change in place of use pursuant to Section 42-1425, Idaho Code.                                                                                                                                                                                                                     |
| 6. | E56 | The rights listed below are limited to the irrigation of a combined total of 547.7 acres in a single irrigation season. Combined Right Nos.: 22-265E, 22-4195, and 22-13479.                                                                                                                                    |

Dates:

Other Information:

State or Federal: S

Owner Name Connector:

Water District Number:

Generic Max Rate per Acre:

Generic Max Volume per Acre:

Swan Falls Trust or Nontrust:

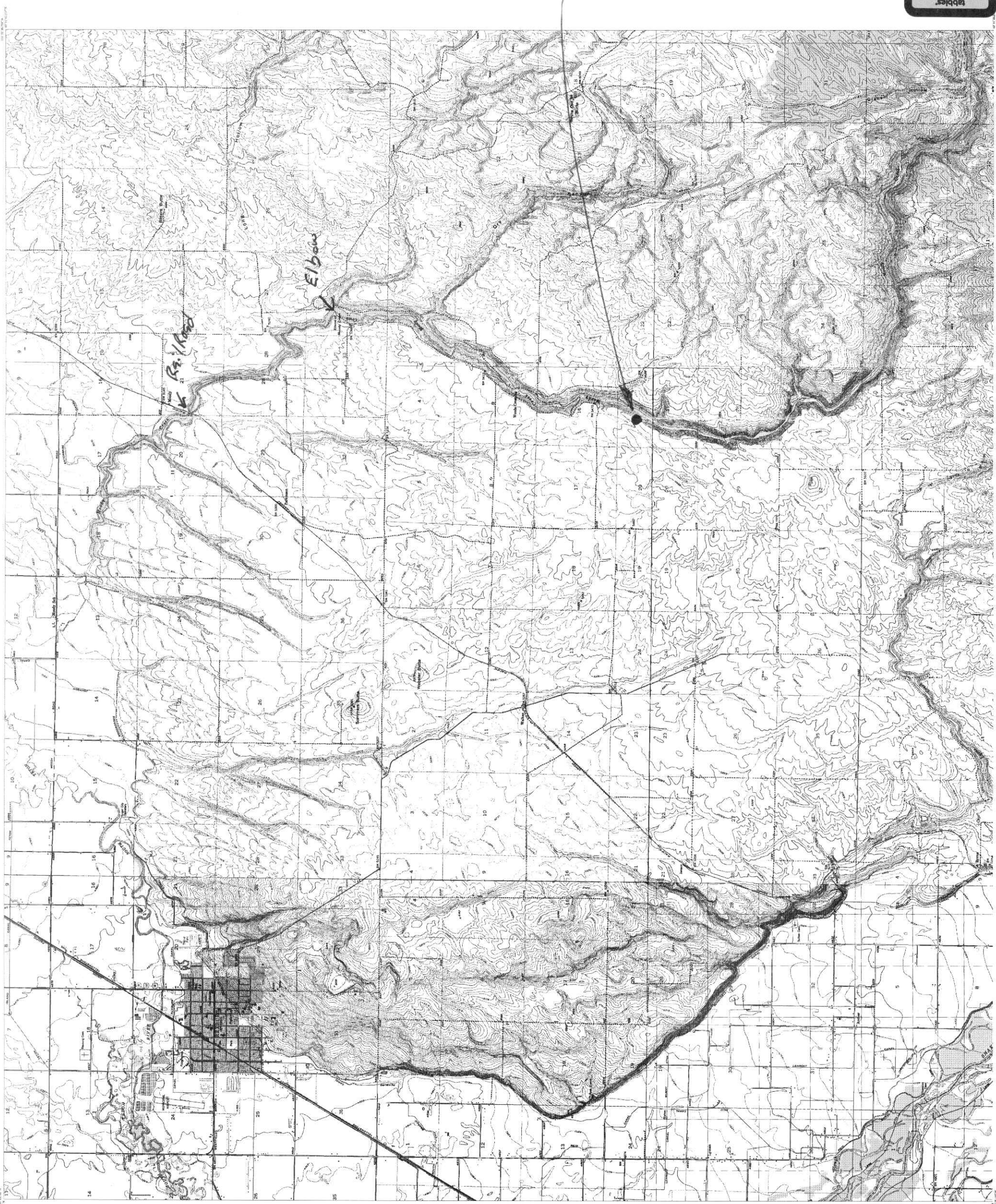
Swan Falls Dismissed:

