

## CHAPTER 13

### WATERSHED PLANNING AND ANALYSIS: SOUTH CORVALLIS

#### 13.1 INTRODUCTION

The South Corvallis watershed lies on either side of Highway 99, south of the Marys River. It is flat with poorly drained soils, reflecting the area's origins as alluvial terraces formed by the Willamette River. The watershed's lack of topographic relief—most slopes have a less than 2 percent gradient—has resulted in a series of small, unconnected drainage basins. Areas west of Highway 99 drain to Marys River, while areas east of Highway 99 drain to Booneville Slough and the Willamette River.

South Corvallis has a long history of flooding problems, most recently in February 1996, as shown in Figure 13-2, Photo 1. The South Corvallis Drainage Master Plan (SCDMP) was completed in 1996 (KCM, 1998). The study area for the SCDMP focused on the areas south of Goodnight Avenue. The SCDMP reported the existing land uses to be mainly farming, with future uses focused on light industrial. The existing airport land use will remain as airport land in the future.

Two drainage basins were examined to provide recommendations for areas not addressed by the SCDMP: Mill Race and Goodnight Avenue. The 350-acre Mill Race drainage basin presently contains a mixture of residential, industrial, and undeveloped property. The City's Comprehensive Plan zoning indicates that, in the future, undeveloped property will be converted to commercial use with some areas reserved as open space.

Existing land use in the 300 acres of the Goodnight Avenue drainage basin consists mainly of residential and undeveloped properties. This area is expected to be developed almost completely as residential and at a somewhat higher density than at present. A portion of this basin overlaps with the SCDMP, specifically the area to the south of Goodnight Avenue. The focus of the SWMP is on the piped system in Goodnight Avenue. The recommendations provided in the SCDMP were assumed to be implemented for the future scenario.

Several smaller areas in South Corvallis that are within the Urban Growth Boundary (UGB) and that drain directly to the Willamette or Marys River were considered to be small basins that did not require detailed modeling or recommendations. Flooding and drainage characteristics in these basins are typically a function of flooding of the Willamette and Marys Rivers. Ryan Creek is an example of one of these small basins. This seasonal creek is an established drainageway with sufficient capacity based on the 1981 Corvallis Drainage Master Plan. The seasonal creeks associated with these smaller basins should be managed based on the policy recommendations for Uplands Natural Resources and Stream System policy sections in Chapter 5.

#### 13.2 WATERSHED FINDINGS

Input on watershed conditions was obtained by collecting public comments at open houses, working with City staff to identify maintenance and operation problems, and by modeling the conveyance system for existing and future build-out scenarios. This information was compiled for the two

drainage basins mentioned above. A map of the South Corvallis watershed, shown in Figure 13-1, identifies the location of the basins within the UGB and identifies some of the major observations made during the watershed study.

Both drainage basins are flat, as is the rest of South Corvallis. A portion of the Goodnight Avenue drainage basin is served by a piped collection system with a small detention pond incorporated into the system, as shown in Figure 13-2, Photo 2. A manmade wetland is located to the south between Goodnight Avenue and Centerpointe Drive. New development to the east and south will add considerable impervious area to what has previously been open space, and will also require expansion of the area's drainage system to handle the resulting increased flows. Assuming SCDMP improvements are made, one section of pipe in Goodnight Avenue would still be undersized for the 10-year storm event. If the SCDMP improvements are not made, the system is overloaded by runoff from the currently undeveloped properties. City Flood Mitigation Projects (1999 and 2000) have attempted to reduce the flooding potential and extent by improving elements of the surface drainage system. These minor improvements have helped drainage in the area; however, the area's chronic flooding will have to be addressed by the SCDMP's recommendations.

The Mill Race drainage basin is a relatively large channel connecting Marys River to the Willamette River. Flooding has been reported on numerous occasions when the Marys and Willamette Rivers are in flood stage and flows overrun the channel. Analysis shows that flooding is not caused by local drainage, although erosion of the channel and banks is a common water quality problem.

Most of the stream reaches have a tree canopy that provides shade. The downstream reach of the Mill Race drainage basin lacks a tree canopy, but does contain numerous small willows that limit channel erosion, as shown in Figure 13-2, Photo 3. The reaches farther upstream have better shade but more problems with channel erosion. During summer months, water in the channel is not hydrologically connected to either the Willamette or the Marys Rivers. The reaches have alternate sections of dry channel, as shown in Figure 13-2, Photo 4, with stagnant pools of water, as shown in Figure 13-2, Photo 5. The upstream end of the Mill Race drainage basin has large trees for shade and woody debris in the channel. It also has erosion problems and a culvert that is almost completely filled in with sediment, as shown in Figure 13-2, Photo 6.

The problem areas identified in the following sections are shown in Figure 13-3.

