

# Green River Natural Area Site Management Guidelines

*September 2004*

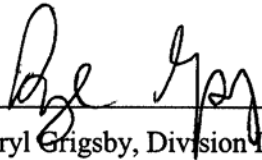


**King County**

Department of Natural Resources and Parks  
**Water and Land Resources Division**

# Green River Natural Area Site Management Guidelines

*September 2004*



Daryl Grigsby, Division Director

King County Water and Land Resources Division



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### **Office of Rural and Resource Programs**

201 South Jackson Street, Suite 600  
Seattle, WA 98104  
206-263-3723  
[dnr.metrokc.gov/natural-lands](http://dnr.metrokc.gov/natural-lands)

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# Acknowledgements

## **Planning Team:**

### King County Department of Natural Resources and Parks

Tom Beavers, Enumclaw Basin Steward, Water and Land Resources Division (WLRD)

Catherine Houck, Ecologist, WLRD

Josh Kahan, Green River Basin Steward, WLRD

Ingrid Lundin, Natural Resource Planner, WLRD

Deb Snyder, Natural Resource Planner, WLRD

Scott Snyder, Resource Coordinator, Parks and Recreation Division (PRD)

## **Reviewed By:**

### King County Department of Natural Resources and Parks

Judy Herring, Farmland Preservation Program Coordinator, Agriculture Program, WLRD

Robert Fuerstenberg, Senior Ecologist, Watershed and Ecological Assessment Team, WLRD

Andy Levesque, Senior Engineer, Flood Hazard Reduction Services, WLRD

## **Report produced by:**

Natural Resource Lands Management Program  
Office of Rural and Resource Programs  
King County Department of Natural Resources and Parks  
201 South Jackson Street, Suite 600  
Seattle, WA 98104-3855  
(206) 263-3723

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# Executive Summary

The King County Department of Natural Resources and Parks (DNRP) acquired the parcels within the natural area between 1973 and 2003 with funds from a variety of sources. The 922-acre Green River Natural Area (GRNA) is located about seven miles east of Auburn in rural King County. It is adjacent to the Green River between River Miles 40.7 (Newaukum Creek) and RM36. The site is located within the Upper Green River Agricultural Production District and is surrounded by properties zoned A-10.

Steep valley walls and a broad valley floor characterize the GRNA. Mixed forest and deciduous upland forests cover much of the valley wall, with several forested and scrub-shrub wetlands nestled in benches on the valley wall. Several of these wetlands form the headwaters of short tributaries to the Green River. Gallery cottonwood forests, deciduous forests, meadows (old pasture/agricultural fields), and forested, scrub-shrub, and emergent wetlands are common on the valley bottom.

The Middle Green River supports populations of coho, chinook, and chum salmon, steelhead, rainbow, and cutthroat trout. Bull trout have also been found. Chinook and bull trout are listed as threatened under the Endangered Species Act. The lower reaches of the wall-based streams in this area are utilized for spawning by coho and chum, and rearing for chinook, coho, chum and winter steelhead. Cutthroat trout have also been reported.

Native plant installation and invasive plant control enhancement efforts have occurred at the GRNA—Metzler and GRNA—O’Grady areas. A chum and coho habitat improvement project was constructed at GRNA—O’Grady. It involved replacing a hanging culvert with a box culvert, rebuilding 200 lineal feet of streambed, and constructing 1200 lineal feet of new streambed for O’Grady Creek.

Visitors to GRNA—O’Grady engage in activities such as walking, bicycling, nature observation and horseback riding. Visitors to GRNA—Metzler engage in fishing and river running activities such as rafting, tubing and kayaking. The other sections of the natural area have little use due to limited access. Inappropriate public use at the site has included hunting, illegal off road vehicle use, alcohol and drug consumption, sign vandalism, shooting, littering, dumping, social trail creation and horseback riding in the Green River at low water during salmon spawning.

King County Department of Natural Resource and Parks goals for all ecological lands are to conserve and enhance the site’s ecological value and support appropriate public use that does not harm ecological resources. The following recommendations have been made for the site.

- complete a biological assessment to improve understanding of the site's ecological characteristics
- fund a restoration study/plan for the Middle Green River Reach to identify preferred habitat enhancement alternatives in this reach based on ecological and landscape principles
- allow the current level of passive recreation opportunities.
- monitor and control visitor impacts on the ecological values of the site
- monitor the site for encroachment, dumping, and other trash and respond as necessary
- close social trails and add a portable toilet during the summer at GRNA—Metzler
- control noxious weeds
- maintain and monitor enhancement projects
- design and implement the Lower Newaukum Enhancement Project
- coordinate with the Corps on Ecosystem Restoration Projects scheduled in the vicinity
- improve access point and natural area boundary signage
- research options for conserving ecological values on the Green River Landing parcels

# Green River Natural Area Site Management Guidelines

## Introduction

Green River Natural Area (GRNA) is a King County Department of Natural Resources and Parks (DNRP) Ecological Land. Ecological Lands are a category of Water and Land Resource Division (WLRD) properties managed for the protection of their ecological value. Appropriate public access and interpretive opportunities are accommodated on these sites where they do not harm the ecological value of the site.

This document provides general property information, a description of existing site conditions, a chronology of land management actions, and a list of management objectives and recommendations for the Green River Natural Area. Site management guidelines are developed using guidance established in *The King County Water and Land Resources Ecological Lands Handbook* (King County 2003a).

## Part 1. General Property Information

The Green River Natural Area borders the Green River in rural south King County between RM 40.7 (Newaukum Creek) and RM 36, east of Auburn, WA. (Refer to Figure 1 for a vicinity map.) It extends just north of the edge of the Enumclaw Plateau, and is about seven miles east of Auburn along State Route 164 and roughly six miles northwest of Enumclaw. The natural area is comprised of the former Metzler, O'Grady and Green River Waterway Parks. The property is within the Upper Green River Agricultural Production District.

**Table 1. Green River Natural Area general information.**

<b>Best Available Address</b>	Metzler: 18737 Green Valley Rd E, Auburn; O'Grady: SE 364th St and 180th Ave SE, Auburn
<b>Thomas Guide Map</b>	Page 776 and 777
<b>Legal Description</b>	Sections 19,29,30,31, Township 21 N, Range 6E, W.M.; Sections 25, 26, 35 Township 21 N, Range 5E, W.M.
<b>Acreage</b>	921.94
<b>Drainage Basin</b>	Middle Green River and/or Newaukum Creek
<b>WRIA</b>	9
<b>Council District</b>	9
<b>King County Sensitive Areas</b>	100-year floodplain, wetlands, erosion, landslide, and seismic hazards; severe and moderate channel migration zones

**Table 2. Green River Natural Area parcel information.**

Parcel Number	Acres*	Purchase Date	Ownership type/price	Other Names	Zoning	Funding Source
Green River Natural Area—O’Grady						
3021069001	96.72+	6/1/1977	Owned in Fee \$500,000	O’Grady Park	A-10 APD	General Fund (Cash plus trade**)
3021069007	42.03					
3021069019	41.3					
**The documentation on this exchange is unclear. It is possible that this property was valued at \$500,000 at the time of the exchange. It is possible that the value of the traded property was \$500,000. And it is possible that the cash part of the trade agreement was \$500,000. Regardless, any funds used were general funds.						
Green River Natural Area—Metzler						
3021069001	88.83+	3/27/1973	Owned in Fee \$113,000	Metzler Park; East Green River III	A-10 APD	IAC project #70-077A (\$56,500 HUD, \$28,250 Outdoor Rec Account); Forward Thrust (\$28,250)
1921069132	0.2+	3/27/1973	Access easement \$1	Metzler Park; East Green River III	A-10 APD	unknown
3021069012	20.3	9/9/2003	Owned in fee \$15,000	Metzler side channel;Nelson, Baken, Houck	A-10 APD	SRFB Project 001841 (83.33%) matched with KC SWM CIP funds (16.64%)
Green River Natural Area—Other						
2921069090	3.22	10/9/1996	Owned in Fee \$55,000	Hauge - Newaukum Parcel; Green River Basin WW; B-2 and B-4	A-10 APD	Waterways 2000 Fund #352406
7327710100	6.37	4/18/2003	Owned in Fee \$69,000	Plemmons	A-10 APD	SRFB Project # Z11293 (84.96 %) matched with KC SWM CIP and KCD funds

Parcel Number	Acres*	Purchase Date	Ownership type/price	Other Names	Zoning	Funding Source
2921069091	20.15	8/2/1995	Owned in fee \$60,000	WRECO – Newaukum Parcel; Green River Landing Homeowners Association.	A-10 APD	Waterways 2000 Fund # 352406
3021069022	20.45	7/1/1995	Owned in fee \$ 215,000	O’Grady A8 A9	A-10 APD	Waterways 2000 Fund # 352406
3021069032	20.55					
3021069016	19.44	9/1/1995	Owned in Fee	Big/South Valley	A-10 APD	Waterways 2000 Fund # 352406
3021069018	19.22					
3021069021	18.24					
3021069025	16.89					
3021069028	17.62					
3021069029	19.22					
3021069030	19.26					
3021069031	24.50					
2521059022	19.64+					
2521059068	17.98+	9/26/1995				
2521059069	33.17+					
3121069001	39.19+	10/1/1995	Owned in Fee \$255,000	Sedenquist A24	A-10	Waterways 2000 Fund # 352406
2621059025	8.25	10/17/1995	Owned in Fee \$140,000	Koster	A-10 APD	Waterways 2000 Fund # 352406
2621059055	6.32					
2621059056	5.34					
2621059057	5.88					
2621059027	55.84	12/29/1995	Owned in Fee \$132, 400	Wenger	A-10 APD	Waterways 2000 Fund # 352406
2621059043	0.38					
3521059044	2.49					
2621059007	6.5	1/9/1996	Owned in Fee \$117,600	Sedenquist A12 A13	A-10 APD	Waterways 2000 Fund # 352406
2621059029	63.55					
2521059038	25.68	4/2/1996	Owned in Fee \$275,000	Sedenquist A10 A11	A-10 APD	Waterways 2000 Fund # 352406
2521059039	21.97					
2921069006	20.25	10/14/1997	Owned in Fee \$562,150	Green River Landing; Weyerhaeuser Real Estate Company;WRECO	A-10 APD	Waterways 2000 Fund # 352406
2921069095	22.28					
2921069096	21.25					
2921069097	21.81					
3121069024	9.66	10/15/1997	Owned in Fee \$75,000	Bietz	A-10 APD	Waterways 2000 Fund # 352406

\*All acreage taken from the King County Assessor’s Property Records except for those marked with +. Acreage marked with + was taken from King County DNRP GIS calculations.

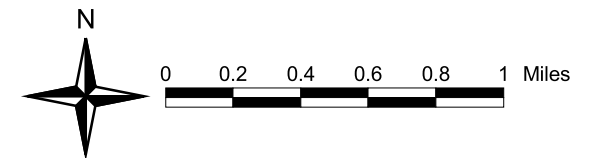


# Figure 1

## Green River Natural Area

### Vicinity Map

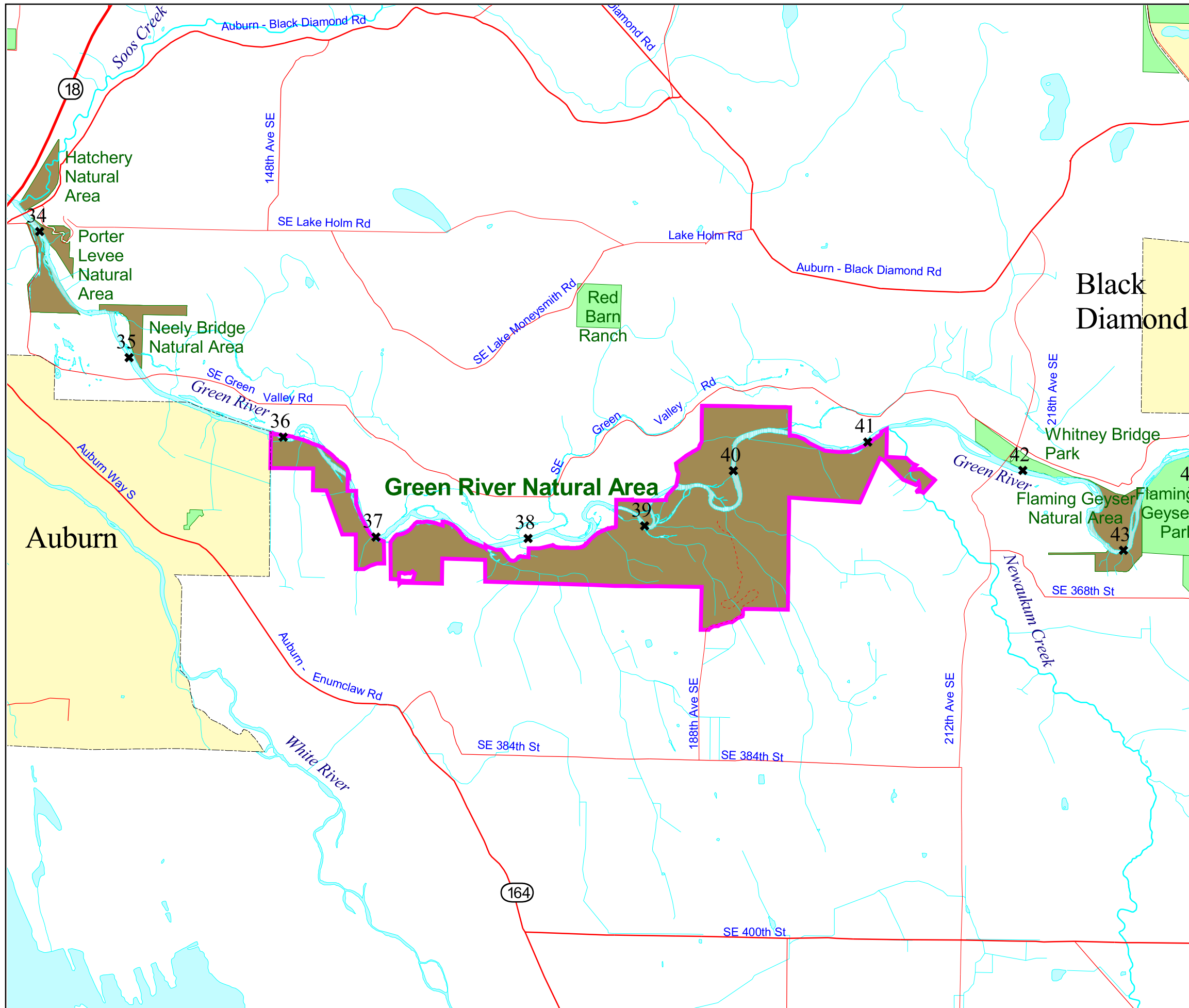
- ✕ River Miles
- Site Boundary
- Natural Areas
- Parks
- Cities