DLE Act Number:

Cary Act Number:

Mitigation Plan: False

Close



POINT OF DIVERSION FOR  
22-594 22-495  
22-13479, 22-265E

DEFENDANT'S  
EXHIBIT  
#5

RECEIVED

MAY 04 2007

Department of Water Resources  
Eastern Region

**CONSENT AGREEMENT AND ORDER FOR PENDING NOTICE OF  
VIOLATION FOR MERLE AND JANICE JEPPESEN**

RECEIVED

MAY 09 2007

DEPARTMENT OF  
WATER RESOURCES

The following is a consent agreement between the Idaho Department of Water Resources (IDWR) and Merle Jeppesen, Janice Jeppesen, (other personal names and entity names), or any business holding water rights to irrigate property described by water right nos. 22-265 and 22-4195, hereafter referred to as "Jeppesens." The consent agreement is the result of earlier communications and a meeting held on January 11, 2007 at the IDWR office in Idaho Falls concerning the Pending Notice of Violation (PNOV) letter that was sent to you from Gary Spackman, dated December 28, 2006. The discussions/negotiations were intended to identify agreeable actions that would address the issues of the PNOV in an open and transparent manner and that would bear scrutiny from all interested parties.

**Jeppesens agree to the following:**

1. Jeppesens will file an application for exchange with IDWR proposing to divert water from Moody Creek in exchange for the delivery of storage water to the Teton River.
2. Jeppesens will identify the precise location of the 200 acres to be irrigated during the 2007 irrigation season with the Jeppesens' portion of Moody Creek water right 22-265. The acreage will be identified by public land survey description with the number of acres tabulated for each public land survey 40-acre tract and by a geographic information system map depicting the location and number of acres irrigated within each public land surveyed 40-acre parcel.
3. Jeppesens will install/maintain operable hour meters on all pivot irrigation systems.
4. Jeppesens will: (a) insure the existing meter measuring total flow diverted through Jeppesens' mainline will be operable at the beginning of the season; (b) calibrate the accuracy of the meter every year with an independent flow meter of known accuracy; and (c) maintain the existing meter on Jeppesens' mainline from Moody Creek in good working order during the irrigation season.
5. Jeppesens will close the mainline delivering Moody Creek water to Pivot #2 so that no water is deliverable from Moody Creek to Pivot #2 for the 2007 irrigation season. The mainline shall be closed with a lockable valve or by permanently placing an obstruction in the mainline to prevent water flow past the obstruction, referred to hereafter as "capping." Jeppesens shall notify the Department and the Watermaster of Water District 01 before commencement of the irrigation season whether a valve will be closed or whether the mainline will be capped. If the valve will be closed and locked,

**DEFENDANT'S  
EXHIBIT**

tabbies

#6

the Watermaster of Water District 01 or a deputy (hereafter referred to as "the Watermaster" or "Water District personnel") must be present at the time the valve is closed and locked and the Watermaster shall be given sole possession of the key or combination to the lock.

**IDWR and the Watermaster agree to the following:**

1. IDWR will process the application for exchange as rapidly as reasonably possible, given other IDWR demands. Filing the application for exchange does not create any obligation on the part of IDWR to allow the physical exchange of water prior to IDWR approval of the application for exchange.

2. Water District personnel will visit the place of use for water right nos. 22-265 and 22-4195 at the beginning of the 2007 irrigation season for the express purpose of measuring the maximum flow rate at each pivot irrigation system with an ultrasonic flow measurement device. The maximum measured rate will be used with the hour meter data to calculate the annual volume used at each pivot irrigation location.