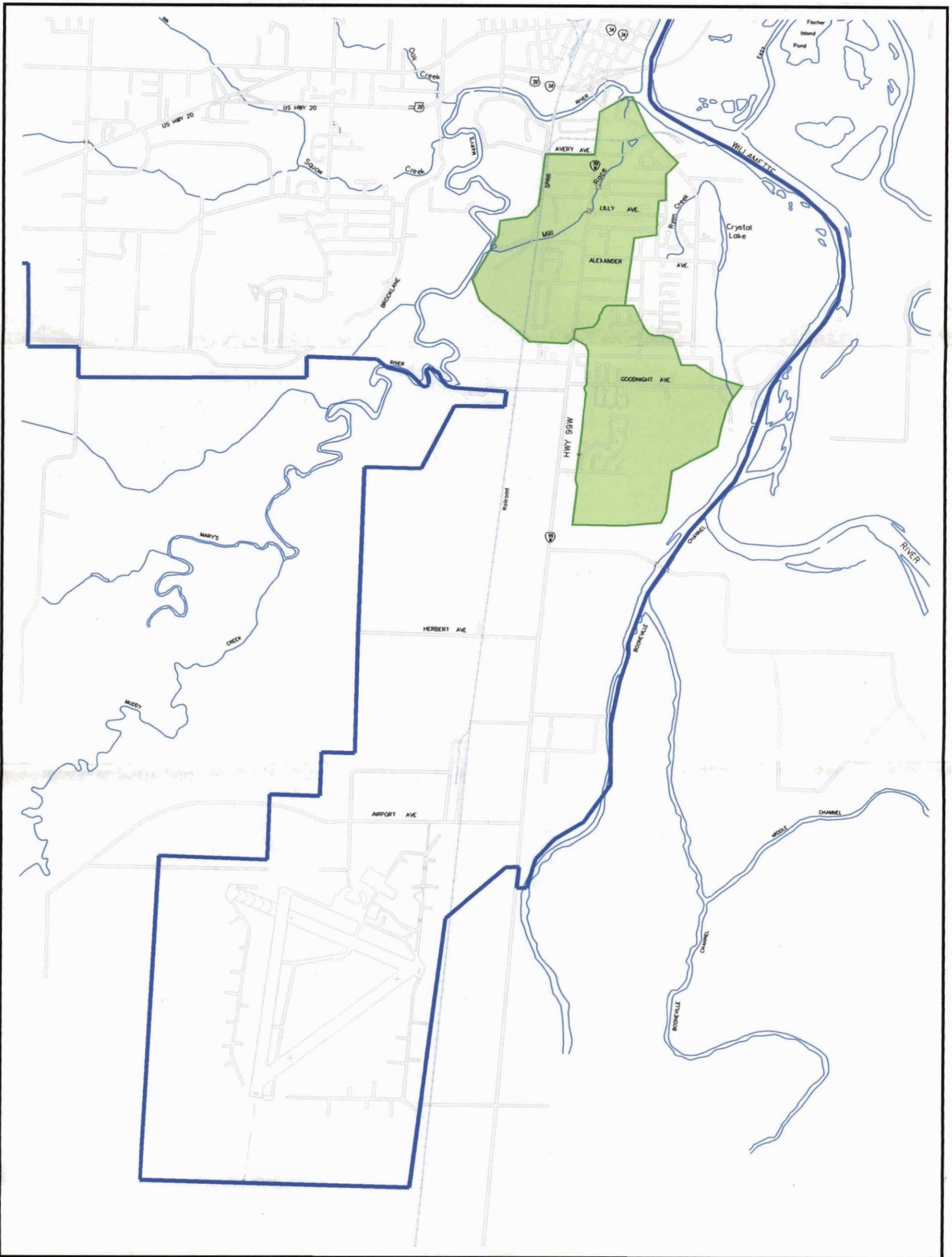
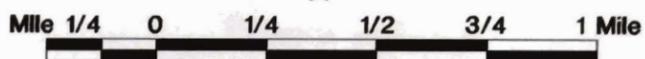


Figure 13-1 South Corvallis Study Areas

**LEGEND**

-  Urban Growth Area
-  Study Basins



Public Works  
Department

**Figure 13-2. Watershed Photos**

Photo 1. 1996 flooding in Avery Park.



Photo 2. Detention pond near Goodnight Avenue.



Photo 3. Channel upstream of Crystal Lake Drive.



Photo 4. Channel upstream of Atwood Avenue.