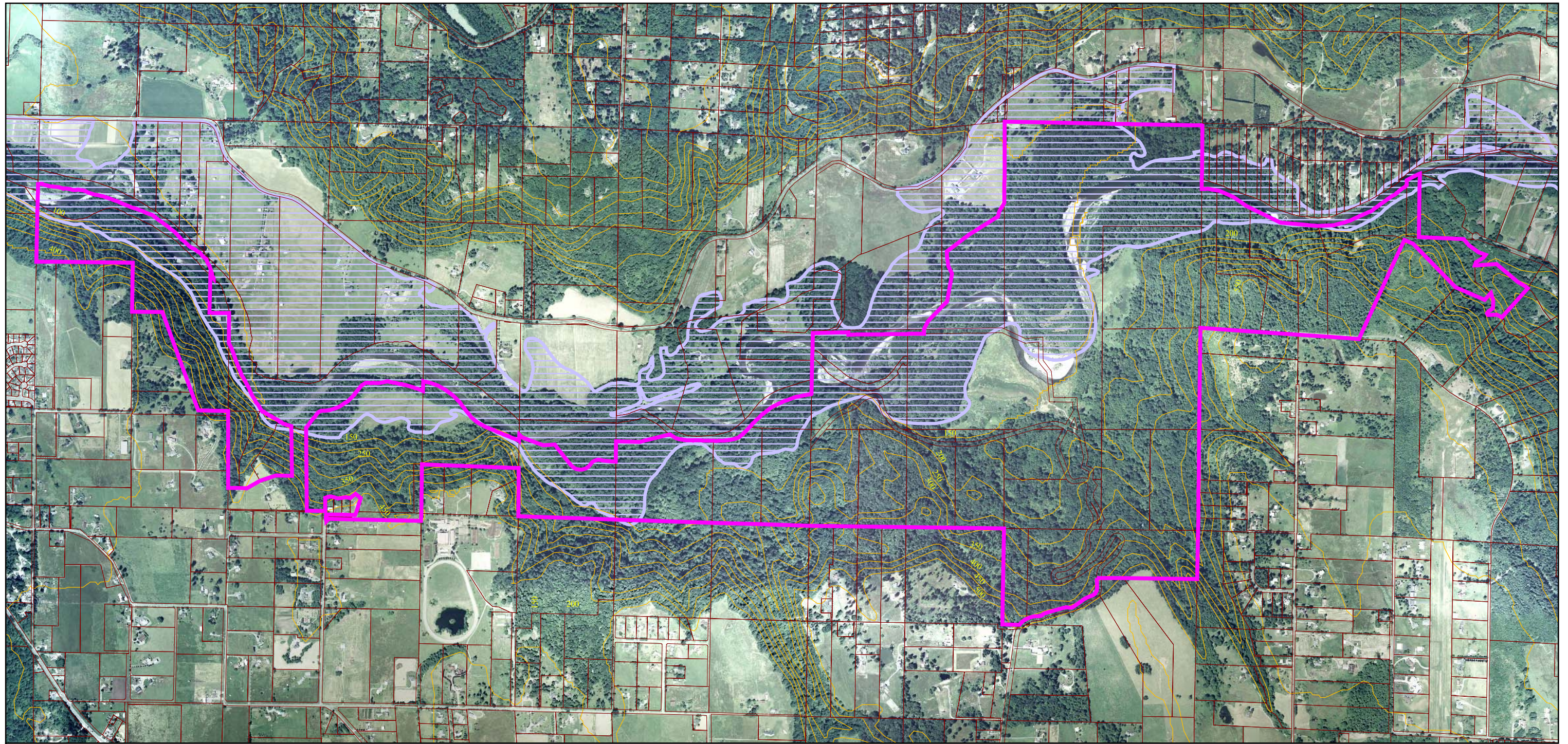
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January 14, 2003

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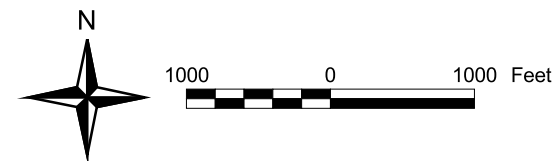


# Figure 2

## Green River Natural Area

### Existing Conditions Map 1

- Site Boundary
- Parcels
- Contours (50 foot)
- 100 Year Floodplain

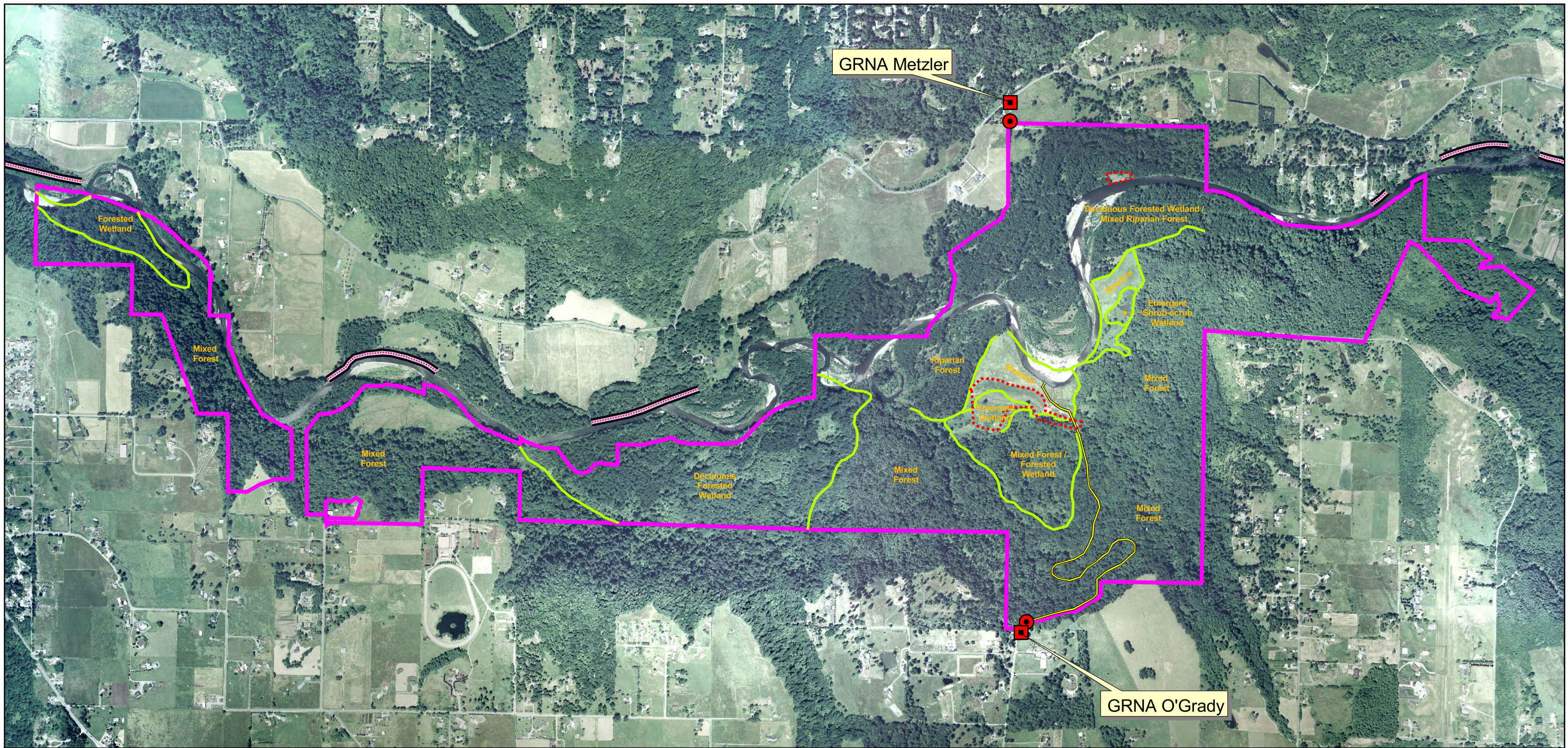


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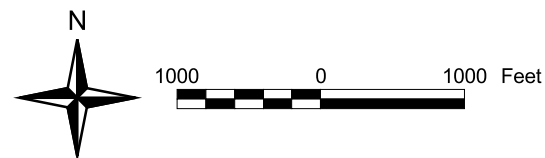
# Figure 3

## Green River Natural Area

### Existing Conditions Map 2

- Site Boundary
- Vegetation Cover
- ⋯ Restoration Areas
- ≡ River Facilities

- Entry Sign
- Access Point
- ~ Trails



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## Part 2. Acquisition, Funding Source and Deed Restrictions

The Green River Natural Area is comprised of parcels purchased with funds obtained from a variety of sources.

### Green River Natural Area – O’Grady

King County originally acquired the former O’Grady Park parcels in the late 1970s through a trade plus cash arrangement for the county-owned Queen Anne Hill Annex property on Crockett Street (Jones and Jones 1990). In 1987, the King County Real Property Department proposed surplus the O’Grady property. The King County Parks Department and local citizens identified the site as significant within the Middle Green River basin, and the property was transferred to the King County Parks Department for future development as a park site. There are no known deed or funding source restrictions associated with these parcels.

### Green River Natural Area - Metzler

The King County Parks Department acquired the former Metzler Park parcels in 1973 with a combination of IAC- Outdoor Recreation, IAC-Hud and Forward Thrust Funds. The O’Grady section of the parcel, and the other parcels associated with the original O’Grady Park, have no deed or funding source restrictions. One of the former O’Grady Park parcels and the Metzler parcel were merged into one parcel record in June 1977 (recording number 7706171065). Therefore, use on the Metzler section of parcel 3021069001 would be constrained by IAC – Outdoor Recreation and Forward Thrust restrictions as described below. The recent Metzler area addition, parcel 3021069012, is constrained by IAC-Salmon Recovery Funding Board (SRFB) restrictions.

### Other Green River Natural Area Parcels

All the other Green River Natural Area parcels, except for 7327710100, are Waterways 2000 purchases and restricted as described in the Waterways section below. Parcel 7327710100 is restricted as described in the IAC –SRFB and King Conservation District Funds sections. Those properties purchased with King County SWM funds have no future management restrictions associated with the SWM funding source.

## Funding Source Descriptions and Restrictions

### Forward Thrust

Forward Thrust was a major King County works program with bond proposals encompassing transportation, community, housing, water issues, and other publicly financed capital improvements. On February 13, 1968, voters approved Proposition 6 (authorized by King County Council Resolution 34571), a \$118 million bond proposal for the purchase, creation and improvement of parks throughout King County.

Land use restrictions associated with Forward Thrust Funding are identified in Section 7 and Section 9 of King County Resolution 34571.

*"Public Park and Recreation Facilities acquired, developed, constructed or improved by the County or any City in whole or in part from the proceeds of the bonds authorized pursuant to this resolution shall not be transferred or conveyed except by agreement providing that such lands shall continue to be used for the purposes*

*contemplated by this resolution, or be converted to a different use unless other equivalent lands and facilities within the County or City shall be received in exchange therefore. The proceeds of any award in condemnation applicable to such Public Park and Recreation Facilities shall be used for the acquisition or provision of other equivalent lands and facilities. However, nothing in this resolution shall prevent the grant of easements or franchises or the making of joint use agreements not incompatible with the use of Public Park and Recreation Facilities for the purposes of this resolution." (Section 7)*

*"...Public Park and Recreation Facilities acquired or developed pursuant to this resolution whether located partly or wholly within or without the Cities of the County will be available to and be of general benefit to all of the residents of the County and, together with existing lands and facilities set aside for such purposes, will constitute a necessary system of Public Park and Recreation Facilities for the County and its residents." (Section 9)*

## **Interagency Committee for Outdoor Recreation – Outdoor Recreation**

Since 1964 the Interagency Committee for Outdoor Recreation has overseen the investment of public funds in parks, trails, beaches, boating facilities, wildlife habitat, and natural areas. Established by citizen Initiative 215 in 1964, the IAC administers several grant programs for recreation and habitat conservation purposes. Depending on the program, eligible project applicants can include municipal subdivisions of the state (cities, towns, and counties, or port, utility, park and recreation, and school districts), Native American tribes, state agencies, and in some cases, federal agencies and nonprofit organizations. To be considered for funding assistance, most grant programs require that the proposed project will be operated and maintained in perpetuity for the purposes for which funding is sought. For instance, the contract for Metzler says that the property will not be converted to uses other than for which it was purchased (outdoor recreation and open space) unless authorization has been granted by the IAC (IAC 2003). Grants are awarded by the Committee based on a public, competitive process which weighs the merits of proposed projects against established program criteria.

## **Interagency Committee for Outdoor Recreation -Salmon Recovery Funding Board**

The Washington State Salmon Recovery Funding Board (SRFB) was created in 1999 to administer funds for salmon recovery appropriated by the state legislature and Congress (RCW 77.85). SRFB's mission is to "support salmon recovery by funding habitat protection and restoration projects and related programs and activities that produce sustainable and measurable benefits for fish and their habitat." SRFB receives administrative support from the State Interagency Committee for Outdoor Recreation (IAC).

Project sponsors such as cities, counties, agencies, tribes, non-profit organizations, and private citizens submit applications to local lead entities such as Watershed Resource Inventory Area Steering Committees. The lead entities submit prioritized lists of project applications to SRFB for consideration. Sponsors request funds to protect or restore salmon habitat, commit to long-term monitoring, and provide a monetary or in-kind match of 15% or more. Projects may include acquisition; in-stream passage or diversion; in-stream, riparian, upland, or estuarine habitat actions; or assessments and studies.

Lands acquired in fee with SRFB assistance must be dedicated to habitat conservation, outdoor recreation or salmon recovery uses in perpetuity. This is done through a recorded Deed of Right to Use Land for Habitat Conservation, Salmon Recovery, or Outdoor Recreation Purposes. This

deed conveys property interests to the public forever. Any inconsistent use must be approved by the SRFB or its successors. This approval will only be granted if other land is substituted of at least equal fair market value at the time of change of use and of (as nearly as feasible) equivalent qualities, characteristics and location for the salmon recovery and conservation purposes for which state assistance was originally granted.

## King Conservation District Funds

Conservation Districts were established in 1973 under Washington State Law RCW 89.08 to preserve natural resources, control floods, prevent impairment of dams and reservoirs, assist in maintaining the navigability of rivers and harbors, preserve wildlife, and protect the tax base and public lands (RCW 89.08.010). The state conservation commission authorizes grants to Conservation Districts. In addition, special assessments can be imposed by the county legislative authority in which the conservation district is located for activities and programs to conserve natural resources, including soil and water. These funds are appropriated to incorporated cities participating as District member cities and Watershed Forums. King Conservation District (KCD) funds must be used for natural resource protection activities consistent with the purposes of the district as established in RCW 89.08.

Assessment funds may be used for acquisition of property that will protect key features for fish and wildlife habitat and protect water quality. Properties purchased with KCD assessment funds are not to be used for active recreation facilities and should have signs indicating that King Conservation District Funds were used to purchase the property.

## Waterways 2000

Most of the parcels that comprise the Green River Natural Area were identified through the Waterways 2000 program initiated in 1993 by the Metropolitan King County Executive and Council. The intent of this pilot program was to establish a system of interlocking greenways along King County's network of streams and rivers "that protects our (King County's) best habitat lands, provides major (passive) recreational opportunities, safeguards critical scenic resources, preserves properties of cultural and historic importance, and helps save our major fish runs." (King County 1993).

The County's most critical waterways were identified and methods for their cost-effective acquisition were outlined. The majority of properties were purchased in fee. On other properties, conservation easements were acquired or the property was enrolled in the Public Benefit Ratings System (PBRs), which allows property owners tax reductions for land left in open space. Over 1,600 acres throughout King County have been preserved through this program.

To fund the Waterways 2000 program, The King County Council appropriated \$14.8 million from Conservation Futures Tax (CFT) levy funds, 1989 Open Space Bond fund reallocations, Real Estate Excise Tax (REET) funds, bond funds and King County general funds (King County 1995). Deeds purchased with these funds include this statement. "The property conveyed herein is subject to open space use restrictions and restrictions on alienation as specified in RCW 84.34.200, ET Seq (authorizing counties to levy conservation futures), and King County Ordinance no. 9071 (authorizing the 1989 Open Space Bonds), 10757, 11068 (authorizing Conservation Futures) and 11713 (allocates funds to various Waterway 2000 projects.) Land use and sale or transfer of properties purchased with Waterways 2000 funds are restricted as described in the ordinances above. A brief description of these restrictions and programs follow.

## Conservation Futures Tax Levy

Washington state statute RCW 84.34.230 authorizes Washington counties to place a Conservation Futures Tax (CFT) levy on all taxable property within their jurisdiction to acquire open space land or rights to future development (termed “conservation futures” in RCW 84.34.220). Open space is defined in RCW 84.34.020 as land contributing to natural resources, streams, water supply, soils, wetlands, public land network, recreation opportunities, historic sites, or visual quality. King County Code 26.12 states that there should be “demonstrable regional visibility, use, ecological, cultural, historical, or other natural resource significance” in CFT funded projects.” (King County 2003)

Properties purchased with Conservation Futures funds are to be used for low-impact, passive-use recreation. They are also limited to non-motorized use, except as necessary for maintenance or staging areas, including entrance roads and parking to provide public access. Non-vegetative impervious surfaces should cover less than 15% of the site, excluding trail systems, unless specially authorized by the King County Council. Conservation futures interests shall not be transferred except with agreement that land interests shall be preserved in accordance with the intent and language of RCW 84.34.230; uses of lands shall not be altered unless equivalent lands within the geographic jurisdiction are provided. (King County 1993a)

## 1989 Open Space Bond Funds

King County voters authorized the \$117,640,000 King County Open Space Bond initiative, described in King County Ordinance 9071, in November 1989 to provide funds for the acquisition, development, renovation and improvement of public green spaces, green belts, open space, parks and trails in King County. Specific goals included preserving wildlife, enhancing scenic vistas, providing access to the water and open space, and providing trail connections between virtually all the cities in King County to a regional trail system and trails within the suburban cities and unincorporated areas of King County (King County 1989).