3. Water District personnel will visit the site periodically and without notice throughout the 2007 irrigation season to verify that:

- a. Hour meters and flow meters are working properly,
- b. Valves or other controlling device(s) are in their proper position,
- c. Places of use being irrigated at that moment are appropriate to the water right(s) and particularly water source.

4. The Watermaster will compare the 2007 annual volume diverted, as accumulated by the meter located in the main pipeline through which all Moody Creek water is diverted, to the combined annual volumes calculated from the hours of operation measured at each irrigation pivot location and the measured flows for each pivot. The Watermaster will reconcile any differences in the comparison, and will determine the total volume of Moody Creek water diverted pursuant to Jeppesen's portion of water right no. 22-265.

5. If filed by Jeppesens, IDWR will process licensing amendments for ground water permit nos. 22-7683 and 22-13671 that will propose adding lands as a place of use to the permits that were previously irrigated with Moody Creek water by Pivot #2. Following approval of the licensing amendments, all lands underneath Pivot #2 will be irrigated with ground water.

6. IDWR will not issue a notice of violation for Jeppesens activities during the 2006 irrigation season.

**IDWR, the Watermaster, and Jeppesens agree:**

Following the close of the 2007 irrigation season, IDWR, the Watermaster, and Jeppesens will evaluate the terms of the agreement to determine whether additional provisions need to be implemented for the following season.

Failure or refusal by Jeppesens to adhere to the terms of this agreement is grounds for IDWR to immediately issue a notice of violation under Idaho Code § 42-351, and to seek other remedies provided by law, including appropriate monetary penalties.

### CONSENT

Jeppesens, IDWR, and the Watermaster acknowledges the facts set forth and accept fully the terms and conditions of this agreement. These terms shall become effective upon execution by the parties.

Signed this 18<sup>th</sup> day of May, 2007.. Gary Spickman

Dan Jeppesens 5-2-07  
Jeppesens

Ernest Carlson 5-7-07  
IDWR Representative

Lyle Swank 5/7/07  
Watermaster, Water District 01

### ORDER

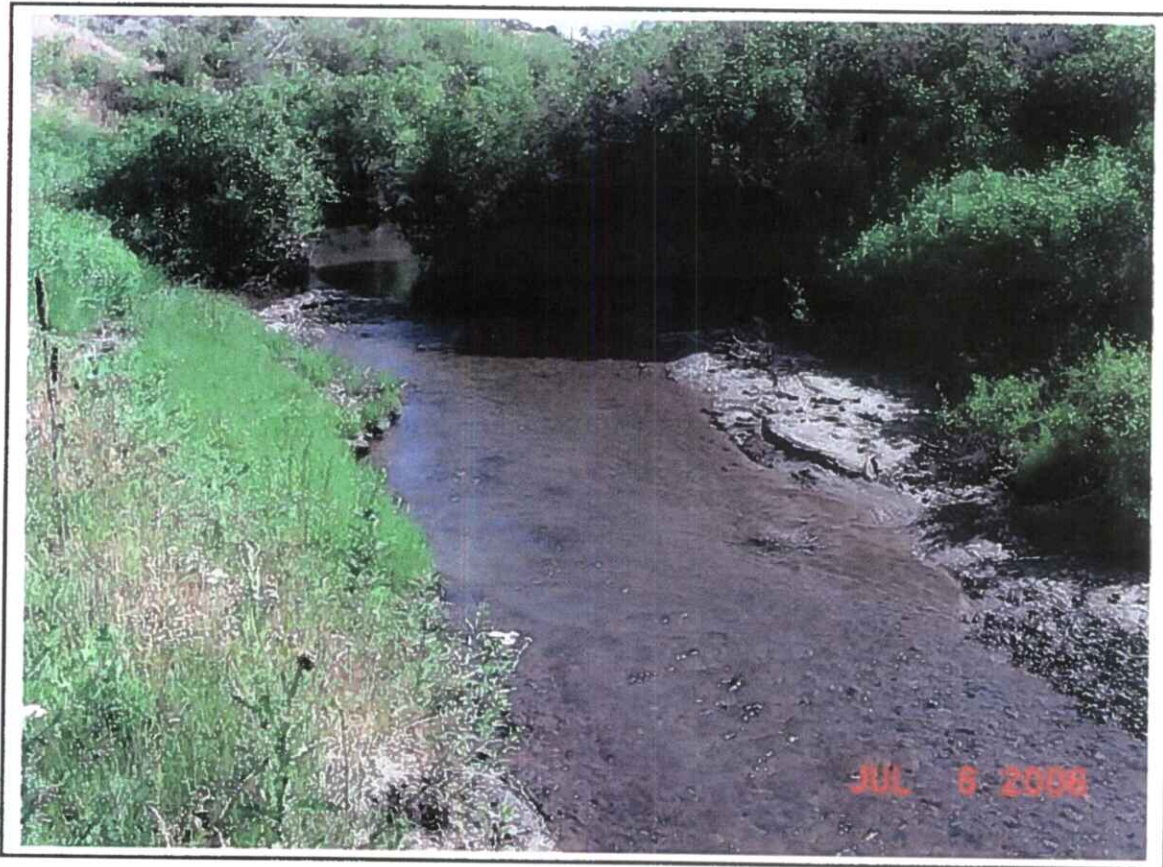
IT IS HEREBY ORDERED that the parties to the Consent Agreement set forth above shall adhere to and comply with the terms and conditions of the Consent Agreement, and that the diversion and use of water under water right no. 22-265 is predicated upon compliance with the provisions of the Consent Agreement.

