

Table D-14. Total area of model patches and Habitats of Concern by 1998 Landsat Landcover Area.

Resource Site: Middle Rock Creek - Tualatin River	Total area of wildlife model patches	Total area of HOCs outside of modeled patches (including wetlands <2 acres)	Percent of total inventoried habitat
Landcover type:			
Water	5.35	0.7	0.3%
Barren	135.08	5.3	5.9%
Low structure agriculture	214.50	2.1	9.1%
High structure agriculture	6.72	0.0	0.3%
Deciduous closed canopy	544.74	1.0	23.0%
Mixed closed canopy	635.98	0.8	26.9%
Conifer closed canopy	56.03	0.9	2.4%
Deciduous open canopy	70.35	1.3	3.0%
Mixed open canopy	61.01	0.6	2.6%
Conifer open canopy	18.22	0.2	0.8%
Deciduous scattered canopy	159.86	0.5	6.8%
Mixed scattered canopy	33.62	0.7	1.4%
Conifer scattered canopy	5.91	0.4	0.3%
Closed canopy shrub	74.12	0.5	3.1%
Open canopy shrub	98.93	0.3	4.2%
Scattered canopy shrub	59.78	0.8	2.6%
Meadow/grass	168.69	3.3	7.3%
Not classified	0.15	0.0	0.0%
Total	2,349.03	19.4	100.0%

The table below provides estimates of each type of the habitats described in Metro’s Technical Report for Fish and Wildlife Habitat, based on Johnson and O’Neil’s (2001) habitat scheme. These numbers are provided for subwatershed comparison purposes and represent estimates of available habitat type. Several data types were used to compile this table, and the data sources vary in their precision. For example, the satellite data sources are less accurate than hand-digitized forest canopy cover. There is also slight overlap between certain habitat types. For example, Riparian Wetlands (RWET) are also partially included in Westside Lowland Coniferous Hardwood/Westside Oak and Douglas-fir (WLCH/WODF) because some wetlands also contain forest, and Open Water (WATR) is not always considered part of habitat patches. Therefore, the sums of these habitat types are slightly different from the “Total wildlife habitat acres in inventory” shown in Table 16. Nonetheless, these numbers provide a generalized means of comparing the quality and quantity of habitat available to wildlife among and between subwatersheds. Note also that the estimates for Westside Grasslands (WEGR) probably represent grasslands that are not native rather than true native grasslands, which are largely extirpated from the metro region.

Table D-15. Wildlife habitat availability¹ based on Johnson & O’Neil’s (2001) habitat types and species-habitat associations.

Resource site: Middle Rock Creek - Tualatin River	Habitat type						
	WATR ²	HWET ³	RWET ³	TOTWET ³	WLCH/ WODF ⁴	WEGR	AGPA
Total acres	0.0	84.3	99.6	199.9	1,592.1	331.8	223.3
Percent of total	0.0%	3.6%	4.2%	8.4%	67.2%	14.0%	9.4%

¹See Table D-14 for land cover types and crosswalk to Johnson and O’Neil’s classification scheme.

²Note that patch type and data limitations result in an underestimation of open water habitats. For example, medium and small sized stream surfaces are excluded.

³Note that HWET and RWET do not represent the full suite of wetlands because some wetlands <2 acres were added in as Habitats of Concern, and some wetlands could not be associated with herbaceous or forested habitats. TOTWET represents the best estimate of all existing wetlands because it includes Habitats of Concern.

⁴Data limitations make it impossible to distinguish between these two habitat types at this time, and no comprehensive oak habitat survey has been conducted for the region. However, known oak habitats are also included in HOCs (see Appendix 10).

SITE #8: Beaverton Creek subwatershed

Named tributaries: Beaverton Creek, Bronson Creek, Cedar Mill Creek, Golf Creek, Johnson Creek, Rock Creek, Wessenger Creek, Willow Creek

Communities within the subwatershed: Beaverton, Hillsboro, Portland, unincorporated Washington County

Total acreage within Metro's boundary: 24,297

Total acres within riparian corridor: 5,822.7

This site contains eight percent of the area comprising Metro's jurisdictional boundary, a relatively substantial amount compared to other Resource Sites (two sites rank higher). Over half of the site (57 percent) is in unincorporated Washington County; 28 percent falls within the City of Beaverton, and four and five percent in the cities of Hillsboro and Portland, respectively. The remaining five percent is in unincorporated Multnomah County (Table D-16).

This site contains 15.3 miles of roads per square mile, placing it in the high end of the third quartile (51-75 percent of maximum) of the range of development compared to all other sites. It is the most developed of the four resource sites in Group D (Table D-2). Zoning is dominated by Zoning is very strongly dominated by single family residential use (Table D-5). More than 6,000 building permits have been issued in this resource site since 1996, more than double that of any other resource site within Metro's boundary (Table D-2).

Riparian resources. Given this site's high development intensity, it is relatively rich with riparian resources; the amount of this site in riparian corridors is 24 percent, comparable to Site #10 in this group (Table 12). The site contributes a substantial amount of the region's riparian corridors, at more than six percent (Table 13).

This resource site has approximately 102 total stream miles, and more than 0.0033 miles of non-piped streams per acre, ranking it 16th among the 27 resource sites (Table 12). Approximately 21 percent of all stream miles are stream links, suggesting a relatively high amount of piping/culverting that is similar to Site #9 (Table D-3). This site has the highest percentage of non-piped streams that are DEQ 303(d) quality limited, at 43 percent (Tables D-2 and D-3). That is not surprising, as research across the country indicates declining stream quality with increasing urbanization (see Metro's Technical Report for Fish and Wildlife Habitat, April 2005). Low to medium gradient streams predominate (Table D-3). Five percent of the site is in the floodplain, with approximately 2-1/2 percent of the land covered by wetland resources (Table D-2). More than a third of the floodplain is developed (the fourth highest level of all resource sites; Table 14), and this probably contributes to decreased stream quality. No anadromous fish are known to be present in this resource site (Table D-2).

Twenty-nine percent of the acreage that falls within the riparian corridor inventory in this site received primary scores for at least three of the five ecological functions, similar to Sites #7 and #10 in Group D (Table D-19). Forty-five percent of the site's riparian corridors receive at least one primary ecological function score, similar to all other sites in this group except Site #9, which has more primary-scoring areas (Table D-19). The vegetation types within 300 ft of streams are co-dominated by forested and low-structure vegetation, most similar to Site #7 in this group (Table D-4). The largest percentage of land receiving a given primary score is for *Bank stabilization and pollution control* and *Large wood and channel dynamics*; however, *Organic*

material sources is also important primary function (Table D-18; see also Table 4 and Appendix 5 for description of ecological functions mapping).

Wildlife habitat resources.

Including Habitats of Concern, 22 percent of the lands in this site fall within the wildlife habitat inventory, ranking it 19th of the 27 resource sites (Table 16). This low ranking relative to the site's substantial lands within the Metro boundary reflects the high urbanization levels. However, within model patches, 40 percent fall within the top third of the point range (Table D-20). The trends for the four criteria in the GIS model are interesting. All of this site's acreage falls in the lowest size category. For habitat interior, there is a dichotomy in which sites are split between the low and high range, with none in the middle; note that only one site (Site #26) contains a higher proportion of the top category for interior habitat. However, nearly all sites score moderate to high in water resources, and the majority are in the highest connectivity score (water and connectivity are likely related) (Table D-21). In general, this site's resources are characterized by small habitat patches, but these are often placed along streams and thus tend to be well connected. This type of resource site is important for wildlife passage, including movements of migratory birds in the spring and fall.

Habitat types in this resource site are strongly dominated by conifer/hardwood forest cover, but wetlands are also important, comprising approximately 12 percent of this site's lands (Table D-25). The site is important to the regional wetland network, contributing over seven percent and ranking third among the 27 resource sites.

Species of Concern. Thirteen Species of Concern sighting locations fall within the site; this high number is partially due to the fact that numerous surveys have been conducted within the resource site, but also likely due to the valuable aquatic habitats and large amount of land in the Metro boundary. It appears to be a very good area for Red-legged frogs. Each sighting may include one or more species; if a species occurs more than once in the resource site it is only listed once here. These include the following species:

- Red-legged frog
- Band-tailed Pigeon
- Pileated Woodpecker
- Olive-sided Flycatcher
- Willow Flycatcher
- Bufflehead
- Northern Pygmy-owl
- Great Blue Heron nesting colony
- Common Nighthawk
- Western pond turtle

There are very likely many other Species of Concern using this resource site, particularly those relying on forest interior habitats (see Table D-25). Examples of species likely to occur in this site may be found by referencing the species list in Appendix 7 and identifying the species with a double "XX" under the habitat. General species needs and potential reasons for their decline are identified in the *Sensitive Species Accounts* section above. More detailed information on all species' needs can be obtained through Johnson and O'Neil (2001).

Habitats of Concern.

The following Habitats of Concern are partially or wholly within this resource site. Using the Unique ID # (UID), please refer to Appendix 8 for information concerning each Habitat of Concern:

UID numbers: 14, 50, 51, 52, 53, 54, 58, 93, 107

Resource site data tables: Riparian Corridors

185657

Table D-16. Acres within resource site by jurisdiction.

Jurisdiction	Acres within subwatershed
Beaverton	6,902.2
Hillsboro	948.0
Portland	1,301.2
Unincorporated Multnomah County	1,246.4
Unincorporated Washington County	13,899.2

Table D-17. Acres in Metro and riparian corridor.

Resource site	Total acres within Metro	Total acres within riparian corridor
Beaverton Creek	24,297.0	5,788.0

Table D-18. Number of acres within riparian corridor providing ecological function.

Resource site:	Ecological function	Primary Value		Secondary Value	
		Acres*	% of Total**	Acres	% of Total
Beaverton Creek	Microclimate & shade	1,190.9	20.6%	2,101.8	36.3%
	Streamflow moderation & water storage	1,069.3	18.5%	4,361.5	75.4%
	Bank stabilization & pollution control	2,364.5	40.9%	340.5	5.9%
	Large wood & channel dynamics	2,160.2	37.3%	423.0	7.3%
	Organic material sources	1,670.9	28.9%	306.6	5.3%

*Number of acres scored within the riparian corridor for each function

**Percent of total acres within the riparian corridor

Table D-19. Breakdown of ecological scores.

Resource site	Ecological Score	Acres	% of Total Acres
Beaverton Creek	1 to 5	3,161.9	54.6%
	6 to 11	475.0	8.2%
	12 to 17	450.9	7.8%
	18 to 23	123.2	2.1%
	24 to 29	1,175.7	20.3%
	30	401.3	6.9%
	Total acres		5,788.0

Resource site data tables: Wildlife Habitat

Table D-20. Breakdown of total wildlife model patch scores.*

Resource site:	Number of acres in each wildlife score category									Total wildlife model patch acres in inventory
	1	2	3	4	5	6	7	8	9	
Beaverton Creek										
Model score	247.9	425.0	479.4	707.9	516.0	699.8	242.9	1,827.5	0.0	5,146.4
Percent of total	4.8%	8.3%	9.3%	13.8%	10.0%	13.6%	4.7%	35.5%	0.0%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table D-21. Breakdown of total wildlife model patch scores by criteria.*

Resource site:	Number of acres by score for each model criterion												Total wildlife model patch acres in inventory
	Size ²			Interior ²			Water ³			Connectivity			
	1	2	3	1	2	3	1	2	3	1	2	3	
Beaverton Creek													
Model score	4,381.9	0.0	0.0	1,392.8	0.0	1,827.5	168.9	3,218.0	1,360.2	1,132.9	1,502.8	2,510.7	5,146.4
Percent of total acres in inventory	85.1%	0.0%	0.0%	27.1%	0.0%	35.5%	3.3%	62.5%	26.4%	22.0%	29.2%	48.8%	na

¹Does not include Habitats of Concern outside of model patches.

²These numbers do not add up to 100.0% because Type 2 patches (low structure vegetation within 300 feet of streams and wetlands) were not ranked for these criteria.

³These numbers do not add up to 100% because not all patches contained or were near water resources.

Table D-22. Breakdown of total wildlife model patch area by 2000 Metro photo interpretation landcover and known wetlands.*

Resource site:	Low structure vegetation within 300 feet of stream		Forested vegetation	Forested wetlands	Grass/shrub wetlands within 300 feet of a stream	Other wetlands	Total wildlife model patch acres in inventory
	Low structure vegetation/intact topsoil	Non-forest woody vegetation					
Beaverton Creek							
Acres	710.7	53.8	3,856.1	190.5	286.5	48.7	5,146.3
Percent of total	13.8%	1.0%	74.9%	3.7%	5.6%	0.9%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table D-23. Total acres of inventoried wildlife habitat by type and total Species of Concern (SOCs).

Resource site: Beaverton Creek	Wildlife patches (acres)	HOCs inside Wildlife patches (acres)*	HOCs outside Wildlife patches (including wetlands <2 acres)	Total inventoried wildlife habitat acres	Total SOCs
Acres	5146.4	529.0	80.0	5226.4	13
Percent of total	98.5%	10.1%	1.5%	100.0%	N/A

*Habitats of Concern.

Table D-24. Total area of model patches and Habitats of Concern by 1998 Landsat Landcover Area.

Resource Site: Beaverton Creek	Total area of wildlife model patches	Total area of HOCs outside of modeled patches (including wetlands <2 acres)	Percent of total inventoried habitat
Landcover type:			
Water	12.46	0.3	0.2%
Barren	289.57	24.6	6.0%
Low structure agriculture	107.13	1.4	2.1%
High structure agriculture	27.07	0.0	0.5%
Deciduous closed canopy	964.32	6.4	18.6%
Mixed closed canopy	1,246.04	3.7	23.9%
Conifer closed canopy	667.35	1.1	12.8%
Deciduous open canopy	378.66	11.8	7.5%
Mixed open canopy	257.30	3.6	5.0%
Conifer open canopy	75.65	1.1	1.5%
Deciduous scattered canopy	232.68	7.1	4.6%
Mixed scattered canopy	155.35	2.9	3.0%
Conifer scattered canopy	46.84	0.8	0.9%
Closed canopy shrub	220.71	3.0	4.3%
Open canopy shrub	94.03	2.3	1.8%
Scattered canopy shrub	115.54	3.4	2.3%
Meadow/grass	255.25	6.4	5.0%
Not classified	0.44	0.0	0.0%
Total	5,146.37	80.0	100.0%

The table below provides estimates of each type of the habitats described in Metro's Technical Report for Fish and Wildlife Habitat, based on Johnson and O'Neil's (2001) habitat scheme. These numbers are provided for subwatershed comparison purposes and represent estimates of available habitat type. Several data types were used to compile this table, and the data sources vary in their precision. For example, the satellite data sources are less accurate than hand-digitized forest canopy cover. There is also slight overlap between certain habitat types. For example, Riparian Wetlands (RWET) are also partially included in Westside Lowland Coniferous Hardwood/Westside Oak and Douglas-fir (WLCH/WODF) because some wetlands also contain forest, and Open Water (WATR) is not always considered part of habitat patches. Therefore, the sums of these habitat types are slightly different from the "Total wildlife habitat acres in inventory" shown in Table 16. Nonetheless, these numbers provide a generalized means of comparing the quality and quantity of habitat available to wildlife among and between subwatersheds. Note also that the estimates for Westside Grasslands (WEGR) probably represent grasslands that are not native rather than true native grasslands, which are largely extirpated from the metro region.

Table D-25. Wildlife habitat availability¹ based on Johnson & O'Neil's (2001) habitat types and species-habitat associations.

Resource site: Beaverton Creek	Habitat type						
	WATR ²	HWET ³	RWET ³	TOTWET ³	WLCH/ WODF ⁴	WEGR	AGPA
Total acres	0.0	335.2	190.5	599.8	4,062.8	476.9	135.6
Percent of total	0.0%	6.4%	3.6%	11.5%	77.7%	9.1%	2.6%

¹See Table D-24 for land cover types and crosswalk to Johnson and O'Neil's classification scheme.

²Note that patch type and data limitations result in an underestimation of open water habitats. For example, medium and small sized stream surfaces are excluded.

³Note that HWET and RWET do not represent the full suite of wetlands because some wetlands <2 acres were added in as Habitats of Concern, and some wetlands could not be associated with herbaceous or forested habitats. TOTWET represents the best estimate of all existing wetlands because it includes Habitats of Concern.

⁴Data limitations make it impossible to distinguish between these two habitat types at this time, and no comprehensive oak habitat survey has been conducted for the region. However, known oak habitats are also included in HOCs (see Appendix 10).

SITE #9: Lower Rock Creek-Tualatin River subwatershed

Named tributaries: Beaverton Creek, Dawson Creek, Rock Creek, Jackson Slough, Tualatin River

Communities within the subwatershed: Hillsboro, unincorporated Washington County

Total acreage within Metro's boundary: 8,717 (combined Lower Rock Creek-Tualatin River and Middle Tualatin-Davis Creek subwatersheds)

Total acres within riparian corridor: 1,808.6

This site contains three percent of the area comprising Metro's jurisdictional boundary. Most of the site lies within the City of Hillsboro's boundaries (88 percent), with the remaining 12 percent in unincorporated Washington County (Table D-26).

Road density, at 12.6 miles per square mile, is similar to the resource sites in Group C and falls close to the mid-range compared to all other resource sites (Table D-2). Single family residential dominates zoning, but commercial and industrial uses are also important land uses (Table D-5). More than 1,500 building permits have been issued here since 1996 (Table D-2).

Riparian resources. The amount of this site in riparian corridors is 20 percent, comparable to Site #10 in this group (Table 12). The site contributes approximately two percent of the region's riparian corridors (Table 13).

This resource site has approximately 33 total stream miles, and more than 0.0029 miles of non-piped streams per acre (Table 12). Approximately 23 percent of all stream miles are stream links, suggesting a relatively high amount of piping/culverting that is similar to Site #8 (Table D-3). This site has the second-highest percentage of non-piped streams that are DEQ 303(d) quality limited, at 29 percent (Tables D-2 and D-3). Low to medium gradient streams strongly predominate (Table D-3). This site also has the highest percentage of the site in the floodplain of all Group D sites, and approximately 11 percent of the land covered by wetland resources, substantially higher than other Group D sites (Table D-2). Only two percent of the floodplain is developed, the lowest of all 27 resource sites. Approximately five stream miles are known to contain anadromous fish (Table D-2).

Scoring ranges for this site indicate high quality riparian resources. Almost half of the acreage that falls within the riparian corridor inventory in this site received primary scores for at least three of the five ecological functions, and 78 percent of riparian acreage received at least one primary function score (Table D-29). The vegetation types within 300 ft of streams is dominated by low-structure vegetation, but there is also a substantial amount of forest cover (Table D-4). The largest percentage of land receiving a given primary score is similar for three functional criteria: *Large wood and channel dynamics*, *Bank stabilization and pollution control* and *Streamflow moderation and water storage* (reflecting the strong floodplain and wetland components) (Table D-28). *Organic material sources* is also important primary function (Table D-28; see also Table 4 and Appendix 5 for description of ecological functions mapping).

Wildlife habitat resources.

Including Habitats of Concern, 19 percent of the lands in this site fall within the wildlife habitat inventory, ranking it 22nd among the 27 resource sites (Table 16). Within model patches, 41 percent fall within the top third of the point range, similar to Beaverton Creek (Table D-30). Of

the four criteria in the GIS model, this site tends to score low in size and interior (there actually is no acreage above the lowest interior class), high in water resources, and very good connectivity (Table D-31). In general, this site's resources are characterized by small to medium habitat patches that are long and narrow, with excellent water resources and connectivity, reflecting the excellent stream and wetland resources in this site. This type of resource site is important for wildlife passage, including movements of migratory birds in the spring and fall.

Habitat types in this resource site are quite mixed, but wetlands are critically important here. Wetlands comprise 57 percent of the site, and contribute 11 percent of the regional wetland network, ranking second highest among the 27 resource sites. Although wetlands cover the highest percentage of land, forests are nearly as high and grasslands and agriculture also provide significant habitat (Table D-35).

Species of Concern. Six Species of Concern sighting locations fall within the site; the site is important to a variety of species, including waterfowl. Each sighting may include one or more species; if a species occurs more than once in the resource site it is only listed once here. These include the following species:

- Pileated Woodpecker
- Olive-sided Flycatcher
- Willow Flycatcher
- Bald Eagle
- Western Meadowlark
- Bufflehead
- Merlin

There are very likely many other Species of Concern using this resource site, particularly those relying on forest interior habitats (see Table D-35). Examples of species likely to occur in this site may be found by referencing the species list in Appendix 7 and identifying the species with a double "XX" under the habitat. General species needs and potential reasons for their decline are identified in the *Sensitive Species Accounts* section above. More detailed information on all species' needs can be obtained through Johnson and O'Neil (2001).

Habitats of Concern.

The following Habitats of Concern are partially or wholly within this resource site. Using the Unique ID # (UID), please refer to Appendix 8 for information concerning each Habitat of Concern:

UID numbers: 58, 59, 108

Resource site data tables: Riparian Corridors

Table D-26. Acres within resource site by jurisdiction.

Jurisdiction	Acres within subwatershed
Hillsboro	7,640.4
Unincorporated Washington County	1,076.8

Table D-27. Acres in Metro and riparian corridor.

Resource site	Total acres within Metro	Total acres within riparian corridor
Lower Rock Creek-Tualatin River	8,717.3	1,736.4

Table D-28. Number of acres within riparian corridor providing ecological function.