King County Ordinance 9071 authorizes reclassification of bond funds in Section 8, part C. Land use restrictions associated with Open Space Bond funds are identified in Section 8, part D.

“Projects carried out by a Governmental Agency in whole or part from bond proceeds shall not be transferred or conveyed except by agreement providing that such land shall continue to be used for the purposes contemplated by this ordinance; nor shall they be converted to a different use unless other equivalent lands and facilities within the Governmental Entity shall be received in exchange therefor. The proceeds of any award in condemnation of any project shall be used for the acquisition or provision of other equivalent lands and facilities. However, nothing in this ordinance shall prevent the granting of easements, franchises, or concessions or the making of joint use agreements or other operations agreements compatible with the use of a Project as provided for in this ordinance.”

## Part 3. Ecological Resources

This section describes the natural resources and ecological processes present at the Green River Natural Area. A complete biological inventory has not been conducted at this location, therefore, the information presented here is not comprehensive. The Green River Natural Area lies within the Middle Green River Reach. Please refer to the Middle Green River Reach report (King County 2003b) for landscape-level natural resource and land use information.

Figure 2 and 3 are aerial photographs of the Green River Natural Area showing topography, vegetative cover, and enhancement efforts.

## Topography and Soils

Steep valley walls and a broad valley floor characterize the Green River Natural Area. Along the valley bottom and river course, soils are generally derived from alluvium and include a variety of silt, sandy loams, and riverwash. Deposits of gravels and cobbles also occur where fast-moving streams from the hillsides encounter the valley floor and begin to drop their load (Jones and Jones 1990). Valley walls in the Green River Natural Area vicinity are usually greater than 50% slope and comprised of compacted glacial deposits susceptible to landslides (Kerwin and Nelson 2000). These landslides provide considerable sediment to the river and are a significant source of gravels to the channel. (Dunne and Dietrich 1978).

## Hydrology

The Middle Green River reach within the GRNA boundaries (RM 40.7 to RM 36) includes some of the least constrained portions of the entire river. No levees or revetments exist within the natural area itself, although three exist across the river from the natural area at about river miles 38 (Lones levee), 37.5 (Turley Levee) and 36 (Hamikami Levee).

Lateral channel movement is characteristic of this river reach, varying up to sixty feet per year during the 1980s with occasional large channel migrations during flooding (e.g. in 1996 the river cut off a large meander at the west end of O'Grady Park, now referred to as the oxbow) (Miller 1989 and King County 1999). The stretch of the Green River along the natural area contains many riffle areas that provide spawning gravel for salmonids as well as pools that provide shelter for rearing.

A number of tributaries flow from the valley walls to the Green River. Newaukum Creek (WRIA # 09.0114) marks the eastern extent of the natural area. This Class 1 stream flows out of the Enumclaw Mountains (foothills to the Cascades) and across the flat Enumclaw Plateau before descending a steep-sided forested ravine to join the river.

Seven Class 2 streams with salmonids also flow through the natural area before joining the Green River. A tributary commonly referred to as O'Grady Creek (#09.0107) originates from a spring on the Enumclaw Plateau. O'Grady Creek and another tributary (#09.0109) flow in ravines east of the O'Grady road. O'Grady Creek's streambed was moved in 2001 as part of an enhancement effort. (See Appendix 1 for details on this project.) Tributary #09.0109 joins O'Grady Creek about a quarter mile upstream and east of the O'Grady road. O'Grady Creek passes under the road in a box culvert and flows along the southerly third of the O'Grady meadow area. Another Class 2 stream with salmonids (an unnumbered tributary) joins O'Grady Creek several hundred feet upstream and south of the oxbow. O'Grady Creek flows into the oxbow, which drains into the Green River at its western end.

An unnamed Class 2 stream with salmonids (#09.0101) is similar to O'Grady Creek in that it begins on the Enumclaw Plateau and flows through a ravine before meeting the wide, flat valley bottom. Three other drainages (#09.0100, #09.0102, #09.0103) steeply descend the valley wall and join tributary #09.0101 on the valley floor before flowing into the Green River. An unclassified tributary (#09.0108) flows in a steeply down-cut channel east of O'Grady Creek. An informal trail crosses over this creek (and ravine) before it flows into the Green River.

A number of other Class 2 and unclassified tributaries flow through ravines from the valley plateau to the valley bottom. Other unclassified tributaries originate from seeps or wetlands along the valley wall. Many of these tributaries are seasonal and are neither mapped nor classified.



Several of the main tributaries that descend to the valley floor through deep ravines (#09.0108, #09.0101, O'Grady Creek) were heavily scoured in past storm events (King County 1999). Deep deposits of gravels and cobbles occur where streams meet the valley floor. Tributaries that receive runoff from the Enumclaw plateau not only have water quantity concerns, but water quality problems. For example, Newaukum Creek is on the Washington State Department of Ecology's 1998 303(d) list for its levels of dissolved oxygen, ammonia, and fecal coliform bacteria (Ecology 1998).

## **Vegetation**

A rich mosaic of plant communities characterizes the natural area. Mixed forest and deciduous upland forests cover much of the valley wall, with several forested and scrub-shrub wetlands nestled in benches on the valley wall. Several of these wetlands form the headwaters of short tributaries to the Green River. Gallery cottonwood forests, deciduous forests, meadows (old pasture/agricultural fields), and forested, scrub-shrub, and emergent wetlands are common on the valley bottom. (A gallery forest is a forest that exhibits at least two, and more usually three, distinct vegetation layers consisting of a tall overstory of mature trees that rises well above a mid-layer of shrubs and young trees, and a lower layer of forbs and grasses.)

The following general vegetation descriptions correspond to mapped areas (please refer to Figure 3) and plant species observed on the site. (Please refer to Appendix 4, Table 4, for a list of plant species observed at the site.)

### **Wetland Cover Types**

Vegetation composition varies within floodplain wetlands and reflects seasonal inundation and soil saturation and the time since the last major (forest-clearing) flood event. Water is seasonally ponded in old river channels and other low-lying areas on the valley floor.

*Emergent Wetlands:* Emergent wetlands are common in meadows (old pastures/field) perched above the active floodplain as well as adjacent to open-water, backwater areas within the active floodplain. Cattail, reed canarygrass, small-fruited bulrush, and creeping buttercup are common herbaceous plants of wetlands in the old pastures/fields in the valley bottom.

*Scrub-shrub Wetlands:* Shrub-dominated wetlands occur in old channels and backwaters within the active floodplain, in the meadows (old pastures/fields) perched above the active floodplain, along tributaries, and in wet pockets on the valley wall. Willows, red-osier dogwood, and spiraea are typical shrubs in these wetlands. Reed canarygrass is ubiquitous and high in cover in the ground cover layer. Other herbaceous species often include creeping buttercup and piggyback plant. Water parsley and skunk cabbage are found in areas with ponded water.

*Forested Wetlands:* Forested wetlands occur in large stands on the valley floor, along tributaries, and in wet pockets on the valley wall. Black cottonwood and red alder are the principal overstory species. Large (4 to 6 ft. diameter) western redcedar are found at the base of the valley wall, especially near perennial creeks. A dense shrub understory commonly includes red-osier dogwood, salmonberry, and willow. Herbaceous species often include reed canarygrass, creeping buttercup, piggy back plant, skunk cabbage, and water parsley.

### **Upland Cover Types**

*Mixed Forest:* The steep, north-facing valley wall supports coniferous and deciduous forest where vegetation remains. Landslide scars are common, especially on the steepest slopes. Red alder and big-leaf maple are the primary deciduous trees in the overstory with a western redcedar

subcanopy. Douglas-fir, western hemlock, and/or western redcedar compose the canopy only in some areas. Understory species often include vine maple, red elderberry, salmonberry, and devil's club. Sword fern forms a dense ground cover layer. Ridgetops and the few south-facing slopes on the site usually are better drained and support Douglas-fir, western hemlock, and western redcedar in the overstory. Drier species such as hazelnut, Oregon grape, and Indian plum are common understory species in these drier areas.

*Meadows:* Pasture grasses and non-native herbaceous species such as common tansy, thistle, and plantain are found in old agricultural areas with well-drained soils on the valley floor. Dense thickets of Himalayan blackberry ring the meadow areas and form a wall between the meadow on the valley floor and forests on the valley wall.

### **Non-native, invasive plant species**

A handful of invasive species are of concern at the natural area. Most of these species are concentrated near old roads, meadows, and old homestead sites. Tansy ragwort is the only known noxious weed on the site that the King County Noxious Weed Control Board currently requires landowners to remove. (Please refer to Appendix 4, Table 3 for a list of observed noxious and invasive plant species.)

### **Enhancement Efforts**

Enhancement efforts with native plant installation and invasive plant control components have occurred at the GRNA—Metzler and GRNA—O'Grady areas. (Please refer to Appendix 1, 2 and 3 for plant lists for these projects.)

## **Fish and Wildlife**

The Wildlife Habitat Network, established in the King County Comprehensive Plan, runs through the Green River Corridor at the Green River Natural Area and up Newaukum Creek. (Please refer to Appendix 4, Table 5 for a list of species observed on site.)

### **Fish**

The Green River between RM 38 and RM 40 supports the highest concentrations of spawning chinook, coho, chum, steelhead and sea-run cut-throat trout in the Green River system. (Herrera 1989 in Jones and Jones 1990b). Rainbow and resident cutthroat trout also reside in the river and its tributaries within the natural area. Bull trout have also been found in the Middle Green River sub-watershed, but their use of this portion of the river is not understood (Corps 2000).

Backwaters and side channels through this reach and lower Newaukum Creek provide refugia for juveniles during summer low-flows and winter high-flows. Hydrologic mixing and gravel deposition at the Newaukum Creek confluence support active spawning and feeding grounds for salmonids and benthic species (King County 1994). Newaukum Creek is the first significant source of stream transported spawning gravels for the mainstem Green River downstream of Howard Hanson Dam. It is estimated that between 1986 and 1997, a mean of 15.6 percent of the naturally spawning adult chinook salmon that entered the Green River Basin spawned in Newaukum Creek (Kerwin and Nelson 2000).

Coho spawn in several of the tributaries that flow through the natural area, including Newaukum Creek, O'Grady Creek downstream of the culvert under the O'Grady road, Tributary #09.0101, and unnamed tributaries. Juvenile coho probably use all the perennial streams on the site for rearing. Chinook are mainstem spawners and are found in Newaukum Creek as well as the river. Juvenile chinook rear in the river and its side channels and pools in winter and spring before

leaving in the spring and summer. Chum spawn in the braided section of the river, in Newaukum and O'Grady creeks, as well as in one unnamed tributary (#09.0101). Fry typically migrate to estuaries soon after they emerge from the gravels, spending little time in the creeks or river.

Steelhead use the main channel of the Green River, Lower Newaukum Creek, and portions of the tributaries within the natural area for spawning and rearing. The Northwest Salmon and Steelhead Council of Trout Unlimited is involved in a wild steelhead broodstock program, a steelhead imprinting program, and habitat enhancement projects in the vicinity of the natural area. Rainbow and cutthroat probably spawn and rear in most perennial streams onsite.

### **Amphibians and Reptiles**

Amphibian surveys were not performed in the site survey for this natural area. However, Pacific chorus frogs have been observed and habitat for a variety of other native amphibians (e.g., northwest salamander and red-legged frog) are present. Along the valley walls where landslides have occurred, Northern alligator lizards would find suitable habitat. Garter snakes are thought to be common in the meadow and forest habitats.

### **Birds**

Bald eagle, osprey, great blue heron, and belted kingfisher are often seen in the valley. Common merganser, common goldeneye, mallard, and hooded merganser can be found in the area around the oxbow and along the main river channel. The mudflats and gravel bars provide habitat and food for shorebirds such as killdeer, spotted sandpipers, and common snipe. American dipper can be seen hunting along the length of Newaukum Creek. Migratory birds are also found in the wetlands and meadows on the valley floor. Rufous hummingbirds are common; flycatchers, swallows, wrens, warblers, grosbeaks, and finches frequent the deciduous forests and meadows. Red-winged blackbirds are found in cattail marshes on the benches above the active floodplain, along with the sparrows and goldfinches that inhabit the valley floor. A continuous band of forest along the valley wall provides habitat for pileated woodpecker, hairy woodpecker, northern flicker, black-capped chickadee, bushtit, brown creeper, winter wren, golden-crowned kinglet, Steller's jay, and ruffed grouse. These birds are also likely to be found where trees extend into the valley floor.

### **Mammals**

Diversity of vegetation types and continuous cover means a wide range of mammals is found in this reach. Elk, cougar, and black bear are common along the river as well as along the smaller tributaries. Coyote and blacktail deer frequent these lower areas as do mink, porcupine, beaver, muskrat, and river otter. Small mammals such as shrews, mice, voles, squirrels, and weasels are also likely inhabitants of the natural area.

## **Part 4. Land Use and Infrastructure**

This section describes current public use, access opportunities, trails, roads, and other infrastructure. Figure 3 illustrates the trails and access points at the Green River Natural Area.

### **Public Use**

Site inspections indicate that the Green River Natural Area currently averages moderate numbers of visitors engaged in recreational activities. Visitors to the O'Grady area tend to engage in activities such as walking, bicycling, nature observation and horseback riding. Visitors to the Metzler area tend to engage in fishing and river running activities such as rafting, tubing and kayaking. The other sections of the natural area have little use due to limited access.

Although hunting is illegal on the site, King County staff has reported encounters with duck hunters. Other abusive activities have included illegal motorized, off road vehicle use, alcohol and drug consumption, sign vandalism, shooting, littering, dumping, social trail creation and horseback riding in the Green River at low water during salmon spawning. There are two old dump sites with trash, old laundry basins and grass clippings at the end of 160<sup>th</sup> Street. Dumping of yard waste has also been reported on the parcels within the Green River Landing residential community.

## **Access**

Visitors generally access the natural area via the Green River Natural Area—O’Grady and Green River Natural Area—Metzler. The other sections of the natural area have little use due to restricted or difficult access because of steep slopes, limited trail opportunities, and private property. We believe that most visitors who use this part of the natural area access it by boat. (Please refer to Figure 3.)

## **Roads and Trails**

### **Green River Natural Area—O’Grady**

The one-mile gravel O’Grady Road/trail (closed to public vehicles) passes through the Green River Natural Area (Please refer to Figure 3). This road is accessed from 188<sup>th</sup> Ave. SE. There is a locked gate at the beginning of the gravel road and a school bus turn around near the gate. On street parking is available for visitors, although they occasionally park in front of the gate which causes access difficulty for maintenance vehicles.

A few social trails enter the natural area off this road, however, dense vegetation and steep slopes restrict most public access from the road. Informal trails created by horse enthusiasts exist along the Green River through the GRNA—O’Grady meadow. The trails extend through a riparian area to the west of the meadow.

Five parcels on the southeastern part of the property are accessed by maintenance staff via a private road. These parcels are part of the Green River Landing residential community and are bound by association covenants. This gated community prohibits general public access via the community road. An informal and unmaintained trail extends through these parcels to a former pasture.

### **Green River Natural Area—Metzler**

The Metzler area is accessed via a road easement south of the Green Valley road that ends in a paved parking lot. This parking area has a signboard and two garbage cans. Two well beaten paths extend to the river. Several social trails enter the natural area off these trails.

## **Signs**

An entrance sign exists at GRNA—Metzler. Both the GRNA—Metzler and GRNA—O’Grady areas have rules signs. A worn Waterways 2000 sign and a no parking sign are also located on the gate at the GRNA—O’Grady access. Several no shooting signs are posted along the gravel road at GRNA—O’Grady.