Dated this 18<sup>th</sup> day of May, 2007.

A handwritten signature in cursive script, reading "Gary Spackman", written over a horizontal line.

**Gary Spackman**  
Acting Administrator

# Moody Creek Stream Inventory Report



*July-August 2005*  
*June-July 2006*



Prepared by Karie Pappani, IASCD



## **Summary of the 2006 Stream Visual Assessment Protocol (SVAP) and Streambank Erosion Condition Inventory (SECI) for Moody Creek**

### **Objective:**

The goal is to survey perennial streams that flow through private agricultural land. Moody Creek was selected for study because of its status as a 1998 §303d listed stream. Moody Creek was listed as impaired due to nutrients from the confluence of the North and South Forks of Moody Creek to the confluence with the Woodmansee Johnson Canal. The 2003 Subbasin Assessment and TMDL states that the pollutants, sediment and temperature, will be added to Idaho's 2002 §303(d) list. The beneficial uses impacted are cold water aquatic life, salmonid spawning, agricultural water supply, industrial water supply, and wildlife habitat. SVAP and SECI information will be used to

- Identify potential water quality concerns and areas for improvement
- Use field based knowledge to develop agricultural implementation plans

Figure 1 shows the eight reaches that were assessed.

Table 1 describes the reaches by elevation, length, and sinuosity.

### **Land Use:**

A large majority of the land in the Lower Teton River Subbasin is privately owned approximately 141,532 acres or 83%. The predominant land uses are cropland and pasture. The Moody Creek watershed contains four subwatersheds totaling 47,211 acres or 76 square miles, of which 37,611 acres is private land. The Idaho Department of Lands (IDL) and the Caribou-Targhee National Forest (CTNF) manage the remainder of the land.

### **Participants:**

Denise Adkins (NRCS, District Conservationist)  
Emily Cook (Clark/Madison District staff)  
Cody Jacobson (NRCS, Farm Bill Assistant)  
Brian Guthrie (IASCD, Water Quality Aide)  
Amy Jenkins (IASCD, Water Quality Analyst)  
Karie Pappani (IASCD, Water Quality Resource Conservationist)  
Kari Short (NRCS, Soil Conservationist)  
Members of BYU agriculture class