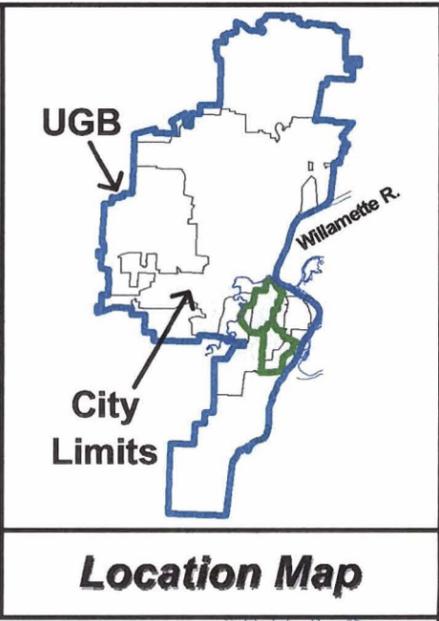
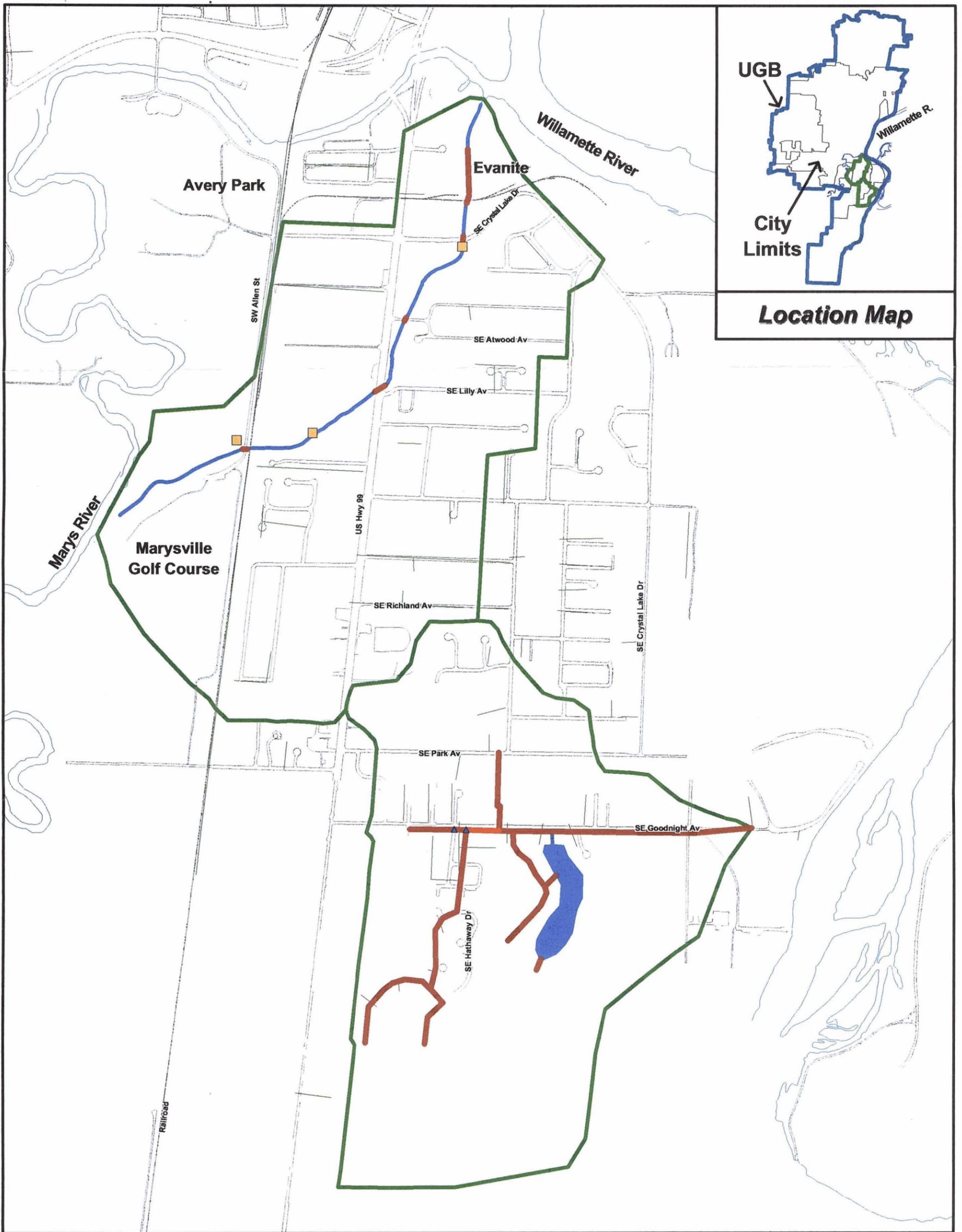


Photo 5. Stagnant water in the Mill Race upstream of Hwy 99.



Photo 6. Culvert at Allen Street filled with sediment.

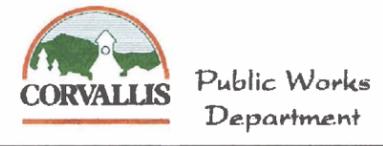
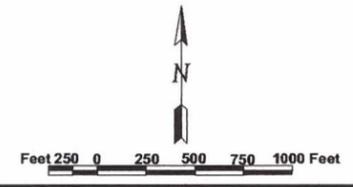




**Figure 13-3 South Corvallis Problem Areas**

**LEGEND**

- Pipes/Bridges
- Channels
- Basin Boundary
- Reported Problems (recorded at open house)
- Surcharged Manholes (10-year future storm)
- Flooded Manholes (10-year future storm)
- High Velocity Areas (> 4 fps, 2-year future storm)
- Undersized Conduits (10-year future storm)
- Undersized Channels (10-year future storm)



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report/figures/final/fig13-3-wor, November 10, 2000, base data from City of Corvallis GIS Department

### 13.2.1 Public Comments

Public input into the watershed planning process has been encouraged and facilitated through a number of public meetings. The first meeting for the South Corvallis watershed was held in conjunction with meetings for the Oak Creek and Marys River watersheds on June 17, 1999, at the LaSells Stewart Center. During the meeting and a subsequent meeting, held September 30, 1999, residents were encouraged to share their knowledge of problem areas and to identify opportunities for improving the health of the South Corvallis watershed. Some general comments offered at the public meetings included:

- “Is there information on subsurface, underground geology? Substrate, etc.?”
- Resident was concerned about her well water quality (shallow well – 40 feet) on Allen Street. “Her neighbor’s water well, her bed sheets are white after being washed.”
- Another resident on Allen Street. “His 27 foot [well] went dry after 40 years. Now well is 57 feet deep. His neighbor’s is 200 feet deep. Well depth necessary to reach water varies highly.”
- “Are we looking at subsurface (groundwater) linkages with the stream from a fish habitat perspective?”
- “Are we modeling areas to west of Highway 99 (South Corvallis)?” [City staff responded that technical work was done with the South Corvallis Drainage Master Plan.]
- “Since South Corvallis has a larger than average acreage of land in the floodplain, will we do analysis of what would happen if we fill all those areas?”
- “Are Beaver Creek and Muddy Creek being considered? i.e., can we look at the entire stream and watershed to go beyond the political boundaries (into the County, etc.)?”
- “Somebody ditched their property into Mill Race. It was separate from development. We need standards (apart from development) triggered to set minimum parameters outside of development.”

Public comments specific to the Mill Race and Goodnight Avenue drainage basins are summarized in Section 13.2.5.

### 13.2.2 City Staff Reports

City Engineering and Utilities Operations staff is familiar with most of the South Corvallis watershed through management of public improvements and field experience in the area. They provided input into the planning process by identifying known problem areas, recommending areas for possible stormwater improvements, and recounting the extent and duration of flooding during major storm events. The February 1996 storm caused flooding in several areas of South Corvallis, including Avery Park, along Crystal Lake Drive, and near the Marysville Golf Course.