## **Historic Infrastructure**

Remnants of a farm exist at GRNA—O’Grady; a few fruit trees remain where an orchard once existed, and remnants of a silo foundation exist near an apple tree.

King County interpretive staff reported that Matthew and Alice O’Grady purchased the land in 1918 and cleared the area for a vegetable farm. They also raised cattle, sheep and pigs. They trucked their produce to Portland to sell.

## Part 5. Site Management Chronology

This section chronicles management activities at Green River Natural Area since 1977. When known, costs associated with these activities are included. (Note: an asterisk (\*) in the funding column indicates that Parks Division labor costs are included in an annual figure listed in the table at the end of each year.)

Date	Action	Associated Costs (if known)
<b>1977</b>	King County Property Services acquired the O'Grady section of the natural area.	
<b>1987</b>	KC Parks took over custodianship and management of the O'Grady property.	
<b>1995-1998</b>	King County's Green River Basin Steward coordinated a few volunteer native plant installations at the former O'Grady agricultural field. Survival of these efforts was minimal due to watering and invasive control challenges.	
<b>1999</b>	KC Park staff contracted with EarthCorps to install twenty 5-foot conifers in the meadow like area adjacent to river in the GRNA-Metzler area. Monitoring indicated that high water knocked down some of these trees the first year.	<b>Cost: \$2,000</b> Funded by KC Parks CIP funds.
<b>1999</b>	KC CPOSA replaced a hanging culvert with a box culvert for fish passage where the O'Grady road crosses O'Grady Creek. Downstream of the box culvert, 200 lineal feet of streambed was rebuilt with boulder wedges and large woody debris. They also contracted with Job's For the Environment (JFE) to remove three culverts and decommission an unused road.	<b>Cost: \$212,000</b> \$99,000 design; \$113,000 construction. Funded with KCSWM CIP funds.
<b>2000</b>	KC CPOSA embedded 1200 lineal feet of constructed streambed in a new floodplain terrace for O'Grady Creek to improve habitat stability and fish passage for coho and chum. Thirteen hundred cubic yards of earth were moved and 8 acres were planted with native plants. They also implemented invasive control strategies and planted native species in a nearby wetland.	<b>Cost: \$620,000</b> Design: \$379,000; Construction: 169,000 Maintenance and Monitoring \$72,000. Funded with KCSWM CIP and \$100,000 in IAC-SRFB grants.
<b>2000</b>	JFE crew covered Japanese knotweed in the wetland south of the new creek bed at GRNA-O'Grady.	<b>Cost: \$4,000</b> Four crew days funded by the JFE
<b>October 2000</b>	KC Park staff and the Green River Basin Steward worked with CPOSA staff to coordinate two volunteer planting events to install vegetation in the graded areas at GRNA-O'Grady.	
<b>2001</b>	KC CPOSA staff linked O'Grady creek to the new stream channel. KC Park staff supported the project by cutting the willow stakes used in revegetating the stream bank.	
<b>2001</b>	KC Park staff mowed the O'Grady meadow in an attempt to control common tansy and thistle.	
<b>September 2001</b>	KC Park staff removed St. Johnswort, Scot's Broom and common tansy at GRNA-Metzler.	

Date	Action	Associated Costs (if known)
<b>December 2001</b>	Small Habitat Restoration Program enhanced about 450 lineal feet along the right bank of the Green River at Metzler by installing native plants. They also underplanted conifers throughout the cottonwood and alder forest along the river.	<b>Cost: \$14,000</b> Funded by the SHRP program.
<b>March 2002</b>	KC Park staff removed Scot's Broom at GRNA-Metzler.	
	KC Park staff and six volunteers removed Scot's Broom and Himalayan and evergreen blackberries.	<b>In Kind \$300</b> (24 volunteer hours x \$12.50 an hour =\$300)
<b>Spring 2002</b>	Neighbors reported drinking and trash dumping at the GRNA – O'Grady gate. Waterways CIP funds were used to install a security light at the gate.	
<b>2002</b>	KC Park staff mowed the O'Grady meadow in an attempt to control common tansy and thistle.	
<b>2003</b>	KC staff merged the former Metzler and O'Grady Parks into the Green River Natural Area.	
<b>2003</b>	Monitoring my KC SHRP project manager revealed very low survival of the plants installed in the 2001 SHRP project.	

## Part 6. Analysis

In this section, site specific information is integrated with larger landscape conservation considerations and fiscal and political constraints to formulate management recommendations that will be summarized in Part 7.

### Information Gaps

In the absence of more complete site information, actions intended to restore parts of the systems present at Green River Natural Area may inadvertently harm rare or critical species and habitats, or negatively affect the ecological processes at the site. A comprehensive ecological assessment would provide an understanding of the species that use this natural area and a characterization of river habitat forming processes such as channel migration, LWD sources, sediment accumulation, current flood flows, and channel complexity. This information would be useful when evaluating the spectrum of ecological impacts from proposed habitat restoration and management activities in the Middle Green River Reach. Some ecological assessment work was done for part of the natural area in the mid 1990s. The results of that work has been included in this document.

### Species of Concern

Because of the lack of a comprehensive biological inventory at the Green River Natural Area, the species identified in this document do not account for all species that use the natural area for one or more stages of their lifecycles. However, evidence of Green River use by three threatened species listed under the Endangered Species Act, chinook salmon, bull trout, and bald eagle, and the presence of great blue herons, a species of concern in Washington State, make habitat preservation and enhancement management priorities at the Green River Natural Area.

### Future Wildlife

The biological and regional significance of the natural area is tied to the conditions of the surrounding landscape. Much of the wildlife that inhabit and frequent the natural area also frequent neighboring lands. Changes in land use on the north side of the river as well as on the plateau will likely result in changes to the wildlife species inhabiting and utilizing the natural area. Over time, the site's vegetation will naturally change as conifers grow to dominance along the hillsides and the valley floor is reworked by the river. Dynamic natural processes, such as river migration during flood events, create a complex assemblage of instream and off-channel habitats within the natural area reach. Eroding banks, shifting gravels, abandoned channels, oxbows, pools, and debris jams are important structural features of meandering rivers and create complex habitats which are critical to a number of species life cycles, notably salmonids and their prey. Conversely, scouring that is now occurring along the tributary streams could be damaging to aquatic invertebrate populations, which in turn will reduce suitability for salmonids. Future scouring and transport of large amounts of cobbles and gravels will likely occur during large storm events unless efforts are made to detain runoff from the plateau.

### Enhancing Ecological Processes, Structure and Function

Conservation theory suggests that the elements of an ecosystem will function properly if the natural processes affecting them are undisturbed (Spence et al 1996). If systems are not functioning properly, the first place to focus management activities is on restoring the rates, magnitude and location of the system-wide processes that form and maintain the affected elements. If natural processes cannot be restored directly then the next option might be to attempt to restore ecological structure and function.



Despite the control of flooding by the Howard Hanson Dam, the Green River moves laterally freely along a large section of the natural area and any alterations to the site should not hinder this process. However, it is likely that rates of channel migration and mechanisms of sediment mobilization, transport, and deposition differ significantly from historic conditions due to dam operations. The dam's existence has resulted in changes in sediment inputs from above the dam, reduced flood peak discharge levels and extended durations of what were historically intermediate flow levels. (Levesque. pers.comm.)

No levees or revetments exist on the natural area itself, although three exist across the river from the natural area at about river miles 38 (Lones levee), 37.5 (Turley Levee) and 36 (Hamakami Levee). These facilities impact the movement of the Green River at the GRNA in those areas. The 1993 King County Flood Hazard Reduction Plan recommends the removal of all three flood facilities from their present landscape location and relocation and setback reconstruction along the margins of the adjacent, historic floodplain terraces present along the right bank through this reach. (Levesque pers.comm.)

### *Ecosystem Restoration Study Enhancement Proposals*

The Ecosystem Restoration Project (Corps 2000) also proposes projects to alter these levees with setbacks and breaches. Complete removal of the levees is prevented by the need to protect private property and public roadway in the floodplain.

The project also proposes large woody debris installations in the Metzler/O'Grady reach and gravel replacement in the Green River upstream of the natural area. These projects would alleviate to some extent the effects of the Howard Hanson Dam on gravel transport and storage in the Metzler/O'Grady reach and allow the Green River to move more naturally within the areas that the facilities are set back or breached. King County manages Ecological Lands in its care to ensure the preservation of their ecological value. Prior to design of the proposed levee setbacks and breaches, as well as the installation of large woody debris in the tributaries to the Green River within the natural area, King County and Corps staff should carefully evaluate the ramifications of these projects on the ecological value of the GRNA and other natural areas downstream to ensure that construction of these projects does not negatively impact the ecological values of the Ecological Lands in the Middle Green Basin.

If the levees are set back across from the Green River Natural Area, the overall ecological benefits are currently unknown. An appropriately designed long-term monitoring regime could provide insight about: (1) the extent that natural processes were restored, (2) how riverine processes affect the structure and function of the surrounding landscape and the species that inhabit it, and (3) how levee removal affects the river system. The results of this type of monitoring program could influence future decisions about other levee removals and installations.

### *Lower Newaukum Creek Enhancement Proposal*

The Lower Newaukum Creek is another site within the natural area that King County staff has identified for enhancement efforts. Newaukum Creek provides spawning habitat for chinook, coho, and steelhead. In the early 1980's, a previous owner of GRNA parcel number 7327710100 eliminated a large meander in the creek which adversely impacted salmon spawning habitat. The subsequent large woody debris removal, stream channel dredging, and bank armoring produced a high gradient stream with little structure to hold gravel. King County staff are proposing to replace some of the large woody debris, eliminate some of the bank armoring and enhance riparian vegetation for about 350 meters upstream from the mouth of the creek. KC WLRD's CPOSA group is expected to provide a conceptual design and cost estimate for this project in January 2004. If funded, CPOSA would design the project in 2005-2006 and construct the project in 2006-2007.

### *Noxious/Invasive Weed Control*

Many non-native noxious and invasive plant species exist on the site. The former agricultural areas are the most heavily impacted. King County's weed control strategy on Ecological Lands consists of: (1) removing those weeds that the King County Noxious Weed Board requires to be removed (this list is updated annually) and (2) eliminating weeds with invasive tendencies, even if the County Weed Board does not require their control, if the infestation is small enough to gain control of with the limited amounts of funds, volunteers and staff available to for this activity. It is prudent to control small infestations of highly invasive species as soon as they are discovered to prevent them from becoming large, expensive to eradicate, infestations.

At the GRNA—Metzler area, KC Park staff and volunteers have worked to control Scot's Broom, tansy ragwort and St. Johnswort. State law requires the removal of the tansy ragwort. The other species occur in relatively small numbers.

At the GRNA—O'Grady area, King County Park staff are attempting to control invasive species such as blackberry, reed canarygrass, thistle, and common tansy at the meadow with a mowing regime designed to discourage flowering, seeding, and vigor of invasive species and encourage competition by native and non-invasive species. In 2000, 2001, and 2002, Park staff mowed the invasive species only once a year because of time constraints. Mowing was done after July 1 to avoid disturbing breeding birds. Increasing the mowing frequency to three times a year would likely expedite invasive species control. Because of current Sensitive Areas Ordinance permit restrictions, it is important that staff use heavy equipment on this property for invasive control at least once every 5 years to ensure that King County retains its ability to use heavy equipment at this site for maintenance purposes. Park staff has also worked to control a small tansy ragwort population at the meadow.

The weedy meadows within the natural area should be evaluated for potential enhancement. Because the Green River is moving dramatically and freely in the former O'Grady farm area, it is likely that no vegetation installations would be recommended in this area because of the likelihood that the river would destroy these efforts. However, two other former agricultural fields with weed problems exist within the natural area. The impacts of erosion and downcutting on the forested steep slopes should also be assessed.

Three planning processes are underway that may result in additions or changes to the enhancement recommendations mentioned above. King County Stewardship staff is developing the Middle Green River Restoration Blueprint (scheduled for completion in 2005), King County Flood Hazard Reduction Services Section staff is revising the Flood Hazard Reduction Plan and WRIA 9 staff is working on the WRIA 9 Habitat Plan (scheduled for completion in 2005).

### **Maintaining Enhancement Projects**

King County CPOSA installed a box culvert and relocated part of O'Grady Creek in 1999, 2000 and 2001 (See Appendix 1). They disturbed eight acres of soil in the process. They planted native plants in this cleared area as well as in the wetland area to the south. They also installed plants as part of an SHRP project at GRNA—Metzler in 2000 (See Appendix 2). King County staff has expressed concerns that higher levels of maintenance need to occur on these project to ensure successful plant establishment. CPOSA is responsible for the maintenance of the O'Grady project at least through 2005 and the Metzler project through 2004. No financial provisions have been made for any additional maintenance that might be necessary on these projects after CPOSA funds are expended, although there is a general belief that the projects will require additional maintenance. To ensure success of these efforts, CPOSA, NRL, and Park Resource and Ecological staff should project maintenance activities, timelines and costs necessary for the successful establishment of these projects. Roles and responsibilities should be assigned and funding should be acquired to implement these activities.

## Land Use

Although the Green River Natural Area is within the Upper Green River Valley Agricultural Production District, much of the property consists of wooded hillsides which are too steep to be easily farmed. None of the three areas of the site that were historically farmed are currently suitable for farming due to access issues, recreational use and the migration of the Green River.

We suggest continuing to direct public use in the Green River Natural Area to the easily accessible O'Grady and Metzler areas and minimizing public use in the other areas. It appears that the Metzler and O'Grady areas are successfully supporting the current level of public use without adversely affecting the ecological value of the site.

Seasonally high use at Metzler creates some difficulties. Staff have reported evidence of human waste at the site, the trash can area in the parking lot is frequently (sometimes daily) used as a home dumping site, and several social trails exist off of the main trails. Park staff plan to close off some of these social trails at Metzler in 2004.

Social trails created and used by equestrians also exist to the west of the O'Grady meadow area. At this time these trails don't appear to adversely effect the ecological values of the site, however, Park staff should monitor this situation for changes.

The gate at the O'Grady road seems to have curtailed most unauthorized motor vehicle access previously reported at the natural area, although there are occasionally reports of unauthorized motorcycle use.

The boundaries between public and private property are not marked or patrolled. While King County staff guess that use is limited to non-existent in many parts of the natural area, further investigations and increased site boundary patrols may reveal inappropriate uses such as boundary encroachments and dumping like the sites reported at the end of 160<sup>th</sup> street.

## Signage

Visitor support infrastructure at the Green River Natural Area could be improved by better parking and site identification signage at the O'Grady road/188<sup>th</sup> Avenue SE access. Occasionally, visitors park in front of the gate and block maintenance staff vehicle access to the site because they are uncertain about the legality of parking along the road edges. Signage on the gate directing visitors where to park should help this situation. An identification sign at the entrance area off of O'Grady road would help visitors locate the natural area.

Effective signage also supports appropriate site use. Natural area rules signs posted at access points provide the legal notice a sheriff requires in order to cite visitors using the natural area in inappropriate ways. A "pack-it-in, pack-it-home" signage strategy might reduce litter. "No Hunting" and "No Shooting" signs inform visitors that hunting and/or shooting is illegal. "No Dumping" signs at the Metzler parking area, although probably not extremely helpful in curtailing the dumping at this entrance, provide legal notice useful to law enforcement personnel attempting to arrest violators.

The Draft King County Interpretive Master Plan recommends against installing interpretive signage at the O'Grady section of the natural area because the cost/benefit ratio due to relatively low visitor use would not make it a good investment. Use is no larger in any of the other south side parcels in the natural area. The Metzler section supports more people and might be considered for interpretive signage as outlined generally in the draft interpretive plan if public use problems increase (Bucy Associates 2002)

## Property Boundary Questions

Accretion and erosion may change the amount of land that the county owns along the river, and may affect the relationship between county property and adjacent private lands. The southward trend of the river channel and side-channels since the time of acquisition has affected the acreage of all these properties over the years. River accretion has increased the land acreage of the original Metzler area and erosion has decreased the land acreage of the original O'Grady area since King County acquired these properties in the 1970s. In some areas along the natural area, it is likely that the river has made major jumps isolating fragments of private parcels that then became contiguous with the natural area.