Resource site:	Ecological function	Primary Value		Secondary Value	
		Acres*	% of Total**	Acres	% of Total
Lower Rock Creek-Tualatin River	Microclimate & shade	482.7	27.8%	190.1	10.9%
	Streamflow moderation & water storage	1,031.5	59.4%	640.7	36.9%
	Bank stabilization & pollution control	1,045.4	60.2%	0.8	0.0%
	Large wood & channel dynamics	1,143.9	65.9%	36.4	2.1%
	Organic material sources	836.1	48.2%	15.3	0.9%

*Number of acres scored within the riparian corridor for each function

**Percent of total acres within the riparian corridor

Table D-29. Breakdown of ecological scores.

Resource site	Ecological Score	Acres	% of Total Acres
Lower Rock Creek-Tualatin River	1 to 5	380.7	21.9%
	6 to 11	163.2	9.4%
	12 to 17	349.1	20.1%
	18 to 23	55.1	3.2%
	24 to 29	428.7	24.7%
	30	359.6	20.7%
	Total acres		1,736.4

Table D-30. Breakdown of total wildlife model patch scores.*

Resource site:	Number of acres in each wildlife score category									Total wildlife model patch acres in inventory
	1	2	3	4	5	6	7	8	9	
Lower Rock Creek - Tualatin River										
Model score	52.4	119.3	210.1	96.5	136.8	327.4	319.5	346.1	0.0	1,608.2
Percent of total	3.3%	7.4%	13.1%	6.0%	8.5%	20.4%	19.9%	21.5%	0.0%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table D-31. Breakdown of total wildlife patch model scores by criteria.*

Resource site:	Number of acres by score for each model criterion												Total wildlife model patch acres in inventory
	Size ²			Interior ²			Water ³			Connectivity			
	1	2	3	1	2	3	1	2	3	1	2	3	
Lower Rock Creek - Tualatin River	935.7	346.1	0.0	1,015.3	0.0	0.0	7.8	442.2	1,095.0	239.3	596.6	772.4	1,608.2
Percent of total acres in inventory	58.2%	21.5%	0.0%	63.1%	0.0%	0.0%	0.5%	27.5%	68.1%	14.9%	37.1%	48.0%	na

¹Does not include Habitats of Concern outside of model patches.

²These numbers do not add up to 100.0% because Type 2 patches (low structure vegetation within 300 feet of streams and wetlands) were not ranked for these criteria.

³These numbers do not add up to 100% because not all patches contained or were near water resources.

Table D-32. Breakdown of total wildlife model patch area by 2000 Metro photo interpretation landcover and known wetlands.*

Resource site:	Low structure vegetation within 300 feet of stream		Forested vegetation	Forested wetlands	Grass/shrub wetlands within 300 feet of a stream	Other wetlands	Total wildlife model patch acres in inventory
	Low structure vegetation/intact topsoil	Non-forest woody vegetation					
Lower Rock Creek - Tualatin River							
Acres	321.9	4.4	375.1	318.0	346.0	242.8	1,608.2
Percent of total	20.0%	0.3%	23.3%	19.8%	21.5%	15.1%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table D-33. Total acres of inventoried wildlife habitat by type and total Species of Concern (SOCs).

Resource site: Lower Rock Creek - Tualatin River	Wildlife patches (acres)	HOCs inside Wildlife patches (acres)*	HOCs outside Wildlife patches (including wetlands <2 acres)	Total inventoried wildlife habitat acres	Total SOCs
Acres	1608.2	314.7	9.2	1617.4	6
Percent of total	99.4%	19.5%	0.6%	100.0%	N/A

Table D-34. Total area of model patches and Habitats of Concern by 1998 Landsat Landcover Area.

Resource Site: Lower Rock Creek - Tualatin River	Total area of wildlife model patches	Total area of HOCs outside of modeled patches (including wetlands <2 acres)	Percent of total inventoried habitat
Landcover type:			
Water	36.55	1.6	2.4%
Barren	188.02	1.0	11.7%
Low structure agriculture	264.71	0.3	16.4%
High structure agriculture	1.90	0.0	0.1%
Deciduous closed canopy	175.64	0.1	10.9%
Mixed closed canopy	167.41	0.2	10.4%
Conifer closed canopy	100.22	0.0	6.2%
Deciduous open canopy	107.94	1.1	6.7%
Mixed open canopy	56.33	0.7	3.5%
Conifer open canopy	18.67	0.4	1.2%
Deciduous scattered canopy	87.96	1.0	5.5%
Mixed scattered canopy	62.13	0.7	3.9%
Conifer scattered canopy	28.07	0.4	1.8%
Closed canopy shrub	71.92	0.3	4.5%
Open canopy shrub	31.69	0.4	2.0%
Scattered canopy shrub	70.45	0.6	4.4%
Meadow/grass	138.61	0.3	8.6%
Not classified	0.00	0.0	0.0%
Total	1,608.23	9.2	100.0%

The table below provides estimates of each type of the habitats described in Metro's Technical Report for Fish and Wildlife Habitat, based on Johnson and O'Neil's (2001) habitat scheme. These numbers are provided for subwatershed comparison purposes and represent estimates of available habitat type. Several data types were used to compile this table, and the data sources vary in their precision. For example, the satellite data sources are less accurate than hand-digitized forest canopy cover. There is also slight overlap between certain habitat types. For example, Riparian Wetlands (RWET) are also partially included in Westside Lowland Coniferous Hardwood/Westside Oak and Douglas-fir (WLCH/WODF) because some wetlands also contain forest, and Open Water (WATR) is not always considered part of habitat patches. Therefore, the sums of these habitat types are slightly different from the "Total wildlife habitat acres in inventory" shown in Table 16. Nonetheless, these numbers provide a generalized means of comparing the quality and quantity of habitat available to wildlife among and between subwatersheds. Note also that the estimates for Westside Grasslands (WEGR) probably represent grasslands that are not native rather than true native grasslands, which are largely extirpated from the metro region.

Table D-35. Wildlife habitat availability¹ based on Johnson & O'Neil's (2001) habitat types and species-habitat associations.

Resource site: Lower Rock Creek - Tualatin River	Habitat type						
	WATR ²	HWET ³	RWET ³	TOTWET ³	WLCH/ WODF ⁴	WEGR	AGPA
Total acres	3.4	588.8	318.0	918.5	809.1	242.0	266.9
Percent of total	0.2%	36.4%	19.7%	56.8%	50.0%	15.0%	16.5%

¹See Table D-34 for land cover types and crosswalk to Johnson and O'Neil's classification scheme.

²Note that patch type and data limitations result in an underestimation of open water habitats. For example, medium and small sized stream surfaces are excluded.

³Note that HWET and RWET do not represent the full suite of wetlands because some wetlands <2 acres were added in as Habitats of Concern, and some wetlands could not be associated with herbaceous or forested habitats. TOTWET represents the best estimate of all existing wetlands because it includes Habitats of Concern.

⁴Data limitations make it impossible to distinguish between these two habitat types at this time, and no comprehensive oak habitat survey has been conducted for the region. However, known oak habitats are also included in HOCs (see Appendix 10).

SITE #10: Middle Tualatin River-Gordon Creek subwatershed

Named tributaries: Butternut Creek, Gordon Creek, Lindow Creek, Rock Creek, Tualatin River

Communities within the subwatershed: Beaverton, Hillsboro, unincorporated Washington County

Total acreage within Metro's boundary: 4,347 (combined Middle Tualatin River-Gordon Creek and Lindow Creek subwatersheds)

Total acres within riparian corridor: 940.4

This site contains one percent of the area comprising Metro's jurisdictional boundary. The majority of the site (97 percent) lies in unincorporated Washington County, with the remainder in Beaverton (two percent) and Hillsboro (one percent) (Table D-36).

Despite that most of this resource site is in unincorporated lands, road density falls near the midpoint of the range compared to all other resource sites (12.1 miles per square mile; Table D-2). Reflecting this level of development, zoning is dominated by single family residential use. However, rural zoning is also an important land use type (Table D-5). More than 750 building permits have been issued here since 1996 (Table D-2).

Riparian resources. The amount of this site in riparian corridors is 22 percent, falling between Sites #8 and #9 in this resource group (Table 12). However, the site contributes only about one percent of the region's riparian corridors (Table 13), because a relatively small portion of the resource site falls within Metro's boundary.

This resource site has approximately 16 total stream miles, and 0.0035 miles of non-piped streams per acre, ranking it 12th among the 27 resource sites (Table 12). Only five percent of all stream miles are stream links, suggesting a relatively minor amount of piping/culverting that is most similar to Site #7 (Table D-3). Twenty percent of non-piped stream miles are DEQ 303(d) quality limited (Tables D-2 and D-3). A mixture of stream gradients is found in this resource site (Table D-3). Only two percent of the site is in the floodplain, with one percent of the land covered by wetland resources (Table D-2). Sixteen percent of the floodplain is developed. Less than half a mile of streams in this site are known to harbor anadromous fish (Table D-2).

Twenty-nine percent of the acreage that falls within the riparian corridor inventory in this site received primary scores for at least three of the five ecological functions, similar to Sites #7 and #10 in Group D (Table D-19). Forty-five percent of the site's riparian corridors receive at least one primary ecological function score, similar to all other sites in this group except Site #9, which has more primary-scoring areas (Table D-19). The vegetation types within 300 ft of streams are co-dominated by forested and low-structure vegetation, most similar to Site #7 in this group (Table D-4). The largest percentage of land receiving a given primary score is for *Bank stabilization and pollution control* and *Large wood and channel dynamics*; however, *Organic material sources* is also important primary function (Table D-18; see also Table 4 and Appendix 5 for description of ecological functions mapping).

Wildlife habitat resources.

Including Habitats of Concern, 22 percent of the lands in this site fall within the wildlife habitat inventory, ranking it 18th among the 27 resource sites (Table 16). Within model patches, no acreage falls within the top third of the point range, although nearly 60 percent fall in the middle range (Table D-40). Of the four criteria in the GIS model, all acreage falls in the low size and

habitat interior ranges. Scores for water resources tend to be moderate, while connectivity is spread between the three point categories (Table D-41). In general, this site's resources are characterized by small habitat patches containing no interior habitat, with moderate water resources and varying levels of connectivity.

Conifer and hardwood forest are the dominant habitat types in this resource site, although agricultural lands cover 17 percent of the site's land (Table D-45). Wetlands comprise only four percent of the site, contributing less than one percent of the region's wetlands and ranking 23rd of the 27 resource sites.

Species of Concern. Three Species of Concern sighting locations fall within the site. Each sighting may include one or more species; if a species occurs more than once in the resource site it is only listed once here. These include the following species:

- Pileated Woodpecker
- Band-tailed Pigeon
- Olive-sided Flycatcher

There are very likely other Species of Concern using this resource site, particularly those relying on forested habitats and agricultural lands (see Table D-45). Examples of species likely to occur in this site may be found by referencing the species list in Appendix 7 and identifying the species with a double "XX" under the habitat. General species needs and potential reasons for their decline are identified in the *Sensitive Species Accounts* section above. More detailed information on all species' needs can be obtained through Johnson and O'Neil (2001).

Habitats of Concern.

The following Habitats of Concern are partially or wholly within this resource site. Using the Unique ID # (UID), please refer to Appendix 8 for information concerning each Habitat of Concern:

UID numbers: 107, 108

Resource site data tables: Riparian Corridors

Table D-36. Acres within resource site by jurisdiction.

Jurisdiction	Acres within subwatershed
Beaverton	78.2
Hillsboro	62.2
Unincorporated Washington County	4,206.9

Table D-37. Acres in Metro and riparian corridor.

Resource site	Total acres within Metro	Total acres within riparian corridor
Middle Tualatin River-Gordon Creek	4,347.3	941.5

Table D-38. Number of acres within riparian corridor providing ecological function.

Resource site:	Ecological function	Primary Value		Secondary Value	
		Acres*	% of Total**	Acres	% of Total
Middle Tualatin River-Gordon Creek	Microclimate & shade	118.7	12.6%	315.6	33.5%
	Streamflow moderation & water storage	88.7	9.4%	756.4	80.3%
	Bank stabilization & pollution control	366.1	38.9%	43.0	4.6%
	Large wood & channel dynamics	304.5	32.3%	58.2	6.2%
	Organic material sources	207.0	22.0%	50.1	5.3%

*Number of acres scored within the riparian corridor for each function

**Percent of total acres within the riparian corridor

Table D-39. Breakdown of ecological scores.

Resource site	Ecological Score	Acres	% of Total Acres
Middle Tualatin River-Gordon Creek	1 to 5	544.8	57.9%
	6 to 11	94.7	10.1%
	12 to 17	96.9	10.3%
	18 to 23	48.7	5.2%
	24 to 29	131.4	14.0%
	30	24.9	2.6%
	Total acres	941.5	100.0%

Resource site data tables: Wildlife Habitat

Table D-40. Breakdown of total wildlife model patch scores.*

Resource site: Middle Tualatin River - Gordon Creek	Number of acres in each wildlife score category									Total wildlife model patch acres in inventory
	1	2	3	4	5	6	7	8	9	
Model score	54.9	129.6	182.7	178.4	208.3	150.4	0.0	0.0	0.0	904.3
Percent of total	6.1%	14.3%	20.2%	19.7%	23.0%	16.6%	0.0%	0.0%	0.0%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table D-41. Breakdown of total wildlife model patch scores by criteria.*

Resource site: Middle Tualatin River - Gordon Creek	Number of acres by score for each model criterion												Total wildlife model patch acres in inventory
	Size ²			Interior ²			Water ³			Connectivity			
	1	2	3	1	2	3	1	2	3	1	2	3	
	569.6	0.0	0.0	395.3	0.0	0.0	103.1	655.9	35.7	215.5	344.6	344.2	904.3
Percent of total acres in inventory	63.0%	0.0%	0.0%	43.7%	0.0%	0.0%	11.4%	72.5%	3.9%	23.8%	38.1%	38.1%	na

¹Does not include Habitats of Concern outside of model patches.

²These numbers do not add up to 100.0% because Type 2 patches (low structure vegetation within 300 feet of streams and wetlands) were not ranked for these criteria.

³These numbers do not add up to 100% because not all patches contained or were near water resources.

Table D-42. Breakdown of total wildlife model patch area by 2000 Metro photo interpretation landcover and known wetlands.*

Resource site: Middle Tualatin River - Gordon Creek	Low structure vegetation within 300 feet of stream		Forested vegetation	Forested wetlands	Grass/shrub wetlands within 300 feet of a stream	Other wetlands	Total wildlife model patch acres in inventory
	Low structure vegetation/intact topsoil	Non-forest woody vegetation					
Acres	313.1	21.6	537.4	19.1	12.0	1.2	904.3
Percent of total	34.6%	2.4%	59.4%	2.1%	1.3%	0.1%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table D-43. Total acres of inventoried wildlife habitat by type and total Species of Concern (SOCs).

Resource site: Middle Tualatin River - Gordon Creek	Wildlife patches (acres)	HOCs inside Wildlife patches (acres)*	HOCs outside Wildlife patches (including wetlands <2 acres)	Total inventoried wildlife habitat acres	Total SOCs
Acres	904.3	214.1	45.1	949.4	2
Percent of total	95.2%	22.5%	4.8%	100.0%	N/A

*Habitats of Concern.

Table D-44. Total area of model patches and Habitats of Concern by 1998 Landsat Landcover Area.

Resource Site: Middle Tualatin River - Gordon Creek	Total area of wildlife model patches	Total area of HOCs outside of modeled patches (including wetlands <2 acres)	Percent of total inventoried habitat
Landcover type:			
Water	0.15	0.0	0.0%
Barren	62.00	8.3	7.4%
Low structure agriculture	139.08	21.9	17.0%
High structure agriculture	4.33	0.0	0.5%
Deciduous closed canopy	114.38	0.2	12.1%
Mixed closed canopy	209.37	1.0	22.2%
Conifer closed canopy	80.68	0.0	8.5%
Deciduous open canopy	44.68	1.9	4.9%
Mixed open canopy	58.09	4.0	6.5%
Conifer open canopy	9.80	0.0	1.0%
Deciduous scattered canopy	55.51	0.9	5.9%
Mixed scattered canopy	18.55	0.0	2.0%
Conifer scattered canopy	7.71	0.0	0.8%
Closed canopy shrub	25.88	1.8	2.9%
Open canopy shrub	9.69	1.4	1.2%
Scattered canopy shrub	18.48	3.7	2.3%
Meadow/grass	45.89	0.0	4.8%
Not classified	0.00	0.0	0.0%
Total	904.28	45.1	100.0%

The table below provides estimates of each type of the habitats described in Metro's Technical Report for Fish and Wildlife Habitat, based on Johnson and O'Neil's (2001) habitat scheme. These numbers are provided for subwatershed comparison purposes and represent estimates of available habitat type. Several data types were used to compile this table, and the data sources vary in their precision. For example, the satellite data sources are less accurate than hand-digitized forest canopy cover. There is also slight overlap between certain habitat types. For example, Riparian Wetlands (RWET) are also partially included in Westside Lowland Coniferous Hardwood/Westside Oak and Douglas-fir (WLCH/WODF) because some wetlands also contain forest, and Open Water (WATR) is not always considered part of habitat patches. Therefore, the sums of these habitat types are slightly different from the "Total wildlife habitat acres in inventory" shown in Table 16. Nonetheless, these numbers provide a generalized means of comparing the quality and quantity of habitat available to wildlife among and between subwatersheds. Note also that the estimates for Westside Grasslands (WEGR) probably represent grasslands that are not native rather than true native grasslands, which are largely extirpated from the metro region.

Table D-35. Wildlife habitat availability¹ based on Johnson & O'Neil's (2001) habitat types and species-habitat associations.

Resource site: Lower Rock Creek - Tualatin River	Habitat type						
	WATR ²	HWET ³	RWET ³	TOTWET ³	WLCH/ WODF ⁴	WEGR	AGPA
Total acres	3.4	588.8	318.0	918.5	809.1	242.0	266.9
Percent of total	0.2%	36.4%	19.7%	56.8%	50.0%	15.0%	16.5%

¹See Table D-34 for land cover types and crosswalk to Johnson and O'Neil's classification scheme.

²Note that patch type and data limitations result in an underestimation of open water habitats. For example, medium and small sized stream surfaces are excluded.

³Note that HWET and RWET do not represent the full suite of wetlands because some wetlands <2 acres were added in as Habitats of Concern, and some wetlands could not be associated with herbaceous or forested habitats. TOTWET represents the best estimate of all existing wetlands because it includes Habitats of Concern.

⁴Data limitations make it impossible to distinguish between these two habitat types at this time, and no comprehensive oak habitat survey has been conducted for the region. However, known oak habitats are also included in HOCs (see Appendix 10).

E. Lower Tualatin River

General watershed information

Resource sites in the Lower Tualatin River Watershed include:

- Lower Tualatin River-Lake Oswego Canal subwatershed
- Upper and Middle Fanno Creek subwatershed/Summer Creek subwatershed
- Lower Fanno Creek subwatershed
- Rock Creek (So. Washington Co.) subwatershed (combined with Cedar Creek, Chicken Creek, and Lower Tualatin River subwatersheds)

Watershed assessments and plans

Bureau of Planning, City of Portland, 1994. *The Fanno Creek and Tributaries Conservation Plan, January 19, 1994*, City of Portland: Portland, Oregon.

Kurahashi and Associates, Inc, 1997. *Fanno Creek Watershed Management Plan*, Unified Sewage Agency: Hillsboro, Oregon.

Oregon Department of Fish and Wildlife (ODFW) and Unified Sewage Agency (USA), 1995. *Distribution of Fish and Crayfish and Measurement of Available Habitat in the Tualatin River Basin, Final Report of Research*, ODFW: Portland, Oregon and Unified Sewage Agency: Hillsboro, Oregon.

Portland State University and Metropolitan Regional Government, 1995. *Rock Creek Watershed Atlas, Planning with an Awareness of Natural Boundaries, March 1995*, Portland State University and Metro: Portland, Oregon.

Tualatin River Watershed Council, 1999. *Tualatin River Watershed, Action Plan*, Tualatin River Watershed Council: Hillsboro, Oregon.

Tualatin Watershed Council, 2001. *Tualatin River Watershed Atlas*, Tualatin Watershed Council: Hillsboro, Oregon.

Watershed councils and related groups

Fanno Creek, Fans of, PO Box 25835, Portland 97225, 503-499-0412, Daniel Heagerty

Lake Oswego Land Trust, 503-636-2451, Debbie Craig

Rock Creek Environmental Center, 503-690-5402, Bob Mann

Rock Creek Watershed Council, 16747 Timber Road, Vernonia 97064, 503-429-2401, Maggie Belmore

Three Rivers Land Conservancy, PO Box 1116, Lake Oswego 97035, 503-699-9825, Jayne Cronlund

Tualatin Watershed Council, 1080 SW Baseline, Bldg. B, Suite B-2, Hillsboro 97123, (503) 681-0953, FAX (503) 681-9772

Tualatin River National Wildlife Refuge, City of Sherwood, 90 NW Park Street, Sherwood 97140, 503-625-5522, Joan Patterson

Tualatin River Rangers, USA, 155 N First Ave., Hillsboro 97124, 503-640-3516, Linda Kelly

Tualatin Riverkeepers, 16340 SW Beef Bend Road, Sherwood 97140, 503-590-5813, Lauri Mullen

Wetlands, Friends of, 503-253-6247, Alice Blatt

Data descriptions

Table E-1 provides information about the subwatersheds within each watershed, the HUC code, and the acres inside Metro's jurisdictional boundary. Keying in on the resource site number will show how the subwatersheds are aggregated into the resource sites listed above.

All of the resource sites and subwatersheds in Section E fall within the Lower Tualatin River watershed. The Lower Tualatin River/Lake Oswego Canal subwatershed forms its own resource site (Site #11). Similarly, Resource Sites #12, 13 and 14 are formed of only one subwatershed each (Upper and Middle Fanno Creek; Summer Creek; and Lower Fanno Creek, respectively). Site #15 is composed of four subwatersheds – Cedar Creek, Chicken Creek, Rock Creek (south Washington County), and Lower Tualatin River–Lake Oswego Canal.

