

APPENDIX B: IMPAIRMENT DETERMINATION LISTING DETAILS FOR THE 1996 AND 2002 303(D) LISTS

This appendix summarizes information used for defining water quality problems and making beneficial use determinations for tributaries identified as impaired on the 2002 303(d) list. Because of its more complicated listing history, Goat Creek is treated separately, while the remaining stream reaches are treated as a group in this appendix¹.

Goat Creek

In 1996, all of Goat Creek was listed as impaired by flow alteration, organic enrichment/DO, siltation, and other habitat alterations. In 2002, the headwaters to Squeezer Creek section was listed for nutrients and suspended solids, while the Squeezer Creek to Swan River section was listed for siltation and other habitat alterations. The impairments causes and impaired uses in Goat Creek are summarized in Table B-1.

Table B-1. Goat Creek 303(d) Listing History

Location	1996 303(d) list probable causes	2002 303(d) list probable causes	Impaired Uses
Headwaters to Squeezer Creek	Flow alteration Organic enrichment/DO Siltation Other habitat alteration	Nutrients Suspended solids	Aquatic Life Cold Water Fishery
Squeezer Creek to Swan River	Flow alteration Organic enrichment/DO Siltation Other habitat alteration	Siltation Other habitat alterations	Aquatic Life Cold Water Fishery

The basis for impairment determinations for the 2002 303(d) list are summarized in the DEQ SCD/BUD worksheets (DEQ, 2004) and the below discussion is derived from documentation contained within DEQ files. The 1996 basis for impairment determinations are not well documented, although in most cases they can be inferred from the SCD/BUD documentation.

Goat Creek (Headwaters to Squeezer Creek)

- *General Comments:* At the time of the DEQ's most recent SCD/BUD review it was determined that there was minor impairment in upper Goat Creek resulting from elevated nitrate and suspended sediment concentrations, as well as logging-related habitat impairments, including slash in the stream, excessive sedimentation, blow downs, and equipment crossings. DEQ notes that this section of Goat Creek was probably close to fully supporting its beneficial uses.

¹ Of all of the Swan tributaries cited on the 1996/2002 303(d) lists and within DEQ's database, only Piper Creek has sufficient and credible data (SCD) to allow for evaluation of its support of the "drinking water" beneficial use. Therefore, additional data will need to be collected for drinking water support determinations. Collection of this information is not a required component of ongoing TMDL development.

- *Siltation (1996)*: A 1989 DEQ stream assessment found localized instances of elevated levels of sediment in the stream, particularly in Section 7.
- *Habitat Alteration (1996)*: A 1989 DEQ stream assessment found that Goat Creek in Sections 8 and 9 was in good condition, but that in Section 7 slash, blowdowns, and equipment crossings in the stream created localized impacts.
- *Flow Alteration (1996)*: A study by Leathe et al. (1983) recommended a minimum flow of 11 cfs for Goat Creek; flow fell to 6 cfs in 1988.
- *Organic Enrichment/DO (1996)*: The reason for this listing is unclear. A possible explanation might be related to indirect effects of elevated sedimentation and nutrient concentrations in this reach.
- *Nutrients (2000)*: Nutrient data analyzed from various sources indicated nitrate levels from 0.06 to 0.10 mg/l, and nitrite + nitrate levels around 0.07 mg/l.
- *Suspended Solids (2000)*: Ellis et al. (1999a) found that total suspended solids (TSS) were higher in logged portions of Goat Creek than in unlogged portions of Lion Creek.

Goat Creek (Squeezer Creek to Swan River)

- *General Comments*: According to DEQ's SCD/BUD documents, lower Goat Creek is currently impaired, particularly near the mouth, because cut logs and slash in the stream have created debris jams that have led to bank erosion and severe sediment scour and deposition.
- *Siltation (1996 and 2000)*: A 1989 DEQ stream assessment found elevated levels of sediment deposition, braiding of the stream channel, and embeddedness of the stream substrate. A 1996 Plum Creek study found signs of elevated sedimentation, erosion, and channel migration, particularly near the mouth of the creek.
- *Flow Alteration (1996)*: A study by Leathe et al. (1983) recommended a minimum flow of 11 cfs for Goat Creek; flow fell to 6 cfs in 1988.
- *Habitat Alteration (1996 and 2000)*: A 1989 DEQ stream assessment found full support in the upper part this reach (assessment score = 82%), but only partial support near the mouth (assessment score = 66%). Problems near the mouth included logging slash, litter, and manure in the stream; debris jams from slash were causing vertical erosion, severe scour and deposition, reduced pools, and braiding of the channel.
- *Organic Enrichment/DO (1996)*: The reason for this listing is unclear. A possible explanation might be related to indirect effects of elevated sedimentation and nutrient concentrations in this reach.

Other Tributaries

All three of the following stream or stream reaches are cited on the 1996 and 2002 303(d) lists as impaired by siltation and other habitat alterations. In 1996, Elk Creek was also listed for organic enrichment/DO.

1. Piper Creek below Moore Creek;
2. Jim Creek
3. Elk Creek

The reasons for the listing of these streams as explained by the SCD/BUD documentation are as follows:

1. *Piper Creek below Moore Creek*: A DEQ stream reach assessment found moderate impairment from excess fine sediment in the channel mainly from timber harvest and roads. Based on this assessment, 53% of the stream reach was found to have reduced riparian recruitment due to harvest within the SMZ.
2. *Jim Creek*: The decision to list this section of Jim Creek was based primarily on a study by Brown et al. (1990) that found 1) fisheries habitat was significantly deteriorated, 2) bull trout eggs all died in the area studied, and 3) westslope cutthroat trout experienced a survival rate of only 4% if spawning took place below the timber sale in the west fork. This timber sale involved significant riparian harvest. A stream assessment by DEQ in 1989 also found logging slash and bridge material in the stream and bank trampling from cattle. A comparison of % fine sediment (very limited data) between Lion Creek and Jim Creek suggested that Jim Creek had a sedimentation level 60 to 130% above the recommended literature sediment levels for bull trout. DEQ SCD/BUD files currently indicate that these noted impacts are below the west fork and that there is a lack of impairment indicators for the portion of Jim Creek above the west fork.
3. *Elk Creek*: According to a 1989 DEQ stream assessment, the lower 4 miles of Elk Creek were impaired by cut logs and bridge parts in the channel, channel migration and bank instability, and reduced riparian shade, all of which resulted in the decision to list Elk Creek for both siltation and habitat alterations in 1996. Elk Creek was also listed for organic enrichment/DO in 1996, possibly related to cattle activities and/or elevated sedimentation in this reach. DEQ SCD/BUD files currently indicate that these noted impacts are below Section 16 and that there is a lack of impairment indicators for the portion of Elk Creek above Section 16.