2.0 Valley Creek Watershed

2.1 Location and General Description

The majority of Valley Creek (sometimes called Valley Branch Creek) is located in the City of Afton and a small portion is located on the east edge of the City of Woodbury. It is comprised of two major branches. The Main Stem of the creek flows 2.7 miles from Lake Edith to the mouth of the creek at the St. Croix River. The other major branch, known as the South Fork, flows 4 miles from its headwaters in the southwest portion of LSCVWD, in Woodbury, to its junction with the Main Stem, 1.7 miles above the mouth of the creek.

Valley Creek has a drainage area of 6,699 acres, in addition to the Lake Edith tributary area of 1,234 acres. Therefore, the total watershed area of Valley Creek is 7,933 acres. The South Fork portion of the drainage area is 5,099 acres and is comprised of subwatersheds SVB-1 to SVB-12. (The group of subwatersheds draining to the South Fork is sometimes collectively called the subwatershed cluster.) The remainder of the Valley Creek tributary area is comprised of subwatersheds NVB-1, NVB-4, MVB-1, and MVB-2. Subwatersheds NVB-2, NVB-3, MVB-3, MVB-4, and MVB-5 drain directly to wetlands that do not have a surface outlet into Valley Creek. (Subwatersheds designated NVB are part of the North Fork Valley Branch Creek cluster. Subwatershed designated MVB are part of the Main Stem Valley Branch Creek cluster.) **Figure 1** shows the tributary area. The majority of the flow at the mouth of the creek comes from the South Fork, which is fed by springs and has very little pond storage. Most of the watershed is undeveloped. Existing and proposed land use is a mixture of rural residential, agricultural and agricultural preserve uses.

The following reaches of the creek are watercourses that are protected by the Minnesota Department of Natural Resources (DNR):

1. The northerly branch of the South Fork, from its beginnings in the southwest quarter of Section 12, Township 28 North, Range 21 West (subwatershed SVB-10), in the City of Woodbury to its junction with the Main Stem.

2. The Main Stem, from Lake Edith to its junction with the South Fork.

3. The Main Stem, from its junction with the South Fork to the St. Croix River.

In addition to Valley Creek, the Valley Creek watershed contains other unnamed DNR- protected waterbodies. DNR- protected waterbody #82-7w is located in NVB2, DNR protected waterbody #82-8w is located within NVB3, and DNR- protected waterbody #82-468w is located within MVB3, and DNR- protected waterbody #82-467w is located within MVB5.

The portion of the creek in Sections 9, 10, 14, 15, 16, and 17 of Township 28 North, Range 20 West is a DNR-designated trout stream, one of 13 trout streams in the Twin Cities metropolitan area. The cold, relatively clean waters of Valley Creek are suitable for trout. The DNR reports that brook, brown and

rainbow trout are currently present in Valley Creek. The reach from the Lake Edith outlet to its junction with the South Fork is a marginal trout stream, mainly because of the warm water discharges from Lake Edith.

2.2 Landscape Units

The Valley Creek Watershed contains several landscape units. These includes significant portions or all of Landscape Units 9-20, and an unmapped Landscape Unit in southwestern Afton. Further description and analysis of these landscape units are contained in the landscape portion of this Natural Resources Inventory (NRI) report.

2.3 Water Quality Management Goals

The LSCVWD 1995 *Water Management Plan* (Plan) identifies Valley Creek as a Category I water body. Further description of this classification is given *in Appendix A* This designation results in a Surface Water Quality Ranking of High. **See Figure 2**

The management goal for Valley Creek is preservation of its water quality and trout stream habitat. Foremost among local concerns is the problem of siltation, which destroys trout spawning habitat. Siltation in the stream has occurred and could still occur as a result of four major watershed factors: sheet erosion from agricultural practices on uplands, gully erosion, runoff from developments, and construction site erosion in and near the stream itself. The DNR recommends that the LSCVWD manage the tributary watershed to:

- maintain its current (high) dissolved oxygen concentration
- avoid increases in water temperature
- avoid increased discharge

Such changes, especially an increase in water temperature, could jeopardize the stream's ability to support a trout population. LSCVD's current regulations concerning development will help prevent impacts to the trout stream. These regulations require that the rate of runoff not be increased as a result of development and that erosion controls be in place on construction sites. The City of Afton's shoreland ordinance requires buffer strips along the stream.

