

## SUMMARY

In order to gain a better understanding of drainage systems, streams, and habitat issues in the Boise Creek, Patterson Creek, and Vashon/Maury Island drainage basins, the King County Council authorized, in 2001, the accelerated development of drainage plans for these areas. The *Patterson Creek Rural Reconnaissance Report* (RRR) is one of three reports prepared to assess these rural drainage basins in King County's expanded surface water service area. The reports provide a general overview of the existing stream and basin conditions and problems related to surface water in these rural areas and identify high priority capital improvement needs and opportunities. They present plans for existing and future drainage infrastructure needs in a way that identifies how to reduce road and property flooding, protect and enhance aquatic habitat, and reduce stormwater pollution.

### SCOPE OF ANALYSIS

The two primary goals of the RRR were to 1.) characterize the drainage basin and 2.) prepare an action plan to protect the existing natural drainage systems and address existing problems. The study area for this report includes the entire drainage basin for Patterson Creek. Predevelopment and existing-conditions flows were estimated using the Hydrologic Simulation Program–FORTRAN (HSPF) drainage model. Drainage, water quality, and habitat needs were developed by reviewing all the available information and conducting field investigations.

### BASIN DESCRIPTION

The Patterson Creek Basin covers 12,711 acres (19.86 square miles) in east King County along the east slope of the Sammamish Plateau including a small portion of the City of Sammamish. Patterson Creek flows into the Snoqualmie River north of Fall City. The Snoqualmie River flows into the Snohomish River, which flows into Puget Sound in the City of Everett. Patterson Creek is approximately 12.1 miles long. The elevation of the Patterson Creek Basin varies from about 70 feet at the confluence with the Snoqualmie River to 1,400 feet in the southwest corner.

### ASSESSMENT OF SUBBASINS

To characterize the drainage basin, it was first divided into five subbasins. Each subbasin was evaluated based on stream habitat, water quality, geomorphology, and flooding/erosion problems. The following is a summary of the major findings for each subbasin:

- **Subbasin 1:** The stream habitat is in fair condition despite channel incision up to 1 foot deep, localized scour down to the underlying silty sand substrate, embedded substrates, and sparse LWD (King County SWM 1993). The subbasin has been moderately impacted by residential development. Fish passage barriers are the most significant limitation to salmonid production in Subbasin 1 and prevent access to approximately 2.5 miles of spawning and rearing habitat. Aside from these specific areas of

impairment, Subbasin 1 remains relatively intact; and measures should be taken to maintain the subbasin's hydrologic and riparian integrity.

- **Subbasin 2:** In this reach, Patterson Creek is a low-gradient floodplain channel that has been highly impacted by land use practices. The once Sitka spruce, western red cedar, and hemlock dominated floodplain has been largely converted to agricultural land, leaving the riparian habitat in poor condition (King County SWM 1993). In addition, the stream has been channelized and dredged, altering the channel morphology and condition, as well as floodplain connectivity. Habitat complexity is limited by the lack of LWD in this reach. The lateral tributaries to Patterson Creek in this subbasin are steep streams that flow off the surrounding slopes of the basin. They are susceptible to erosion and contribute fine sediment to the mainstem of Patterson Creek (King County SWM 1993).
- **Subbasin 3:** Canyon Creek, whose watershed makes up Subbasin 3, is a significant tributary for salmonid production in the Patterson Creek Basin. The Canyon Creek drainage is a forested watershed that originates on Grand Ridge, and has some of the best high-gradient channel stability and fish habitat in the Patterson Creek Basin (King County SWM 1993). The stream habitat is in relatively good condition, with clean gravel substrate, abundant woody debris, and high habitat complexity. The reach below RM 0.7 is the only significantly degraded portion of the subbasin, with degradation similar to other floodplain reaches in the Patterson Creek Basin. Canyon Creek is primarily a moderate-gradient, moderately contained channel type, with intermittent areas of palustrine channels.
- **Subbasin 4:** Subbasin 4 is the second largest of the subbasins in terms of stream miles. The upper stream channels are in good condition, with abundant cover and LWD, but the lower reaches pass through livestock pastures and have been degraded similarly to other floodplain channel reaches in the Patterson Creek Basin (King County SWM 1993). Subbasin 4 is an important subbasin of the Patterson Creek Basin for its miles of stream spawning and rearing habitat. However, the integrity of the habitat has been impaired by fish passage barriers and degradation of the riparian area.
- **Subbasin 5:** The stream banks of Patterson Creek in this subbasin are dominated by agriculture and pastureland, with little or no riparian vegetation (King County SWM 1993). Channelization, deepening, dredging, and livestock trampling have severely degraded the channel and stream banks through this reach. The scarcity of LWD contributes to low habitat complexity and poor channel conditions. Tributary 0381's drainage area remains a forested watershed, but fish passage barriers limit the use of habitat (Haring 2002). In Subbasin 5, the mainstem of Patterson Creek is a floodplain channel type, and Tributary 0381 is a moderate-gradient, mixed-control channel type.