Tables E-1 and E-2 provide general description about the 5th field and 6th field HUCs. Below these tables are descriptions of the riparian and wildlife habitat resources resource site.

Watershed data tables

Table E-1. Watersheds (5th level HUC), subwatersheds (6th level HUC), and acres within Metro jurisdictional boundary.

Watershed (5th level HUC)	5th field HUC code	Resource site #	Subwatershed (6th level HUC)	6th field HUC code	Acres in Metro
Lower Tualatin River	1709001005	11	Lower Tualatin River - Lake Oswego Canal	170900100501	15,230.9
		12	Upper and Middle Fanno Creek	170900100502	11,183.4
		13	Summer Creek	170900100503	3,769.1
		14	Lower Fanno Creek	170900100504	8,453.8
		15	Cedar Creek	170900100505	1528.42
			Chicken Creek	170900100506	133.5
			Rock Creek (south Washington County)	170900100507	2,102.3
			Lower Tualatin River - Lake Oswego Canal	170900100508	475.1

Table E-2. Resource sites: general information.

General information	Lower Tualatin River - Lake Oswego Canal	Upper and Middle Fanno Creek	Summer Creek	Lower Fanno Creek	Rock Creek (south Washington County)
Miles of DEQ 303(d) listed streams	13.1	12.8	3.9	8.7	4.9
Road density (road miles/square miles in subwatershed)	9.0	17.3	15.0	15.0	10.3
Miles of stream with known anadromous fish presence	8.7	7.1	0.0	8.6	0.6
Acres of hydrologically connected wetlands	359.3	317.2	118.5	237.8	259.8
Total acres of wetlands	369.2	323.8	118.5	238.3	261.5
Acres of floodplains (100 year FEMA + 1996 inundation area)	1,132.0	517.5	61.8	829.0	315.0
Acres of developed floodplains	283.1	107.8	7.0	87.8	22.8
Building permits since 1996 (number)	878.0	1,057.0	1,095.0	1,104.0	1,366.0

Table E-3. Characteristics of stream miles by resource site.

Resource site	Stream miles by channel type		Miles of stream links*	Miles of streams not categorized by channel type	Total stream miles
	Low to medium	High			
Lower Tualatin River - Lake Oswego Canal	28.2	6.4	8.4	21.7	64.7
Upper and Middle Fanno Creek	13.3	5.6	7.6	19.7	46.2
Summer Creek	2.3	0.1	2.6	11.7	16.7
Lower Fanno Creek	12.2	0.8	8.6	16.4	38.1
Rock Creek (so. Washington Co.)	6.1	0.0	2.0	4.8	12.9

*Stream links are links between surface streams and may be piped or culverted.

Table E-4. Riparian vegetation by resource site.

Resource site	Vegetation types within 300 feet of a stream (acres)			Forested vegetation >300 feet from a stream
	Low structure vegetation/intact topsoil	Non-forest woody vegetation	Forested vegetation	
Lower Tualatin River - Lake Oswego Canal	1,374.1	35.4	1,790.8	2,251.8
Upper and Middle Fanno Creek	389.6	8.0	949.3	1,208.1
Summer Creek	182.4	16.5	301.8	381.9
Lower Fanno Creek	376.9	10.2	626.7	551.0
Rock Creek (so. Washington Co.)	330.3	13.3	253.8	434.9

Table E-5. Regional zoning by resource site.

Resource site	Acres by zone within each resource site						
	Commercial	Industrial	Multi-family residential	Public/open space	Rural	Single family residential	Mixed use
Lower Tualatin River - Lake Oswego Canal	622.0	1,433.7	224.2	6.2	8,692.0	3,493.8	0.0
Upper and Middle Fanno Creek	967.2	483.5	747.1	231.5	0.0	7,652.2	37.8
Summer Creek	22.2	5.3	424.4	0.0	185.3	2,340.1	237.0
Lower Fanno Creek	909.2	764.6	761.8	65.5	304.2	4,355.4	223.8
Rock Creek (so. Washington Co.)	340.6	732.2	188.9	0.0	947.6	1,540.3	0.0

SITE #11: Lower Tualatin River-Lake Oswego Canal subwatershed

Named streams: Athey Creek, Fields Creek, Lake Oswego Canal, Nyberg Creek, Pecan Creek, Saum Creek, Tualatin River, Wilson Creek

Communities within the subwatershed: Durham, Lake Oswego, Rivergrove, Sherwood, Tigard, Tualatin, West Linn, unincorporated Clackamas County, unincorporated Washington County

Total acreage within Metro's boundary: 15,231

Total acres within riparian corridor: 5,861.2

Other information: One dam with a fishway present and functioning, and a weir pool. Two additional barriers to fish with unknown impact.

This site contains five percent of the area comprising Metro's jurisdictional boundary. It encompasses portions of nine jurisdictions: unincorporated Clackamas County (51 percent), unincorporated Washington County (10 percent), and the cities of Tualatin (25 percent), Lake Oswego (six percent), West Linn (five percent), and one percent or less of the site in the cities of Durham, Rivergrove, Sherwood, and Tigard (Table E-6).

Road density in this site is 9.0 miles per square mile; this is relatively low compared to all other resource sites, falling within the low end of the second quartile (26 to 50 percent of maximum) (Table E-2). Reflecting the relatively undeveloped nature of this resource site, the primary zoning is rural. Single family residential zoning also covers considerable land area in this site (Table E-5). Considering the relatively large amount of this site's land falling within Metro's boundary, the number of building permits issued since 1996 is relatively low at 878 (Table E-2).

Riparian resources. The percentage of this site in riparian corridors is more than 38 percent, substantially higher than the other four Group E sites (Table 12). The site contributes over six percent of the region's riparian corridors; only two sites contribute more (Sites #26 and 27) (Table 13).

This resource site has approximately 30 total stream miles, or 0.0037 miles of non-piped streams per acre (similar to Sites #12, 13 and 14 in Group E) (Tables E-3 and 12); the site ranks tenth among the 27 resource sites in terms of stream density. Approximately 13 percent of all stream miles are stream links. Twenty-three percent of non-piped streams are DEQ 303(d) water-quality limited, the lowest of any site in Group E (Tables E-2 and E-3). The majority of streams in this site are low gradient (Table E-3). Slightly over seven percent of the site is in the floodplain, similar to Site #15 in this group. Approximately three percent of the land is covered by wetland resources (Table E-2). One quarter of the floodplain is developed, most similar to Site #12 in this group and ranking its floodplains fifth most developed among all 27 resource sites (Table 14); Sites #11 and #12 have the most developed floodplains in this group (Table E-2). Anadromous fish are known to be present in nearly nine stream miles (Table E-2).

Twenty-seven percent of the acreage that falls within the riparian corridor inventory in this site received primary scores for at least three of the five ecological functions; this is somewhat lower than other sites in this group (Table E-9). Forty-two percent of the site's riparian corridors receive at least one primary ecological function score (Table E-9). The vegetation types within 300 ft of streams are co-dominated by forested (slightly more) and low-structure vegetation (Table E-4). The largest percentage of land receiving a given primary score is for *Bank stabilization and pollution control* and *Large wood and channel dynamics*, but *Organic material*

sources is also an important primary functions (Table E-8; see also Table 4 and Appendix 5 for description of ecological functions mapping).

Wildlife habitat resources.

Including Habitats of Concern, 35 percent of the lands in this site fall within the wildlife habitat inventory, ranking it fifth among the 27 resource sites and first among Group E (Table 16). Within model patches, more than 20 percent falls within the top third of the point range, with another 61 percent in the middle range (Table E-10). Of the four criteria in the GIS model, the majority of acreage falls in the low size and habitat interior ranges (Table E-11). However, more than 16 percent falls in the midrange for both criteria, suggesting some fairly large habitat patches that are shaped in such a way as to minimize edge habitat. Wildlife patches in this site have good water resources, with nearly three quarters falling in the midrang and 18 percent in the top score range. Connectivity is excellent, with 65 percent in the top class and another 29 percent in the midrange. In general, this site has strong wildlife habitat resources that tend to be large, well connected, and provide water to wildlife.

Conifer and hardwood forest are the predominant habitat types in this resource site (71 percent), although agricultural lands and grasslands cover another 19 percent (Table E-15). Wetlands are an important wildlife resource here, comprising seven percent of the site. This site contributes more than four percent of the region's wetlands and ranks fourth of the 27 resource sites.

Species of Concern. Three Species of Concern sighting locations fall within the site. Each sighting may include one or more species; if a species occurs more than once in the resource site it is only listed once here. These include the following species:

- Pileated Woodpecker
- Western Bluebird
- Bald Eagle (at least two nests)

There are very likely other Species of Concern using this resource site, particularly those relying on forested habitats and agricultural lands (see Table E-15). Examples of species likely to occur in this site may be found by referencing the species list in Appendix 7 and identifying the species with a double "XX" under the habitat. General species needs and potential reasons for their decline are identified in the *Sensitive Species Accounts* section above. More detailed information on all species' needs can be obtained through Johnson and O'Neil (2001).

Habitats of Concern.

The following Habitats of Concern are partially or wholly within this resource site. Using the Unique ID # (UID), please refer to Appendix 8 for information concerning each Habitat of Concern:

UID numbers: 100, 101, 102, 109, 110, 111, 112, 152

Resource site data tables: Riparian Corridors

Table E-6. Acres within resource site by jurisdiction.

Jurisdiction	Acres within subwatershed
Durham	78.8
Lake Oswego	914.6
Rivergrove	160.3
Sherwood	104.5
Tigard	3.1
Tualatin	3,873.3
West Linn	779.3
Unincorporated Clackamas County	7,822.1
Unincorporated Washington County	1,495.0

Table E-7. Acres in Metro and riparian corridor.

Resource site	Total acres within Metro	Total acres within riparian corridor
Lower Tualatin River - Lake Oswego Canal	15,231.1	5,830.7

Table E-8. Number of acres within riparian corridor providing ecological function.

Resource site:	Ecological function	Primary Value		Secondary Value	
		Acres*	% of Total**	Acres	% of Total
Lower Tualatin River - Lake Oswego Canal	Microclimate & shade	1,089.0	18.7%	2,196.7	37.7%
	Streamflow moderation & water storage	1,045.3	17.9%	4,674.9	80.2%
	Bank stabilization & pollution control	2,100.2	36.0%	286.3	4.9%
	Large wood & channel dynamics	1,970.0	33.8%	491.4	8.4%
	Organic material sources	1,392.9	23.9%	347.9	6.0%

*Number of acres scored within the riparian corridor for each function

**Percent of total acres within the riparian corridor

Table E-9. Breakdown of ecological scores.

Resource site	Ecological Score	Acres	% of Total Acres
Lower Tualatin River - Lake Oswego Canal	1 to 5	3,389.3	58.1%
	6 to 11	501.4	8.6%
	12 to 17	374.1	6.4%
	18 to 23	297.7	5.1%
	24 to 29	886.1	15.2%
	30	382.0	6.6%
	Total acres		5,830.7

Resource site data tables: Wildlife Habitat

185657

Table E-10. Breakdown of total wildlife model patch scores.*

Resource site: Lower Tualatin River - Lake Oswego Canal	Number of acres in each wildlife score category									Total wildlife model patch acres in inventory
	1	2	3	4	5	6	7	8	9	
Model score	130.9	145.9	708.5	680.3	448.7	2,140.2	223.3	868.0	0.0	5,345.8
Percent of total	2.4%	2.7%	13.3%	12.7%	8.4%	40.0%	4.2%	16.2%	0.0%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table E-11. Breakdown of total wildlife patch model scores by criteria.*

Resource site: Lower Tualatin River - Lake Oswego Canal	Number of acres by score for each model criterion												Total wildlife model patch acres in inventory
	Size ²			Interior ²			Water ³			Connectivity			
	1	2	3	1	2	3	1	2	3	1	2	3	
	3,358.0	868.0	0.0	2,679.2	868.0	0.0	210.6	3,931.8	942.1	335.0	1,570.4	3,440.5	5,345.8
Percent of total acres in inventory	62.8%	16.2%	0.0%	50.1%	16.2%	0.0%	3.9%	73.5%	17.6%	6.3%	29.4%	64.4%	na

¹Does not include Habitats of Concern outside of model patches.

²These numbers do not add up to 100.0% because Type 2 patches (low structure vegetation within 300 feet of streams and wetlands) were not ranked for these criteria.

³These numbers do not add up to 100% because not all patches contained or were near water resources.

Table E-12. Breakdown of total wildlife model patch area by 2000 Metro photo interpretation landcover and known wetlands.*

Resource site: Lower Tualatin River - Lake Oswego Canal	Low structure vegetation within 300 feet of stream		Forested vegetation	Forested wetlands	Grass/shrub wetlands within 300 feet of a stream	Other wetlands	Total wildlife model patch acres in inventory
	Low structure vegetation/ intact topsoil	Non-forest woody vegetation					
Acres	1,095.0	24.8	3,868.3	110.2	195.7	51.8	5,345.8
Percent of total	20.5%	0.5%	72.4%	2.1%	3.7%	1.0%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table E-13. Total acres of inventoried wildlife habitat by type and total Species of Concern (SOCs).

Resource site: Lower Tualatin River - Lake Oswego Canal	Wildlife patches (acres)	HOCs inside Wildlife patches (acres)*	HOCs outside Wildlife patches (including wetlands <2 acres)	Total inventoried wildlife habitat acres	Total SOCs
Acres	5345.8	1019.2	8.6	5354.4	3
Percent of total	99.8%	19.0%	0.2%	100.0%	N/A

*Habitats of Concern.

Table E-14. Total area of model patches and Habitats of Concern by 1998 Landsat Landcover Area.

Resource Site: Lower Tualatin River - Lake Oswego Canal	Total area of wildlife model patches	Total area of HOCs outside of modeled patches (including wetlands <2 acres)	Percent of total inventoried habitat
Landcover type:			
Water	23.19	0.0	0.4%
Barren	251.95	1.4	4.7%
Low structure agriculture	595.68	2.1	11.2%
High structure agriculture	28.65	0.0	0.5%
Deciduous closed canopy	1,138.17	0.6	21.3%
Mixed closed canopy	1,394.27	0.4	26.0%
Conifer closed canopy	344.21	0.0	6.4%
Deciduous open canopy	305.56	0.5	5.7%
Mixed open canopy	249.63	1.5	4.7%
Conifer open canopy	68.04	0.2	1.3%
Deciduous scattered canopy	159.55	0.3	3.0%
Mixed scattered canopy	131.43	0.2	2.5%
Conifer scattered canopy	29.00	0.0	0.5%
Closed canopy shrub	229.91	0.1	4.3%
Open canopy shrub	80.29	0.1	1.5%
Scattered canopy shrub	172.79	0.5	3.2%
Meadow/grass	141.81	0.7	2.7%
Not classified	1.66	0.0	0.0%
Total	5,345.81	8.6	100.0%

The table below provides estimates of each type of the habitats described in Metro's Technical Report for Fish and Wildlife Habitat, based on Johnson and O'Neil's (2001) habitat scheme. These numbers are provided for subwatershed comparison purposes and represent estimates of available habitat type. Several data types were used to compile this table, and the data sources vary in their precision. For example, the satellite data sources are less accurate than hand-digitized forest canopy cover. There is also slight overlap between certain habitat types. For example, Riparian Wetlands (RWET) are also partially included in Westside Lowland Coniferous Hardwood/Westside Oak and Douglas-fir (WLCH/WODF) because some wetlands also contain forest, and Open Water (WATR) is not always considered part of habitat patches. Therefore, the sums of these habitat types are slightly different from the "Total wildlife habitat acres in inventory" shown in Table 16. Nonetheless, these numbers provide a generalized means of comparing the quality and quantity of habitat available to wildlife among and between subwatersheds. Note also that the estimates for Westside Grasslands (WEGR) probably represent grasslands that are not native rather than true native grasslands, which are largely extirpated from the metro region.

Table E-15. Wildlife habitat availability¹ based on Johnson & O'Neil's (2001) habitat types and species-habitat associations.

Resource site: Lower Tualatin River - Lake Oswego Canal	Habitat type						
	WATR ²	HWET ³	RWET ³	TOTWET ³	WLCH/ WODF ⁴	WEGR	AGPA
Total acres	167.0	247.5	110.2	369.2	3,823.4	396.3	626.5
Percent of total	3.1%	4.6%	2.1%	6.9%	71.4%	7.4%	11.7%

¹See Table E-14 for land cover types and crosswalk to Johnson and O'Neil's classification scheme.

²Note that patch type and data limitations result in an underestimation of open water habitats. For example, medium and small sized stream surfaces are excluded.

³Note that HWET and RWET do not represent the full suite of wetlands because some wetlands <2 acres were added in as Habitats of Concern, and some wetlands could not be associated with herbaceous or forested habitats. TOTWET represents the best estimate of all existing wetlands because it includes Habitats of Concern.

⁴Data limitations make it impossible to distinguish between these two habitat types at this time, and no comprehensive oak habitat survey has been conducted for the region. However, known oak habitats are also included in HOCs (see Appendix 10).

SITE #12: Upper and Middle Fanno Creek subwatershed

Named tributaries: Ash Creek, Fanno Creek, Ivey Creek, Summer Creek, Sylvan Creek

Communities within the subwatershed: Beaverton, Lake Oswego, Portland, Tigard, unincorporated Multnomah County, unincorporated Washington County

Total acreage within Metro's boundary: 11,183

Total acres within riparian corridor: 2,693.5

This site contains four percent of the area comprising Metro's jurisdictional boundary. About 40 percent of the site is in the City of Portland, with the remainder in unincorporated Washington County (23 percent), Beaverton (21 percent), Tigard (12 percent), Multnomah County (four percent), and less than one percent in the City of Lake Oswego (Table E-16).

This site, at 17.3 miles of road per square mile, falls within the top quartile (76 to 100 percent of maximum) of development compared to all other resource sites (Table E-2). Reflecting the relatively urban nature of this site, zoning is strongly dominated by single family residential land use (Table E-5). More than a thousand building permits have been issued in this resource site since 1996 (Table E-2).

Riparian resources. The percentage of this site in riparian corridors is more than 24 percent, close to the proportions in Sites #13, 14 and 15 (Table 12). The site contributes three percent of the region's riparian corridors, the second highest in Group E (Table 13).

This resource site has approximately 46 total stream miles, or 0.0035 miles of non-piped streams per acre (similar to Site #14, and ranking 14th among the 27 resource sites) (Tables E-3 and 12). Approximately 16 percent of all stream miles are stream links, similar to Sites #13 and #15 in this group (Table E-3). Thirty-three percent of non-piped streams are DEQ 303(d) water-quality limited, the second highest in Group E behind Site #15 (Tables E-2 and 12). Five percent of the site is in the floodplain, and two percent of the land is covered by wetland resources (Table E-2). Twenty-one percent of the floodplain is developed, most similar to Site #11 in this group and ranking it seventh most developed among all resource sites (Tables 14 and E-2). Anadromous fish are known to be present in more than seven stream miles (Table E-2).

Nearly a third of the acreage that falls within the riparian corridor inventory in this site received primary scores for at least three of the five ecological functions, similar to Site #12 (Table E-19). Forty-seven percent of the site's riparian corridors receive at least one primary ecological function score, again most similar to Site #12 in this group (Table E-19). The most common vegetation type within 300 ft of streams is forest (Table E-4). The largest percentage of land receiving a given primary score is for *Large wood and channel dynamics* and *Bank stabilization and pollution control* and, but *Organic material sources* is also an important primary function (Table E-18; see also Table 4 and Appendix 5 for description of ecological functions mapping).

Wildlife habitat resources.

Including Habitats of Concern, 23 percent of the lands in this site fall within the wildlife habitat inventory, ranking it 16th among the 27 resource sites and third within Group E (Table 16). Within model patches approximately six percent falls within the top third of the point range, or about a fourth of the proportion within Site #11. However, another 72 percent falls in the middle range (Table E-20). Of the four criteria in the GIS model, the majority of acreage falls in the low

182881

size and habitat interior ranges, with about 40 percent of acreage containing no habitat interior (Table E-21). Wildlife patches in this site have moderate to good water resources, with nearly 40 percent falling in the midrange and another 30 percent in the top score range. Connectivity is moderate, with 53 percent in the midrange and more than 20 percent in the low and high categories. In general, this site can be characterized as having relatively small habitat patches with little forest interior, but reasonably good water resources and connectivity. The site likely provides substantial habitat for native wildlife, with good migratory corridors but limited breeding habitat for Neotropical migratory birds and other wildlife needing interior habitat or less disturbed areas.

Conifer and hardwood forest are the predominant habitat types in this resource site (83 percent) (Table E-25). Wetlands are an even more important wildlife resource here than in Site #11, comprising nearly 13 percent of the site. However, the site's contribution to regional wetland resources is slightly lower than Site #11 because less land falls within the Metro boundary. This site contributes nearly four percent of the region's wetlands and ranks sixth of the 27 resource sites.

Species of Concern. Seven Species of Concern sighting locations fall within the site. Each sighting may include one or more species; if a species occurs more than once in the resource site it is only listed once here. These include the following species:

- Willow Flycatcher
- Northwestern Pond Turtle
- Bald Eagle roost

There are very likely other Species of Concern using this resource site, particularly those relying on forested habitats and wetlands (see Table E-25). There are several Willow Flycatcher and turtle sightings here, suggesting that lowland riparian-wetland complexes may provide very important habitat resources to sensitive wildlife species. Examples of species likely to occur in this site may be found by referencing the species list in Appendix 7 and identifying the species with a double "XX" under the habitat. General species needs and potential reasons for their decline are identified in the *Sensitive Species Accounts* section above. More detailed information on all species' needs can be obtained through Johnson and O'Neil (2001).

Habitats of Concern.