To prevent temperature increases in the creek, the DNR suggests that infiltration ponds be built as development occurs. Instead of relatively warm stormwater runoff entering the creek, the runoff water would seep through the bottom of the infiltration basin into the groundwater, giving the water a chance to cool before discharging to the creek. The LSCVWD requires the use of infiltration basins in developments in the Valley Creek Watershed on a case-by-case basis.

In the LSCVWD plan, the watershed district expressed interest in installing an automatic temperature-monitoring device in Valley Creek to determine if the creek is affected by temperature changes. Since 1998, the St. Croix Watershed Research Station (SCWRC) has been collecting

continuous flow and temperature data at four monitoring locations on Valley Creek. Two of the monitoring sites are along the perennial portions of the stream, and two are along the intermittent portions. The SCWRC operates another continuous monitoring station through their participation in the Metropolitan Council's Watershed Outlet Monitoring Program (WOMP) station. The SCWRC also operates an automatic weather station in the Valley Creek watershed.

The overall water quality of the stream is excellent and has not changed significantly since 1972. During the period 1984 through 1991, 1993, and annually since 1995, the LSCVWD has conducted an annual biological survey of the Main Stem of the stream, immediately downstream of Highway 95, to evaluate its water quality. Monitoring for the presence or absence of biological indicator organisms provides indirect evidence of the effects of transitory changes in stream water quality related to storm runoff. As attached organisms, benthic aquatic invertebrates are exposed to all the variations in stream water quality over time, and will live on the stream bottom only as long as water quality conditions permit. As more pollutants enter the stream, more organisms are eliminated, depending on their sensitivity to pollution. During the period 1984 through 1991, and again from 1996 through 2000, the biological monitoring results indicate the water quality of Valley Creek was consistently very good. This ranking suggests there may only be a slight possibility of organic pollution in the stream. During 1993, however, the biotic index value was in the fairly poor water quality category, probably due to high quantities of suspended solids contained in the backwaters from the (flooded) St. Croix River, which affected the stream. In 1995, the stream had recovered somewhat, with a biotic index value on the borderline of fair and good. Since 1996, the biotic index value has been. within the very good water quality category.

The LSCVWD has also conducted biological monitoring on the South Fork of the stream, 800 feet upstream of its junction with the Main Stem. The biotic index values for 1998 through 2000 indicate the water quality of the South Fork is also in the very good category.

In 1999 and 2000, the DNR worked with students from the Stillwater Area High School to collect physical and biological stream data.

Further evidence of the excellent water quality in Valley Creek is the presence of the American brook lamprey. Valley Creek is the only stream supporting this species in the Twin Cities metropolitan area. The American brook lamprey is threatened because of the effects of urbanization on stream habitat. The DNR considers this species of special concern. The American brook lamprey is a non-parasitic filter feeder and it does not exceed 8 inches in length. Because a trout habitat is also suitable for the American brook lamprey, protection of the trout habitat in Valley Creek will also ensure the survival of this species.

2.4 Groundwater Recharge/Infiltration/Permeability

The Valley Creek watershed contains variable groundwater recharge/infiltration rates. As a generalization, the rankings move from high groundwater recharge/infiltration to the west and moderate to the east. Some subwatersheds contain a majority of high groundwater recharge/infiltration rankings. These include NVB-4, SVB-3, SVB-8, and SVB-9. Other subwatersheds contain a predominance of moderate groundwater recharge/infiltration rankings, including NVB-1, NVB-2, NVB-3, and all of the MVB subwatershed cluster. No subwatersheds contain a dominance of low groundwater recharge/infiltration rankings.