## Green River Landing Homeowners Association Parcels

King County pays homeowner association dues on four parcels located within the Green River Landing Homeowner Association's jurisdiction. Annual dues are \$2,640 a year. In 2000 the county was assessed an additional \$16,000 for an asphalt road. The net result is relatively high ownership costs for King County for these parcels. Natural Resource Lands staff and Land and Watershed stewardship staff are exploring the possibility of removing the development rights from these properties to preserve the original ecological goals associated with their purchase and selling the underlying fee.

## Revenue Generating Opportunities

There are no obvious revenue generating opportunities at the site at this time.

## Part 7. Management Goals, Objectives and Recommendations

The objectives and recommendations that follow are derived from the analysis in the previous section. Office of Rural Resource Programs staff will revise the recommendations for the Green River Natural Area when new information from site monitoring programs and other initiatives indicate a need for a change in management strategies.

### Goals for Ecological Lands

King County Department of Natural Resource and Parks goals for all ecological lands are to:

- conserve and enhance the site's ecological value, and
- support appropriate public use that does not harm ecological resources.

The objectives and recommendations that follow are designed to support these goals when practicable at the Green River Natural Area.

### Objective: Understand implications of management actions

#### ➤ *Recommendation: Fill in data gaps*

The Science, Monitoring and Data Management section should complete an ecological assessment for the Green River Natural Area to gain a more thorough understanding of the ecological characteristics of the area. This should include species use. (Schedule: 2005)

#### ➤ *Recommendation: Coordinate site enhancement opportunities*

King County NRL LAWS, FHRS, Corps, and WRIA 9 staff should coordinate to ensure that any recommendations for Green River Natural Area presented in the Middle Green River Restoration Blueprint, the Flood Hazard Reduction Plan, the WRIA 9 Habitat Plan, and the Ecosystem

Restoration Project are coordinated and maximize the ecological potential for the site.  
(Schedule: 2004-2008).

## **Objective: Enhance the ecological structure and function of the site**

### **➤ *Recommendation: Control and Monitor Invasive Vegetation***

KC Park staff should monitor and manage the noxious and invasive plant species that infest a large portion of the natural area. The current King County noxious weed list should be reviewed annually for changes in listing status and control requirements. (Schedule: annually)

KC Park staff should monitor and remove Scot's Broom, St. Johnswort and tansy ragwort at GRNA-Metzler and tansy ragwort at GRNA-O'Grady. (Schedule: annually until control is established.)

KC Park staff should continue with the current mowing strategy at the GRNA-O'Grady area to control invasive species in the grass/common tansy area. The mowing frequency should be three times a year until monitoring indicates success. The first mowing should occur after July 1 to avoid disturbing breeding birds on site. Staff should use Integrated Pest Management strategies to adapt the control methods as new information and control opportunities become available. (Schedule: 2004-?)

### **➤ *Recommendation: Maintain and Monitor Enhancement Projects***

CPOSA staff should remove support stakes from the 2000 plantings in the O'Grady farm area. (Schedule: 2003)

CPOSA staff should maintain and monitor the 2000 planting at the O'Grady farm area. (Schedule: as needed through 2005)

CPOSA, NRL, and Park Resource staff should estimate the future project maintenance activities, timelines and costs necessary for the successful establishment of the O'Grady and Metzler CIP projects. Roles and responsibilities should be assigned and funding should be acquired to implement these activities. (Schedule: 2004)

### **➤ *Recommendation: Ecosystem Restoration Project Coordination***

The Green River Basin Steward, NRL staff,, the King County WLRD-Corps Partnership Coordinator, Flood Hazard Reduction staff and Science, Monitoring and Data Management staff should coordinate with the Corps on the levee setback, gravel, large woody debris and engineered logjam projects planned in the vicinity of the Green River Natural Area. As co-sponsors of some of these efforts, King County staff members should coordinate with Corps staff prior to and during the project design phase to define the monitoring strategies for the projects and ensure that necessary baseline data is collected prior project implementation. (Schedule: 2004-2005)

### **➤ *Recommendation: Design and implement the Lower Newaukum Creek Enhancement Project***

King County CPOSA and the Enumclaw Basin Steward should continue their design and fund raising efforts for the Lower Newaukum Creek Enhancement Project. (Schedule: 2004-2007)

**Objective: Support the current level of passive recreation opportunities such as fishing, nature observation, horseback riding and walking**

➤ *Recommendation: Improve access point signage*

KC Park staff should install signs identifying the GRNA-Metzler and GRNA-O'Grady accesses. (Schedule: 2004)

KC Park staff should compose and install signs at the O'Grady road access indicating where visitors to the natural area can legally park. They should consult with King County Roads staff when designing this signage effort. (Schedule: 2004)

*Recommendation: Improve visitor services at GRNA—Metzler*

KC Park staff should install a port-a-potty at the Metzler Parking area between May and September. (Schedule: annually)

KC Park staff should close off the social trails that lead from the main trails at Metzler. (Schedule: 2004)

➤ *Recommendation: Monitor public use*

Park staff should note changes in visitor numbers, types of recreational activities, and noticeable visitor impacts on the ecological values of the site. This information should be reported annually to King County Natural Resource Lands Management staff responsible for updating site management guidelines. The above objective should be modified if necessary to protect the ecological value of the site. (Schedule: monthly)

**Objective: Protect the site from inappropriate public uses**

➤ *Recommendation: Control Vandalism, Litter/Dumping and Encroachment Activities*

Park staff should monitor the site for vandalism, encroachment, dumping, and other trash and respond as necessary to maintain a clean and safe property. (Schedule: GRNA—Metzler: twice a week; GRNA—O'Grady: weekly; GRNA—other: monthly)

Park staff should remove dumped materials at the end of 160<sup>th</sup> Street. (Schedule: 2004)

Park staff should remove the duck blind on site. (Schedule: 2004)

➤ *Recommendation: Install Necessary Capital Improvements*

KC Park staff should recommend, install, and maintain any necessary capital improvements to protect the site from inappropriate public uses. This could include bollards, signs, concrete blocks, and boundary markers. (Schedule: as needed)

Park staff should install and maintain rules signs at all formal accesses to the natural area as well as at selected boundary points (such as the dumping area off 160<sup>th</sup> street and the Newaukum parcels) identified by Park staff. (Schedule: 2003-2004)

Park staff should install and maintain additional “no hunting, “no shooting”, and “no motor vehicle” signs along the O'Grady road. (Schedule: 2004)

Park staff should consider installing “Pack-it-in, Pack-it-home” signs on this property if litter activity increases. (Schedule: as needed)

➤ *Recommendation: Resolve boundary questions*

Natural Resource Lands staff should contract with surveyors to mark the natural area property lines. Once the survey is complete, King County Park Resource Staff should install natural area boundary markers at appropriate intervals along the surveyed lines. Natural Resource Lands staff may also have to contract with a forester and a lawyer to resolve questions about whether some of the Green River Natural Area parcel boundaries extend to the Green River. (Schedule: 2004)

**Objective: Control Ecological Land ownership costs**

➤ *Recommendation: Research selling the parcels in the Green River Landing Homeowner’s Association*

Natural Resource Lands staff, Land and Watershed Stewardship staff, and Capital Projects and Open Space Acquisitions staff should explore the feasibility of removing the development rights and selling the parcels bound by the Green River landing Homeowners Association covenants. (Schedule: 2004)

**Objective: Implement site management guidelines recommendations**

➤ *Recommendation: Site Maintenance Plan Creation*

Park Resource staff should coordinate with the Green River and Enumclaw Basin Stewards to prepare a site maintenance plan (a work plan) to include the litter/dumping, inspection, public use monitoring and invasive control tasks identified in the recommendations. NRL staff should coordinate with Park Resource staff on this effort. (Schedule: annually).

➤ *Recommendation: Coordinate Recommendation Implementation*

NRL staff should coordinate with the various programs responsible for implementing these recommendations to facilitate their timely accomplishment. (Schedule: ongoing).

NRL staff should coordinate with the Green River Basin Steward, the Enumclaw Basin Steward, and Park Resource staff to revise the site management guidelines. (Schedule: as needed or 2008).

**Table 3. Green River NA Recommendations: budget, schedule and staff matrix**

Recommendations	Cost	schedule	Park Resource staff	Enumclaw Basin Steward	GR Basin Steward	WEAT	CPOSA	WLRD/ Corps Partnership Coordinator	KC FHRS	WRIA 9	Corps	NRL staff
<b>Priority One</b>												
create site maintenance plan		annually	x	x	x							x
inspect site/litter removal/visitation monitoring/other preserve and protect actions		2x week/monthly	x									
remove dumped materials at the end of 160 <sup>th</sup> St.		2004	x									
improve access point signage		2004	x									
install rule, boundary and other regulatory signs		2004	x									
install portable toilet at Metzler area from May-September		annually	x									
project future maintenance needs for O'Grady CIP and Metzler SHRP project. Identify costs, timelines, roles and responsibilities.		2004	x				x					x
maintain and monitor 2000 planting		at least through 2005					x					
remove support stakes from 2000 O'Grady planting		2003-2004					x					
remove tansy ragwort, Scot's broom, and St. Johnswort		annually	x									
Ecosystem Restoration Project coordination		2004-?	x		x	x		x				x
mow GRNA-O'Grady (3x a year until under control then as needed)		2004 thru ?	x									
update site management guidelines		as needed or 2008	x	x	x							x
coordinate smg recommendation implementation		ongoing										x
<b>Priority Two</b>												
complete ecological assessment		2005				x						
remove duck blind		2004	x									
close social trails at Metzler area		2004	x									
design and implement Lower Newaukum Creek Project		2004-2007		x			x					
research selling parcels in the Green River Landing Homeowners Association		2004			x							x
resolve boundary questions												x
coordinate site enhancement opportunities		2004-2008		x	x			x	x		x	



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## Appendix 1: GRNA—O'Grady Enhancements

O'GRADY PARK WETLAND AND STREAM HABITAT ENHANCEMENTS

YEAR THREE (FINAL)

CIP # 0B1505

CIP #0C1505

Green River Basin

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CONSTRUCTED: 1999-2001

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Project Manager: Kathryn Neal, P.E.

Project Engineer: Doug Brown

Project Ecologist: Arny Stonkus

Landscape Architect: Fauna Nopp

Monitoring Ecologist: Laura Doherty

O'GRADY PARK WETLAND AND STREAM HABITAT ENHANCEMENTS  
YEAR THREE (FINAL) MONITORING REPORT

HPA #00-D8992-03

Grading Permit #L00CG087

## 1.0 PROJECT DESCRIPTION

The King County Department of Natural Resources implemented a comprehensive wetland and stream enhancement program at O'Grady Park beginning in 1999. The program included two separate CIP projects constructed in phases to minimize onsite erosion and water quality impacts and to optimize the ecological benefits of the projects.

Work on the first project included installation of a fish passable culvert on O'Grady Creek (Tributary #09.0107), rebuilding 200 lineal feet of streambed, decommissioning about 1,000 lineal feet of gravel road, and removal of three culverts.

The second project involved construction of approximately 1200 feet of channel to separate it from its wall-base tributaries and extensive floodplain and wetland restoration and enhancement. About 1300 cubic yards of earth were moved to form a wide floodplain bench and about nine acres were revegetated. An additional six acres of wetland were enhanced with native plants. The stream culvert replacement was completed in 1999. Phase 1 of channel relocation was completed in 2000, and Phase 2 was completed in 2001.

### 1.1 Location

O'Grady Park is a 184-acre tract owned and managed by King County as Open Space. It is located approximately four miles east of Auburn, Washington (Township 21N, Range 6E, Section 30), along the left bank of the Green between RM 39.8 and 40.6.

To access the site take I-5 south, exit east on Highway 18, and exit east at Highway 164 (Auburn-Enumclaw Road). Turn left at SE 380<sup>th</sup> Place, and right at 160<sup>th</sup> Place SE, which turns into SE 384<sup>th</sup> Street. Turn left onto 188<sup>th</sup> Avenue SE. Drive for about one mile where the road ends at the Park gate. Unlock the gate and proceed about 3,000 feet down the gravel road to the valley bottom. The pasture may be driven on in the dry season. A vicinity map is included as Figure 1. The project planting plan is shown in Figure 2.

## 2.0 STATEMENT OF PROBLEM AND REASON FOR PROJECT

O'Grady Creek originates on agricultural land on the Enumclaw Plateau. It descends through a steep ravine and emerges onto the valley floor through a large alluvial fan before discharging to the Green River at approximately River Mile 39.

Insert figure 1, vicinity map.

Insert Figure 2, project plan

At the upstream end of the alluvial fan, a 30" diameter culvert had a 3.7 foot eroded drop at its downstream end and was impassable to fish (Photo 1). An unauthorized access road had been built along the south margin of the creek and this road included three culverts ranging in size from 12" diameter to 36" diameter that conveyed wall-based tributaries to O'Grady Creek.



Photo 1. Fish-impassable culvert on O'Grady Creek. Spring 1999.

The creek carries substantial coarse sediment during large storm events that deposits in the low gradient reach on the alluvial fan. In February 1996, O'Grady Creek left its channel and sheet flowed over the abandoned pasture area (Photo 2). The porous nature of the soils in the area resulted in most of the stream flow infiltrating the soil, which eliminated a surface water connection to the river. Concerns over fish stranding led to emergency excavation in the abandoned channel to return the creek to a previous alignment. This alignment connected the creek with the adjacent wall-base tributary. After the initial excavation, the channel again aggraded, resulting in overbank flooding, fish stranding, and deposition of sediment in the surrounding wetland and the wall-base tributary.

Historic land uses, including forest clearing and agricultural development and subsequent conversion of the site into a minimally maintained passive-use park, have resulted in significant modification and degradation of the native plant communities onsite. Much of the site was covered with pasture grasses, and invasive and highly competitive non-native plants, such as reed canary grass (RCG), tansy and thistles. Native forest cover onsite was scant. Wetland plant communities were also degraded, and reflect the type and degree of past and present disturbances. Significant modification of habitat has also affected the type and abundance of wildlife onsite.



Photo 2. February 1996 – Sediment deposited by storm flows forces O'Grady Creek onto pasture.

### 3.0 PROJECT GOALS AND OBJECTIVES

#### 3.1 Project Goals

The goals of this project were to: 1) improve fish passage throughout the project reach and restore fish passage above the culvert; 2) reduce fish stranding due to overbank flows; 3) create a larger floodplain to allow the stream channel to migrate and to accommodate high sediment loads; 4) improve cover and diversity of native plants while reducing the presence of non-natives and invasives; 5) improve riparian habitat along O'Grady Creek; and 6) preserve the integrity of the wall-base tributary.

#### 3.2 Project Objectives

The wetland and stream enhancement program included two CIP projects that were implemented in phases. Project #0C1505, completed in 1999, replaced the stream culvert underneath the access road. A perched 30" culvert, which created a blockage for fish, was replaced with a 10-foot wide concrete box culvert and the incised 200-foot reach of stream channel was rebuilt with a series of stepped boulder wedges and approximately 50 pieces of LWD (Photos 3 and 4). In addition, a gravel access road about 1,000 feet long was decommissioned, and three culverts, ranging in size from 12" diameter to 36" diameter, were removed.



Photos 3 and 4. New box culvert and downstream reach immediately following construction in September 1999.

Project #0B1505 was constructed in two phases to minimize erosion by allowing recently planted areas time to achieve greater plant growth and root development before reintroduction of surface flows. In Phase 1, completed in May 2000, a 1,200-foot reach of new stream channel was constructed and approximately nine acres of surrounding area were graded to form a large floodplain for the new stream alignment (Photo 5). This large floodplain includes both lower and upper floodplain benches, and adjacent mounds. The work area is not within the 100-year floodplain of the Green River. The design intent was to allow aggradation and subsequent channel migration within a forested floodplain. In the fall of 2000, the entire graded area, as well as some undisturbed areas, were planted with native species (Figure 2). In Phase 2, completed in June 2001, the new stream channel was connected to O'Grady Creek below the bridge at the upstream end below the bridge, and to an existing abandoned side channel of the Green River at the downstream end.