The following Habitats of Concern are partially or wholly within this resource site. Using the Unique ID # (UID), please refer to Appendix 8 for information concerning each Habitat of Concern:

UID numbers: 94, 95, 105

Resource site data tables: Riparian Corridors

Table E-16. Acres within resource site by jurisdiction.

Jurisdiction	Acres within subwatershed
Beaverton	2,318.9
Lake Oswego	9.5
Portland	4,479.2
Tigard	1,310.6
Unincorporated Multnomah County	465.0
Unincorporated Washington County	2,600.4

Table E-17. Acres in Metro and riparian corridor.

Resource site	Total acres within Metro	Total acres within riparian corridor
Upper and Middle Fanno Creek	11,183.5	2,651.7

Table E-18. Number of acres within riparian corridor providing ecological function.

Resource site:	Ecological function	Primary Value		Secondary Value	
		Acres*	% of Total**	Acres	% of Total
Upper and Middle Fanno Creek	Microclimate & shade	585.4	22.1%	1,116.6	42.1%
	Streamflow moderation & water storage	500.7	18.9%	1,977.8	74.6%
	Bank stabilization & pollution control	1,044.5	39.4%	82.9	3.1%
	Large wood & channel dynamics	1,100.9	41.5%	227.4	8.6%
	Organic material sources	819.4	30.9%	170.4	6.4%

*Number of acres scored within the riparian corridor for each function
 **Percent of total acres within the riparian corridor

Table E-19. Breakdown of ecological scores.

Resource site	Ecological Score	Acres	% of Total Acres
Upper and Middle Fanno Creek	1 to 5	1,421.1	53.6%
	6 to 11	195.9	7.4%
	12 to 17	205.1	7.7%
	18 to 23	35.1	1.3%
	24 to 29	632.9	23.9%
	30	161.6	6.1%
	Total acres		2,651.7

Resource site data tables: Wildlife Habitat

Table E-20. Breakdown of total wildlife model patch scores.*

Resource site:	Number of acres in each wildlife score category									Total wildlife model patch acres in inventory
	1	2	3	4	5	6	7	8	9	
Upper and Middle Fanno Creek										
Model score	135.4	149.5	267.7	307.5	720.6	782.1	8.4	129.9	0.0	2,501.3
Percent of total	5.4%	6.0%	10.7%	12.3%	28.8%	31.3%	0.3%	5.2%	0.0%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table E-21. Breakdown of total wildlife model patch scores by criteria.*

Resource site:	Number of acres by score for each model criterion											Total wildlife model patch acres in inventory	
	Size ²			Interior ²			Water ³			Connectivity			
	1	2	3	1	2	3	1	2	3	1	2		3
Upper and Middle Fanno Creek	1,865.5	446.3	0.0	1,387.7	0.5	129.4	594.7	987.5	735.8	562.7	1,327.4	611.2	2,501.3
Percent of total acres in inventory	74.6%	17.8%	0.0%	55.5%	0.0%	5.2%	23.8%	39.5%	29.4%	22.5%	53.1%	24.4%	na

¹Does not include Habitats of Concern outside of model patches.

²These numbers do not add up to 100.0% because Type 2 patches (low structure vegetation within 300 feet of streams and wetlands) were not ranked for these criteria.

³These numbers do not add up to 100% because not all patches contained or were near water resources.

Table E-22. Breakdown of total wildlife model patch area by 2000 Metro photo interpretation landcover and known wetlands.*

Resource site:	Low structure vegetation within 300 feet of stream		Forested vegetation	Forested wetlands	Grass/shrub wetlands within 300 feet of a stream	Other wetlands	Total wildlife model patch acres in inventory
	Low structure vegetation/intact topsoil	Non-forest woody vegetation					
Upper and Middle Fanno Creek							
Acres	189.5	0.0	1,999.7	98.1	164.8	49.0	2,501.3
Percent of total	7.6%	0.0%	79.9%	3.9%	6.6%	2.0%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table E-23. Total acres of inventoried wildlife habitat by type and total Species of Concern (SOCs).

Resource site: Upper and Middle Fanno Creek	Wildlife patches (acres)	HOCs inside Wildlife patches (acres)*	HOCs outside Wildlife patches (including wetlands <2 acres)	Total inventoried wildlife habitat acres	Total SOCs
Acres	2501.3	200.7	21.0	2522.3	7
Percent of total	99.2%	8.0%	0.8%	100.0%	N/A

*Habitats of Concern.

Table E-24. Total area of model patches and Habitats of Concern by 1998 Landsat Landcover Area.

Resource Site: Upper and Middle Fanno Creek	Total area of wildlife model patches	Total area of HOCs outside of modeled patches (including wetlands <2 acres)	Percent of total inventoried habitat
Landcover type:			
Water	3.86	0.0	0.2%
Barren	117.49	7.3	4.9%
Low structure agriculture	0.00	0.0	0.0%
High structure agriculture	0.00	0.0	0.0%
Deciduous closed canopy	433.84	1.7	17.3%
Mixed closed canopy	536.90	0.4	21.3%
Conifer closed canopy	319.75	0.2	12.7%
Deciduous open canopy	303.58	3.3	12.2%
Mixed open canopy	200.26	0.9	8.0%
Conifer open canopy	48.03	0.4	1.9%
Deciduous scattered canopy	120.64	3.3	4.9%
Mixed scattered canopy	86.79	0.7	3.5%
Conifer scattered canopy	20.50	0.1	0.8%
Closed canopy shrub	81.65	0.3	3.2%
Open canopy shrub	52.41	0.7	2.1%
Scattered canopy shrub	43.48	1.1	1.8%
Meadow/grass	132.10	0.6	5.3%
Not classified	0.00	0.0	0.0%
Total	2,501.27	21.0	100.0%

The table below provides estimates of each type of the habitats described in Metro's Technical Report for Fish and Wildlife Habitat, based on Johnson and O'Neil's (2001) habitat scheme. These numbers are provided for subwatershed comparison purposes and represent estimates of available habitat type. Several data types were used to compile this table, and the data sources vary in their precision. For example, the satellite data sources are less accurate than hand-digitized forest canopy cover. There is also slight overlap between certain habitat types. For example, Riparian Wetlands (RWET) are also partially included in Westside Lowland Coniferous Hardwood/Westside Oak and Douglas-fir (WLCH/WODF) because some wetlands also contain forest, and Open Water (WATR) is not always considered part of habitat patches. Therefore, the sums of these habitat types are slightly different from the "Total wildlife habitat acres in inventory" shown in Table 16. Nonetheless, these numbers provide a generalized means of comparing the quality and quantity of habitat available to wildlife among and between subwatersheds. Note also that the estimates for Westside Grasslands (WEGR) probably represent grasslands that are not native rather than true native grasslands, which are largely extirpated from the metro region.

Table E-25. Wildlife habitat availability¹ based on Johnson & O'Neil's (2001) habitat types and species-habitat associations.

Resource site: Upper and Middle Fanno Creek	Habitat type						
	WATR ²	HWET ³	RWET ³	TOTWET ³	WLCH/ WODF ⁴	WEGR	AGPA
Total acres	0.0	213.8	98.1	323.8	2,081.3	230.4	0.0
Percent of total	0.0%	8.5%	3.9%	12.8%	82.5%	9.1%	0.0%

¹See Table E-24 for land cover types and crosswalk to Johnson and O'Neil's classification scheme.

²Note that patch type and data limitations result in an underestimation of open water habitats. For example, medium and small sized stream surfaces are excluded.

³Note that HWET and RWET do not represent the full suite of wetlands because some wetlands <2 acres were added in as Habitats of Concern, and some wetlands could not be associated with herbaceous or forested habitats. TOTWET represents the best estimate of all existing wetlands because it includes Habitats of Concern.

⁴Data limitations make it impossible to distinguish between these two habitat types at this time, and no comprehensive oak habitat survey has been conducted for the region. However, known oak habitats are also included in HOCs (see Appendix 10).

SITE #13: Summer Creek subwatershed**Named tributaries:** Fanno Creek, Summer Creek**Communities within the subwatershed:** Beaverton, Tigard, unincorporated Washington County**Total acreage within Metro's boundary:** 3,769.1**Total acres within riparian corridor:** 826.5

This site contains one percent of the area comprising Metro's jurisdictional boundary. This site is split nearly equally between Beaverton and Tigard (39 and 41 percent, respectively), with another 20 percent in unincorporated Washington County (Table E-26).

The road density in this site is 15.0 miles per square mile, placing it in the third quartile (51 to 75 percent of maximum) compared to development in all other resource sites (Table E-2). The dominant zoning by far is single family residential (Table E-5). More than a thousand building permits have been issued here since 1996, a high number compared to the acreage within Metro's boundary (Table E-2).

Riparian resources. The percentage of this site in riparian corridors is 23 percent, similar to Sites #12 and #14 in this group (Table 12). The site contributes about one percent of the region's riparian corridors (Table 13).

This resource site has approximately 30 total stream miles, or 0.0037 miles of non-piped streams per acre (similar to Sites #12 and #14 in Group E) (Tables E-3 and 12). The site's stream density ranks ninth among the 27 resource sites. Approximately 16 percent of all stream miles are stream links, as in Sites #12 and #15 (Table E-3). A third of non-piped streams are DEQ 303(d) water-quality limited, similar to Site #14 in Group E (Tables E-2 and 12). Two percent of the site is in floodplain, and wetlands comprise three percent of the lands in this resource site (Table E-2). Eleven percent of the floodplain is developed, similar to Site #14 in this group (Table E-2). Anadromous fish are not known to be present in streams within this site (Table E-2).

Thirty-two percent of the acreage that falls within the riparian corridor inventory in this site received primary scores for at least three of the five ecological functions, similar to Site #12 (Table E-29). Nearly half of the site's riparian corridors receive at least one primary ecological function score (Table E-29). The vegetation type within 300 ft of streams is predominantly forested, also with substantial amounts of low-structure vegetation (Table E-4). The largest percentage of land receiving a given primary score is for *Bank stabilization and pollution control* and *Large wood and channel dynamics*, but *Organic material sources* is also an important primary function (Table E-28; see also Table 4 and Appendix 5 for description of ecological functions mapping).

Wildlife habitat resources.

Including Habitats of Concern, 22 percent of the lands in this site fall within the wildlife habitat inventory, ranking it 17th among the 27 resource sites and fourth within Group E (Table 16). Within model patches less than four percent falls within the top third of the point range, the lowest of the five Group E sites (Table E-30). However, another 72 percent falls in the middle range. Of the four criteria in the GIS model, none of the acreage scored above the lowest class for size or interior ((Table E-31). Wildlife patches in this site have water resources, with this

highest proportion in the midrange but nearly equal percentages for each of the three water classes. Connectivity is moderate, with 43 percent in the midrange and another 29 percent in both the low and high score categories. In general, this site can be characterized as having small habitat patches with little or no forest interior, but reasonably good water resources and connectivity. As with Site #12, this site likely provides substantial habitat for native wildlife, with good migratory corridors but limited breeding habitat for Neotropical migratory birds and other wildlife needing interior habitat or less disturbed areas. A relatively large amount of parklands preserved along Fanno Creek and other tributaries contributes to this site's importance to the region's wildlife.

Habitat types are similar to Site #12. Conifer and hardwood forest are the predominant habitat types in this resource site (80 percent) (Table E-35). Wetlands comprise more than 14 percent of the site, placing it in the middle of the five Group E resource sites. However, the site contributes relatively little (about one and one-half percent of total, ranking 16th of all sites) to regional wetland resources due to the relatively small amount of acreage falling within the Metro boundary.

Species of Concern. There are no known Species of Concern sightings falling within this resource site, although it may provide important habitat resources to sensitive wildlife species. Examples of species likely to occur in this site may be found by referencing the species list in Appendix 7 and identifying the species with a double "XX" under the habitat. General species needs and potential reasons for their decline are identified in the *Sensitive Species Accounts* section above. More detailed information on all species' needs can be obtained through Johnson and O'Neil (2001).

Habitats of Concern.

The following Habitats of Concern are partially or wholly within this resource site. Using the Unique ID # (UID), please refer to Appendix 8 for information concerning each Habitat of Concern:

UID numbers: 96, 97, 107, 168

Resource site data tables: Riparian Corridors

Table E-26. Acres within resource site by jurisdiction.

Jurisdiction	Acres within subwatershed
Beaverton	1,468.9
Tigard	1,533.8
Unincorporated Washington County	766.5

Table E-27. Acres in Metro and riparian corridor.

Resource site	Total acres within Metro	Total acres within riparian corridor
Summer Creek	3,769.1	855.6

Table E-28. Number of acres within riparian corridor providing ecological function.

Resource site:	Ecological function	Primary Value		Secondary Value	
		Acres*	% of Total**	Acres	% of Total
Summer Creek	Microclimate & shade	203.3	23.8%	339.2	39.6%
	Streamflow moderation & water storage	136.8	16.0%	642.3	75.1%
	Bank stabilization & pollution control	388.5	45.4%	51.1	6.0%
	Large wood & channel dynamics	334.7	39.1%	63.8	7.5%
	Organic material sources	268.4	31.4%	53.3	6.2%

*Number of acres scored within the riparian corridor for each function

**Percent of total acres within the riparian corridor

Table E-29. Breakdown of ecological scores.

Resource site	Ecological Score	Acres	% of Total Acres
Summer Creek	1 to 5	429.7	50.2%
	6 to 11	90.6	10.6%
	12 to 17	63.7	7.4%
	18 to 23	26.9	3.1%
	24 to 29	190.4	22.2%
	30	54.3	6.3%
	Total acres		855.6

Table E-30. Breakdown of total wildlife model patch scores.*

Resource site:	Number of acres in each wildlife score category									Total wildlife model patch acres in inventory
	1	2	3	4	5	6	7	8	9	
Summer Creek	19.6	89.9	89.3	177.1	327.1	85.8	29.8	0.0	0.0	818.6
Model score	19.6	89.9	89.3	177.1	327.1	85.8	29.8	0.0	0.0	818.6
Percent of total	2.4%	11.0%	10.9%	21.6%	40.0%	10.5%	3.6%	0.0%	0.0%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table E-31. Breakdown of total wildlife patch model scores by criteria.*

Resource site:	Number of acres by score for each model criterion												Total wildlife model patch acres in inventory
	Size ²			Interior ²			Water ³			Connectivity			
	1	2	3	1	2	3	1	2	3	1	2	3	
Summer Creek	704.7	0.0	0.0	492.2	0.0	0.0	208.6	264.8	260.5	234.6	350.0	234.1	818.6
Percent of total acres in inventory	86.1%	0.0%	0.0%	60.1%	0.0%	0.0%	25.5%	32.3%	31.8%	28.7%	42.7%	28.6%	na

¹Does not include Habitats of Concern outside of model patches.

²These numbers do not add up to 100.0% because Type 2 patches (low structure vegetation within 300 feet of streams and wetlands) were not ranked for these criteria.

³These numbers do not add up to 100% because not all patches contained or were near water resources.

Table E-32. Breakdown of total wildlife model patch area by 2000 Metro photo interpretation landcover and known wetlands.*

Resource site:	Low structure vegetation within 300 feet of stream		Forested vegetation	Forested wetlands	Grass/shrub wetlands within 300 feet of a stream	Other wetlands	Total wildlife model patch acres in inventory
	Low structure vegetation/intact topsoil	Non-forest woody vegetation					
Summer Creek	102.4	11.5	596.2	45.6	53.3	9.6	818.6
Acres	102.4	11.5	596.2	45.6	53.3	9.6	818.6
Percent of total	12.5%	1.4%	72.8%	5.6%	6.5%	1.2%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table E-33. Total acres of inventoried wildlife habitat by type and total Species of Concern (SOCs).

Resource site: Summer Creek	Wildlife patches (acres)	HOCs inside Wildlife patches (acres)*	HOCs outside Wildlife patches (including wetlands <2 acres)	Total inventoried wildlife habitat acres	Total SOCs
Acres	818.6	91.8	13.7	832.3	0
Percent of total	98.4%	11.0%	1.6%	100.0%	N/A

*Habitats of Concern.

Table E-34. Total area of model patches and Habitats of Concern by 1998 Landsat Landcover Area.

Resource Site: Summer Creek	Total area of wildlife model patches	Total area of HOCs outside of modeled patches (including wetlands <2 acres)	Percent of total inventoried habitat
Landcover type:			
Water	3.57	0.0	0.4%
Barren	47.57	2.1	6.0%
Low structure agriculture	10.06	0.0	1.2%
High structure agriculture	0.23	0.0	0.0%
Deciduous closed canopy	137.51	1.0	16.6%
Mixed closed canopy	200.04	0.6	24.1%
Conifer closed canopy	128.04	0.3	15.4%
Deciduous open canopy	59.50	2.4	7.4%
Mixed open canopy	38.83	1.5	4.8%
Conifer open canopy	15.38	0.6	1.9%
Deciduous scattered canopy	39.87	2.2	5.1%
Mixed scattered canopy	25.61	0.6	3.1%
Conifer scattered canopy	14.34	0.3	1.8%
Closed canopy shrub	34.76	0.3	4.2%
Open canopy shrub	15.09	0.4	1.9%
Scattered canopy shrub	19.83	1.2	2.5%
Meadow/grass	28.41	0.2	3.4%
Not classified	0.00	0.0	0.0%
Total	818.62	13.7	100.0%

The table below provides estimates of each type of the habitats described in Metro's Technical Report for Fish and Wildlife Habitat, based on Johnson and O'Neil's (2001) habitat scheme. These numbers are provided for subwatershed comparison purposes and represent estimates of available habitat type. Several data types were used to compile this table, and the data sources vary in their precision. For example, the satellite data sources are less accurate than hand-digitized forest canopy cover. There is also slight overlap between certain habitat types. For example, Riparian Wetlands (RWET) are also partially included in Westside Lowland Coniferous Hardwood/Westside Oak and Douglas-fir (WLCH/WODF) because some wetlands also contain forest, and Open Water (WATR) is not always considered part of habitat patches. Therefore, the sums of these habitat types are slightly different from the "Total wildlife habitat acres in inventory" shown in Table 16. Nonetheless, these numbers provide a generalized means of comparing the quality and quantity of habitat available to wildlife among and between subwatersheds. Note also that the estimates for Westside Grasslands (WEGR) probably represent grasslands that are not native rather than true native grasslands, which are largely extirpated from the metro region.

Table E-35. Wildlife habitat availability¹ based on Johnson & O'Neil's (2001) habitat types and species-habitat associations.

Resource site: Summer Creek	Habitat type						
	WATR ²	HWET ³	RWET ³	TOTWET ³	WLCH/ WODF ⁴	WEGR	AGPA
Total acres	0.0	62.9	45.6	118.5	668.6	65.2	10.3
Percent of total	0.0%	7.6%	5.5%	14.2%	80.3%	7.8%	1.2%

¹See Table E-34 for land cover types and crosswalk to Johnson and O'Neil's classification scheme.

²Note that patch type and data limitations result in an underestimation of open water habitats. For example, medium and small sized stream surfaces are excluded.

³Note that HWET and RWET do not represent the full suite of wetlands because some wetlands <2 acres were added in as Habitats of Concern, and some wetlands could not be associated with herbaceous or forested habitats. TOTWET represents the best estimate of all existing wetlands because it includes Habitats of Concern.

⁴Data limitations make it impossible to distinguish between these two habitat types at this time, and no comprehensive oak habitat survey has been conducted for the region. However, known oak habitats are also included in HOCs (see Appendix 10).

SITE #14: Lower Fanno Creek subwatershed

Named tributaries: Ball Creek, Bonita Creek, Carter Creek, Fanno Creek, Tualatin River

Communities within the subwatershed: Durham, King City, Lake Oswego, Portland, Tigard, Tualatin, unincorporated Clackamas County, unincorporated Multnomah County, unincorporated Washington County

Total acreage within Metro's boundary: 8,453.8

Total acres within riparian corridor: 1,907.5

This site contains three percent of the area comprising Metro's jurisdictional boundary. This site encompasses portions of nine different jurisdictions: Tigard (52 percent), unincorporated Washington County (19 percent), Lake Oswego (11 percent), Tualatin (five percent), Lake Oswego (four percent), unincorporated Clackamas County (four percent), King City (three percent), Durham (two percent), and less than one percent in unincorporated Multnomah County (Table E-36).

The estimated development density is similar to Site #13, at 15.0 miles of roads per square mile (Table E-2). Similarly, single family residential land use strongly dominates zoning patterns (Table E-5). However, a similar amount of building permits issued since 1996 (Table E-2) but well more than double the amount of acreage within the Metro boundary suggest that development is occurring more rapidly in Resource Site #13 compared to this site.

Riparian resources. The amount of this site in riparian corridors is 22 percent, the lowest of the five Group E sites but similar to Sites #12 and 13 (Table 12). The site contributes two percent of the region's riparian corridors, placing it within the mid-range of sites within this group (Table 13).

This resource site has approximately 38 total stream miles, or 0.0035 miles of non-piped streams per acre (similar to Site #12, and ranking 13th among all resource sites) (Tables E-3 and 12). Twenty-three percent of all stream miles are stream links, the highest proportion in Group D; this implies that a substantial portion of streams in this resource site have been piped underground or culverted (Table E-3). Thirty percent of non-piped streams are DEQ 303(d) water-quality limited (Tables E-2 and 12). The majority of streams in this site are low gradient (Table E-3). Ten percent of the site is in floodplain, and of that, eleven percent is developed (Table E-2). Three percent of the land in this site is covered by wetlands (Table E-2). Anadromous fish are known to be present in nearly nine stream miles (Table E-2).