### 13.2.3 Field Study Observations

No detailed field investigations were conducted for the South Corvallis watershed. Channel assessments were limited to areas adjacent to road crossings. Some information regarding the drainage system was collected in 1999 as part of the City's 1999/2000 Flood Mitigation Project.

### 13.2.4 Modeling Results

A computer model for the Mill Race and Goodnight Avenue drainage basins identified the hydraulic capacity and projected flows in the conveyance systems for existing and future build-out scenarios. The model based the existing scenarios on watershed conditions at the time of modeling (spring 2000). Future conditions were based on full development of the watershed (build-out) as identified in the City's Comprehensive Plan. A full range of storm events was modeled for the existing and future scenarios, including the 2-, 10-, 25-, and 100-year storm events.

The model showed that only one section of pipe in the Goodnight Avenue drainage basin is undersized for the City's 10-year design storm. The capacity of many pipes is limited by their flat slopes, but no pipes were identified as a source of flooding. None of the Mill Race drainage basin culverts was shown to be undersized for flows originating from the surrounding area. Overflows from the Marys and Willamette Rivers were not modeled, since the flooding problems associated with the two rivers is beyond the scope of this plan. A complete summary of all modeled segments is provided in Appendix C.

**Table 13-1. Modeled Flow for Undersized Hydraulic Structures within the South Corvallis Watershed, cubic feet per second (cfs)**

Reach/Location/Model segment	Full pipe or channel capacity	10-year storm flows		Flooding predicted by model	Flooding reported by staff or public
		Existing	Future		
Goodnight Avenue/Goodnight Avenue/GDN045	9.2	11.8	11.7 <sup>1</sup>	No	No

<sup>1</sup> The apparent decrease in flow is within the model tolerance. The higher flow should be used for design purposes.

The hydrologic/hydraulic model also estimated flow velocities in channel segments to determine areas at risk for channel or streambank erosion. Stream velocities in excess of 4 feet per second (fps) may cause erosion of the streambank or streambed during the 2-year storm event—the storm size most responsible for determining the channel configuration. None of the velocities in the Mill Race or Goodnight Avenue drainage basin systems was high enough to cause channel erosion.

### 13.2.5 Stream Reach Summaries

Information for the South Corvallis watershed applies to either the Mill Race or Goodnight Avenue drainage basins. The Mill Race drainage basin was divided into four reaches. Public comments are shown as they were recorded during public meetings. Where required, clarifications are included in parentheses.

### **Goodnight Avenue Drainage Basin**

**Public Comments:** “Concerned that development occurring on South 3<sup>rd</sup> Street that drains to Goodnight Creek has not been adequately planned to prevent impact to downstream property owners. Concerned that long-term maintenance requirements of detention facilities will be ignored by developed property owners and will impact flows into Goodnight Creek.”

During one of the field observations, the manager of the mobile home park commented: “Flooding was not a problem in the park during the last winter (1999/2000). (He felt that) City efforts downstream had been successful.” The mobile home park would like to convert the detention pond on its property to other uses.

**City Staff Reports:** Hathaway Drive was closed due to flooding during the February 1996 storm. Several bottlenecks in the system appear to exist. A 24-inch pipe along Goodnight Avenue is downstream of larger pipes. Roots have infiltrated and partially blocked a pipe along Goodnight Avenue. A diversion structure located at the south end of the mobile home park shunts flows to a detention pond and appears to be causing problems. Changes in City operation of this diversion structure have decreased flooding complaints. The detention pond at the mobile home park is a public facility located on private property, which raises access and maintenance issues.

**Field Observations:** The diversion structure located between Hathaway Drive and the mobile home park contains an orifice plate for detaining higher flows. Water backed up behind the plate is stored in the piped system and the detention pond located just to the east. As designed, the pond acts as a surge pond. The pond margins are mowed regularly and grass clippings are dumped on the banks.

**Modeling Results:** Modeling showed that the pipe along Goodnight Avenue between Deborah Place and Summerfield Drive is undersized for the 10-year design storm (existing and future). The problem pipe is 24 inches in diameter downstream of a 30-inch pipe from the south and a 24-inch pipe from the west. The pipe downstream of this section is 42 inches and is adequately sized. The pipe is shown to surcharge but not flood during the 10-year future storm event. The root blockage that is alleged to have caused past flooding problems was removed in summer/fall 2000 as part of the City’s Flood Mitigation Project. The City will monitor the performance of the conveyance system and replace the pipe if flooding occurs. No velocity problems exist in this basin.

### **Mill Race Drainage Basin – Willamette River to Evanite Culvert**

**Public Comments:** No public comments were received for this reach.

**City Staff Reports:** There is good vegetation along the stream, but the top of bank needs shade trees. This reach would be a good candidate for an adopt-a-stream program, since a lot of trash is tossed into the channel.

**Field Observations:** The BMX bike track is located in this reach.

**Modeling Results:** Modeling showed no capacity or velocity problems. Flooding along the Mill Race appears to be due to high water levels in the Marys and Willamette Rivers.

### **Mill Race Drainage Basin – Evanite Culvert to Highway 99**

Public Comments: “The change in locations of Crystal Lake Drive [1989] diked water to make flooding worse.”

City Staff Reports: Crystal Lake Drive on either side of the Mill Race drainage basin was closed due to flooding during the February 1996 storm. Since then, the culvert has been substantially increased at the Evanite factory. There is good vegetation along the stream, but the top of the bank needs shade trees. This reach would be a good candidate for the adopt-a-stream program, since a lot of trash is dumped in or along the channel.