Photo 5. Shaping a broad floodplain bench for the new O'Grady Creek stream channel. May 2000.

#### 4.0 PERMIT/ MONITORING REQUIREMENTS

King County Department of Development and Environmental Services (DDes) Grading Permit: Requires 80% survival at the end of three years.

Washington State Department of Fisheries Hydraulic Project Approval (HPA):

Requires a minimum of 80% survival of each planted species at the end of three years.

A Washington State Shoreline Exemption was issued, but required no post-project monitoring.

#### 5.0 MONITORING METHODS

##### 5.1 Vegetation Survival (Required By Permit)

Planting occurred in areas that were completely cleared during construction and in areas where no clearing occurred but communities were otherwise degraded. The project area was classified into eight planting areas A-H (Figure 2). Several 30-foot diameter plots were selected within each planting area. Plots in planting areas A, B, C, F, G, and H were randomly selected to provide a representative sample of species within the planting area, and were spaced to cover the geographic extent of the planting area.

Area D was dominated by RCG and is inhabited by deer and elk. Therefore, plots about 6-1/2 X 10-1/2' were fenced using an eight foot tall, vinyl mesh deer fence and eight foot tall T-posts. Black weed barrier and about two feet of mulch was laid down in the Area D plots and planted densely with the following: one spruce, one Oregon ash, one Western red cedar, two red alders, and two cottonwoods. The fenced areas were heavily mulched. The fenced plots were randomly chosen for monitoring plant survival.

The northwest corner poles of each fenced D plot were then used to establish sampling plot boundaries for Area E. The distance from the northwest corner pole (flagged) to the next nearest fenced plot was used as the radius of the sampling plot. All trees planted within that radius were included in survival monitoring for planting area E.

A total of thirty-eight monitoring plots were selected throughout the project area, and approximate locations of each are shown in Figure 2. The number of live plants within each plot were counted and compared to the number planted within the plots to determine percent survival for each species in the overall site.

The description and number of plots within each planting area is as follows:

Inside the Construction Area (Completely Cleared Areas)



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- Upland areas planted with trees and shrubs (10 plots).
- High stream bank areas planted with trees and shrubs (5 plots).
- Low stream bank areas staked with willow (5 plots).

### Outside the Construction Areas Uncleared Areas with Existing Plant Communities)

- Reed canarygrass dominated wetland areas planted with trees using a weed barrier and deer fencing (5 fenced plots)
- Reed canarygrass dominated wetland areas planted with alder and cottonwood (5 plots)
- Watercress and buttercup dominated wetland areas planted with trees (2 plots).
- Conifer underplanting areas (3 plots).
- Upland grass areas where native trees were planted (3 plots).

### Qualitative Assessments (Not-required by Permit)

Additional monitoring of habitat characteristics was conducted in order to collect useful information that can help guide future projects of this type and scale.

### Vegetation Cover

Total vegetation cover, total cover of trees and total cover of shrubs were estimated at each plot.

### Invasive species

During field visits, qualitative assessments of invasive species status were conducted.

### General wetland, riparian, and wildlife habitat

During field visits, qualitative assessment of upland, wetland and riparian habitat, including cover, structure and habitat diversity were conducted.

### Wetland Hydrology

Twice yearly, once during the growing season and once during late summer/early fall (at the end of the dry season), observations of inundation and soil saturation in the wetland vegetation plots were made.

### Fish passage

Twice yearly, once during the vegetation monitoring period and once during the fall spawning period, observations were made of fish use upstream and downstream of the culvert on O'Grady Creek, in the relocated reach, and in the wall-base tributary.

### Channel migration and floodplain functions

During field visits, observations of any channel migration and general conditions of the floodplain were made. At least once yearly, the newly constructed channel and the new culvert

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were observed and photographed. General changes within these areas such as bank stability, erosion, fish habitat, substrate, and sediment deposition were described.

Habitat quality within the wall-based tributary

During field visits, instream habitat quality within the wall-base tributary was observed.

### Photo Documentation

Photopoints encompassing the project area were established and mapped. Photos were replicated in each monitoring year.

## 6.0 MONITORING SCHEDULE

Only Vegetation Survival and Reporting are required monitoring tasks. Qualitative assessments of habitat characteristics were conducted but were not required.

TASK	SCHEDULE
Vegetation Survival	Summers 2001, 2002, and 2003
Qualitative Assessments	Summer/Fall 2001, 2002, and 2003
Reporting	Fall/Winter 2001, 2002, and 2003

## 7.0 RESULTS AND DISCUSSION

### 7.1 Vegetation Survival (Required By Permit)

Vegetation survival was determined in summer of 2001, 2002 and 2003. Overall plant survival was 96%, 76%, and 60% respectively. In 2003, the following species had less than a 76% survival rate: Western red cedar (68%), red osier dogwood (54%), black hawthorn (50%), red alder (46%), grand fir (33%), vine maple (22%), Indian plum (20%), big leaf maple (10%), red elderberry (0%), and salmonberry (0%) (Table 1). Cedars suffered from full sun. Big leaf maples and most of the shrubs did not compete well against the tall RCG, tansy, and thistle. About 400 alder and 300 of the big leaf maples were salvaged from Parks.

Area D had the highest overall plant survival rate of 89% due to moist soils, dense planting, and fencing from deer and elk. Area G (a forested plot) had a high plant survival rate of 88% due to moist soils, shade, and minimal browsing. The E plots, adjacent to the D plots, had the lowest plant survival rate (31%) and the highest percent of RCG at 100%. These plants suffered from severe rub and browse as well as competition from RCG. In Wetland F area the small-fruited bulrush and spruce were doing well. Two of four spruce, covered with *Galium aparine* (cleavers), were not browsed or rubbed on.

Notes on deer and elk activity: Deer and elk browsed most of the tree species except for big leaf maple, grand fir, and hemlock. Spruce were typically stripped from antler rub. Larger trees of all species were pushed over or their upper halves were snapped. The cedars that did survive were mostly void of branches below four feet. Trees were rubbed and browsed regardless of deer "garlic" repellent tags. A mix of cayenne pepper and grafting wax applied to the browse prone species may deter the herbivores, but would required multiple applications. It has proved successful at the Emerald Downs Mitigation Site in the Mill Creek basin in Auburn.

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### Supplemental and additional planting:

To meet the permit requirements additional plants were installed in November 2003 (See Section 8).

### 7.2 Qualitative Assessments (Not-Required by Permit)

Average percent cover of the installed vegetation was about 26% in 2002 and 25% in 2003 (Table 2). The average percent cover per area, including installed and naturally recruited vegetation, increased from 30% in 2002 to 37% in 2003. The fenced D plots exhibited the highest percent cover (48% in 2002 and 96% in 2003) of installed vegetation due to dense plantings and protection from browsing.

Area C, along the constructed channel, was planted with willow and is providing sufficient cover to the stream. Percent cover of willow doubled from an average of 18% in 2002 to 37% in 2003. Willows at the upstream half of the project reach averaged 6-10' tall, whereas the willows at the downstream half were heavily browsed and averaged only 3-6' tall. Additionally, naturally recruited alder and cottonwood seedlings constituted 7% and 12% cover, respectively.

Insert Table 1

Insert table 2

Cottonwoods naturally seeded in Areas A, B, and C. Cottonwood cover was estimated in 2003 only in which they exhibited a 28% cover (Area A), 42% cover (Area B), and 12% cover (Area C). The naturally recruited cottonwoods will likely provide increased cover as they become established. No natural recruitment of cottonwoods was observed in areas that were hydroseeded or otherwise dominated by grass.

Invasive species are present throughout the project area. The average percent cover of invasive species (RCG, thistle, tansy, and Himalayan blackberry) increased from 33% in 2002 to 43% in 2003. However, excluding RCG, the average percent cover of invasives remained relatively unchanged at 12% in 2002 and 14% in 2003. Reed canarygrass was dominant in Areas A, D, F, and H; thistle was dominant in Area H; tansy was dominant in Area A. In Areas D and E, RCG was dominant and large patches of thistle were common. The lower portions of Areas B and Area C were dominated by native rather than invasive species, perhaps due to thorough removal of soil, thereby removing the established seed of the non-native species that exist in other areas of the project site.

Weed Barrier Plots 1 and 2 (near A-10) and Weed Barrier Plot 3 (near A-9): Black weed barrier fabric was tied and staked down over large patches of RCG and knotweed. Neither species grew through the fabric in 2002 or 2003; however, knotweed grew around the outside edges of the fabric. This weed control method could be improved by planting cottonwood, alder, or other fast-growing species densely around the edges to shade the area and reduce potential growth and spread of knotweed and RCG before the fabric is removed.

Also, strong, sturdy wood stakes should be used instead of natural branches to hold down fabric. Once the branches dried out they became brittle and were easily broken or uprooted by deer. The plots required restretching of the fabric and restaking where the fabric had dislodged as well as dense planting around the edges.

General wetland, riparian, and wildlife habitat: Within the project area there are forested, open grassland, riparian, and wetland habitats in close proximity, reflecting an overall high habitat complexity. However, prior to conducting the project, relatively low vegetative diversity existed within each of the different habitats. At the same time, significant colonization by non-native invasive species has occurred in the open grassland, riparian, and wetland habitats within both the graded and the undisturbed areas. Overall habitat quality is expected to increase as the

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planted communities mature and late seral stage species become established. Deer and elk tracks were observed in the project area during every visit. A coyote was also observed.

**Wetland Hydrology:** Wetland enhancement Area F had soils saturated to the surface in late October in all monitoring years. Upon the October site visit in 2001, water from the old stream channel, which now conveys flow from the wall-base tributaries, overtopped the stream channel and sheet flowed through the forested riparian area into the buttercup dominated area (indicated on Figure 2), thereby maintaining a high level of saturation. In contrast, the wetland seems drier and has fewer emergents and watercress and more buttercup present than prior to the project.

Overtopping flows were not observed during the October visits of 2002 and 2003; however, standing water was observed in the buttercup and cattail portion of the wetland and at the west end of area F.

**Fish Passage:** In November 1999 adult coho were observed upstream of the new box culvert, and spawning coho and chum were observed in the rebuilt reach downstream of the culvert. Hundreds of juvenile coho salmon were observed in the new channel in July 2001, shortly after it was connected to the Green River side channel.

In the summer and fall of 2002 and 2003 juvenile coho were observed within the newly constructed channel, mostly in small pools behind wood structures and in the newly formed side channel. Unidentified juveniles were observed upstream of the installed box culvert in July of 2002 and October of 2002. The box culvert appears to be fish passable at all discharge and stage levels. On December 19, 2002 the old channel was walked from the vicinity of the buttercup wetland up to the culvert, but no spawners were observed.

In January of 2003, the stream was walked from the project area downstream to the confluence of the abandoned oxbow and the Green River to search for a fish barrier. A beaver dam was observed at the confluence. Since adult fish were not observed in the project reach in fall of 2002, this dam appeared to be passable at higher discharges on the mainstem when backwatering would presumably occur near the O'Grady Creek confluence. In addition, the dam appeared to provide excellent off-channel rearing habitat for juveniles.

Moreover, adult coho did pass upstream in November of 2003, when hundreds of juveniles and at least twenty adult spawners were observed within the project reach. Two dead adults were observed upstream of the box culvert, again indicating that installation of the box culvert had successfully corrected the fish blockage.

**Channel Migration and Floodplain Functions:** In the newly constructed channel most of the woody debris appeared stable. In addition, overall channel complexity was increased by the formation of a small side channel about 65 feet downstream from the connection of the new channel to the previously existing channel. The side channel parallels the constructed channel for about 100 feet before descending one to two feet to match the water level of the constructed channel. As flows continue to incise this nickpoint, the elevation of the side channel should match that of the relocated channel. The causative factor inducing formation of the new side channel appears to be flow deflection from several of the instream rootwads. Coho were observed in this newly formed side channel in June 2002.

In December 2002 roughly equal flow volumes were observed in the constructed channel and in the side channel, and approximately 75% of the flow reentered the main channel 45 feet downstream from the upstream point of divergence of the two channels. The remaining 25% of the flow volume entered the constructed channel 20 feet further downstream. It is expected that the rills connecting the two channels will eventually stabilize in a single location. No significant changes in channel form were observed in 2003.

## DRAFT MONITORING REPORT 2/4/04

Erosion was observed downstream of the side channel on both banks (approximately between plots C1 and C2), probably due to extensive wood placement in this area. The flows scoured out some willow stakes and two large stumps that now occupy the middle of the channel. Sediment has accumulated instream, downstream from the erosive reach in slower water areas. At the downstream end of the constructed channel, flows have overtopped the banks and deposited sediment onto the floodplain in a natural distribution pattern. As mentioned in the introduction, floodplains occupied by alluvial fans are inherently dynamic and channel migration and sediment accumulation commonly occur in these areas. Thus, some scour and deposition is expected as the channel adjusts into a more stable configuration. Gravels within the riffles were clean. Instream habitat complexity remained high throughout the monitoring period due to instream wood and the resultant pools.

### Habitat quality in the wall-based tributary

Habitat quality in the wall-base tributary also remained high. The water ran clear on all monitoring visits after construction. While, some sand and fines have accumulated instream, the gravels were mostly clean and no areas of concern were noted.

## 7.3 Photo Documentation

Year 2003 photographs are presented at the end of this report. Note that photos were taken in 2003 though the photo imprint indicates 2000.

## 2003 SUPPLEMENTAL PLANTING

To achieve the required 80 percent survival rate, some of the dead plants were replaced in November of 2003. King County DNRP, Northwest School volunteers, and World Conservation and Earth Corps Crews installed and fenced the plants. At the same time, Restoration Logistics, a consultant firm, selected O'Grady park as a mitigation site for a Puget Sound Energy (PSE) project on the Green River, referred to as "OSC 22 and 23." With approval by the King County DNRP, these groups installed and fenced additional plants. The locations and general scope of plantings by these various crews are as follows:

### King County DNRP work, Area A north (right) bank:

Planted and individually fenced 45 Douglas' fir, 10 cedar, five Sitka spruce and 10 alder. Posts were set on six-foot centers in a triangle and wrapped with seven-foot deer fence.

Triangular plots were installed around 50 random previously planted trees to prevent destruction by deer and elk.

### King County DNRP work, Area A south (left) bank:

Upstream of the existing mature cottonwoods, five Douglas fir were planted and protected with fencing.

Downstream of the existing mature cottonwoods, ten 15 X 20' plots covered with weed fabric were planted with 10 Douglas fir, 10 cedar, 10 Sitka spruce, and 20 alder posts were set five to ten feet apart and wrapped with seven foot tall deer fence.

## DRAFT MONITORING REPORT 2/4/04

### King County work, Buttercup Wetland F:

Six groups of twelve 4-6' willow poles were cut onsite and planted in the eastern portion of the wetland.

### Restoration Logistics work, north and south sides of stream between Areas B and C:

Fifteen 20 X 20' fenced plots were planted with 30 Douglas fir, 30 Sitka spruce, 15 cedar, and 30 red alder. Plots were mulched but weed fabric was not used.

### Restoration Logistics work, at King County Weed barrier Plots 1-2 near A-10 (Figure 2)

Two pre-existing 20 X 20' weed barrier plots were planted with four black hawthorn, 12 red alder, 12 Sitka spruce, and 12 Sitka willow and fenced with seven foot tall deer fencing.

### Restoration Logistics work, at King County Weed barrier Plot 3 near A-9 (Figure 2)

One 25 X 100' pre-existing weed barrier plot west of the forested area and northeast of the buttercup wetland area was planted and fenced. The following species and quantities were installed: nine black hawthorn, three Douglas fir, 12 Oregon ash, six alder, eight Sitka spruce, six Sitka willow, 11 red cedar, 29 Pacific ninebark, 28 red-osier dogwood, and 28 salmonberry.

## 9.0 SUMMARY OF PERMIT COMPLIANCE

Prior to replanting, survival was below the required 80%. After evaluating the site with the Landscape Architect it was determined that except for within fenced plots, planting shrubs was not recommended due to weed and grass competition and deer and elk damage. In 2003, it was also determined that the quantity of replacement plants (410 trees and shrubs and about 72 willow poles) was sufficient and appropriately spaced for the site to develop into a forested floodplain. Prior to the project only pasture grasses and invasives were present. The installed vegetation and abundance of naturally recruited cottonwoods has provided excellent plant diversity and structure and has already enhanced the quality of fish and wildlife habitat, regardless of plant survival. Plant maintenance will be conducted in 2004; monitoring is no longer required.