The ecological criteria scores for this site indicate high-quality riparian resources. Forty-three percent of the acreage that falls within the riparian corridor inventory in this site received primary scores for at least three of the five ecological functions, the highest of all sites in Group E (Table E-39). More than 65 percent of this site's riparian corridors receive at least one primary ecological function score, also the highest proportion in Group E (Table E-9). The vegetation types within 300 ft of streams is dominated by forest, but there is also a substantial amount of low-structure vegetation near streams (Table E-4). The largest percentage of land receiving a particular primary score is for *Bank stabilization and pollution control* and *Large wood and channel dynamics*. However, *Organic material sources* and *Streamflow moderation and water storage* are also important primary functions (Table E-38; see also Table 4 and Appendix 5 for description of ecological functions mapping).

Wildlife habitat resources.

Including Habitats of Concern, 18 percent of the lands in this site fall within the wildlife habitat inventory, ranking it 24th among the 27 resource sites and last within Group E (Table 16). Within model patches approximately six percent falls within the top third of the point range with another 57 percent in the middle range (Table E-40). Of the four criteria in the GIS model, all of the acreage falls in the low size and habitat interior ranges (Table E-41). However, wildlife patches in this site have very good water resources, with 46 percent falling in the top score category and another 36 percent in the middle category. Connectivity is moderate, with 58 percent in the midrange and the majority of the remainder in the low category. In general, this site can be characterized as having relatively small habitat patches with little forest interior, but reasonably good connectivity and very good water resources. The site likely provides important habitat for native wildlife, with relatively good migratory corridors but limited breeding habitat for Neotropical migratory birds and other wildlife needing interior habitat or less disturbed areas.

Conifer and hardwood forest are the predominant habitat types in this resource site (72 percent), but grasslands may also provide important wildlife habitat (Table E-25). Wetlands comprise more than 15 percent of the site's wildlife habitat, ranking it second among Group E. The site's contribution to regional wetland resources is nearly three percent, and it ranks 11th among the 27 resource sites and fourth among the five Group E resource sites.

Species of Concern. Seven Species of Concern sighting locations fall within the site. Each sighting may include one or more species; if a species occurs more than once in the resource site it is only listed once here. These include the following species:

- Pileated Woodpecker
- Band-tailed Pigeon
- Great Blue Heron rookery

There are very likely other Species of Concern using this resource site, particularly those relying on forested habitats, grasslands and wetlands (see Table E-45). Examples of species likely to occur in this site may be found by referencing the species list in Appendix 7 and identifying the species with a double "XX" under the habitat. General species needs and potential reasons for their decline are identified in the *Sensitive Species Accounts* section above. More detailed information on all species' needs can be obtained through Johnson and O'Neil (2001).

Habitats of Concern.

The following Habitats of Concern are partially or wholly within this resource site. Using the Unique ID # (UID), please refer to Appendix 8 for information concerning each Habitat of Concern:

UID numbers: 98, 99, 100, 106

Table E-36. Acres within resource site by jurisdiction.

Jurisdiction	Acres within subwatershed
Durham	191.2
King City	282.0
Lake Oswego	919.2
Portland	347.0
Tigard	4,423.1
Tualatin	413.0
Unincorporated Clackamas County	296.4
Unincorporated Multnomah County	0.0
Unincorporated Washington County	1,581.9

Table E-37. Acres in Metro and riparian corridor.

Resource site	Total acres within Metro	Total acres within riparian corridor
Lower Fanno Creek	8,453.8	1,864.0

Table E-38. Number of acres within riparian corridor providing ecological function.

Resource site:	Ecological function	Primary Value		Secondary Value	
		Acres*	% of Total**	Acres	% of Total
Lower Fanno Creek	Microclimate & shade	523.0	28.1%	442.1	23.7%
	Streamflow moderation & water storage	790.2	42.4%	933.3	50.1%
	Bank stabilization & pollution control	943.2	50.6%	11.5	0.6%
	Large wood & channel dynamics	1,137.1	61.0%	95.7	5.1%
	Organic material sources	740.6	39.7%	80.4	4.3%

*Number of acres scored within the riparian corridor for each function

**Percent of total acres within the riparian corridor

Table E-39. Breakdown of ecological scores.

Resource site	Ecological Score	Acres	% of Total Acres
Lower Fanno Creek	1 to 5	644.0	34.5%
	6 to 11	118.0	6.3%
	12 to 17	294.8	15.8%
	18 to 23	93.3	5.0%
	24 to 29	423.1	22.7%
	30	290.8	15.6%
	Total acres		1,864.0

Resource site data tables: Wildlife Habitat

Table E-40. Breakdown of total wildlife model patch scores.*

Resource site:	Number of acres in each wildlife score category									Total wildlife model patch acres in inventory
	1	2	3	4	5	6	7	8	9	
Lower Fanno Creek										
Model score	121.9	127.4	161.4	331.6	368.9	311.2	87.4	0.0	0.0	1,509.8
Percent of total	8.1%	8.4%	10.7%	22.0%	24.4%	20.6%	5.8%	0.0%	0.0%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table E-41. Breakdown of total wildlife model patch scores by criteria.*

Resource site:	Number of acres by score for each model criterion											Total wildlife model patch acres in inventory	
	Size ²			Interior ²			Water ³			Connectivity			
	1	2	3	1	2	3	1	2	3	1	2		3
Lower Fanno Creek													
	1,255.2	0.0	0.0	697.7	0.0	0.0	114.2	546.5	689.6	429.6	878.0	202.2	1,509.8
Percent of total acres in inventory	83.1%	0.0%	0.0%	46.2%	0.0%	0.0%	7.6%	36.2%	45.7%	28.5%	58.2%	13.4%	na

¹Does not include Habitats of Concern outside of model patches.

²These numbers do not add up to 100.0% because Type 2 patches (low structure vegetation within 300 feet of streams and wetlands) were not ranked for these criteria.

³These numbers do not add up to 100% because not all patches contained or were near water resources.

Table E-42. Breakdown of total wildlife model patch area by 2000 Metro photo interpretation landcover and known wetlands.*

Resource site:	Low structure vegetation within 300 feet of stream		Forested vegetation	Forested wetlands	Grass/shrub wetlands within 300 feet of a stream	Other wetlands	Total wildlife model patch acres in inventory
	Low structure vegetation/intact topsoil	Non-forest woody vegetation					
Lower Fanno Creek							
Acres	245.6	9.1	1,037.3	91.6	64.4	61.9	1,509.8
Percent of total	16.3%	0.6%	68.7%	6.1%	4.3%	4.1%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table E-43. Total acres of inventoried wildlife habitat by type and total Species of Concern (SOCs).

Resource site: Lower Fanno Creek	Wildlife patches (acres)	HOCs inside Wildlife patches (acres)*	HOCs outside Wildlife patches (Including wetlands <2 acres)	Total inventoried wildlife habitat acres	Total SOCs
Acres	1509.8	263.5	23.6	1533.4	2
Percent of total	98.5%	17.2%	1.5%	100.0%	N/A

*Habitats of Concern.

Table E-44. Total area of model patches and Habitats of Concern by 1998 Landsat Landcover Area.

Resource Site: Lower Fanno Creek	Total area of wildlife model patches	Total area of HOCs outside of modeled patches (including wetlands <2 acres)	Percent of total inventoried habitat
Landcover type:			
Water	12.35	0.0	0.8%
Barren	109.57	4.4	7.4%
Low structure agriculture	31.32	2.7	2.2%
High structure agriculture	0.02	0.0	0.0%
Deciduous closed canopy	236.96	1.5	15.5%
Mixed closed canopy	278.06	0.2	18.1%
Conifer closed canopy	140.22	0.1	9.2%
Deciduous open canopy	150.83	2.1	10.0%
Mixed open canopy	99.39	0.2	6.5%
Conifer open canopy	26.67	0.2	1.8%
Deciduous scattered canopy	81.23	1.3	5.4%
Mixed scattered canopy	54.38	0.8	3.6%
Conifer scattered canopy	23.63	0.0	1.5%
Closed canopy shrub	56.86	0.4	3.7%
Open canopy shrub	37.01	0.9	2.5%
Scattered canopy shrub	43.63	1.2	2.9%
Meadow/grass	127.43	7.7	8.8%
Not classified	0.29	0.0	0.0%
Total	1,509.84	23.6	100.0%

The table below provides estimates of each type of the habitats described in Metro's Technical Report for Fish and Wildlife Habitat, based on Johnson and O'Neil's (2001) habitat scheme. These numbers are provided for subwatershed comparison purposes and represent estimates of available habitat type. Several data types were used to compile this table, and the data sources vary in their precision. For example, the satellite data sources are less accurate than hand-digitized forest canopy cover. There is also slight overlap between certain habitat types. For example, Riparian Wetlands (RWET) are also partially included in Westside Lowland Coniferous Hardwood/Westside Oak and Douglas-fir (WLCH/WODF) because some wetlands also contain forest, and Open Water (WATR) is not always considered part of habitat patches. Therefore, the sums of these habitat types are slightly different from the "Total wildlife habitat acres in inventory" shown in Table 16. Nonetheless, these numbers provide a generalized means of comparing the quality and quantity of habitat available to wildlife among and between subwatersheds. Note also that the estimates for Westside Grasslands (WEGR) probably represent grasslands that are not native rather than true native grasslands, which are largely extirpated from the metro region.

Table E-45. Wildlife habitat availability¹ based on Johnson & O'Neil's (2001) habitat types and species-habitat associations.

Resource site: Lower Fanno Creek	Habitat type						
	WATR ²	HWET ³	RWET ³	TOTWET ³	WLCH/ WODF ⁴	WEGR	AGPA
Total acres	60.7	126.3	91.6	238.3	1,097.7	217.9	34.0
Percent of total	4.0%	8.2%	6.0%	15.5%	71.6%	14.2%	2.2%

¹See Table E-44 for land cover types and crosswalk to Johnson and O'Neil's classification scheme.

²Note that patch type and data limitations result in an underestimation of open water habitats. For example, medium and small sized stream surfaces are excluded.

³Note that HWET and RWET do not represent the full suite of wetlands because some wetlands <2 acres were added in as Habitats of Concern, and some wetlands could not be associated with herbaceous or forested habitats. TOTWET represents the best estimate of all existing wetlands because it includes Habitats of Concern.

⁴Data limitations make it impossible to distinguish between these two habitat types at this time, and no comprehensive oak habitat survey has been conducted for the region. However, known oak habitats are also included in HOCs (see Appendix 10).

SITE #15: Rock Creek (South Washington County) subwatershed

Named tributaries: Cedar Creek, Chicken Creek, West Fork Chicken Creek, Goose Creek, Rock Creek

Communities within the subwatershed: Sherwood, Tualatin, unincorporated Washington County

Total acreage within Metro's boundary: 4,239.3 (includes Cedar Creek, Chicken Creek & Lower Tualatin River subwatersheds)

Total acres within riparian corridor: 1,075.1

This site contains one percent of the area comprising Metro's jurisdictional boundary. About 59 percent of the site is in the City of Sherwood, 32 percent in unincorporated Washington County, with the remainder in Tualatin (nine percent) (Table E-46).

The road density in this resource site (10.3 miles per square mile) is relatively low compared to three of four other sites in Group E (Table E-2). Zoning is dominated by single family residential, but rural and industrial land uses are also important in this resource site (Table E-5). The number of building permits issued since 1996 is 1,366 in this site (Table E-2).

Riparian resources. Twenty-six percent of this resource site is within the riparian corridor inventory, second only to Site #11 within Group E (Table 12). The site contributes a little more than one percent of the region's riparian corridors (Table 13).

This resource site has approximately 38 total stream miles, or 0.0035 miles of non-piped streams per acre (similar to Site #12, and ranking 22nd among all resource sites) (Tables E-3 and 12). Twenty-three percent of all stream miles are stream links, the highest proportion in Group D; this implies that a substantial portion of streams in this resource site have been piped underground or culverted (Table E-3). Thirty percent of non-piped streams are DEQ 303(d) water-quality limited (Tables E-2 and 12). The majority of streams in this site are low gradient (Table E-3). Ten percent of the site is in floodplain, and of that, eleven percent is developed (Table E-2). Three percent of the land in this site is covered by wetlands (Table E-2). Anadromous fish are known to be present in nearly nine stream miles (Table E-2).

The ecological criteria scores for this site indicate relatively high-quality riparian resources, second within this group only to Site #14. Thirty-seven percent of the acreage that falls within the riparian corridor inventory in this site received primary scores for at least three of the five ecological functions (Table E-49). Fifty-eight percent of this site's riparian corridors receive at least one primary ecological function score (Table E-49). Vegetation within 300 ft of streams is co-dominated by low structure vegetation and forest (Table E-4). The largest percentage of land receiving a particular primary score is for *Bank stabilization and pollution control* and *Large wood and channel dynamics*. However, *Organic material sources* and *Streamflow moderation and water storage* also contribute important primary functions (Table E-48; see also Table 4 and Appendix 5 for description of ecological functions mapping).

Wildlife habitat resources.

Including Habitats of Concern, more than 25 percent of the lands in this site fall within the wildlife habitat inventory, ranking it 12th among the 27 resource sites and second within Group E (Table 16). Within model patches approximately six percent falls within the top third of the

point range with another 79 percent in the middle range (Table E-50). Of the four criteria in the GIS model, all of the acreage falls in the low size and habitat interior ranges (Table E-51). However, wildlife patches in this site have very good water resources, with 27 percent falling in the top score category and another 64 percent in the middle category. Connectivity is excellent, with 63 percent in the midrange and the majority of the remainder in the midrange category. In general, this site can be characterized as having relatively small habitat patches with little forest interior, but very good water resources and excellent connectivity to other natural areas. The site is probably highly important to animals moving between patches, including Neotropical migratory birds. Aside from the importance of water to wildlife, the strong water resources in this well-connected site likely produce great insect resources for migrating songbirds and nesting native birds and other wildlife.

Conifer and hardwood forest are the predominant habitat types in this resource site (72 percent), but wetlands and grasslands are also highly important (Table E-55). Wetlands comprise more than 24 percent of the site's wildlife habitat, ranking it first among Group E. The site's contribution to regional wetland resources is three percent, and it ranks ninth among the 27 resource sites and third among the five Group E resource sites. However, consider that this site's area falling within the Metro boundary is only 38 percent of that in Site #12, but it contributes close to the same amount to the region's wetland resources.

Species of Concern. One Species of Concern sighting locations fall within the site. Each sighting may include one or more species; if a species occurs more than once in the resource site it is only listed once here. These include the following species:

- Peregrine Falcon

There are very likely other Species of Concern using this resource site, particularly those relying on forested habitats, grasslands and wetlands (see Table E-55). Examples of species likely to occur in this site may be found by referencing the species list in Appendix 7 and identifying the species with a double "XX" under the habitat. General species needs and potential reasons for their decline are identified in the *Sensitive Species Accounts* section above. More detailed information on all species' needs can be obtained through Johnson and O'Neil (2001).

Habitats of Concern.

The following Habitats of Concern are partially or wholly within this resource site. Using the Unique ID # (UID), please refer to Appendix 8 for information concerning each Habitat of Concern:

UID numbers: 106, 107, 154, 155, 156

Resource site data tables: Riparian Corridors

Table E-46. Acres within resource site by jurisdiction.

Jurisdiction	Acres within subwatershed
Sherwood	2,518.8
Tualatin	383.6
Unincorporated Washington County	1,337.0

Table E-47. Acres in Metro and riparian corridor.

Resource site	Total acres within Metro	Total acres within riparian corridor
Rock Creek (so. Washington Co.)	4,239.3	1,102.2

Table E-48. Number of acres within riparian corridor providing ecological function.

Resource site:	Ecological function	Primary Value		Secondary Value	
		Acres*	% of Total**	Acres	% of Total
Rock Creek (so. Washington County)	Microclimate & shade	277.4	25.2%	282.9	25.7%
	Streamflow moderation & water storage	413.1	37.5%	647.1	58.7%
	Bank stabilization & pollution control	500.8	45.4%	41.3	3.7%
	Large wood & channel dynamics	486.2	44.1%	38.4	3.5%
	Organic material sources	406.2	36.9%	18.1	1.6%

*Number of acres scored within the riparian corridor for each function

**Percent of total acres within the riparian corridor

Table E-49. Breakdown of ecological scores.

Resource site	Ecological Score	Acres	% of Total Acres
Rock Creek (so. Washington County)	1 to 5	466.5	42.3%
	6 to 11	131.9	12.0%
	12 to 17	93.0	8.4%
	18 to 23	23.8	2.2%
	24 to 29	240.5	21.8%
	30	146.5	13.3%
	Total acres		1,102.2

Resource site data tables: Wildlife Habitat

Table E-50. Breakdown of total wildlife model patch scores.*

Resource site: Rock Creek (so. Washington County)	Number of acres in each wildlife score category									Total wildlife model patch acres in inventory
	1	2	3	4	5	6	7	8	9	
Model score	27.3	8.4	118.3	202.3	38.3	574.6	62.2	0.0	0.0	1,031.5
Percent of total	2.6%	0.8%	11.5%	19.6%	3.7%	55.7%	6.0%	0.0%	0.0%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table E-51. Breakdown of total wildlife model patch scores by criteria.*

Resource site: Rock Creek (south Washington County)	Number of acres by score for each model criterion												Total wildlife model patch acres in inventory
	Size ²			Interior ²			Water ³			Connectivity			
	1	2	3	1	2	3	1	2	3	1	2	3	
	831.6	0.0	0.0	710.2	0.0	0.0	22.1	659.3	276.7	109.4	273.9	648.3	1,031.5
Percent of total acres in inventory	80.6%	0.0%	0.0%	68.8%	0.0%	0.0%	2.1%	63.9%	26.8%	10.6%	26.5%	62.8%	na

¹Does not include Habitats of Concern outside of model patches.

²These numbers do not add up to 100.0% because Type 2 patches (low structure vegetation within 300 feet of streams and wetlands) were not ranked for these criteria.

³These numbers do not add up to 100% because not all patches contained or were near water resources.

Table E-52. Breakdown of total wildlife model patch area by 2000 Metro photo interpretation landcover and known wetlands.*

Resource site: Rock Creek (so. Washington Co.)	Low structure vegetation within 300 feet of stream		Forested vegetation	Forested wetlands	Grass/shrub wetlands within 300 feet of a stream	Other wetlands	Total wildlife model patch acres in inventory
	Low structure vegetation/ intact topsoil	Non-forest woody vegetation					
Acres	187.0	12.9	579.5	94.1	115.5	42.5	1,031.5
Percent of total	18.1%	1.3%	56.2%	9.1%	11.2%	4.1%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table E-53. Total acres of inventoried wildlife habitat by type and total Species of Concern (SOCs).

Resource site: Rock Creek (south Washington Co.)	Wildlife patches (acres)	HOCs inside Wildlife patches (acres)*	HOCs outside Wildlife patches (including wetlands <2 acres)	Total inventoried wildlife habitat acres	Total SOCs
Acres	1031.5	661.0	40.9	1072.5	2
Percent of total	96.2%	61.6%	3.8%	100.0%	N/A

*Habitats of Concern.

Table E-54. Total area of model patches and Habitats of Concern by 1998 Landsat Landcover Area.

Resource Site: Rock Creek (so. Washington Co.)	Total area of wildlife model patches	Total area of HOCs outside of modeled patches (including wetlands <2 acres)	Percent of total inventoried habitat
Landcover type:			
Water	0.31	0.0	0.0%
Barren	100.86	10.2	10.4%
Low structure agriculture	66.56	2.2	6.4%
High structure agriculture	3.59	0.0	0.3%
Deciduous closed canopy	92.49	1.6	8.8%
Mixed closed canopy	100.80	0.6	9.5%
Conifer closed canopy	43.38	0.2	4.1%
Deciduous open canopy	51.48	2.4	5.0%
Mixed open canopy	201.02	6.6	19.4%
Conifer open canopy	17.16	0.6	1.7%
Deciduous scattered canopy	35.05	2.0	3.5%
Mixed scattered canopy	20.42	0.9	2.0%
Conifer scattered canopy	3.55	0.2	0.3%
Closed canopy shrub	44.43	1.1	4.2%
Open canopy shrub	36.45	2.3	3.6%
Scattered canopy shrub	102.01	3.4	9.8%
Meadow/grass	111.97	6.5	11.0%
Not classified	0.00	0.0	0.0%
Total	1,031.53	40.9	100.0%

The table below provides estimates of each type of the habitats described in Metro's Technical Report for Fish and Wildlife Habitat, based on Johnson and O'Neil's (2001) habitat scheme. These numbers are provided for subwatershed comparison purposes and represent estimates of available habitat type. Several data types were used to compile this table, and the data sources vary in their precision. For example, the satellite data sources are less accurate than hand-digitized forest canopy cover. There is also slight overlap between certain habitat types. For example, Riparian Wetlands (RWET) are also partially included in Westside Lowland Coniferous Hardwood/Westside Oak and Douglas-fir (WLCH/WODF) because some wetlands also contain forest, and Open Water (WATR) is not always considered part of habitat patches. Therefore, the sums of these habitat types are slightly different from the "Total wildlife habitat acres in inventory" shown in Table 16. Nonetheless, these numbers provide a generalized means of comparing the quality and quantity of habitat available to wildlife among and between subwatersheds. Note also that the estimates for Westside Grasslands (WEGR) probably represent grasslands that are not native rather than true native grasslands, which are largely extirpated from the metro region.

Table E-55. Wildlife habitat availability¹ based on Johnson & O'Neil's (2001) habitat types and species-habitat associations.

Resource site: Rock Creek (so. Washington Co.)	Habitat type						
	WATR ²	HWET ³	RWET ³	TOTWET ³	WLCH/ WODF ⁴	WEGR	AGPA
Total acres	3.4	157.9	94.1	261.5	580.6	262.7	72.3
Percent of total	0.3%	14.7%	8.8%	24.4%	54.1%	24.5%	6.7%

¹See Table E-54 for land cover types and crosswalk to Johnson and O'Neil's classification scheme.