Field Observations: The channel lacks tree cover through the lower part of the reach. Large open fields lie to the east of the Mill Race drainage basin, north and south of Crystal Lake Drive. A dense stand of young willows occupies most of the channel. The willows decrease the channel’s capacity, but also decrease the erosion problems that are common upstream. The channel banks under the Crystal Lake Drive bridge are covered with concrete, limiting erosion there. From Highway 99 to downstream of Atwood Avenue, the canopy coverage is better, with many mature trees. However, the lower streambanks show signs of erosion and the channel bottom consists of stagnant pools interrupted by stretches of dry sediment deposits during dry summer months. Very little organic material, such as woody debris, is found in this section of the channel. Three large stormwater pipes discharge to the Mill Race beneath the Highway 99 bridge. A fourth pipe discharges immediately upstream of Highway 99 on the north bank.

Modeling Results: Modeling showed no capacity or velocity problems. Flooding is attributed to high water levels in the Marys and Willamette Rivers.

### **Mill Race Drainage Basin – Highway 99 to Allen Street**

Public Comments: “Mill Race is disgustingly dirty—especially in lower flows (algae, pollutants, mosquitoes) and people dump into it. She has well water, which has lower water quality. (She lives on Allen Street).”

“Would like it (Mill Race) to be dry, when not carrying water.”

“People are dumping into Mill Race channel between railroad tracks and 3<sup>rd</sup> Street.”

City Staff Reports: Several roads in this reach had flooding problems during the February 1996 storm. Leonard Street, Pickford Street, and Wake Robin Avenue near the Marysville Golf Course all experienced high water on the roadways, as did Lilly Avenue at Highway 99. The stream corridor is very narrow in this reach and adjacent parking lots drain directly to the stream. Old tires and metal have been dumped into the stream and need to be removed. The water quality impact of runoff from the Marysville Golf Course should be considered.

Field Observations: A low spot in the channel just upstream of Highway 99 contains a long length of stagnant water with plentiful algae growth. An abundance of trash throughout this reach indicates that dumping is a problem. The stream banks show signs of lateral erosion. The outfall pipe from Marysville Golf Course discharges into the Mill Race drainage basin from under Allen Street. The

channel downstream of Allen Street is eroded toward the bottom of the banks. The channel has little natural habitat value because it lacks woody debris or vegetation.

Modeling Results: Modeling showed no capacity or velocity problems. Flooding is due to high water levels in the Marys and Willamette Rivers.

### **Mill Race Drainage Basin – Allen Street to Marys River**

Public Comments: “How important is the Mill Race in helping dissipate flow?”

City Staff Reports: This reach is outside of the city limits. It contains some good habitat that can be enhanced and/or protected.

Field Observations: The culvert under Allen Street is almost completely clogged with sediment at the downstream end; only the top one-foot remains free. The metal culvert is corroded and appears to be sagging under the road. Large trees shade the channel upstream of Allen Street. A number of logs are present along the channel bottom, representing potential fish habitat. However, the bottoms of the streambanks are eroding.

Modeling Results: Modeling showed no capacity or velocity problems, but the modeling assumed all existing pipes were clean, free flowing, and not filled with sediment. Flooding appears to be due to high water levels in the Marys and Willamette Rivers.

## **13.3 WATERSHED MANAGEMENT OPTIONS**

Watershed management options for the Mill Race and Goodnight Avenue drainage basins were developed by the consultant team based on input from public comments, City staff reports, field observations, and modeling results. Table 13-2 lists recommended options including the following:

- Establishing stream buffers and planting trees in the lower reaches of the Mill Race drainage basin to provide shade to the channel.
- Stabilizing stream banks with log structures to prevent erosion in the upper reaches of the Mill Race drainage basin.
- Replacing the culvert under Allen Street.

Developing a way to keep the Mill Race channel flowing during summer months may solve problems with water quality, erosion, and habitat. The most likely alternative would be to open up the Mill Race channel to yearlong flow from Marys River. However, the idea has its own set of issues, including temperature, TMDL requirements related to the Endangered Species Act, and water rights that would have to be addressed. A feasibility study is recommended to investigate the merits of augmenting Mill Race flow with water from the Marys River. Coordination with federal, state, and local officials will be required, as well as additional surveying and engineering analysis.

During public meetings, citizens raised concerns regarding the current recommendations in the SCDMP. Citizens were concerned that City-owned airport and industrial park lands needed to be considered for water quality recommendations. These issues have been included in Table 13-2.

Citizens also expressed concerns about the ability to use swales instead of large underground pipe systems for stormwater conveyance as recommended in the SCDMP. The recommendations included in this SWMP may result in adjustments to the recommendations in the SCDMP. The SCDMP recommendations can be reviewed for consistency with the new SWMP on a case-by-case basis.

Short- and long-term recommendations for South Corvallis are listed in Table 13-3 and 13-4, respectively. The general locations of the short-term projects are shown in Figure 13-4, while long-term projects are shown in Figure 13-5.