### **Areas for Improvement:**

Riparian zone, instream fish cover, and canopy cover averaged the lowest scores across the eight reaches. However, reaches 0 through 3 largely contributed to the above categories scoring poor for the SVAP rating. On a reach by reach basis, there were some additional water quality concerns. Reach 0 was channelized from the Woodmansee Johnson Canal to after the stream crossed 2000 North, Moody Creek road. This same section was turbid. There were at least four concrete diversion structures for water withdrawal, which were also fish barriers. The riparian zone was significantly compromised because it lacked riparian vegetation, and there was very little cover to shade the stream. Pools were practically absent. Reach 1 was moderately incised

with high banks. Instream fish cover and invertebrate habitat scored low because there was not a diversity of habitat types. For reaches 1 and 2, riparian vegetation was typically only present on one side of the streambank and the other side of the streambank contained upland species. Cropland bordered the streambank on one side; however, there were no sediment inputs observed at that time. Reach 3 was heavily grazed. It had very limited woody riparian vegetation and a majority of the herbaceous vegetation had very low stubble height, so there was no canopy cover available. Streambanks were unstable due to animal access/holding areas and lack of vegetation. Banks were typically high on one side. The stream was shallow, with few pools. Reach 6 was heavily grazed to a low stubble height in some areas. There were eroding streambanks with cracking and clumps and slumps due to livestock crossing and holding and rubbing areas. Cattle manure and urine were present instream. Tables 2 and 3 contain SVAP and SECI data describing the above concerns.

### **Recommendations for Improvement:**

Implementation of best management practices (BMPs) with the voluntary participation of landowners can be used to restore riparian condition. Reaches 4, 5, and 7 are in good to excellent condition. No action is needed. Any efforts to improve water quality/quantity of Moody Creek should be focused on reaches 0 through 3, from Woodmansee Johnson Canal to the railroad crossing near 7000 East. The riparian zone needs to be allowed to recover in heavily grazed and farmed areas. Some examples of BMPs that can be installed include fencing to exclude livestock, use exclusion, off-site watering facilities to redistribute livestock away from heavily impacted riparian areas, and grazing management strategies (stocking rate, rotation, season of use) to maintain riparian vegetation, control erosion, and improve water quality. Heavy use area protection and streambank/channel vegetation plantings may also provide improvement. County road maintenance crews need to address culvert wash out and erosion along 6000 East that may be a source of sediment during runoff periods.

### **Notes:**

Noxious weeds, in particular leafy spurge and Canada thistle, are a serious problem along Moody Creek and the adjacent rangelands. This resource concern needs to be addressed.

**Table 1. Moody Creek Reach Descriptions**

| Reach | Top of Reach<br>Elevation (ft) | Bottom of<br>Reach<br>Elevation (ft) | Reach<br>Length<br>(ft) | Reach<br>Length<br>(miles) | Reach<br>Sinuosity |
|-------|--------------------------------|--------------------------------------|-------------------------|----------------------------|--------------------|
| MC0   | 4,960                          | 4,920                                | 7,730                   | 1.5                        | 1.3                |
| MC1   | 5,000                          | 4,940                                | 10,500                  | 2.0                        | 1.4                |
| MC2   | 5,000                          | 5,000                                | 6,200                   | 1.2                        | 1.5                |
| MC3   | 5,050                          | 5,000                                | 1,900                   | 0.4                        | 1.1                |
| MC4   | 5,100                          | 5,000                                | 2,850                   | 0.5                        | 1.0                |
| MC5   | 5,120                          | 5,100                                | 6,690                   | 1.3                        | 1.3                |
| MC6   | 5,300                          | 5,200                                | 3,750                   | 0.7                        | 1.7                |
| MC7   | 5,300                          | 5,240                                | 2,350                   | 0.6                        | 1.1                |