²Note that patch type and data limitations result in an underestimation of open water habitats. For example, medium and small sized stream surfaces are excluded.

³Note that HWET and RWET do not represent the full suite of wetlands because some wetlands <2 acres were added in as Habitats of Concern, and some wetlands could not be associated with herbaceous or forested habitats. TOTWET represents the best estimate of all existing wetlands because it includes Habitats of Concern.

⁴Data limitations make it impossible to distinguish between these two habitat types at this time, and no comprehensive oak habitat survey has been conducted for the region. However, known oak habitats are also included in HOCs (see Appendix 10).

F. Lower Clackamas River Watershed

General watershed information

Resource sites in the Lower Clackamas River Watershed include:

- Richardson Creek subwatershed (combined with North Fork Deep Creek subwatershed)
- Rock Creek-Clackamas River subwatershed

Watershed assessments and plans

Clackamas River Basin Council and Ecotrust, 2000. *Rock and Richardson Creek Watershed Assessment, October 2000*, Ecotrust: Portland, Oregon.

Metro. 2000. *Rock and Richardson Creek Landscape and Natural Resource Assessment*. September 2000.

Metropolitan Regional Government, 1995. *Clackamas River Watershed Atlas, September 1995*, Metro: Portland, Oregon.

Portland State University and Metropolitan Regional Government, 1995. *Rock Creek Watershed Atlas, Planning with an Awareness of Natural Boundaries, March 1995*, Portland State University and Metro: Portland, Oregon.

Watershed councils and related groups

- Clackamas River Basin Council, PO Box 1869, Clackamas, 97015-1869, (503) 650-1256
- Clackamas River, Friends of, 9205 SE Clackamas, #142, Clackamas 97015, 503-492-1593, Scott Forrester
- Clackamas River Water, 16770 SE 82nd Drive, Clackamas 97015, 503-722-9241
- Rock Creek Environmental Center, 503-690-5402, Bob Mann
- Rock Creek Watershed Council, 16747 Timber Road, Vernonia 97064, 503-429-2401, Maggie Belmore
- Wetlands, Friends of, 503-253-6247, Alice Blatt
- Johnson Creek Watershed Action Plan. Available online at: <http://www.jcwc.org/actionPlan/WAP10.30.03.pdf>.

Data descriptions

Table F-1 provides information about the subwatersheds within each watershed, the HUC code, and the acres inside Metro's jurisdictional boundary. Keying in on the resource site number will show how the subwatersheds are aggregated into the resource sites listed above.

All three of the subwatersheds fall within the same 5th field HUC (Lower Clackamas River), but they are divided into two resource sites. Resource Site #16 is comprised of the North Fork Deep Creek and Richardson Creek subwatersheds, for a total of 6,486 acres within the Metro Boundary. Resource is comprised only of its namesake, Rock Creek-Clackamas River, and contains 11,121 acres falling within Metro's jurisdictional boundary.

Tables F-1 and F-2 provide general description about the 5th field and 6th field HUCs. Below these tables are descriptions of the riparian and wildlife habitat resources resource site.

Watershed data tables

Table F-1. Watersheds (5th level HUC), subwatersheds (6th level HUC), and acres within Metro jurisdictional boundary.

Watershed (5th level HUC)	5th field HUC code	Resource site #	Subwatershed (6th level HUC)	6th field HUC code	Acres in Metro
Lower Clackamas River	1709001122	16	North Fork Deep Creek	170900112205	2,644.3
			Richardson Creek	170900112206	3,821.2
		17	Rock Creek - Clackamas River	170900112208	11,120.6

Table F-2. Resource sites: general information.

General information	Richards on Creek	Rock Creek -
Miles of DEQ 303(d) listed streams	0.0	4.0
Road density (road miles/square miles in subwatershed)	5.1	8.1
Miles of stream with known anadromous fish presence	4.4	4.4
Acres of hydrologically connected wetlands	99.4	98.1
Total acres of wetlands	99.5	99.7
Acres of floodplains (100 year FEMA + 1996 inundation area)	0.0	761.9
Acres of developed floodplains	0.0	87.1
Building permits since 1996 (number)	141.0	1,404.0

Table F-3. Characteristics of stream miles by resource site.

Resource site	Stream miles by channel type		Miles of stream links*	Miles of streams not categorized by channel type	Total stream miles
	Low to medium	High			
Richardson Creek	0.0	0.8	0.0	29.3	30.1
Rock Creek - Clackamas River	8.0	3.0	5.2	33.3	49.5

*Stream links are links between surface streams and may be piped or culverted.

Table F-4. Riparian vegetation by resource site.

Resource site	Vegetation types within 300 feet of a stream (acres)			Forested vegetation >300 feet from a stream
	Low structure vegetation/intact topsoil	Non-forest woody vegetation	Forested vegetation	
Richardson Creek	1,076.3	57.7	508.4	601.6
Rock Creek - Clackamas River	1,073.3	101.0	1,062.5	1,623.4

Table F-5. Regional zoning by resource site.

Resource site	Acres by zone within each resource site						
	Commercial	Industrial	Multi-family residential	Public/open space	Rural	Single family residential	Mixed use
Richardson Creek	100.7	162.1	0.0	0.0	6,202.7	0.0	0.0
Rock Creek - Clackamas River	266.3	1,705.0	255.9	115.0	6,812.9	1,827.9	105.1

SITE #16: Richardson Creek subwatershed

Named streams: Clackamas River, Elliott Spring, Foster Creek, Goose Creek, Richardson Creek, Dolan Creek, Doane Creek, North Fork Deep Creek, Noyer Creek

Communities within the subwatershed: unincorporated Clackamas County

Total acreage within Metro's boundary: 6,465.5 (includes North Fork Deep Creek subwatershed)

Total acres within riparian corridor: 2,270.7

Other information: Two dams present, unknown impact to fish.

This site contains two percent of the area comprising Metro's jurisdictional boundary. Of this, all falls within unincorporated Clackamas County (Table F-6).

This site is quite undeveloped compared to other sites. The road density, at 5.1 miles per square mile, falls within the lowest quartile (0 to 25 percent of maximum); only Resource Site #1 is lower in road density (Tables A-2 and F-2). This is reflected in the near-complete dominance of rural zoning type (Table F-5). Only 141 building permits have been issued here since 1996 (Table F-2).

Riparian resources. Site #16, similar to the other resource site in Group F, contains a relatively high proportion of riparian resources at 35 percent of its total lands within the Metro Boundary (Table 12). The site contributes almost 2-1/2 percent of the region's riparian corridors (Table 13).

This resource site contains approximately 30.1 total stream miles, none of which are stream links (Table F-3). This suggests minimal piping and culverting. Stream density is 0.0047 miles per acre (Table 12), the second highest of all 27 resource sites. None of the stream miles appear on the DEQ 303(d) water-quality limited list (Table F-2). None of the site is in the floodplain, but the 100 acres of wetlands comprise approximately two percent of this resource site's land (Table F-2). Anadromous fish are known to be present in about four and one-half stream miles (Table F-2).

Twenty-one percent of the acreage that falls within the riparian corridor inventory in this site received primary scores for at least three of the five ecological functions; 40 percent of the site's riparian corridors receive at least one primary ecological function score (Table F-9). Low structure vegetation/intact topsoil is the dominant vegetation cover within 300 ft of streams, in contrast with the other Group F resource site, which also includes substantial forest (Table F-4). The percentage of land receiving a given primary score was dominated by *Bank stabilization and pollution control*, but *Large wood and channel dynamics* also provided a relatively important primary ecological function (Table F-8; see also Table 4 and Appendix 5 for description of ecological functions mapping).

Wildlife habitat resources.

Including Habitats of Concern, more than 34 percent of the lands in this site fall within the wildlife habitat inventory, ranking it sixth among the 27 resource sites (Table 16). Within model patches approximately 21 percent falls within the top third of the point range with another 46 percent in the middle range (Table F-10). Of the four criteria in the GIS model, acreage is split about equally between the lowest and middle size category (Table F-11). A majority of acreage

fell in the lowest category for the interior criterion, but a substantial proportion was also in the middle category. The relatively low total percentages for size and interior (51 percent) suggests that many of the wildlife habitat patches are low structure patches within 300 ft of streams, because these patch types are not scored for size and interior. Thus, low structure vegetation likely provides important connectivity along streams. Water resources were strongly clustered in the middle category, whereas connectivity scored primarily in the high range, with substantial amounts also in the middle category. However, this site rates high for interior habitat relative to most other sites discussed thus far, although the proportion in the other Group F site is even higher. In general, this site can be characterized as having a number of fairly large habitat patches, and many of the larger forested patches contain interior habitat; water resources are very good, and connectivity is excellent. The site is probably highly important to animals moving between patches, including both stopover and breeding territory for Neotropical migratory birds.

Conifer and hardwood forest are the predominant habitat types in this resource site (55 percent), followed by agricultural lands (29 percent) (Table F-15). Wetlands comprise more than four percent of the site's wildlife habitat, proportionally higher than the other Group F site. The site's contribution to regional wetland resources is slightly over one percent, and it ranks 19th among the 27 resource sites.

Species of Concern. One Species of Concern sighting locations fall within the site. Each sighting may include one or more species; if a species occurs more than once in the resource site it is only listed once here. These include the following species:

- Red-legged Frog

There are very likely other Species of Concern using this resource site, particularly those relying on forested habitats, agricultural lands, and low-structure vegetation along streams – such as the Red-legged Frog (see Table F-15). Examples of species likely to occur in this site may be found by referencing the species list in Appendix 7 and identifying the species with a double “XX” under the habitat. General species needs and potential reasons for their decline are identified in the *Sensitive Species Accounts* section above. More detailed information on all species' needs can be obtained through Johnson and O'Neil (2001).

Habitats of Concern.

The following Habitats of Concern are partially or wholly within this resource site. Using the Unique ID # (UID), please refer to Appendix 8 for information concerning each Habitat of Concern:

UID numbers: 139, 140, 141

Resource site data tables: Riparian Corridors

Table F-6. Acres within resource site by jurisdiction.

Jurisdiction	Acres within subwatershed
Unincorporated Clackamas County	6,465.5

Table F-7. Acres in Metro and riparian corridor.

Resource site	Total acres within Metro	Total acres within riparian corridor
Richardson Creek	6,465.5	2,271.8

Table F-8. Number of acres within riparian corridor providing ecological function.

Resource site:	Ecological function	Primary Value		Secondary Value	
		Acres*	% of Total**	Acres	% of Total
Richardson Creek	Microclimate & shade	289.1	12.7%	674.3	29.7%
	Streamflow moderation & water storage	100.8	4.4%	2,095.9	92.3%
	Bank stabilization & pollution control	834.5	36.7%	129.4	5.7%
	Large wood & channel dynamics	589.5	26.0%	143.2	6.3%
	Organic material sources	479.9	21.1%	125.9	5.5%

*Number of acres scored within the riparian corridor for each function

**Percent of total acres within the riparian corridor

Table F-9. Breakdown of ecological scores.

Resource site	Ecological Score	Acres	% of Total Acres
Richardson Creek	1 to 5	1,372.2	60.4%
	6 to 11	311.1	13.7%
	12 to 17	110.3	4.9%
	18 to 23	192.1	8.5%
	24 to 29	244.4	10.8%
	30	41.7	1.8%
	Total acres		2,271.8

Resource site data tables: Wildlife Habitat

Table F-10. Breakdown of total wildlife model patch scores.*

Resource site:	Number of acres in each wildlife score category									Total wildlife model patch acres in inventory
	1	2	3	4	5	6	7	8	9	
Richardson Creek										
Model score	8.7	84.0	645.2	518.2	91.2	407.6	59.1	394.3	0.0	2,208.1
Percent of total	0.4%	3.8%	29.2%	23.5%	4.1%	18.5%	2.7%	17.9%	0.0%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table F-11. Breakdown of total wildlife patch model scores by criteria.*

Resource site:	Number of acres by score for each model criterion											Total wildlife model patch acres in inventory	
	Size ²			Interior ²			Water ³			Connectivity			
	1	2	3	1	2	3	1	2	3	1	2		3
Richardson Creek													
	559.0	568.5	0.0	563.9	402.4	0.0	282.6	1,715.8	169.6	101.5	847.4	1,259.2	2,208.1
Percent of total acres in inventory	25.3%	25.7%	0.0%	25.5%	18.2%	0.0%	12.8%	77.7%	7.7%	4.6%	38.4%	57.0%	na

¹Does not include Habitats of Concern outside of model patches.

²These numbers do not add up to 100.0% because Type 2 patches (low structure vegetation within 300 feet of streams and wetlands) were not ranked for these criteria.

³These numbers do not add up to 100% because not all patches contained or were near water resources.

Table F-12. Breakdown of total wildlife model patch area by 2000 Metro photo interpretation landcover and known wetlands.*

Resource site:	Low structure vegetation within 300 feet of stream		Forested vegetation	Forested wetlands	Grass/shrub wetlands within 300 feet of a stream	Other wetlands	Total wildlife model patch acres in inventory
	Low structure vegetation/ Intact topsoil	Non-forest woody vegetation					
Richardson Creek							
Acres	1,028.7	51.8	1,042.1	41.2	31.6	12.7	2,208.1
Percent of total	46.6%	2.3%	47.2%	1.9%	1.4%	0.6%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table F-13. Total acres of inventoried wildlife habitat by type and total Species of Concern (SOCs).

Resource site:	Wildlife patches (acres)	HOCs inside Wildlife patches (acres)*	HOCs outside Wildlife patches (including wetlands <2 acres)	Total inventoried wildlife habitat acres	Total SOCs
Richardson Creek					
Acres	2208.1	436.3	4.5	2212.6	1
Percent of total	99.8%	19.7%	0.2%	100.0%	N/A

*Habitats of Concern.

Table F-14. Total area of model patches and Habitats of Concern by 1998 Landsat Landcover Area.

Resource Site: Richardson Creek	Total area of wildlife model patches	Total area of HOCs outside of modeled patches (including wetlands <2 acres)	Percent of total inventoried habitat
Landcover type:			
Water	0.00	0.0	0.0%
Barren	152.93	0.1	6.9%
Low structure agriculture	593.00	3.2	26.9%
High structure agriculture	45.84	0.0	2.1%
Deciduous closed canopy	161.94	0.0	7.3%
Mixed closed canopy	685.99	0.0	31.0%
Conifer closed canopy	66.21	0.0	3.0%
Deciduous open canopy	122.22	0.0	5.5%
Mixed open canopy	99.17	0.0	4.5%
Conifer open canopy	6.42	0.0	0.3%
Deciduous scattered canopy	48.96	1.1	2.3%
Mixed scattered canopy	21.50	0.0	1.0%
Conifer scattered canopy	4.56	0.0	0.2%
Closed canopy shrub	44.68	0.0	2.0%
Open canopy shrub	18.06	0.0	0.8%
Scattered canopy shrub	25.82	0.0	1.2%
Meadow/grass	110.79	0.1	5.0%
Not classified	0.00	0.0	0.0%
Total	2,208.09	4.5	100.0%

The table below provides estimates of each type of the habitats described in Metro's Technical Report for Fish and Wildlife Habitat, based on Johnson and O'Neil's (2001) habitat scheme. These numbers are provided for subwatershed comparison purposes and represent estimates of available habitat type. Several data types were used to compile this table, and the data sources vary in their precision. For example, the satellite data sources are less accurate than hand-digitized forest canopy cover. There is also slight overlap between certain habitat types. For example, Riparian Wetlands (RWET) are also partially included in Westside Lowland Coniferous Hardwood/Westside Oak and Douglas-fir (WLCH/WODF) because some wetlands also contain forest, and Open Water (WATR) is not always considered part of habitat patches. Therefore, the sums of these habitat types are slightly different from the "Total wildlife habitat acres in inventory" shown in Table 16. Nonetheless, these numbers provide a generalized means of comparing the quality and quantity of habitat available to wildlife among and between subwatersheds. Note also that the estimates for Westside Grasslands (WEGR) probably represent grasslands that are not native rather than true native grasslands, which are largely extirpated from the metro region.

Table F-15. Wildlife habitat availability¹ based on Johnson & O'Neil's (2001) habitat types and species-habitat associations.

Richardson Creek	Habitat type						
	WATR ²	HWET ³	RWET ³	TOTWET ³	WLCH/WODF ⁴	WEGR	AGPA
Total acres	0.0	44.3	41.2	99.5	1,218.0	154.8	642.1
Percent of total	0.0%	2.0%	1.9%	4.5%	55.1%	7.0%	29.0%

¹See Table F-14 for land cover types and crosswalk to Johnson and O'Neil's classification scheme.

²Note that patch type and data limitations result in an underestimation of open water habitats. For example, medium and small sized stream surfaces are excluded.

³Note that HWET and RWET do not represent the full suite of wetlands because some wetlands <2 acres were added in as Habitats of Concern, and some wetlands could not be associated with herbaceous or forested habitats. TOTWET represents the best estimate of all existing wetlands because it includes Habitats of Concern.

⁴Data limitations make it impossible to distinguish between these two habitat types at this time, and no comprehensive oak habitat survey has been conducted for the region. However, known oak habitats are also included in HOCs (see Appendix 10).

SITE #17: Rock Creek-Clackamas River subwatershed

Named streams: Clackamas River, Cow Creek, Johnson Creek, Rock Creek, Sieben Drainage Ditch, Tour Creek

Communities within the subwatershed: Gladstone, Happy Valley, Oregon City, unincorporated Clackamas County

Total acreage within Metro's boundary: 11,120.6

Total acres within riparian corridor: 4,172.5

Other information: One barrier to fish passage present with unknown impacts to fish.

This site contains four percent of the area comprising Metro's jurisdictional boundary. Most of the site (79 percent) is in unincorporated Clackamas County, but there are also portions in Oregon City, Happy Valley, and Gladstone (eight, seven, and five percent, respectively) (Table F-16).

The site's road density reflects the relatively undeveloped nature of this site; at 8.1 road miles per square mile, it falls at the top end of the lowest quartile (0 to 25 percent of maximum) compared to all other resource sites (Table F-2). However, compared to Site #16 and reflecting a somewhat increased road density, the zoning shows a rural dominance but also important single family residential and industrial components (Table F-5). About 1,400 building permits have been issued here since 1996 (Table A-2), a relatively low number compared to the amount of land falling within the Metro boundary.

Riparian resources. Site #17, similar to the other resource site in Group F, contains a relatively high proportion of riparian resources at 38 percent of its total lands within the Metro Boundary (Table 12). The site contributes four and one-half percent of the region's riparian corridors; only five of the 27 resource sites contribute more (Table 13).

This resource site contains approximately 50 total stream miles, of which 11 percent are stream links, suggesting a relatively low amount of piping or culverting (Table F-3). Non-piped stream density is 0.0040 miles per acre, somewhat lower than Site #16 (Table 12) but still in the top quarter of all 27 resource sites. Of non-piped streams, nine percent are DEQ 303(d) water-quality limited (Table F-2). Seven percent of the site is in the floodplain, and wetlands comprise less than one percent of this resource site's land (Table F-2). Anadromous fish are known to be present in about four and one-half stream miles.

Higher proportions of this site received primary ecological scores, compared to Site #16. Twenty-six percent of the acreage that falls within the riparian corridor inventory in this site received primary scores for at least three of the five ecological functions; more than 43 percent received at least one primary ecological function score (Table F-19). Vegetation near the stream is co-dominated by forest and low structure vegetation, in contrast with the other Group F resource site, which contains primarily low structure vegetation (Table F-4). The percentage of land receiving a given primary score was co-dominated by *Large wood and channel dynamics* and *Bank stabilization and pollution control* (Table F-18; see also Table 4 and Appendix 5 for description of ecological functions mapping).

Wildlife habitat resources.

Including Habitats of Concern, 34 percent of the lands in this site fall within the wildlife habitat inventory, ranking it seventh among the 27 resource sites, just behind the other Group F resource site (Table 16). Within model patches approximately 31 percent falls within the top third of the point range, ten percent higher than the other resource site in this group. Another 44 percent falls in the middle range (Table F-20). Of the four criteria in the GIS model, the highest proportion of acreage is in the lowest size category, although more than one fourth of this site's land are in the middle size class (Table F-21). Compared to the other resource site in Group F, the percentages for size and interior (71 percent) suggest that approximately 70 percent of wildlife habitat patches within 300 ft of stream are forested, because low-structure patch types are not scored for size and interior (see also Table F-22). A majority of acreage fell in the lowest category for the interior criterion, but a substantial proportion was also in the middle category. Water resources are highest in the middle range followed by the lowest scoring category, whereas connectivity scored primarily in the high range, with substantial amounts also in the middle category. This site rates high for interior habitat relative to most other sites discussed thus far, and has more interior habitat than the other Group F resource site.

In general, this site can be characterized as having large amounts of total and interior habitat; water resources are very good, and connectivity is excellent. The site is probably highly important to animals moving between patches, including both stopover and breeding territory for Neotropical migratory birds. The connectivity with extensive natural areas to the south of this site makes it highly valuable to wildlife, allowing strong possibility of species reintroduction in the event of local extirpations.

Conifer and hardwood forest are the predominant habitat types in this resource site (69 percent) (Table F-25). However, agricultural lands and grasslands comprise another 22 percent. Wetlands cover approximately three percent of the site's wildlife habitat, proportionally lower than the other Group F site. However, at just over one percent the site's contribution to regional wetland resources is about the same as Site #16, ranking 18th among the 27 resource sites.

Species of Concern. One Species of Concern sighting locations fall within the site. Each sighting may include one or more species; if a species occurs more than once in the resource site it is only listed once here. These include the following species:

- Red-legged Frog

There are very likely other Species of Concern using this resource site, particularly those relying on forested habitats and agricultural lands (see Table F-25). Examples of species likely to occur in this site may be found by referencing the species list in Appendix 7 and identifying the species with a double "XX" under the habitat. General species needs and potential reasons for their decline are identified in the *Sensitive Species Accounts* section above. More detailed information on all species' needs can be obtained through Johnson and O'Neil (2001).