Table 13-2. South Corvallis Options

Reach	Abridged observations	Recommended activity	Timing
Goodnight Avenue Basin	1) Flooding was not a problem at trailer park during the last winter.	a. Monitor area to ensure changes in City operation of diversion structure remain effective.	Short-term
	2) Hathaway Drive closed to flooding during 1996.	a. Monitor to ensure removal of root blockage in pipe along Goodnight Avenue prevents flooding.	Short-term
	3) Public detention pond located on private property acting as surge pond.	a. Surge pond is not required. City should investigate other use for this land.	Long-term
Mill Race Basin – Willamette River to Evanite Culvert	1) Good reach for community stewardship. Top of bank lacks shade trees.	a. Community involvement opportunity for tree planting effort.	Short-term
Mill Race Basin – Evanite Culvert to Highway 99	1) Good reach for community stewardship. Top of bank lacks shade trees.	a. Community involvement opportunity for tree planting effort.	Short-term
	2) Large open fields lie to east of the Mill Race at Crystal Lake Drive.	a. Protect existing habitat by establishing larger stream buffer in this area.	Short-term
	3) Willows decrease channel capacity but prevent erosion.	a. Maintenance required to thin willow stands to improve passage of flows.	Short-term
	4) Erosion along lower streambanks downstream of Highway 99.	a. Stabilize with structures along banks that also provide habitat value.	Long-term
		b. Decrease flow variations along the Mill Race to control erosive forces. (See last Mill Race recommendation in table.)	Long-term
	5) Stagnant water interspersed with exposed sediment deposits.	a. Increase flow in the Mill Race during summer. (See last Mill Race recommendation in table.)	Long-term
	6) The channel lacks large, instream woody habitat downstream of Highway 99.	a. Anchor large woody debris in channel.	Long-term
Mill Race Basin – Highway 99 to Allen Street	1) Mill Race contains algae, pollutants, and mosquitoes.	a. Increase flows in the Mill Race during summer. (See last recommendation in table.)	Long-term
	2) Dumping of trash in the Mill Race.	a. Educate public on importance of water quality.	On going
	3) Several roads had problems with flooding in 1996.	a. Flooding due to high water levels in Marys and Willamette Rivers. Provide information to homeowners on flood proofing techniques for their homes.	Short-term
	4) Narrow stream corridor with parking lots draining directly to stream.	a. Develop citywide ordinances for stream buffer zones to protect instream and riparian habitat.	On going

Table 13-2. South Corvallis Options (continued)

Reach	Abridged observations	Recommended activity	Timing
		b. Develop citywide ordinances requiring treatment of parking lot runoff.	On going
	5) Stagnant water with algae.	a. Increase summertime flows through the Mill Race. (See last Mill Race recommendation in table.)	Long-term
	6) Erosion problems along lower bank throughout reach.	a. Stabilize with structures along banks that also provide habitat value.	Long-term
		b. Decrease flow variations along the Mill Race to control erosive forces. (See last Mill Race recommendation in table.)	Long-term
	7) Outfall pipe from Marysville Golf Course at Allen Street. Golf course is outside City limits.	a. Coordinate with Benton County to develop ordinances requiring chemical management plans to reduce the potential of fertilizers, herbicides, and pesticides from contaminating stormwater runoff from golf courses, parks, playgrounds, and other large, non-native grassy areas.	Short-term
	8) Channel lacking habitat, woody debris downstream of Allen Street.	a. Anchor large woody debris in channel.	Long-term
Mill Race Basin – Allen Street to Marys River	1) Reach contains good habitat that should be protected.	a. Develop citywide ordinances for stream buffer zones to protect instream and riparian habitat.	On going
	2) Culvert under Allen Street is filled with sediment and structurally failing.	a. Replace culvert.	Short-term
	3) Lower edge of streambanks are failing.	a. Work with Benton County to stabilize with structures along stream banks that also provide habitat value. These can be worked in with large woody debris already in this stream reach.	Long-term
	4) Re-connect the Mill Race to Marys River to provide summertime flows through the Mill Race.	a. Conduct feasibility study to identify regulatory (environmental and water rights) and engineering issues with reconnecting the Mill Race with Marys River.	Long-term
Airport area City-owned land	1) Do not use Dry Creek for water quality.	a. Implement citywide policies to protect stream channels.	On going
	2) Meet water quality requirements of HB1010 for all City lands in agricultural production.	a. Implement citywide policies to address water quality.	On going
	3) Implement a monitoring program for airport to address sludge application procedures.	a. Implement citywide policies to monitor stormwater quality.	On going

Table 13-3. South Corvallis Short-Term Program

Reach	Recommended activity	Capital cost (\$)	Annual O&M (\$)	Project type <sup>1</sup>
Goodnight Avenue Basin	1) Monitor to ensure changes in City operation of diversion structure remain effective.	NA	80	<input checked="" type="checkbox"/>
	2) Monitor to ensure that removal of root blockage in pipe along Goodnight Avenue prevents flooding.	NA	80	
Mill Race Basin – Willamette River to Evanite Culvert	1) Community involvement opportunity for tree planting effort.	1,600	80	Orange line
Mill Race Basin – Evanite Culvert to Highway 99	1) Community involvement opportunity for tree planting effort.	3,200	160	Orange line
	2) Protect existing habitat by establishing stream buffer and interpretive trail in this area.	12,000	600	
	3) Maintenance required to thin willow stands near Crystal Lake Drive to allow passage of flows.	NA	960	
Mill Race Basin – Highway 99 to Allen Street	3) Flooding due to high water levels in Marys and Willamette Rivers. Educate homeowners on flood proofing techniques for their homes.	20,000	NA	
	7) Coordinate with Benton County to develop ordinances requiring chemical management plans to reduce the potential of fertilizers, herbicides, and pesticides from contaminating stormwater runoff from golf courses, parks, playgrounds, and other large, non-native grassy areas.	8,000	NA	
Mill Race Basin – Allen Street to Marys River	2) Replace culvert.	9,100	455	
<b>Total</b>		<b>53,900</b>	<b>2,415</b>	

<sup>1</sup>Project types are in the Figure 13-4 map legend.