The Valley Creek watershed is the only riverine drainage system in Afton with areas ranked high in groundwater recharge/infiltration. Some of these areas ranked high in groundwater

recharge/infiltration are located in low areas, where stormwater runoff can accumulate. **See Figure 3**

2.5 Erosion Index Ranking

The Valley Creek watershed as a whole receives a high soil erosion index (EI) ranking of 11. Although the ranking varies by subwatershed throughout the watershed, from an EI of 8.55 in the North Valley Branch subwatershed cluster to an EI of 11.01 in the South Valley Branch subwatershed cluster, all of the subwatersheds receive a high erosion ranking. On a subwatershed basis, the EI values vary widely, ranking from low to high. The low EI values are in the MVB-1 (ranking of 2.52), while the high EI values are in the SVB-1 (ranking of 16.33). **See Table 3, which itemizes the EI values according to subwatershed.** See also **Figures 6a**-6c for EI values and rankings for the Valley Creek Subwatershed Clusters.

No trends regarding EI rankings were evident for the Valley Creek Watershed.

2.6 Valley Creek Natural Resource Inventory Results

The Valley Creek NRI was conducted in 2000. The data and supporting information is included in this document to create a more comprehensive report. The NRI for Trout Brook and Kelles Coulee were done to compliment what was started here.

Valley Creek Natural Resource Inventory Components

Feature Inventoried	Feature Type	Additional Inventory Information	Number of Features Mapped	Why Feature Was Mapped	Discussion
Centerline Stream	line	percent canopy, riparian Landuse	NA	Identification of where stream is located, determine amount of tree/shrub cover, identify what is adjacent to the stream	This data can be used and compared as future site visits occur. Canopy can affect such things as stream temperature and vegetative growth in and along the stream. What is done along the stream impacts the stream itself.
Sediment Delivery	line	type, severity index	21	Identification of where sediment could be entering the creek, and therefore identify areas which may need to be addressed	In the US, sediment is the biggest polluter by volume. Sediment can impact water quality, habitat, and carry nutrients, and other chemicals.
Sediment-ation Site	area	Depression Area Type	25	Identification of areas where sediment from a sediment delivery site may settle before entering the creek	This data identifies and can be analyzed as to the amount of sediment that is treated. May be areas where future sediment treatment facilities are located.
Stream Width	point	number	50	Identification of stream characteristics	Data can be used in stream classification & stream flow analysis.
Streambank erosion	point	condition, size	59	Identification of areas where stream	These areas identify where streambank stabilization is

Valley Creek Natural Resource Inventory Components					
Feature Inventoried	**Feature Type**	**Additional Inventory Information**	**Number of Features Mapped**	**Why Feature Was Mapped**	**Discussion**
				is unstable, and there is an opportunity for remediation	warranted and should undergo further analysis.
Plant Population	point	size, type	50	Identification where significant plant populations exist	Plant populations may impact habitat, relate to sedimentation and nutrients.
Human-Made	point	type, extent/feature	458	Identifications of structures in and along creek	These structures may impact stream flow, habitat, water quantity and quality.
Sediment Sample Point	point	Number	42	Locate sample collection point which will be analyzed	Coordinated with SCWRS for identification of sample location and numbers.
Tree Downfalls	point	none	118	Identification of where trees impede stream flow, and could provide habitat	May impact streamflow, streambank erosion, habitat
Seeps	point	none	48	Identification where groundwater may be discharging	May provide base flow & other inputs
Springs	point	none	12	Identification where groundwater is discharging	May provide baseflow & other inputs
		Total	**862**		

The Valley Creek Natural Resource Inventory, completed by the Washington Soil and Water Conservation District (SWCD) gathered the above information. All information was gathered by utilizing Global Positioning System (GPS) Technology, and compiled and formatted using Geographic Information System (GIS) Technology.