Habitats of Concern.

The following Habitats of Concern are partially or wholly within this resource site. Using the Unique ID # (UID), please refer to Appendix 8 for information concerning each Habitat of Concern:

UID numbers: 121, 123, 138

Resource site data tables: Riparian Corridors

Table F-16. Acres within resource site by jurisdiction.

Jurisdiction	Acres within subwatershed
Gladstone	554.4
Happy Valley	829.5
Oregon City	902.9
Unincorporated Clackamas County	8,833.9

Table F-17. Acres in Metro and riparian corridor.

Resource site	Total acres within Metro	Total acres within riparian corridor
Rock Creek - Clackamas River	11,120.7	4,177.9

Table F-18. Number of acres within riparian corridor providing ecological function.

Resource site:	Ecological function	Primary Value		Secondary Value	
		Acres*	% of Total**	Acres	% of Total
Rock Creek - Clackamas River	Microclimate & shade	722.8	17.3%	1,165.6	27.9%
	Streamflow moderation & water storage	722.8	17.3%	3,339.3	79.9%
	Bank stabilization & pollution control	1,446.5	34.6%	124.0	3.0%
	Large wood & channel dynamics	1,494.1	35.8%	254.9	6.1%
	Organic material sources	952.9	22.8%	231.6	5.5%

*Number of acres scored within the riparian corridor for each function

**Percent of total acres within the riparian corridor

Table F-19. Breakdown of ecological scores.

Resource site	Ecological Score	Acres	% of Total Acres
Rock Creek - Clackamas River	1 to 5	2,372.0	56.8%
	6 to 11	367.9	8.8%
	12 to 17	349.7	8.4%
	18 to 23	280.0	6.7%
	24 to 29	609.5	14.6%
	30	198.8	4.8%
	Total acres		4,177.9

Resource site data tables: Wildlife Habitat

Table F-20. Breakdown of total wildlife model patch scores.*

Resource site: Rock Creek - Clackamas River	Number of acres in each wildlife score category									Total wildlife model patch acres in inventory
	1	2	3	4	5	6	7	8	9	
Model score	40.6	227.7	695.4	532.5	529.4	574.0	1,089.5	66.0	0.0	3,755.2
Percent of total	1.1%	6.1%	18.5%	14.2%	14.1%	15.3%	29.0%	1.8%	0.0%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table F-21. Breakdown of total wildlife model patch scores by criteria.*

Resource site: Rock Creek - Clackamas River	Number of acres by score for each model criterion											Total wildlife model patch acres in inventory	
	Size ²			Interior ²			Water ³			Connectivity			
	1	2	3	1	2	3	1	2	3	1	2		3
	1,683.4	1,003.4	0.0	1,335.2	976.8	0.0	1,375.8	1,761.7	429.9	329.2	1,061.9	2,364.0	3,755.2
Percent of total acres in inventory	44.8%	26.7%	0.0%	35.6%	26.0%	0.0%	36.6%	46.9%	11.4%	8.8%	28.3%	63.0%	na

¹Does not include Habitats of Concern outside of model patches.

²These numbers do not add up to 100.0% because Type 2 patches (low structure vegetation within 300 feet of streams and wetlands) were not ranked for these criteria.

³These numbers do not add up to 100% because not all patches contained or were near water resources.

Table F-22. Breakdown of total wildlife model patch area by 2000 Metro photo interpretation landcover and known wetlands.*

Resource site: Rock Creek - Clackamas River	Low structure vegetation within 300 feet of stream		Forested vegetation	Forested wetlands	Grass/shrub wetlands within 300 feet of a stream	Other wetlands	Total wildlife model patch acres in inventory
	Low structure vegetation/ intact topsoil	Non-forest woody vegetation					
Acres	972.6	95.8	2,597.0	30.2	31.2	28.4	3,755.2
Percent of total	25.9%	2.6%	69.2%	0.8%	0.8%	0.8%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table F-23. Total acres of inventoried wildlife habitat by type and total Species of Concern (SOCs).

Resource site: Rock Creek - Clackamas River	Wildlife patches (acres)	HOCs inside Wildlife patches (acres)*	HOCs outside Wildlife patches (including wetlands <2 acres)	Total inventoried wildlife habitat acres	Total SOCs
Acres	3755.2	675.9	6.6	3761.7	1
Percent of total	99.8%	18.0%	0.2%	100.0%	N/A

*Habitats of Concern.

Table F-24. Total area of model patches and Habitats of Concern by 1998 Landsat Landcover Area.

Resource Site:	Total area of wildlife model patches	Total area of HOCs outside of modeled patches (including wetlands <2 acres)	Percent of total inventoried habitat
Rock Creek - Clackamas River			
Landcover type:			
Water	54.38	0.0	1.4%
Barren	191.64	1.5	5.1%
Low structure agriculture	478.88	0.6	12.7%
High structure agriculture	35.97	0.0	1.0%
Deciduous closed canopy	713.05	0.3	19.0%
Mixed closed canopy	914.08	0.8	24.3%
Conifer closed canopy	283.57	0.0	7.5%
Deciduous open canopy	220.05	1.1	5.9%
Mixed open canopy	207.61	0.3	5.5%
Conifer open canopy	17.38	0.0	0.5%
Deciduous scattered canopy	127.28	0.5	3.4%
Mixed scattered canopy	59.84	0.0	1.6%
Conifer scattered canopy	30.05	0.0	0.8%
Closed canopy shrub	129.24	0.2	3.4%
Open canopy shrub	56.65	0.2	1.5%
Scattered canopy shrub	66.31	0.3	1.8%
Meadow/grass	168.94	0.7	4.5%
Not classified	0.25	0.0	0.0%
Total	3,755.17	6.6	100.0%

The table below provides estimates of each type of the habitats described in Metro’s Technical Report for Fish and Wildlife Habitat, based on Johnson and O’Neil’s (2001) habitat scheme. These numbers are provided for subwatershed comparison purposes and represent estimates of available habitat type. Several data types were used to compile this table, and the data sources vary in their precision. For example, the satellite data sources are less accurate than hand-digitized forest canopy cover. There is also slight overlap between certain habitat types. For example, Riparian Wetlands (RWET) are also partially included in Westside Lowland Coniferous Hardwood/Westside Oak and Douglas-fir (WLCH/WODF) because some wetlands also contain forest, and Open Water (WATR) is not always considered part of habitat patches. Therefore, the sums of these habitat types are slightly different from the “Total wildlife habitat acres in inventory” shown in Table 16. Nonetheless, these numbers provide a generalized means of comparing the quality and quantity of habitat available to wildlife among and between subwatersheds. Note also that the estimates for Westside Grasslands (WEGR) probably represent grasslands that are not native rather than true native grasslands, which are largely extirpated from the metro region.

Table F-25. Wildlife habitat availability¹ based on Johnson & O’Neil’s (2001) habitat types and species-habitat associations.

Resource site:	Habitat type						
	WATR ²	HWET ³	RWET ³	TOTWET ³	WLCH/WODF ⁴	WEGR	AGPA
Rock Creek - Clackamas River							
Total acres	132.6	59.6	30.2	99.7	2,575.9	293.1	515.4
Percent of total	3.5%	1.6%	0.8%	2.7%	68.5%	7.8%	13.7%

¹See Table F-24 for land cover types and crosswalk to Johnson and O’Neil’s classification scheme.

²Note that patch type and data limitations result in an underestimation of open water habitats. For example, medium and small sized stream surfaces are excluded.

³Note that HWET and RWET do not represent the full suite of wetlands because some wetlands <2 acres were added in as Habitats of Concern, and some wetlands could not be associated with herbaceous or forested habitats. TOTWET represents the best estimate of all existing wetlands because it includes Habitats of Concern.

⁴Data limitations make it impossible to distinguish between these two habitat types at this time, and no comprehensive oak habitat survey has been conducted for the region. However, known oak habitats are also included in HOCs (see Appendix 10).

G. Johnson Creek

General watershed information

Resource sites within the Johnson Creek Watershed include:

- Johnson Creek-Sunshine Creek subwatershed
- Kelley Creek subwatershed
- Middle Johnson Creek subwatershed
- Lower Johnson Creek-Willamette River
- Lake Oswego subwatershed
- Tryon Creek subwatershed
- Johnson Creek-Crystal Springs Creek subwatershed
- Mount Scott Creek subwatershed

Watershed assessments and plans

- Bureau of Planning, City of Portland, 1991. *Johnson Creek Basin Protection Plan, July 17, 1991*, City of Portland: Portland, Oregon.
- Bureau of Planning, City of Portland, 1993. *The East Buttes, Terraces and Wetlands Conservation Plan, May 26, 1993*, City of Portland: Portland, Oregon.
- Bureau of Planning, City of Portland, 1997. *Portland Environmental Handbook*, City of Portland: Portland, Oregon.
- Bureau of Planning, City of Portland, 2001. *Portland's Willamette River Atlas*, City of Portland: Portland, Oregon.
- Community and Economic Development Department, City of Gresham, 1988. *Inventory of Significant Natural Resources and Open Spaces*, City of Gresham: Gresham, Oregon.
- Lev, Esther, 2001. *Wildlife Habitat Inventory for the Willamette River*, Environmental Consulting: Portland, Oregon.
- Moses, Todd, 1993. *Stream Rehabilitation Concepts, Upper Fairview Creek, Gresham, Oregon*, Watershed Applications: Portland, Oregon.
- Oregon Department of Fish and Wildlife (ODFW) and Bureau of Environmental Services, City of Portland, 1999-2000. *Aquatic Inventories Project and Physical Habitat Surveys – Kelley Creek and tributaries, Lower Willamette Basin*, ODFW: Portland, Oregon.
- Oregon Department of Fish and Wildlife (ODFW) and Bureau of Environmental Services, City of Portland, 1999-2000. *Aquatic Inventories Project and Physical Habitat Surveys – Johnson Creek and tributaries, Lower Willamette Basin*, ODFW: Portland, Oregon.
- Portland Multnomah Progress Board, 2000. *Salmon Restoration in an Urban Watershed: Johnson Creek, Oregon – Conditions, Programs and Challenges*, Portland Multnomah Progress Board: Portland, Oregon.
- Portland State University and Metropolitan Regional Government, 1995. *Tryon Creek Watershed Atlas, Planning with an Awareness of Natural Boundaries, March 1995*, Portland State University and Metro: Portland, Oregon.
- United States Geological Service (USGS), 2000. *Willamette Basin Ground-Water Study*, USGS: Portland, Oregon.
- USGS, 1995. *NAWQA Willamette Basin Study*, USGS: Portland, Oregon.
- Willamette Basin Task Force, Pacific Northwest River Basins Commission, 1969. *The Willamette Basin, Comprehensive Study of Water and Related Land Resources*, Pacific Northwest River Basins Commission: Portland, Oregon.

- Willamette Basin Task Force, Pacific Northwest River Basins Commission, 1997. *The Willamette Basin, Recommendations to Governor John Kitzhaber*, Willamette River Basin Task Force: Portland, Oregon.
- Willamette Restoration Initiative, 2001. *Restoring A River of Life, The Willamette Restoration Strategy Overview, February 2001*, Willamette Restoration Initiative: Portland, Oregon.
- Willamette Restoration Initiative, 2001. *Restoring A River of Life, The Willamette Restoration Strategy – Recommendations for the Willamette Basin Supplement to the Oregon Plan for Salmon and Watersheds, February 2001*, Willamette Restoration Initiative: Portland, Oregon.
- Woodward-Clyde Consultants, 1995. *Johnson Creek Resources Management Plan*, Woodward-Clyde Consultants: Portland, Oregon.

Watershed councils and related groups

- Clackamas River Basin Council, PO Box 1869, Clackamas, 97015-1869, (503) 650-1256
- Clackamas River, Friends of, 9205 SE Clackamas, #142, Clackamas 97015, 503-492-1593, Scott Forrester
- Clackamas River Water, 16770 SE 82nd Drive, Clackamas 97015, 503-722-9241
- Fairview Creek Watershed Group, 2115 SE Morrison St., Portland 97214, (503) 661-7612, FAX (503) 661-5296
- Fairview Creek Watershed Council, PO Box 36, Fairview 97024, (503) 231-2270, Shannon Schmitt
- Fairview Creek Watershed Conservation Group, PO Box 36, Fairview 97204, 503-669-6000, Gregory Dresden
- Johnson Creek Watershed Council, 525 Logus St., Oregon City 97045, (503) 239-3932, FAX (503) 239-3946
- Johnson Creek Watershed Council, 8300 SE McLaughlin Blvd, Portland 97282, 503-239-3932, Kim Hatfield
- Johnson Creek, Friends of Beaverton's 503-626-4398, Susan Langston
- Johnson Creek, Friends of, 503-257-3161, Clifton Lee Powell
- Mt. Scott and Kellogg Creeks, Friends of, PO Box 22373, Milwaukie 97269, 503-653-7875, Steve Berliner
- Minthorn Springs, Friends of, 3006 SE Washington Street, Milwaukie 97222, 503-659-8509, Mart Hughes
- Tryon Creek Watershed Council, 10750 Boones Ferry Rd., Portland 97219, (503) 823-5596
- Tryon Creek State Park, Friends of, 11321 SW Terwilliger Blvd, Portland 97219, 503-636-4398, Louise Shorr
- Wetlands, Friends of, 503-253-6247, Alice Blatt
- Willamette River Restoration Committee, 541-484-9466, Timothy Green

Data descriptions

Table G-1 provides information about the subwatersheds within each watershed, the HUC code, and the acres inside Metro's jurisdictional boundary. In Section G, all subwatersheds also comprise their own resource site, with the same names. All eight of the resource sites fall within the same 5th field HUC (Johnson Creek).

Tables G-1 and G-2 provide general description about the 5th field and 6th field HUCs. Below these tables are descriptions of the riparian and wildlife habitat resources resource site.

Watershed data tables

Table G-1. Watersheds (5th level HUC), subwatersheds (6th level HUC), and acres within Metro jurisdictional boundary.

Watershed (5th level HUC)	5th field HUC code	Resource site #	Subwatershed (6th level HUC)	6th field HUC code	Acres in Metro
Johnson Creek	1709001201	18	Johnson Creek - Sunshine Creek	170990120101	12,372.9
		19	Kelley Creek	170990120102	3,175.6
		20	Middle Johnson Creek	170990120103	8,949.5
		21	Lower Johnson Creek - Willamette River	170990120104	5,950.2
		22	Lake Oswego	170990120105	4,168.7
		23	Tryon Creek	170990120106	4,356.4
		24	Johnson Creek - Crystal Springs Creek	170990120107	7,844.6
		25	Mount Scott Creek	170990120108	11,809.6

Table G-2. Resource sites: general information.

General information	Johnson - Sunshine Creeks	Kelley Creek	Middle Johnson Creek	Lower Johnson Creek	Lake Oswego	Tryon Creek	Johnson - Crystal Springs Creeks	Mount Scott Creek
Miles of DEQ 303(d) listed streams	10.0	0.0	3.6	3.9	2.8	5.2	6.8	2.2
Road density (road miles/square miles in subwatershed)	7.8	5.5	14.7	14.9	15.3	14.6	20.9	14.3
Miles of stream with known anadromous fish presence	9.7	2.3	3.4	4.0	0.4	2.6	8.3	9.2
Acres of hydrologically connected wetlands	111.0	16.0	14.4	38.6	10.2	3.8	39.7	146.1
Total acres of wetlands	111.1	16.0	14.4	38.6	13.1	3.8	46.4	147.0
Acres of floodplains (100 year FEMA + 1996 inundation area)	346.8	34.4	378.9	717.1	590.2	107.7	572.0	706.5
Acres of developed floodplains	11.8	1.2	164.4	74.6	75.8	37.1	295.4	149.6
Building permits since 1996 (number)	622.0	258.0	1,474.0	557.0	417.0	285.0	1,016.0	1,452.0

Table G-3. Characteristics of stream miles by resource site.

Resource site	Stream miles by channel type		Miles of stream links*	Miles of streams not categorized by channel type	Total stream miles
	Low to medium	High			
Johnson - Sunshine Creeks	11.9	1.9	3.7	31.3	48.9
Kelley Creek	3.0	0.7	0.2	8.4	12.2
Middle Johnson Creek	4.2	0.6	26.7	5.2	36.7
Lower Johnson Creek - Willamette River	15.5	6.4	7.1	2.5	31.5
Lake Oswego	12.0	1.6	6.1	3.3	23.0
Tryon Creek	1.3	2.4	2.7	17.4	23.8
Johnson - Crystal Springs Creeks	9.2	1.3	20.6	3.8	34.9
Mount Scott Creek	11.1	2.5	16.3	17.4	47.3

*Stream links are links between surface streams and may be piped or culverted.

Table G-4. Riparian vegetation by resource site.

Resource site	Vegetation types within 300 feet of a stream (acres)			Forested vegetation >300 feet from a stream
	Low structure vegetation/intact topsoil	Non-forest woody vegetation	Forested vegetation	
Johnson - Sunshine Creeks	1,201.5	90.5	1,156.8	2,371.5
Kelley Creek	350.1	14.8	339.6	729.7
Middle Johnson Creek	142.2	6.0	408.7	899.8
Lower Johnson Creek - Willamette River	119.3	6.9	691.6	705.0
Lake Oswego	40.6	2.7	376.0	602.0
Tryon Creek	93.7	0.0	949.7	886.2
Johnson - Crystal Springs Creeks	259.4	2.8	227.8	367.8
Mount Scott Creek	447.5	21.0	597.4	1,184.9

Table G-5. Regional zoning by resource site.

Resource site	Acres by zone within each resource site						
	Commercial	Industrial	Multi-family residential	Public/open space	Rural	Single family residential	Mixed use
Johnson - Sunshine Creeks	39.7	306.4	388.4	124.3	7,347.8	3,953.1	213.3
Kelley Creek	7.7	0.0	0.0	2.0	2,569.5	596.5	0.0
Middle Johnson Creek	289.6	348.0	1,415.5	975.1	0.0	5,401.3	517.9
Lower Johnson Creek - Willamette River	254.8	82.9	304.0	164.2	51.5	4,667.3	205.0
Lake Oswego	189.5	0.0	144.6	0.0	85.5	3,260.6	55.4
Tryon Creek	135.7	37.8	137.9	528.6	107.8	3,350.3	58.3
Johnson - Crystal Springs Creeks	223.7	932.1	923.2	679.5	0.0	4,819.3	254.0
Mount Scott Creek	287.6	937.7	555.9	519.3	266.3	7,899.7	1,242.1

SITE #18: Johnson Creek-Sunshine Creek subwatershed

Named streams: Butler Creek, Fairview Creek, Johnson Creek, Kelly Creek, Sunshine Creek

Communities within the subwatershed: Gresham, Portland, unincorporated Clackamas County, unincorporated Multnomah County

Total acreage within Metro's boundary: 12,372.9

Total acres within the riparian corridor: 4,787.5

This site contains four percent of the area comprising Metro's jurisdictional boundary. Forty percent of this site is in unincorporated Clackamas County; 38 percent is in Gresham, 20 percent in unincorporated Multnomah County, and two percent in the City of Portland. About seven percent of the site is in the City of Troutdale, with the remaining two percent in unincorporated Multnomah County (Table G-6).

This site and the next (Site #19) are the two least developed resource sites in Group G (Table G-2). This resource site has a road density of 7.8 miles per square mile, falling in the first quartile (0 to 25 percent of maximum) compared to all other resource sites. Zoning is strongly rural, but single family residential covers nearly half as much acreage (Table G-5), primarily reflecting the portion of the site's land falling with Gresham's boundaries. Over 600 building permits have been issued here since 1996 (Table G-2), but this is a relatively low number compared to the amount of land within Metro's boundary.

Riparian resources. Thirty-nine percent of this site is part of the riparian corridor inventory, the third highest proportion of the eight resource sites in Group G (Table 12). It contributes more than five percent of the region's total riparian resources, the fifth highest amount of all 27 resource sites (Table 13).

This resource site contains 49 total stream miles, and about 0.0037 miles of non-piped streams per acre, ranking it 11th among the 27 resource sites; 3.7 miles, or about eight percent, are stream links and may be piped or culverted (Tables 12 and G-3). About 22 percent of non-piped stream miles are listed by the DEQ as 303(d) quality-limited (Tables G-2 and 12). Anadromous fish are known to be present in approximately 10 stream miles (Table G-2). Three percent of the site is floodplain, and one percent is wetland (Table G-2 and G-3). About 3-1/2 percent of the floodplain is developed, similar to Site #19 in this group.

Approximately 20 percent of this site's acreage within the riparian corridor inventory received primary scores for at least three of the five ecological functions. However, nearly 70 percent the site's riparian resources are limited to secondary functions, similar to Sites #19 and 20 in Group G (Table G-9). The highest percentage of land receiving a primary score was fairly evenly divided between *Large wood and channel dynamics* and *Bank stabilization and pollution control* (Table G-8; see also Table 4 and Appendix 5 for description of ecological functions mapping).

Wildlife habitat resources. Including Habitats of Concern, 39 percent of the lands in this site fall within the wildlife habitat inventory, ranking it fourth among the 27 resource sites (Table 16). Within model patches approximately 24 percent falls within the top third of the point range, the fourth highest proportion of the eight Group G resource sites; another 59 percent falls in the middle range (Table G-10). Of the four criteria in the GIS model, the proportion of acreage is divided nearly equally between the middle and lowest category, at 39 and 36 percent, respectively (Table G-11). The highest percentage for the interior criterion was the lowest score

category (46 percent), although another 23 percent fell in the middle category. These total percentages suggest that nearly one fourth of this site's wildlife resources are low-structure vegetation patches within 300 ft of streams, because these patch types are not scored for these two criteria (see also Table G-12). Water resources were highest in the low range (53 percent) followed by the middle scoring category (36 percent), whereas connectivity scored primarily in the high range (74 percent), with substantial amounts also in the middle category. This site rates high for interior habitat relative to many other sites discussed thus far, and ranks fourth among the generally well-connected resource sites within Group G.