MC##=Moody Creek Reach Number

**Table 2. Moody Creek Stream Visual Assessment Protocol (SVAP)**

| Reach         | Reach Length (ft) | Reach Length (miles) | Channel condition | Hydrologic alteration | Riparian zone | Bank stability | Water appearance | Nutrient enrichment | Notes |
|---------------|-------------------|----------------------|-------------------|-----------------------|---------------|----------------|------------------|---------------------|-------|
| Moody Creek 0 | 7,730             | 1.5                  | 7                 | 6                     | 2             | 8              | 9                | 9                   |       |
| Moody Creek 1 | 10,500            | 2.0                  | 8                 | 5                     | 4             | 8              | 8                | 10                  |       |
| Moody Creek 2 | 6,200             | 1.2                  | 9                 | 7                     | 5             | 8              | 10               | 10                  |       |
| Moody Creek 3 | 1,900             | 0.4                  | 7                 | 7                     | 1             | 2              | 8                | 7                   |       |
| Moody Creek 4 | 2,850             | 0.5                  | 9                 | 8                     | 8             | 10             | 9                | 9                   |       |
| Moody Creek 5 | 6,690             | 1.3                  | 10                | 10                    | 9             | 9              | 9                | 9                   |       |
| Moody Creek 6 | 3,750             | 0.7                  | 6                 | 8                     | 8             | 3              | 10               | 10                  |       |
| Moody Creek 7 | 2,350             | 0.6                  | 9                 | 9                     | 10            | 8              | 9                | 9                   |       |

| Reach         | Barriers to fish movement | Instream fish cover | Pools | Invertebrate habitat | Canopy cover | Manure presence | SVAP Total Points | SVAP Score | SVAP Category |
|---------------|---------------------------|---------------------|-------|----------------------|--------------|-----------------|-------------------|------------|---------------|
| Moody Creek 0 | 1                         | 3                   | 2     | 3                    | 1            | 5               | 56                | 4.7        | Poor          |
| Moody Creek 1 | 3                         | 5                   | 7     | 5                    | 5            | 5               | 73                | 6.1        | Fair          |
| Moody Creek 2 | 10                        | 5                   | 9     | 7                    | 5            | *               | 85                | 7.7        | Good          |
| Moody Creek 3 | 10                        | 3                   | 4     | 5                    | 1            | 4               | 59                | 4.9        | Poor          |
| Moody Creek 4 | 10                        | 8                   | 9     | 9                    | 7            | *               | 96                | 8.7        | Good          |
| Moody Creek 5 | 10                        | 8                   | 8     | 10                   | 9            | *               | 101               | 9.2        | Excellent     |
| Moody Creek 6 | 10                        | 8                   | 8     | 9                    | 5            | 2               | 87                | 7.3        | Fair          |
| Moody Creek 7 | 10                        | 8                   | 8     | 10                   | 10           | *               | 100               | 9.1        | Excellent     |

\* Categories marked with an asterisk were not applicable because there were no cattle or manure present.

## **Addendum to Table 2:**

### **Stream Visual Assessment Protocol (SVAP) Terms and Definitions**

*Each assessment element is rated with a value from 1 to 10 with the exception of manure presence (rated from 1 to 5). The maximum, best, score possible is the highest number possible. For example, if the rating is from 1 to 10, then 10 is the maximum score possible.*

**Channel condition**-evidence of channel alteration and structural changes, such as dikes and levees

**Hydrologic alteration**- flood frequency and high/low flow patterns

**Riparian zone**- the extent or width of natural riparian vegetation along streambanks

**Bank stability**-the presence of vegetation supporting the banks, the evidence of soil erosion from banks

**Water appearance**-the clarity and visibility of the water, the presence of algae and other aquatic plants, odor

**Nutrient enrichment**- presence and abundance of aquatic plants that indicate high inputs of nutrients into the stream

**Barriers to fish movement**-presence of culverts, dams, and diversions; seasonal water withdrawals that may affect fish movement

**Instream fish cover**-number of types of cover, such as woody debris, pools, overhanging vegetation, macrophyte beds, cobbles, riffles, etc. available to fish

**Pools**-presence and abundance of deep pools, pockets of water

**Invertebrate habitat**-the amount of habitat (cover types) available, such as fine woody debris, submerged logs, leaf packs, undercut banks, cobble, boulders, etc.