In addition, for each subbasin, a systematic inventory and analysis of stream conditions and drainage systems was conducted, covering resources and problems under current and future land uses. Each subbasin was ranked using the methods of the Center for Watershed Protection's *Watershed Vulnerability Analysis*. The eight-step analysis provides the following information for each subbasin:

- An initial subbasin classification, based solely on impervious area
- A final subbasin classification, based on more detailed assessments of conditions along the stream corridor and throughout the subbasin
- A ranking of subbasin vulnerability to impacts from future changes

This assessment is described in more detail in Chapter 8 and Appendix F.

## PROJECTS RECOMMENDED FOR DETAILED WRITE-UP

Based on the subbasin analysis and several review meetings with King County Staff, 22 potential projects were identified to help restore natural flows and sediment regimes, restore fish passage and habitat by reconnecting fragmented environments, and reduce risks to health, safety and aquatic habitat. The projects were prioritized, and 10 were selected for detailed write-up. Feasibility sketches and cost estimates were prepared for each project and are included in Appendix A.

## BASINWIDE RECOMMENDATIONS

In addition to the 10 projects selected for detailed write-up, the following basinwide recommendations are intended to improve and protect the overall quality of the Patterson Creek Basin:

- **BW-1—Remove Fish Passage Barriers:** Improving fish passage conditions within the basin is critical to restoring fisheries habitat and making the available salmon spawning habitat in the basin accessible. The Water Resource Inventory Area (WRIA) 7 Limiting Factors Analysis report (Haring 2002) indicated that there are many impassable culverts in the basin (22 of 38 culverts). Modifying or replacing these culverts would increase the accessibility of spawning habitat in the basin and broaden the salmonid distribution within the basin.
- **BW-2—Riparian Habitat Restoration:** Improving the riparian habitat of the Patterson Creek Basin would directly improve the salmonid habitat by providing cover, streambank stability, stream temperature control, production of fish prey (terrestrial insects), and long-term recruitment of large woody debris (LWD). Since riparian habitat impairment is widespread in Patterson Creek Basin, the prescriptions described below should be implemented where applicable. This restoration action is most applicable in subbasins 2 and 5, where long expanses of the riparian habitat have been removed. Implementation of agricultural/grazing best management practices would also benefit subbasin 4.
- **BW-3—Protect/restore natural hydrology:** Further development of the Patterson Creek Basin may alter the hydrology of the basin. It is necessary to maintain natural hydrology in Patterson Creek to prevent altering in-

channel hydraulics, which could lead to channel incision, erosion, and transport of sediment to downstream low gradient reaches. This basinwide recommendation would include strict adherence to the most current surface water drainage requirements.

- **BW-4—Habitat preservation and acquisition:** The Patterson Creek Basin is a complex basin with a diversity of habitats that are essential for salmonid spawning and rearing that vary from good to poor condition. Due to the threat of development in the basin, the acquisition of property may be necessary to protect areas of existing high quality habitat and improve degraded reaches. These acquisitions should focus on the areas of high priority discussed within this report.
- **BW-5—Addition of LWD:** Large woody debris is an important component to fish habitat and stream function (Reeves et al. 1991). Much of the Patterson Creek Basin is deficient or void of LWD. Therefore, LWD should be added to Patterson Creek and its tributaries where applicable and possible (private ownership will limit where this activity may occur).

## **KING COUNTY WORKSHOPS**

Following the completion of the Draft Patterson Creek Rural Reconnaissance Characterization Reports, the findings including the CIP and basinwide recommendations were reviewed by an expanded team of King County Staff. Comments from this review were discussed at two workshops with the expanded team and consultants. Based upon these workshops, modifications were made to the report including the recommended CIP list.

## **RECOMMENDED CAPITAL PROJECTS AND PROGRAMS**

Based on the subbasin analysis and two King County workshops, 32 action items (shown in Tables S-1 and S-2) were identified to restore natural flows, sediment regimes, restore fish passage/habitat and reduce risks to public health and safety. These action items consisted of CIP projects, right-of-way acquisition, studies, and programs. County staff ranked these projects as high, medium, and low. Ranking criteria used consisted of the following: 1) Ecological Significance, 2) Threat to Life, Limb, and Property, and 3) Project Efficacy (what is the likelihood of project success). The details of this ranking criterion is shown in Figure 9-2.