## 10.0 COMMENTS/RECOMMENDATIONS TO PROJECT TEAM

The planting portion of the project has performed relatively well despite full sun exposure, pre-existing dominance of invasives such as thistle, tansy, and RCG, and high deer and elk usage. Trees within fenced plots exhibited a greater percent survival and cover, and thus are recommended for future projects. In particular, the dense planting of spruce, alder, cottonwood, and Oregon ash was an excellent combination within the RCG. Shrubs, except for the willow and dogwood along the new channel, did not do well and are not recommended at sites such as O'Grady.

## DRAFT MONITORING REPORT 2/4/04

Since the branches of the planted trees were already growing through the deer fence in the first year of monitoring, larger plots are recommended for use in the future. In addition, it is recommended that the plot dimensions be at least 15 X 15', with a four to five foot clearance from the center of each plant to the fence line. Plots should be planted densely enough to prevent deer from jumping over the seven foot tall fence (eight foot T-posts). Deer disturbed the lighter gauge fencing, which necessitated fence repairs; therefore heavier gauge fencing may reduce the amount of damage. The plot edges were mowed to keep the RCG from invading the plots, and it is recommended that plot perimeter mowing also be carried out in future projects. Heavy mulching in saturated soils dominated by reed canary-grass areas is also recommended. In the future, if fencing of individual plants or plots is not used to protect plants from deer and elk damage, losses should be expected and compensated for by overplanting.

The cottonwood seedlings have formed dense patches in grass-free open areas such as right bank plots A1 through A5 and to somewhat less of an extent in the right bank B/C.. As the cottonwoods become established they should provide enough cover to reduce the number of shade intolerant invasives such as RCG, tansy, and thistle. Maintenance crews maintained five to ten foot swathes around the installed trees to allow for growth. In other areas, the cottonwood will naturally thin out as they mature.

In 2002, adult fish were not observed within the project area due to the presence of a beaver dam at the Green River, however in 2003, adult coho were observed spawning within the new channel, indicating that the beaver dam was not a total fish passage blockage. In addition, fish have been observed spawning and rearing upstream from the box culvert, indicating that the project goals with respect to fish passage have been achieved.

The project team and Parks should explore the possibility of inhibiting usage of existing horsetrails that run through the wetland and stream and provide alternate trails in order to prevent degradation of these protected sensitive areas.

### 2004 NOTES:

Order aerial photo from Ned Ahrens if we don't use money for maintenance in future.

# Appendix 2: Metzler Park Riparian Enhancement project

Small Habitat Restoration Program (SHRP) Project No. 7E1095

Abel Eckhardt, Ecological Technician, King County Ecological Services Unit

March 2001

## Introduction

The King County Department of Natural Resources' Small Habitat Restoration Program proposes to enhance roughly 450 lineal feet along the right bank of the Green river within Metzler Park by removing small patches of Himalayan blackberry and planting native species in meadow area. In addition to the stream planting the WCC crews will underplant conifers, primarily Cedar, throughout the Cottonwood and Alder forest along the river. The proposed planting site along the river is a high use area and therefore we need to allow for public access. The planting area, for the most part, will be set back from the rivers edge with clusters of plants planted right up to the bank. This will leave areas open for fishermen/women and other river enthusiasts.

## Project Goals

The primary goals for the project are to enhance fish and wildlife habitat by rehabilitating the riparian buffer, and encouraging conifer occupation in an Alder/Cottonwood dominated forest.

## Construction Management

All construction activities will occur in the following sequence:

Coordinate with WCC crew to perform work.

Clear small blackberry areas.

Plant area using WCC crews.

Flag plants and set up transects for future monitoring.

## Long-Term Goals

The primary goals of the project include:

Establish a native riparian plant community in areas where invasives and grasses exist.

Encourage conifer dominance in Alder/Cottonwood areas.

## Objectives and Performance Standards

***Objective 1: Establish a native riparian plant community.***

Performance Standard: Plant community success will be evaluated on percent survival of desirable species, including both planted and volunteer species.

All planted species must demonstrate 100% survival by Year One, 85% survival by Year Three.

***Objective 2: Encourage conifer dominance in Alder/Cottonwood areas.***



KEY:	SPECIES NAME:	COMMON NAME:	Qty:	Size	condition	\$/ unit	Total
EVERGREEN TREES:							
	Picea sitchensis	Sitka Spruce	65	3'-4'	2gal	\$6.00	\$390.00
	Thuja plicata	Western Redcedar	20	4-5'	2 gal	\$6.00	
	Thuja plicata	Western Redcedar	500	Seedling		Free	
DECIDUOUS TREES:							
	Crataegus douglasii	Black Hawthorne	6	3'-4'	2gal	\$6.00	\$36.00
	Fraxinus latifolia	Oregon Ash	5	3'-4'	2gal	\$6.00	\$30.00
	Populus trichocarpa	Black Cottonwood	25	3'-4'	2gal	\$6.00	\$150.00
	Salix lasiandra	Pacific Willow	5	3'-4'	2gal	\$6.00	\$30.00
	Salix scouleriana	Scouler Willow	200	Stakes			
DECIDUOUS SHRUBS:							
	Cornus stolonifera	Red-Osier Dogwood	50	Seedling		Free	
	corylus cornuta californica	Western Hazelnut	15	3'-4'	2gal	\$6.00	\$90.00
	Lonicera involucrata	Black Twinberry	20	3'-4'	2gal	\$6.00	\$120.00
	Physocarpus capitatus	Pacific Ninebark	25	3'-4'	2gal	\$6.00	\$150.00
	Rosa nutkana	Nootka Rose	75	3'-4'	2gal	\$6.00	\$450.00
	Symphoricarpos albus	Snowberry	20	3'-4'	2gal	\$6.00	\$120.00
1122							\$2,232.00

## Appendix 3: 1998 O'Grady Volunteer Planting

Project Manager: Linda Hanson, Green River Basin Steward

These plants were installed October 31, 1998, adjacent to the Green River in the old O'Grady agricultural field downstream of the maintenance road. Originally they were installed 50 feet from the river. River erosion has removed this 50 feet of land and the planting currently abuts the edge of the river.

10	Bigleaf Maple
5	Chokecherry
10	cottonwood
19	Douglas-fir
6	Douglas Hawthorn
3	Pacific crabapple
5	Pacific Madrona
13	Red alder
10	Western redcedar
3	amelanchier
6	Beaked hazelnut
6	cascara
63	Nootka rose
43	Ocean spray
29	Oregon grape - tall
12	Red currant
43	Red elderberry
87	snowberry
65	Red osier dogwood

## Appendix 4: Species Lists for Green River Natural Area

Following are lists of noxious and invasive plant species, general plant species, and wildlife species reported at the Green River Natural Area.

**Table 1: Noxious/invasive plant species identified at GRNA**

Species	Location
Common Tansy	O'Grady meadow
Tansy ragwort	Informal trail NW of O'Grady meadow leading to beach
Japanese knotweed	Localized patches (unnamed tributary, O'Grady Road, O'Grady Creek)
Scot's broom	Forested valley bottom in west side of O'Grady; Metzler
Herb Robert	Natural area along O'Grady Road
English ivy	Occasional along valley wall and on valley floor; Metzler area;
Oxeye daisy	meadows
Reed canarygrass	meadows
Bitter nightshade	Tina where
English holly	
St. Johnswort	Meadows; open areas
Evergreen blackberry	meadows
Canada thistle	meadows
Himalayan blackberry	Periphery of O'Grady meadow

**Table 2: Plant species observed at Green River Natural Area**

SCIENTIFIC NAME	COMMON NAME	SCIENTIFIC NAME	COMMON NAME
<b><u>FERNS AND ALLIES</u></b>		<b><u>GRASSES</u></b>	
<i>Adiantum pedatum</i>	Maidenhair Fern	<i>Agropyron repens</i>	Quack-grass
<i>Athyrium filix-femina</i>	Lady Fern	<i>Agrostis alba</i>	Creeping Bentgrass
<i>Blechnum spicant</i>	Deer Fern	<i>Agrostis tenuis</i>	Colonial Bentgrass
<i>Equisetum hyemale</i>	Scouring-Rush	<i>Dactylis glomerata</i>	Orchard Grass^
<i>Equisetum spp.</i>	Horsetail	<i>Festuca rubra</i>	Red Fescue^
<i>Polypodium glycorrhiza</i>	Licorice Fern	<i>Holcus lanatus</i>	Velvet-grass^
<i>Polystichum munitum</i>	Sword Fern	<i>Glyceria elata</i>	Manna grass^
<i>Pteridium aquilinum</i>	Bracken Fern	<i>Lolium multiflorum</i>	Italian ryegrass^
<b><u>AQUATICS</u></b>		<i>Phalaris arundinacea</i>	Reed Canary Grass+
<i>Lemna minor</i>	Duck-weed	<i>Phleum pratense</i>	Timothy
<i>Sparganium sp.</i>	Bur-reed	<i>Poa pratensis</i>	Kentucky Bluegrass
<b><u>HERBS</u></b>		<b><u>RUSHES/SEDGES</u></b>	
<i>Achlys triphylla</i>	Vanilla-leaf	<i>Eleocharis sp.</i>	Spike-rush
<i>Angelica sp.</i>	Angelica	<i>Juncus effusus</i>	Soft Rush
<i>Artemisia suksdorfii</i>	Suksdorf's Wormwood	<i>Juncus spp.</i>	Rush
<i>Cardamine sp.</i>	Bittercress	<i>Carex deweyana</i>	Short-scale Sedge
<i>Chrysanthemum leucanthemum</i>	Oxe-eye Daisy	<i>Carex obnupta</i>	Slough Sedge
<i>Cirsium arvense</i>	Canada thistle	<i>Scirpus microcarpus</i>	Small-fruited Bulrush
<i>Claytonia sibirica</i>	Siberian Miner's-Lettuce	<b><u>SHRUBS/SMALL TREES</u></b>	
<i>Conium maculatum</i>	Poison-hemlock	<i>Acer circinatum</i>	Vine Maple
<i>Daucus carota</i>	Queen Anne's lace^	<i>Berberis nervosa</i>	Oregon Grape
<i>Dicentra formosa</i>	Pacific Bleeding Heart	<i>Corylus cornuta</i>	Hazelnut
<i>Digitalis purpurea</i>	Foxglove^	<i>Cornus stolonifera</i>	Red-osier Dogwood
<i>Dipsacus sylvestris</i>	Teasle	<i>Cytisus scoparius</i>	Scot's Broom
<i>Epilobium watsonii</i>	Watson's willow-herb	<i>Gaultheria shallon</i>	Salal
<i>Galium sp.</i>	Bedstraw	<i>Hedera helix</i>	Ivy
<i>Geranium robertianum</i>	Robert Geranium	<i>Holodiscus discolor</i>	Oceanspray
<i>Geum macrophyllum</i>	Big-leaf Avenas	<i>Ilex sp.</i>	Holly

<i>Heracleum lanatum</i>	Cow parsnip	<i>Oemleria cerasiformis</i>	Indian Plum
<i>Heuchera</i> sp.	Heuchera	<i>Oplopanax horridus</i>	Devil's Club
<b><i>Hypericum perforatum</i></b>	<b>St. Johns wort</b> <sup>^</sup>	<i>Physocarpus capitatus</i>	ninebark
<b><i>Hypochaeris radicata</i></b>	<b>Hairy Cat's-ear</b>	<i>Ribes lacutre</i>	Black swamp currant
<i>Leucantheemem vulgare</i>	<b>Oxeye daisy</b> <sup>^</sup>	<i>Rosa nutkana</i>	Nutka Rose
<i>Lysichiton americanum</i> *	Skunk Cabbage	<b><i>Rosa pisocarpa</i></b> <sup>^</sup>	Swamp rose
<i>Maianthemum dilatatum</i>	False Lily of the Valley	<b><i>Rubus discolor</i></b>	<b>Himalayan Blackberry</b>
<b><i>Melilotus alba</i></b>	<b>White Sweet Clover</b>	<b><i>Rubus laciniatus</i></b>	<b>Evergreen Blackberry</b>
<i>Myosotis laxa</i>	Small-flowered Forget-me-not	<i>Rubus parviflorus</i>	Thimbleberry
<i>Oenanthe sarmentosa</i>	Water Parsley	<i>Rubus spectabilis</i>	Salmonberry
<i>Petasites frigidus</i>	Colt's-foot	<i>Rubus ursinus</i>	Trailing Blackberry (Dewberry)
<b><i>Plantago lanceolata</i></b>	<b>English Plantain</b>	<i>Salix</i> spp.	Willow
<b><i>Plantago major</i></b>	<b>Common Plantain</b>	<i>Sambucus racemosa</i>	Red Elderberry
<b><i>Polygonum cuspidatum</i></b>	<b>Japanese knotweed</b>	<i>Spiraea douglassii</i>	Hardhack
<b><i>Ranunculus repens</i></b>	<b>Creeping Buttercup</b>	<i>Symphoricarpos albus</i>	Snowberry
<b><i>Rorippa nasturtium-aquaticum</i></b>	<b>Watercress</b>	<i>Vaccinium ovatum</i>	Evergreen Huckleberry
<b><i>Rumex crispus</i></b>	<b>Dock</b>	<i>Vaccinium parvifolium</i>	Red Huckleberry
<b><i>Senecio vulgaris</i></b>	<b>Common Groundsel</b>	<i>Viburnum edule</i>	Highbush Cranberry
<b><i>Senecio jacobaea</i></b>	<b>Tansy ragwort</b> <sup>^</sup>		
<b><i>Solanum dulcamara</i></b>	<b>Bittersweet Nightshade</b>		
<i>Solidago</i> sp.	Goldenrod		
<i>Smilacena</i> sp.	False solomon's seal <sup>^</sup>		
<i>Stachys cooleyae</i>	Cooley's Hedge-nettle		
<b><i>Tanacetum vulgare</i></b>	<b>Common Tansy</b>	<b><u>TREES</u></b>	
<b><i>Taraxacum officinale</i></b>	<b>Dandelion</b>	<i>Acer macrophyllum</i>	Bigleaf Maple
<i>Tiarella trifoliata</i>	Foamflower	<i>Pseudotsuga menziesii</i>	Douglas-fir
<i>Tolmiea menziesii</i>	Piggy-Back Plant	<i>Rhamnus purshiana</i>	Cascara
<i>Tridentalis latifolia</i>	Western Star-flower	<i>Salix lucida</i> ssp. <i>lasiandra</i> *	Pacific Willow
<b><i>Trifolium repens</i></b>	<b>White Clover</b>	<i>Taxus brevifolia</i>	Western Yew
<i>Trillium ovatum</i>	Western Trillium	<i>Thuja plicata</i>	Western Redcedar
<i>Typha latifolia</i>	Broad-leaved Cattail	<i>Tsuga heterophylla</i>	Western Hemlock
<i>Urtica dioica</i>	Stinging Nettle <sup>^</sup>	<i>Alnus rubra</i>	Red Alder
<b><i>Verbascum thapsus</i></b>	<b>Common Mullein</b>	<i>Fraxinus latifolia</i>	Oregon Ash
<i>Veronica americana</i>	American speedwell	<i>Malus fusca</i>	Crab Apple
<b><i>Vicia</i> sp.</b>	<b>Vetch</b>	<i>Picea sitchensis</i>	Sitka Spruce
		<i>Populus balsamifera</i> var. <i>trichocarpa</i> *	Black Cottonwood

#### **NOTES:**

**Bold indicates non-native species.**

+ Indicates native status undetermined.

\* Identifies updated plant names. Updated taxonomy follows Hickman (1993). All other nomenclature follows Hitchcock and Cronquist (1978).

Site was visited April-May, 1997. This data is strictly seasonal and limited in nature; other species are expected to occur throughout the natural area.

<sup>^</sup>Indicates plants documented in July 2003.