**Canopy cover**-the percentage of the stream that is shaded by vegetation

**Manure presence**-evidence of livestock use of riparian zone and stream banks

**Table 3. Moody Creek Streambank Erosion Condition Inventory (SECI)**

| Reach<br>(MoodyCr) | Total<br>Reach<br>Length<br>(ft) | Total Bank<br>Length (ft) | Eroding<br>Bank<br>Length<br>(ft) | Percentage<br>of Total<br>Length<br>Eroding (%) | Avg.<br>Bank<br>Height<br>(ft) | Soils                                  | Bulk<br>Density<br>(lb/ft <sup>3</sup> ) | Bank<br>Erosion | Bank<br>Condition | Vegetation<br>or Cover | Channel<br>Stability | Channel<br>Bottom | Deposition | Total<br>LRR<br>Value | Erosion<br>Severity | Lateral<br>Recession<br>Rate (ft/yr) | Erosion<br>Length | Erosion<br>Rate<br>(tons/yr) |
|--------------------|----------------------------------|---------------------------|-----------------------------------|-------------------------------------------------|--------------------------------|----------------------------------------|------------------------------------------|-----------------|-------------------|------------------------|----------------------|-------------------|------------|-----------------------|---------------------|--------------------------------------|-------------------|------------------------------|
| 0                  | 7,730                            | 15,460                    | 820                               | 5.30                                            | 4.4                            | Rexburg silt<br>loam                   | 79.54                                    | 0.5             | 0                 | 0                      | 0                    | 0                 | 1          | 1.5                   | Slight              | 0.026                                | 820               | 34                           |
| 1                  | 10,500                           | 21,000                    | 1,485                             | 7.07                                            | 6.8                            | Swanner-<br>Rock<br>outcrop<br>complex | 102.9                                    | 1               | 0.5               | 0.5                    | 0                    | 0                 | 1          | 3.0                   | Slight              | 0.040                                | 1,485             | 147                          |
| 2                  | 6,200                            | 12,400                    | 938                               | 7.56                                            | 8.5                            | Swanner-<br>Rock<br>outcrop<br>complex | 102.9                                    | 1               | 0.5               | 0                      | 0                    | 0                 | 0.5        | 2.0                   | Slight              | 0.030                                | 938               | 81                           |
| 3                  | 1,900                            | 3,800                     | 1,168                             | 30.74                                           | 5.8                            | Haplaquolls                            | 84.21                                    | 2               | 1                 | 1                      | 0.5                  | 0                 | 0.5        | 5.0                   | Moderate            | 0.058                                | 1,168             | 27                           |
| 4                  | 2,850                            | 5,700                     | 0                                 | 0.00                                            | NA                             | Haplaquolls                            | 84.21                                    | 0               | 0                 | 0                      | 0                    | 0                 | 0.5        | 0.5                   | Slight              | 0.016                                | 0                 |                              |
| 5                  | 6,690                            | 13,380                    | 283                               | 2.11                                            | 6.8                            | Haplaquolls                            | 84.21                                    | 0               | 0                 | 0                      | 0                    | 0                 | 1          | 1.0                   | Slight              | 0.020                                | 283               | 38                           |
| 6                  | 3,750                            | 7,500                     | 5,264                             | 70.18                                           | 5.5                            | Haplaquolls                            | 84.21                                    | 2.5             | 0.5               | 0.5                    | 1                    | 0.5               | 1          | 6.0                   | Moderate            | 0.096                                | 5,264             | 84                           |
| 7                  | 2,350                            | 4,700                     | 361                               | 7.68                                            | 5.3                            | Haplaquolls                            | 84.21                                    | 0.5             | 0.5               | 0                      | 0.5                  | 0.5               | 1          | 3.0                   | Slight              | 0.040                                | 361               | 21                           |

|       |        |        |        |                                                   |        |
|-------|--------|--------|--------|---------------------------------------------------|--------|
| Feet  | 41,970 | 83,940 | 10,319 | Total erosion length                              | 10,319 |
| Miles | 7.9    | 15.9   | 2.0    | Percent of stream with a Slight Erosion Problem   | 5      |
|       |        |        |        | Percent of stream with a Moderate Erosion Problem | 8      |
|       |        |        |        | Percent of stream with a Severe Erosion Problem   | 0      |
|       |        |        |        | Total Percent of Stream assessed                  | 42     |