TABLE S-1 RECOMMENDED CIP PROJECTS				
Rank	Project #	Project Name	Estimated Cost	Funding Program
1	<b>5</b>	NE 52nd Place culvert replacement	\$495,400	RDP
2	<b>6</b>	SE 40th Place culvert replacement	\$150,000	RDP
3	<b>12B</b>	Riparian Corridor restoration - Isaacson	< \$150,000	SHARP
4	<b>12A</b>	Riparian Corridor restoration - Novack	< \$100,000	SHARP
5	<b>12C</b>	Riparian Corridor restoration - Condit	< \$100,000 <sup>1</sup>	SHARP
6	<b>12D</b>	Riparian Corridor restoration - Members' Club	< \$200,000	SHARP
7	<b>4</b>	Pond Berm on Canyon Ck Trib	\$379,700	RDP
8	<b>12E</b>	Riparian Corridor restoration - APD	< \$100,000 <sup>2</sup>	SHARP
9	<b>10</b>	NE 67th Place culvert replacement	< \$100,000	KCDOT
10	<b>17</b>	NE 40th and 45 Street culvert	\$150,000	RDP
11	<b>9</b>	Upper Patterson Creek at SR 202	\$177,000	WSDOT
12	<b>15</b>	Patterson Tributary 0377	\$75,000	RDP
13	<b>7</b>	Remove Access road (NE 36th Place) and culvert	> \$600,000	RDP
14	<b>13</b>	4' x 2' Culvert Under SR 202	> \$275,000	WSDOT
15	<b>3</b>	Hirsovescu/Dry Creek Fish Passage	\$188,000	RDP
16	<b>8</b>	Erosion along Dry Creek at Ames Lake Rd	> \$600,000	RDP
17	<b>1B</b>	Patterson Creek Access Issues - E. Main and NE 4th	> \$500,000	RDP
18	<b>1A</b>	Patterson Creek Access Issues - Provide emergency access to residences served by 268th and 264th	> \$500,000	RDP
19	<b>1C</b>	Patterson Creek Access Issues - Condit and Crittenden Access	> \$50,000 <sup>3</sup>	RDP
20	<b>2</b>	Flooding Near Endeavour School and Issaquah-Fall City Rd.	\$419,700	KCDOT
21	<b>11</b>	Restoration of Tributary to Canyon Creek	> \$275,000	RDP
22	<b>14</b>	Ponding on Union Hill Road	< \$75,000 <sup>4</sup>	KCDOT
			< \$500,000 <sup>5</sup>	
	<b>18</b>	Monte Lindsey Dam <sup>6</sup>		

<sup>1</sup> Opportunity for cost sharing with landowner.

<sup>2</sup> Will not be an extensive planting event. Will only plan a narrow buffer area near stream.

<sup>3</sup> Potentially a no cost solution to the County.

<sup>4</sup> To clean.

<sup>5</sup> To elevate the road.

<sup>6</sup> Action has already been taken by County on this project.

TABLE S-2  
ACQUISITION RECOMMENDATIONS

Acquisition Projects Rank	Projects	Project Name	Estimated Cost	Funding Program
1	<b>16C</b>	Connection Piece by Korn Property	\$1,500,000	Grant/CFT
2	<b>16B</b>	Tributary 0383	\$2,500,000 <sup>7</sup>	Grant/CFT
3	<b>16D</b>	Korn Reach extension	> \$1,500,000	Grant/CFT
4	<b>16A</b>	Stevlingson property	\$419,400	Grant/CFT
5	<b>16E</b>	Canyon Creek	> \$3,000,000 <sup>8</sup>	Grant/CFT
6	<b>19D</b>	Mitchell Hill Acq	> \$4,800,000	Grant/CFT
7	<b>19B</b>	DNR Lands in Subbasin 2B	> \$6,400,000	Grant/CFT
8	<b>19C</b>	Laird Norton Trust properties	> \$6,400,000	Grant/CFT
9	<b>19A</b>	DNR Lands in Subbasin 2A	> \$3,200,000	Grant/CFT

## FURTHER ACTIONS NEEDED

### Coordination with Other Agencies

The needed improvements and protections cannot be done by one agency, jurisdiction, or citizen groups. King County should continue to encourage and facilitate multi-jurisdictional efforts and continue to bring issues to light. It is recommended that a meeting be held with all involved agencies, jurisdictions, and citizen groups to develop a comprehensive plan to start implementing the recommended projects. Some of the key agencies and groups are: King County, the Washington Department of Fish and Wildlife, the Washington Department of Ecology, Washington Department of Transportation, and Patterson Creek Flood Control Zone District.

### Updates to Characterization Report

This report was an analysis of existing data. More fieldwork to identify specific habitat needs is needed to improve the habitat assessment. Also, the hydrology model can be improved by calibrating the model to local precipitation data and surveying channel characteristics (cross-sections, slope, existing drainage structures) for each of the subbasins.

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<sup>7</sup> Could be lower if we are able to employ lower cost measures such as conservation easements. (Needs to be assessed.)

<sup>8</sup> Could be lower if we are able to employ lower cost measures such as conservation easements. (Needs to be assessed.)