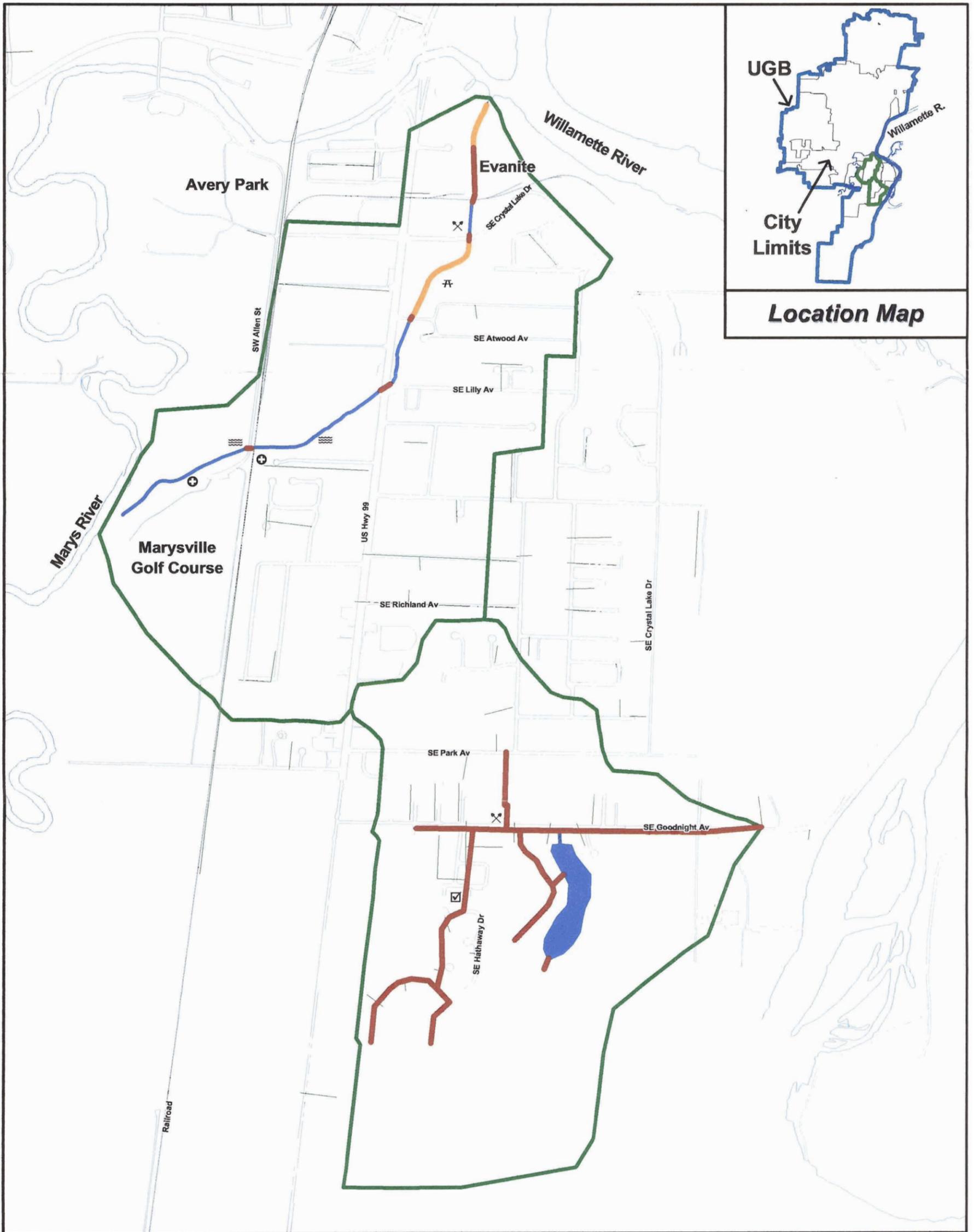
NA=Not Applicable

**Table 13-4. South Corvallis Long-Term Program**

Reach	Recommended activity	Capital cost (\$)	Annual O&M (\$)	Project type <sup>1</sup>
Goodnight Avenue Basin	3) Investigate sale to trailer court.	2,000	NA	
Mill Race Basin – Evanite Culvert to Highway 99	4) Stabilize banks with structures along banks that also provide habitat value.	63,000	3,150	Green line
	6) Anchor large woody debris in channel to improve habitat and stabilize channel bottom.	20,000	1,000	
Mill Race Basin – Highway 99 to Allen Street	6) Stabilize banks with structures that also provide habitat value.	70,000	3,500	Green line
	8) Anchor large woody debris in channel to improve habitat and stabilize channel bottom.	12,000	600	
Mill Race Basin – Allen Street to Marys River	3) Work with Benton County to stabilize with structures that also provide habitat value. These can be worked in with large woody debris already in this stream reach.	2,000	NA	Green line
	4) Conduct feasibility study to identify regulatory (environmental and water rights) and engineering issues with re-connection of the Mill Race to Marys River.	30,000	NA	
<b>Total</b>		<b>199,000</b>	<b>8,250</b>	

<sup>1</sup>Project types are in the Figure 13-5 map legend.