The purpose of this report is to further describe the features inventoried, identification of feature criteria, the significance of inventorying these features, and general discussion of findings.

See Figures 7a for NRI features identified in the Valley Creek Watershed. **Figures 7a1—7a9** illustrate each of these features individually.

Centerline of Stream: This feature was mapped from the confluence of Valley Creek and the St. Croix River, to the origin of the stream channel in Section 12, Woodbury to the west, and Section 29, Afton at its most southerly point. The north branch was also mapped to it's intersection with Stagecoach Trail. In general, the **percent canopy** tended to be higher downstream, and tended to open up further west. The **riparian landuse** was variable adjacent to the stream, and generally tended to become more undisturbed the further downstream traveled.

Sediment Delivery Site: This feature was mapped predominately along the main branch to south fork of Valley Creek in Sections 16 and 17 in Afton. This area was mapped to a greater extent, not only because of the greater occurrence of sediment delivery sites in this area, but because this area of the creek was determined to be the area of greatest concern, therefore more inventory detail was warranted. The major **type** of sediment delivery areas noted through out the watersheds were gullies. There was no evident pattern to the **severity** of these gullies.

Sedimentation Site Sedimentation Areas identified areas where soil deposition was evident. These sites included significant in-stream pools and riparian deposition areas, usually located at the base of sediment delivery sites. This feature was mapped to identify areas which either currently or potentially may eliminate or mitigate sedimentation into Valley Creek

Stream Width: Stream widths were measured at points along the perennial Valley Creek.. The width of the stream was measured at bankfull, which is higher than the low or baseflow water level, and the water level during the mapping period. This feature was mapped to provide some base information regarding stream characteristics.

Streambank Erosion: Streambank erosion was observed and mapped along perennial and intermittent reaches of Valley Creek. The **condition and size** of streambank erosion sites tended to be slight to moderate, indicated a healthy drainage system. It is noteworthy that the South Branch tended to have a greater density of erosion sites.

Plant Populations: Points of significant plant populations were mapped within the perennial Valley Creek. Only plant growth occurring within the banks of Valley Creek was mapped. Significant plant populations were mapped as to their **size** and **type**. Some plant population areas were sampled by the St. Croix Watershed Research Station at the time of mapping, and were investigated in greater detail at a later date. This feature was mapped, since further research will occur to determine if these are areas with a greater accumulation of sediment which facilitate the associated plant growth.

Human-Made features were mapped along all areas of the Valley Creek Sub-watershed. Compared to the Trout Brook, and especially Kelles Coulee perennial reaches, Valley Creek has much higher occurrences of human-made features. This includes both the **extent and type** of human made features. This is due the Valley Creek area containing large lot development, which has resulted in greater use of the stream corridor.

Sediment Sample Point: Sediment Sample Points were mapped along the perennial portions of Valley Creek. These area were mapped when the SCRWRS took sediment samples as a part of a separate study. These samples were taken to the SCWRS lab to be analyzed. Point mapping will served to identify these areas again in the future, to assist with developing trends within Valley Creek. It is important to note that samples were taken in locations only where unusual amounts and types of fine sediments were found. 42 Sediment Samples were collected within perennial Valley Creek.

Tree Downfalls: Tree Downfalls were mapped within the perennial Valley Creek if it made it difficult to walk the stream. Tree downfall locations were mapped in Valley Creek more closely due to both their potential to impact stream flow and for their trout habitat value.

Seeps were predominately along perennial sections of Valley Creek, and are likely sites of groundwater discharge. Springs were evident throughout the perennial portion of Valley Creek, with three occurrences within a sediment delivery area.

Springs: Springs were mapped along perennial Valley Creek. In its two forks, Valley Creek becomes perennial due to the presence of springs. Springs are evident by the presence of small areas white sands often with water bubbling out due to water pressure. These are locations of groundwater discharge. Of the three drainage area inventoried, springs were only found within Valley Creek.