**Table 3: Wildlife species observed at Green River Natural Area**

SCIENTIFIC NAME	COMMON NAME	SCIENTIFIC NAME	COMMON NAME
<b>MAMMALS</b>		<u>Erethizontidae</u>	
<b><u>Pouched Mammals (Marsupialia)</u></b>		<i>Erethizon dorsatum</i>	Porcupine*
<i>Didelphis marsupialis</i>	Opossum	<b><u>Pikas, Hares, and Rabbits</u></b>	
<b><u>Insect-eaters (Insectivora)</u></b>		<b><u>(Lagomorpha)</u></b>	
<u>Soricidae</u>		<u>Leporidae</u>	
<i>Sorex bendirei</i>	Marsh Shrew	<i>Sylvilagus</i> spp.	Cottontail Rabbit*
<i>Sorex cinereus</i>	Masked Shrew	<b><u>Even-hoofed Mammals (</u></b>	
<i>Sorex palustris</i>	Water Shrew	<b><u>Artiodactyla)</u></b>	
<i>Sorex trowbridgei</i>	Trowbridge Shrew	<u>Cervidae</u>	
<i>Sorex vagrans</i>	Vagrant Shrew	<i>Cervus elaphus</i>	Elk*^
<u>Talpidae</u>		<i>Odocoileus hemionus</i>	Blacktail Deer *+
<i>Neurotrichus gibbsii</i>	Shrew-mole		
<i>Scapanus orarius</i>	True-coast Mole	<b>BIRDS</b>	
<i>Scapanus townsendi</i>	Townsend's Mole	<u>Grebes (Podicipedidae)</u>	
<b><u>Bats (Chiroptera)</u></b>		<i>Podilymbus podiceps</i>	Pied-billed Grebe
<i>Eptesicus fuscus</i>	Big Brown Bat	<i>Podiceps auritus</i>	Horned Grebe
<i>Lasionycteris noctivagans</i>	Silver Haired Bat	<i>Podiceps nigricollis</i>	Eared Grebe
<i>Myotis californicus</i>	California Myotis	<i>Aechmophorus occidentalis</i>	Western Grebe
<i>Myotis evotis</i>	Long-eared Myotis	<b><u>Cormorants (Phalacrocoracidae)</u></b>	
<i>Myotis lucifugus</i>	Little Brown Myotis	<i>Phalacrocorax auritus</i>	Double-crested Cormorant
<i>Myotis volans</i>	Long-legged Myotis	<b><u>Hérons, Bitterns (Ardeidae)</u></b>	
<b><u>Flesh-eaters (Carnivora)</u></b>		<i>Botaurus lentiginosus</i>	American Bittern
<u>Ursidae</u>		<i>Ardea herodias</i>	Great Blue Heron*+
<i>Ursus americanus</i>	Black Bear+	<i>Butorides virescens</i>	Green Heron
<u>Procyonidae</u>		<b><u>Waterfowl (Anatidae)</u></b>	
<i>Procyon lotor</i>	Raccoon	<u>Geese (Anserini)</u>	
<u>Mustelidae</u>		<i>Branta canadensis</i>	Canada Goose
<i>Lutra canadensis</i>	River Otter*	<b><u>Ducks (Anatinae)</u></b>	
<i>Martes americana</i>	Marten	<i>Aix sponsa</i>	Wood Duck
<i>Mustela erminea</i>	Short-tailed Weasel	<i>Anas crecca</i>	Green-winged Teal
<i>Mustela frenata</i>	Long-tailed Weasel*	<i>Anas platyrhynchos</i>	Mallard*+
<i>Mustela vison</i>	Mink	<i>Anas acuta</i>	Northern Pintail
<i>Mephitis mephitis</i>	Striped Skunk	<i>Anas discors</i>	Blue-winged Teal*
<i>Spilogale putorius</i>	Spotted Skunk	<i>Anas cyanoptera</i>	Cinnamon Teal
<u>Canidae</u>		<i>Anas clypeata</i>	Northern Shoveler
<i>Canis latrans</i>	Coyote*+	<i>Anas strepera</i>	Gadwall
<i>Vulpes fulva</i>	Red Fox	<i>Anas americana</i>	American Wigeon
<u>Felidae</u>		<i>Aythya americana</i>	Redhead
<i>Felis concolor</i>	Cougar	<i>Aythya collaris</i>	Ring-necked Duck
<i>Felis rufus</i>	Bobcat	<i>Aythya affinis</i>	Lesser Scaup
<b><u>Gnawing Mammals (Rodentia)</u></b>		<i>Histrionicus histrionicus</i>	Harlequin Duck
<u>Apodontaidae</u>		<i>Bucephala clangula</i>	Common Goldeneye*
<i>Apodonta rufa</i>	Mountain Beaver*	<i>Bucephala albeola</i>	Bufflehead
<u>Sciuridae</u>		<i>Lophodytes cucullatus</i>	Hooded Merganser*
<i>Eutamias townsendi</i>	Townsend Chipmunk	<i>Mergus merganser</i>	Common Merganser*+
<i>Glauconys sabrinus</i>	Northern Flying Squirrel	<i>Mergus serrator</i>	Red-breasted Merganser
<i>Sciurus carolinensis</i>	Eastern Gray Squirrel	<i>Oxyura jamaicensis</i>	Ruddy Duck
<i>Tamiasciurus douglasi</i>	Douglas Squirrel	<b><u>Hawks, etc. (Accipitridae)</u></b>	
<u>Castoridae</u>		<i>Pandion haliaetus</i>	Osprey*+
<i>Castor canadensis</i>	Beaver*+	<i>Haliaeetus leucocephalus</i>	Bald Eagle*
<u>Cricetidae</u>		<i>Circus cyaneus</i>	Northern Harrier
<i>Peromyscus maniculatus</i>	Deer Mouse	<i>Accipiter striatus</i>	Sharp-shinned Hawk+
<i>Peromyscus oreas</i>		<i>Accipiter cooperii</i>	Cooper's Hawk*
<i>Clethrionomys gapperi</i>	Boreal Red Backed Vole	<i>Buteo jamaicensis</i>	Red-tailed Hawk*+
<i>Microtus oregoni</i>	Oregon Vole	<b><u>Falcons (Falconidae)</u></b>	
<i>Microtus longicaudus</i>	Long-tailed Meadow Vole	<i>Falco sparverius</i>	American Kestrel
<i>Microtus richardsoni</i>	Water Vole	<i>Falco columbarius</i>	Merlin
<i>Microtus townsendii</i>	Townsend's Vole	<b><u>Fowl-Like Birds (Phasianidae)</u></b>	
<i>Ondatra zibethica</i>	Muskrat	<i>Phasianus colchicus</i>	Ring-Necked Pheasant+
<u>Muridae</u>		<i>Bonasa umbellus</i>	Ruffed Grouse*
<i>Mus musculus</i>	House Mouse	<i>Callipepla californica</i>	California Quail
<i>Rattus norvegicus</i>	Norway Rat	<b><u>Rails, etc. (Rallidae)</u></b>	
<i>Rallus limicola</i>	Virginia Rail+	<b><u>Jays, Magpies, Crows (Corvidae)</u></b>	

**SCIENTIFIC NAME***Porzana carolina**Fulica americana*Plovers (Charadriidae)*Charadrius vociferus*Sandpipers, Phalaropes (Scolopacidae)*Tringa melanoleuca**Tringa flavipes**Actitis hypoleucos**Actitis macularia**Calidris mauri**Calidris alpina**Limnodromus griseus**Limnodromus scolopaceus**Gallinago gallinago*Jaeger, Gulls, etc. (Laridae)*Larus delawarensis**Larus californicus**Larus glaucescens*Pigeons, Doves (Columbidae)***Columba livia****Columba fasciata**Zenaida macroura*Owls (Tytonidae, Strigidae)*Tyto alba**Otus kennicottii**Bubo virginianus**Strix varia*Swifts (Apodidae)*Chaetura vauxi*Hummingbirds (Trochilidae)*Calypte anna**Selasphorus rufus*Kingfishers (Alcedinidae)*Ceryle alcyon*Woodpeckers (Picidae)***Colaptes auratus****Sphyrapicus thyroideus**Drycopus pileatus**Picoides pubescens**Picoides villosus**Contopus borealis**Contopus sordidulus**Empidonax traillii**Empidonax difficilis**Empidonax hammondi**Empidonax oberholseri*Swallows (Hirundinidae)*Tachycineta bicolor**Tachycineta thalassina**Stelgidopteryx serripennis**Hirundo pyrrhonota**Hirundo rustica**Pheucticus melanocephalus**Passerina amoena***COMMON NAME**

Sora

American Coot

Killdeer\*+

Greater Yellowlegs+

Lesser Yellowlegs

Common Sandpiper

Spotted Sandpiper+

Western Sandpiper

Dunlin

Short-billed Dowitcher

Long-billed Dowitcher

Common Snipe+

Ring-billed Gull+

California Gull\*+

Glaucous-winged Gull\*+

**Rock Dove**

Band-tailed Pigeon

Mourning Dove

Barn Owl

Western Screech-owl

Great Horned Owl

Barred Owl

Vaux's Swift

Anna's Hummingbird

Rufous Hummingbird\*

Belted Kingfisher\*+

Flicker^

Red-breasted Sapsucker\*+

Pileated woodpecker^

Downy Woodpecker^

Hairy Woodpecker\*

Olive-sided Flycatcher

Western Wood Pewee

Willow Flycatcher^

Pacific-slope Flycatcher

Hammond's Flycatcher

Dusky Flycatcher

Tree Swallow

Violet-green Swallow+

N. Rough-winged Swallow

Cliff Swallow+

Barn Swallow+

Black-headed Grosbeak

Lazuli Bunting

**SCIENTIFIC NAME***Cuanoatta stelleri**Corvus brachyrhynchos**Corvus caurinus**Corvus corax*Chickadees, Titmice (Paridae)*Parvus atricapillus**Parvus rufescens*Bushtit (Aegithalidae)*Psaltriparus minimus*Nuthatches (Sittidae)*Sitta canadensis*Creepers (Certhiidae)*Certhia americana*Wrens (Troglodytidae)*Thryomanes bewickii**Troglodytes aedon**Troglodytes troglodytes**Cistothorus palustris*Dippers (Cinclidae)*Cinclus mexicanus*Kinglets, etc. (Muscicapidae)*Regulus satrapa**Regulus calendula**Catharus ustulatus**Catharus guttatus**Turdus migratorius**Ixoreus naevius*Waxwings (Bombycillidae)*Bombycilla garrulus*Starlings (Sturnidae)***Sturns vulgaris***Vireos (Vireonidae)*Vireo solitarius**Vireo huttoni**Vireo gilvus**Vireo olivaceus*Emberizids (Emberizidae)Wood Warblers (Parulinae)*Vermiura celata**Dendroica petechia**Dendroica nigrescens**Dendroica coronata**Dendroica townsendi**Dendroica occidentalis**Oporornis tolmiei**Geothlypis trichas**Wilsonia pusilla*Tanagers (Thraupinae)*Piranga ludoviciana*Grosbeaks, etc. (Cardinalinae)*Ensatina eschscholtzii*Dicamptodontidae*Dicamptodon ensatus***COMMON NAME**

Steller's Jay\*+

American Crow\*+

Northwestern Crow\*+

Common Raven

Black-capped Chickadee\*+^

Chestnut-backed Chickadee

Bushtit\*+

Red-breasted Nuthatch

Brown Creeper++

Bewick's Wren\*+

House Wren

Winter Wren\*+

Marsh Wren\*+

American Dipper\*+

Golden-crowned Kinglet\*+

Ruby-crowned Kinglet+

Swainson's Thrush

Hermit Thrush

American Robin\*+^

Varied Thrush\*^

Cedar Waxwing+

**European Starling+**

Solitary Vireo

Hutton Vireo

Warbling Vireo

Red-eyed Vireo

Orange-crowned Warbler

Yellow Warbler

Black-throated Gray Warbler

Yellow-rumped Warbler

Townsend's Warbler

Hermit Warbler

MacGillivray's Warbler

Common Yellowthroat+

Wilson's Warbler^

Western Tanager

Ensatina

Pacific Giant Salamander

SCIENTIFIC NAME	COMMON NAME	SCIENTIFIC NAME	COMMON NAME
<u>Towhees, Sparrows, etc. (Emberizinae)</u>		<u>Newts (Salamandridae)</u>	
<i>Pipilo erythrophthalmus</i>	Spotted Towhee*+	<i>Taricha granulosa</i>	Rough-skinned Newt
<i>Spizella passerina</i>	Chipping Sparrow	<u>Lungless Salamanders (Plethodontidae)</u>	
<i>Passerculus sandwichensis</i>	Savannah Sparrow +	<i>Plethodon vehiculum</i>	Westerm Red-backed Salamander
<i>Passerella iliaca</i>	Fox Sparrow	<b><u>Frogs and Toads (Ascaphidae)</u></b>	
<i>Melospiza melodia</i>	Song Sparrow*+^	<u>Bufonidae</u>	
<i>Melospiza lincolni</i>	Lincoln's Sparrow+	<i>Bufo boreas</i>	Western Toad
<i>Zonotrichia leucophrys</i>	White-crowned Sparrow	<u>Tree Frogs and their Allies (Hylidae)</u>	
<i>Zonotrichia atricapilla</i>	Golden-crowned Sparrow	<i>Hyla regilla</i>	Pacific Chorus Frog+^
<i>Junco hyemalis</i>	Dark-eyed Junco+	<u>True Frogs (Ranidae)</u>	
<u>Blackbirds, Orioles, etc. (Icterinae)</u>		<i>Rana aurora</i>	Red-legged Frog^
<i>Agelaius phoeniceus</i>	Red-winged Blackbird+	<b><i>Rana catesbiana</i></b>	<b>Bullfrog</b>
<i>Euphagus cyanocephalus</i>	Brewer's Blackbird	<u>Boas and Pythons (Boidae)</u>	
<b><i>Molothrus ater</i></b>	<b>Brown-headed Cowbird</b>	<i>Charina bottae</i>	Rubber Boa
<i>Icterus galbula</i>	Northern Oriole	<u>Colubrids (Colubridae)</u>	
<u>Finches (Fringillidae)</u>		<i>Thamnophis elegans</i>	W. Terrestrial Garter Snake
<i>Carpodacus purpureus</i>	Purple Finch+	<i>Thamnophis ordinoides</i>	Northwestern Garter Snake
<i>Carpodacus mexicanus</i>	House Finch+	<i>Thamnophis sirtalis</i>	Common Garter Snake
<i>Loxia curvirostra</i>	Red Crossbill	<u>Alligator Lizards (Anguidae)</u>	
<i>Carduelis pinus</i>	Pine Siskin	<i>Elgaria coerulea</i>	Northern Alligator Lizard
<i>Carduelis tristis</i>	American Goldfinch+^		
<i>Coccothraustes vespertina</i>	Evening Grosbeak		
<u>Weaver Finches (Passeridae)</u>			
<i>Passer domesticus</i>	House Sparrow		

## FISH

<u>Salmons,Trouts, etc. (Salmonidae)</u>	
<i>Oncorhynchus clarki</i>	Cutthroat Trout (resident and searun)
<i>Oncorhynchus keta</i>	Chum Salmon*
<i>Oncorhynchus kisutch</i>	Coho Salmon*
<i>Oncorhynchus mykiss</i>	Steelhead/Rainbow Trout
<i>Oncorhynchus tshawytscha</i>	Chinook Salmon
<u>Sticklebacks (Gasterosteidae)</u>	
<i>Gasterosteus aculeatus</i>	Three-spine Stickleback
<u>Sculpin (Cottidae)</u>	
<i>Cottus</i> sp.	Sculpin

## AMPHIBIANS

### Salamanders and Relatives

<u>Ambystomatidae</u>	
<i>Ambystoma gracile</i>	Northwestern Salamander
<i>Ambystoma macrodactylum</i>	Long-toed Salamander

### Notes:

#### **Bold indicates non-native species**

\*Indicates species observed at O'Grady Park in 1989 (Jones and Jones 1989).

+Indicates species observed at O'Grady Park and Green River Natural Area during site inventory (June 1998).

^Indicates species observed at Green River Natural Area in September 2003.