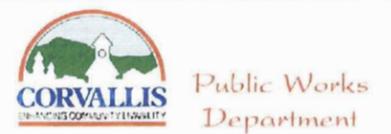
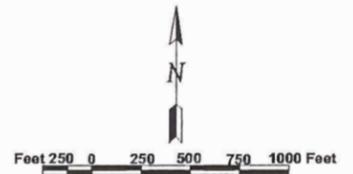
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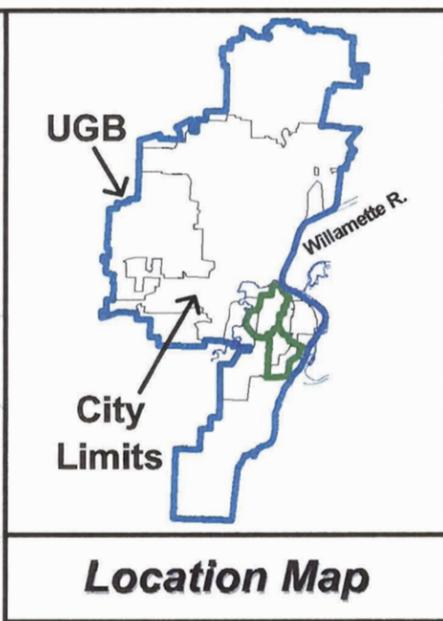
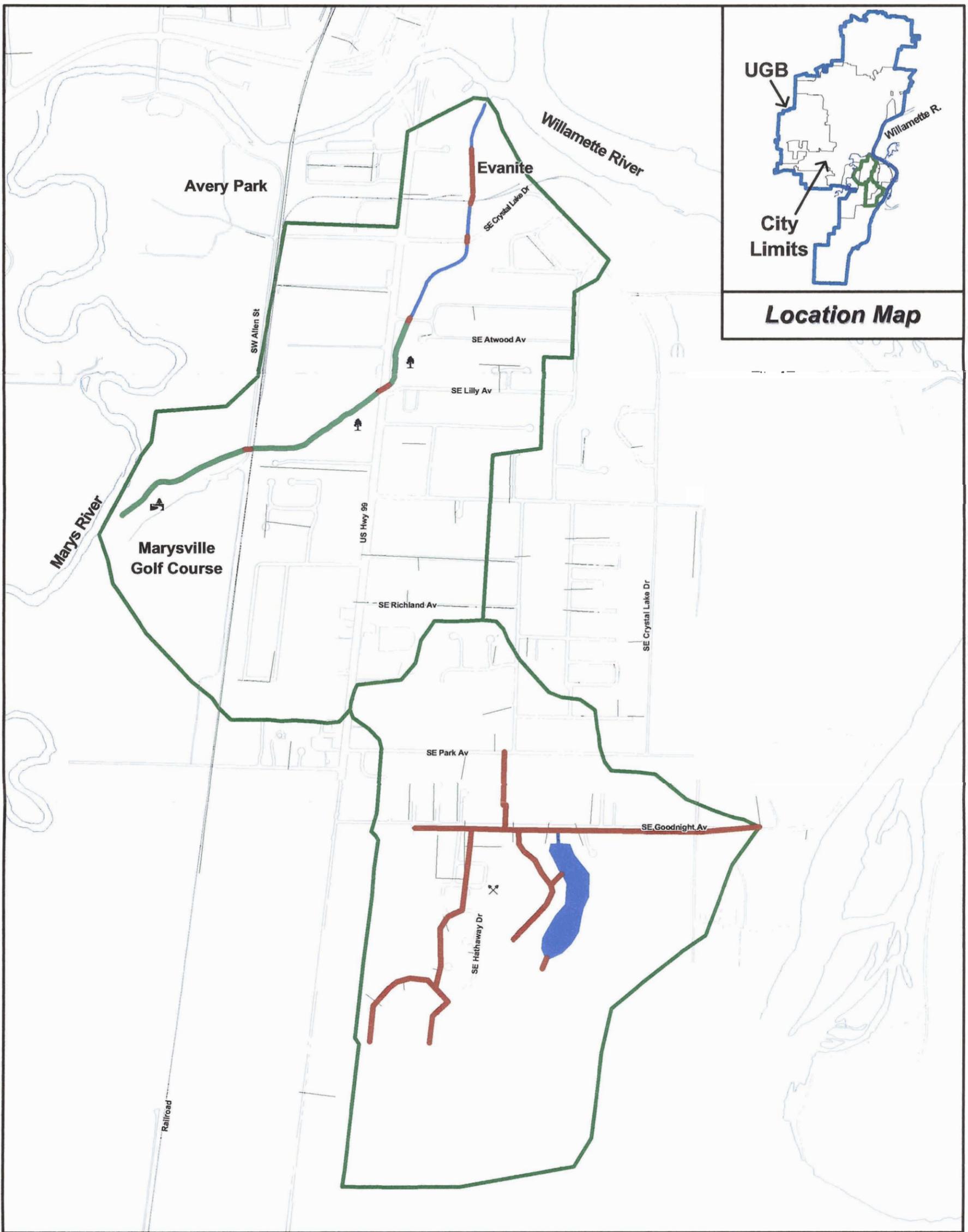


**Figure 13-4 Short Term Project Locations**

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|--|-------------------------|--|---------------------|--|-------------------------|
|  | Pipes/Bridges           |  | Channels            |  | Basin Boundary          |
|  | Bank Stabilization      |  | Canopy Revegetation |  | Channel Improvement     |
|  | Replace Pipe/Bridge     |  | Fish Passage        |  | Buffer/Riparian Habitat |
|  | Floodplain Reconnection |  | Water Quality BMP   |  | Flood BMP               |
|  | Maintenance             |  | Monitor             |  | Multi-Use Facility      |

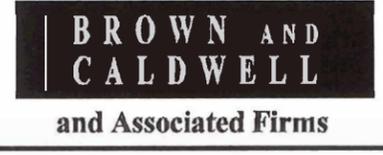
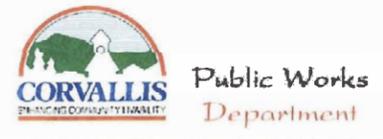
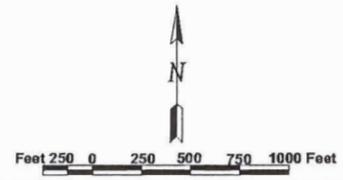




**Figure 13-5 Long Term Project Locations**

**LEGEND**

- |  |                         |  |                     |  |                         |
|--|-------------------------|--|---------------------|--|-------------------------|
|  | Pipes/Bridges           |  | Channels            |  | Basin Boundary          |
|  | Bank Stabilization      |  | Canopy Revegetation |  | Channel Improvement     |
|  | Replace Pipe/Bridge     |  | Fish Passage        |  | Buffer/Riparian Habitat |
|  | Floodplain Reconnection |  | Water Quality BMP   |  | Flood BMP               |
|  | Maintenance             |  | Monitor             |  | Multi-Use Facility      |



report/figures/final/fig13-5.wor, November 10, 2000, base data from City of Corvallis GIS Department