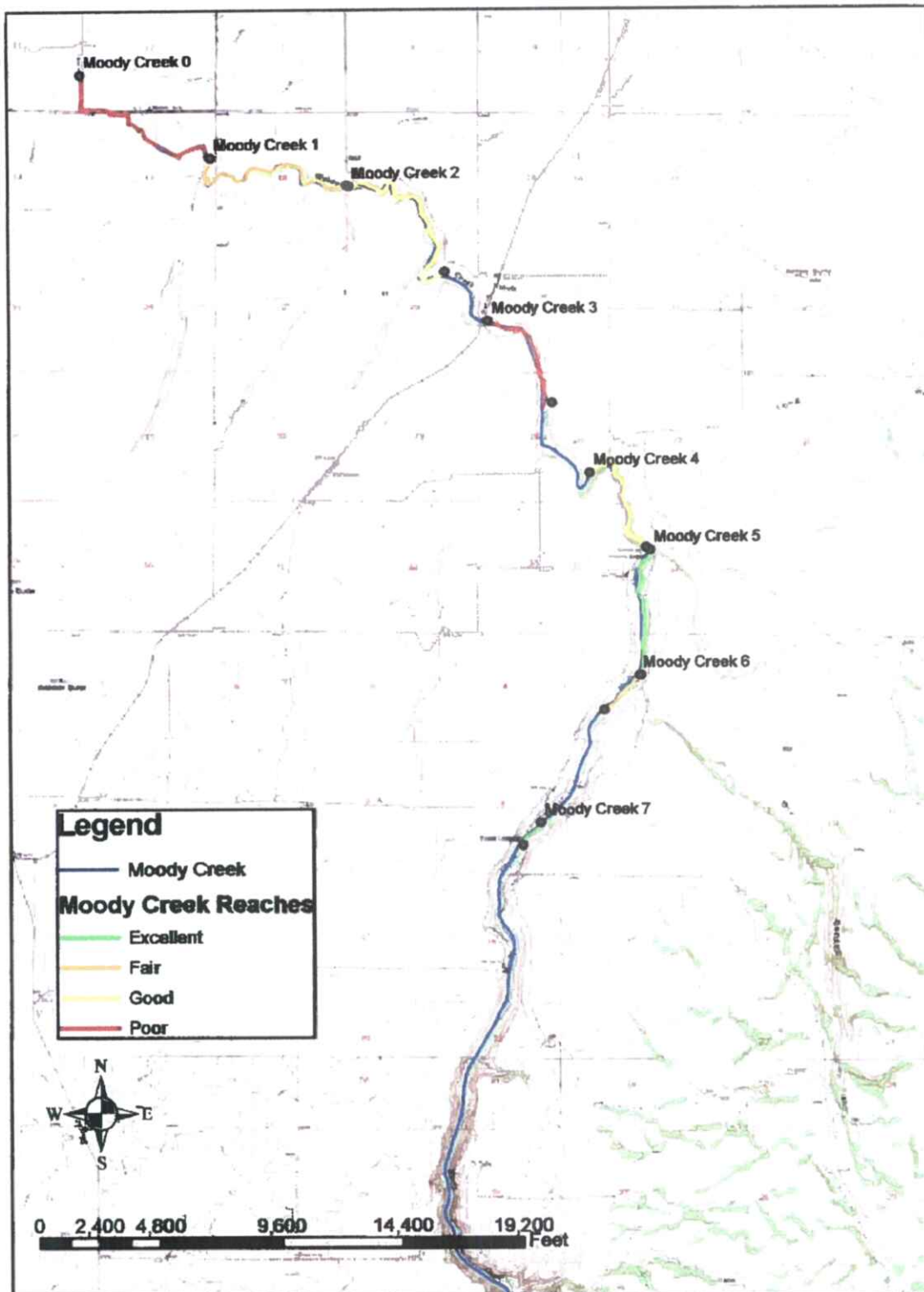


**Figure 1. Moody Creek Assessed Reaches**