In general, this site can be characterized as having large amounts of total and interior habitat; water resources are moderate, but that is influenced by the unusually large amount of upland habitats in addition to riparian resources. Connectivity to other natural areas is excellent. The site is probably highly important to animals moving between patches, including both stopover and breeding territory for Neotropical migratory birds. The connectivity with extensive natural areas in adjacent watersheds makes it highly valuable to wildlife, allowing potential for species reintroduction in the event of local extirpations.

Conifer and hardwood forest are the predominant habitat types in this resource site (76 percent) (Table G-15). Wetlands cover more than two percent of the site's wildlife habitat, proportionally lower than the many of the 27 resource sites but ranking fourth among the eight resource sites in Group G. The site contributes a little over one percent to the region's wetland resources, ranking 17th among the 27 resource sites.

Species of Concern. Nine Species of Concern sighting locations fall within the site. Each sighting may include one or more species; if a species occurs more than once in the resource site it is only listed once here. These include the following species:

- Pileated Woodpecker (numerous sightings, reflecting strong coniferous component)
- Willow Flycatcher
- Bald Eagle nest site

There are very likely other Species of Concern using this resource site, particularly those relying on forested habitats and agricultural lands (see Table G-15). Examples of species likely to occur in this site may be found by referencing the species list in Appendix 7 and identifying the species with a double "XX" under the habitat. General species needs and potential reasons for their decline are identified in the *Sensitive Species Accounts* section above. More detailed information on all species' needs can be obtained through Johnson and O'Neil (2001).

Habitats of Concern.

The following Habitats of Concern are partially or wholly within this resource site. Using the Unique ID # (UID), please refer to Appendix 8 for information concerning each Habitat of Concern:

UID numbers: 12, 133, 136, 137

Resource site data tables: Riparian Corridors

Table G-6. Acres within resource site by jurisdiction.

Jurisdiction	Acres within subwatershed
Gresham	4,730.0
Portland	244.3
Unincorporated Clackamas County	4,928.2
Unincorporated Multnomah County	2,470.4

Table G-7. Acres in Metro and riparian corridor.

Resource site	Total acres within Metro	Total acres within riparian corridor
Johnson - Sunshine Creeks	12,372.9	4,777.5

Table G-8. Number of acres within riparian corridor providing ecological function.

Resource site	Ecological function	Primary Value		Secondary Value	
		Acres*	% of Total**	Acres	% of Total
Johnson - Sunshine Creeks	Microclimate & shade	751.1	15.7%	1,513.1	31.7%
	Streamflow moderation & water storage	402.3	8.4%	4,282.2	89.6%
	Bank stabilization & pollution control	1,293.2	27.1%	410.2	8.6%
	Large wood & channel dynamics	1,158.2	24.2%	281.7	5.9%
	Organic material sources	929.7	19.5%	233.2	4.9%

*Number of acres scored within the riparian corridor for each function

**Percent of total acres within the riparian corridor

Table G-9. Breakdown of ecological scores.

Resource site	Ecological Score	Acres	% of Total Acres
Johnson - Sunshine Creeks	1 to 5	3,297.1	69.0%
	6 to 11	372.7	7.8%
	12 to 17	169.1	3.5%
	18 to 23	136.9	2.9%
	24 to 29	595.5	12.5%
	30	206.2	4.3%
	Total acres		4,777.5

Resource site data tables: Wildlife Habitat

Table G-10. Breakdown of total wildlife model patch scores.*

Resource site: Johnson - Sunshine Creeks	Number of acres in each wildlife score category									Total wildlife model patch acres in inventory
	1	2	3	4	5	6	7	8	9	
Model score	27.5	131.8	662.4	703.2	777.9	1,298.3	1,133.7	0.0	0.0	4,734.6
Percent of total	0.6%	2.8%	14.0%	14.9%	16.4%	27.4%	23.9%	0.0%	0.0%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table G-11. Breakdown of total wildlife patch model scores by criteria.*

Resource site: Johnson - Sunshine Creeks	Number of acres by score for each model criterion												Total wildlife model patch acres in inventory
	Size ²			Interior ²			Water ³			Connectivity			
	1	2	3	1	2	3	1	2	3	1	2	3	
	1,699.3	1,835.1	0.0	2,156.7	1,071.7	0.0	2,506.2	1,681.0	382.1	226.6	994.5	3,513.5	4,734.6
Percent of total acres in inventory	35.9%	38.8%	0.0%	45.6%	22.6%	0.0%	52.9%	35.5%	8.1%	4.8%	21.0%	74.2%	na

¹Does not include Habitats of Concern outside of model patches.

²These numbers do not add up to 100.0% because Type 2 patches (low structure vegetation within 300 feet of streams and wetlands) were not ranked for these criteria.

³These numbers do not add up to 100% because not all patches contained or were near water resources.

Table G-12. Breakdown of total wildlife model patch area by 2000 Metro photo interpretation landcover and known wetlands.*

Resource site: Johnson - Sunshine Creeks	Low structure vegetation within 300 feet of stream		Forested vegetation	Forested wetlands	Grass/shrub wetlands within 300 feet of a stream	Other wetlands	Total wildlife model patch acres in inventory
	Low structure vegetation/ intact topsoil	Non-forest woody vegetation					
Acres	1,122.3	77.9	3,430.8	42.5	47.6	13.5	4,734.6
Percent of total	23.7%	1.6%	72.5%	0.9%	1.0%	0.3%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table G-13. Total acres of inventoried wildlife habitat by type and total Species of Concern (SOCs).

Resource site: Johnson - Sunshine Creeks	Wildlife patches (acres)	HOCs inside Wildlife patches (acres)*	HOCs outside Wildlife patches (including wetlands <2 acres)	Total inventoried wildlife habitat acres	Total SOCs
Acres	4734.6	248.7	87.7	4822.3	9
Percent of total	98.2%	5.2%	1.8%	100.0%	N/A

*Habitats of Concern.

Table G-14. Total area of model patches and Habitats of Concern by 1998 Landsat Landcover Area.

Resource Site: Johnson - Sunshine Creeks	Total area of wildlife model patches	Total area of HOCs outside of modeled patches (including wetlands <2 acres)	Percent of total inventoried habitat
Landcover type:			
Water	0.76	0.0	0.0%
Barren	152.23	7.5	3.3%
Low structure agriculture	396.96	1.3	8.3%
High structure agriculture	121.05	2.0	2.6%
Deciduous closed canopy	1,423.25	2.2	29.6%
Mixed closed canopy	1,348.09	2.7	28.0%
Conifer closed canopy	303.19	0.7	6.3%
Deciduous open canopy	230.76	1.4	4.8%
Mixed open canopy	118.02	0.8	2.5%
Conifer open canopy	11.92	0.2	0.3%
Deciduous scattered canopy	134.68	1.4	2.8%
Mixed scattered canopy	68.13	0.9	1.4%
Conifer scattered canopy	7.34	0.0	0.2%
Closed canopy shrub	158.54	5.3	3.4%
Open canopy shrub	44.25	3.0	1.0%
Scattered canopy shrub	63.53	10.0	1.5%
Meadow/grass	151.95	48.2	4.2%
Not classified	0.01	0.0	0.0%
Total	4,734.65	87.7	100.0%

The table below provides estimates of each type of the habitats described in Metro's Technical Report for Fish and Wildlife Habitat, based on Johnson and O'Neil's (2001) habitat scheme. These numbers are provided for subwatershed comparison purposes and represent estimates of available habitat type. Several data types were used to compile this table, and the data sources vary in their precision. For example, the satellite data sources are less accurate than hand-digitized forest canopy cover. There is also slight overlap between certain habitat types. For example, Riparian Wetlands (RWET) are also partially included in Westside Lowland Coniferous Hardwood/Westside Oak and Douglas-fir (WLCH/WODF) because some wetlands also contain forest, and Open Water (WATR) is not always considered part of habitat patches. Therefore, the sums of these habitat types are slightly different from the "Total wildlife habitat acres in inventory" shown in Table 16. Nonetheless, these numbers provide a generalized means of comparing the quality and quantity of habitat available to wildlife among and between subwatersheds. Note also that the estimates for Westside Grasslands (WEGR) probably represent grasslands that are not native rather than true native grasslands, which are largely extirpated from the metro region.

Table G-15. Wildlife habitat availability¹ based on Johnson & O'Neil's (2001) habitat types and species-habitat associations.

Resource site:	Habitat type						
	WATR ²	HWET ³	RWET ³	TOTWET ³	WLCH/ WODF ⁴	WEGR	AGPA
Johnson - Sunshine Creeks							
Total acres	25.3	61.1	42.5	111.1	3,655.7	321.0	521.4
Percent of total	0.5%	1.3%	0.9%	2.3%	75.8%	6.7%	10.8%

¹See Table G-14 for land cover types and crosswalk to Johnson and O'Neil's classification scheme.

²Note that patch type and data limitations result in an underestimation of open water habitats. For example, medium and small sized stream surfaces are excluded.

³Note that HWET and RWET do not represent the full suite of wetlands because some wetlands <2 acres were added in as Habitats of Concern, and some wetlands could not be associated with herbaceous or forested habitats. TOTWET represents the best estimate of all existing wetlands because it includes Habitats of Concern.

⁴Data limitations make it impossible to distinguish between these two habitat types at this time, and no comprehensive oak habitat survey has been conducted for the region. However, known oak habitats are also included in HOCs (see Appendix 10).

SITE #19: Kelley Creek subwatershed**Named streams:** Kelly Creek, Mitchell Creek**Communities within the subwatershed:** Gresham, Happy Valley, Portland, unincorporated Clackamas County, unincorporated Multnomah County**Total acreage within Metro's boundary:** 3,175.6**Total acres within the riparian corridor:** 1,424.9

This site contains one percent of the area comprising Metro's jurisdictional boundary. Forty-six percent of the site falls within unincorporated Multnomah County; the remainder falls in unincorporated Clackamas County (37 percent), Portland (12 percent), Gresham (four percent), and Happy Valley (two percent) (Table G-16).

This site is the third least developed of all resource sites, with only 5.5 road miles per square mile (Table G-2). It is also the least developed resource site in Group G. The zoning is strongly rural, with some single family residential (Table G-5). About 260 building permits have been issued here since 1996 (Table G-2).

Riparian resources. Forty-five percent of this site is part of the riparian corridor inventory, the second highest proportion of the eight resource sites in Group G (Table 12). However, it contributes only one and one-half percent of the region's total riparian resources due to the relatively small acreage falling within the Metro boundary (Table 13).

This resource site contains 12 total stream miles, and about 0.0038 miles of non-piped streams per acre, ranking it eighth among the 27 resource sites. Two percent of total stream miles are stream links and may be piped or culverted (Tables 12 and G-3). None of the stream miles are DEQ 303(d) listed (Table G-2). Anadromous fish are known to be present in approximately 2 stream miles (Table G-2). One percent of the site is floodplain, and one percent is wetland (Tables G-2 and G-3). About 3-1/2 percent of the floodplain is developed, similar to Site #18 in this group.

Approximately 16 percent of this site's acreage within the riparian corridor inventory received primary scores for at least three of the five ecological functions (Table G-19). However, 74 percent the site's riparian resources are limited to secondary functions, similar to Sites #18 and 20 in Group G. The highest percentage of land receiving a primary score was for *Bank stabilization and pollution control*, followed by *Large wood and channel dynamics* (Table G-18; see also Table 4 and Appendix 5 for description of ecological functions mapping).

Wildlife habitat resources. Including Habitats of Concern, 45 percent of the lands in this site fall within the wildlife habitat inventory, ranking it second among the 27 resource sites and first in Group G (Table 16). Within model patches approximately 43 percent falls within the top third of the point range, the third highest proportion of the eight Group G resource sites; another 38 percent falls in the middle range (Table G-20). Of the four criteria in the GIS model, the highest proportion of acreage is in the middle size score category (43 percent), with another 32 percent in the lowest category (Table G-11). The acreage for the interior criterion was about equally divided between the lowest and middle categories (35 and 34 percent, respectively). These total percentages suggest that approximately 30 percent of this site's wildlife resources are low-structure vegetation patches within 300 ft of streams, because these patch types are not scored for

these two criteria (see also Table G-22). Water resources were highest in the medium range (59 percent) followed by the middle scoring category (35 percent), whereas connectivity scored primarily in the high range (76 percent, with another 23 percent in the middle category). This site ranks very high for interior habitat relative to many of the 27 resource sites, and ranks third among the generally well-connected resource sites within Group G.

In general, this site can be characterized as having extensive amounts of total habitat, substantial interior habitat, good water resources and outstanding connectivity. Water resources are moderate rather than high due to the unusually large amount of upland habitats in addition to riparian resources. As with other sites with these characteristics, this site is probably highly important to animals moving between patches, including both stopover and breeding territory for Neotropical migratory birds. The connectivity with extensive natural areas in adjacent watersheds makes it highly valuable to wildlife, allowing potential for species reintroduction in the event of local extirpations.

Conifer and hardwood forest are the predominant habitat types in this resource site (76 percent) (Table G-25). Wetlands cover more just over one percent of the site's wildlife habitat, proportionally lower than the many of the 27 resource sites and ranking sixth among the eight resource sites in Group G. The site contributes 0.2 percent to the region's wetland resources, ranking 24th among the 27 resource sites.

Species of Concern. No Species of Concern sighting locations fall within the site. However, there are very likely Species of Concern using this resource site, particularly those relying on forested habitats (see Table G-25). Examples of species likely to occur in this site may be found by referencing the species list in Appendix 7 and identifying the species with a double "XX" under the habitat. General species needs and potential reasons for their decline are identified in the *Sensitive Species Accounts* section above. More detailed information on all species' needs can be obtained through Johnson and O'Neil (2001).

Habitats of Concern.

The following Habitats of Concern are partially or wholly within this resource site. Using the Unique ID # (UID), please refer to Appendix 8 for information concerning each Habitat of Concern:

UID numbers: 123, 138

Resource site data tables: Riparian Corridors

Table G-16. Acres within resource site by jurisdiction.

Jurisdiction	Acres within subwatershed
Gresham	135.9
Happy Valley	47.7
Portland	369.4
Unincorporated Clackamas County	1,177.5
Unincorporated Multnomah County	1,445.1

Table G-17. Acres in Metro and riparian corridor.

Resource site	Total acres within Metro	Total acres within riparian corridor
Kelley Creek	3,175.6	1,423.1

Table G-18. Number of acres within riparian corridor providing ecological function.

Resource site	Ecological function	Primary Value		Secondary Value	
		Acres*	% of Total**	Acres	% of Total
Kelley Creek	Microclimate & shade	191.5	13.5%	461.8	32.4%
	Streamflow moderation & water storage	49.5	3.5%	1,354.1	95.2%
	Bank stabilization & pollution control	332.3	23.4%	104.9	7.4%
	Large wood & channel dynamics	283.8	19.9%	90.8	6.4%
	Organic material sources	223.9	15.7%	75.3	5.3%

*Number of acres scored within the riparian corridor for each function

**Percent of total acres within the riparian corridor

Table G-19. Breakdown of ecological scores.

Resource site	Ecological Score	Acres	% of Total Acres
Kelley Creek	1 to 5	1,046.1	73.5%
	6 to 11	118.4	8.3%
	12 to 17	33.1	2.3%
	18 to 23	33.9	2.4%
	24 to 29	163.7	11.5%
	30	28.0	2.0%
	Total acres		1,423.1

Resource site data tables: Wildlife Habitat

Table G-20. Breakdown of total wildlife model patch scores.*

Resource site:	Number of acres in each wildlife score category									Total wildlife model patch acres in inventory
	1	2	3	4	5	6	7	8	9	
Kelley Creek										
Model score	13.8	15.3	234.5	127.7	78.0	331.1	609.5	0.0	0.0	1,410.0
Percent of total	1.0%	1.1%	16.6%	9.1%	5.5%	23.5%	43.2%	0.0%	0.0%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table G-21. Breakdown of total wildlife patch model scores by criteria.*

Resource site:	Number of acres by score for each model criterion											Total wildlife model patch acres in inventory	
	Size ²			Interior ²			Water ³			Connectivity			
	1	2	3	1	2	3	1	2	3	1	2		3
Kelley Creek													
Percent of total acres in inventory	32.0%	43.2%	0.0%	34.9%	33.8%	0.0%	35.1%	59.0%	3.8%	1.2%	22.6%	76.1%	na

¹Does not include Habitats of Concern outside of model patches.

²These numbers do not add up to 100.0% because Type 2 patches (low structure vegetation within 300 feet of streams and wetlands) were not ranked for these criteria.

³These numbers do not add up to 100% because not all patches contained or were near water resources.

Table G-22. Breakdown of total wildlife model patch area by 2000 Metro photo interpretation landcover and known wetlands.*

Resource site:	Low structure vegetation within 300 feet of stream		Forested vegetation	Forested wetlands	Grass/shrub wetlands within 300 feet of a stream	Other wetlands	Total wildlife model patch acres in inventory
	Low structure vegetation/intact topsoil	Non-forest woody vegetation					
Kelley Creek							
Acres	334.9	14.4	1,046.8	6.1	5.3	2.4	1,410.0
Percent of total	23.8%	1.0%	74.2%	0.4%	0.4%	0.2%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table G-23. Total acres of inventoried wildlife habitat by type and total Species of Concern (SOCs).

Resource site: Kelley Creek	Wildlife patches (acres)	HOCs inside Wildlife patches (acres)*	HOCs outside Wildlife patches (including wetlands <2 acres)	Total inventoried wildlife habitat acres	Total SOCs
Acres	1410.0	330.0	12.1	1422.0	0
Percent of total	99.2%	23.2%	0.8%	100.0%	N/A

*Habitats of Concern.

Table G-24. Total area of model patches and Habitats of Concern by 1998 Landsat Landcover Area.

Resource Site: Kelley Creek	Total area of wildlife model patches	Total area of HOCs outside of modeled patches (including wetlands <2 acres)	Percent of total inventoried habitat
Landcover type:			
Water	0.00	0.0	0.0%
Barren	32.23	0.1	2.3%
Low structure agriculture	204.41	2.1	14.5%
High structure agriculture	29.83	0.0	2.1%
Deciduous closed canopy	318.76	1.1	22.5%
Mixed closed canopy	588.09	5.6	41.7%
Conifer closed canopy	49.34	0.1	3.5%
Deciduous open canopy	26.03	0.9	1.9%
Mixed open canopy	37.74	0.6	2.7%
Conifer open canopy	6.03	0.5	0.5%
Deciduous scattered canopy	28.52	0.3	2.0%
Mixed scattered canopy	9.89	0.2	0.7%
Conifer scattered canopy	0.17	0.0	0.0%
Closed canopy shrub	32.55	0.3	2.3%
Open canopy shrub	8.10	0.2	0.6%
Scattered canopy shrub	17.28	0.3	1.2%
Meadow/grass	21.01	0.0	1.5%
Not classified	0.00	0.0	0.0%
Total	1,409.97	12.1	100.0%

The table below provides estimates of each type of the habitats described in Metro's Technical Report for Fish and Wildlife Habitat, based on Johnson and O'Neil's (2001) habitat scheme. These numbers are provided for subwatershed comparison purposes and represent estimates of available habitat type. Several data types were used to compile this table, and the data sources vary in their precision. For example, the satellite data sources are less accurate than hand-digitized forest canopy cover. There is also slight overlap between certain habitat types. For example, Riparian Wetlands (RWET) are also partially included in Westside Lowland Coniferous Hardwood/Westside Oak and Douglas-fir (WLCH/WODF) because some wetlands also contain forest, and Open Water (WATR) is not always considered part of habitat patches. Therefore, the sums of these habitat types are slightly different from the "Total wildlife habitat acres in inventory" shown in Table 16. Nonetheless, these numbers provide a generalized means of comparing the quality and quantity of habitat available to wildlife among and between subwatersheds. Note also that the estimates for Westside Grasslands (WEGR) probably represent grasslands that are not native rather than true native grasslands, which are largely extirpated from the metro region.

Table G-25. Wildlife habitat availability¹ based on Johnson & O'Neil's (2001) habitat types and species-habitat associations.

Resource site: Kelley Creek	Habitat type						
	WATR ²	HWET ³	RWET ³	TOTWET ³	WLCH/ WODF ⁴	WEGR	AGPA
Total acres	0.0	7.8	6.1	16.0	1,073.7	46.8	236.3
Percent of total	0.0%	0.5%	0.4%	1.1%	75.5%	3.3%	16.6%

¹See Table G-24 for land cover types and crosswalk to Johnson and O'Neil's classification scheme.

²Note that patch type and data limitations result in an underestimation of open water habitats. For example, medium and small sized stream surfaces are excluded.

³Note that HWET and RWET do not represent the full suite of wetlands because some wetlands <2 acres were added in as Habitats of Concern, and some wetlands could not be associated with herbaceous or forested habitats. TOTWET represents the best estimate of all existing wetlands because it includes Habitats of Concern.

⁴Data limitations make it impossible to distinguish between these two habitat types at this time, and no comprehensive oak habitat survey has been conducted for the region. However, known oak habitats are also included in HOCs (see Appendix 10).

SITE #20: Middle Johnson Creek subwatershed**Named streams:** Fairview Creek, Johnson Creek**Communities within the subwatershed:** Gresham, Happy Valley, Portland, unincorporated Clackamas county, unincorporated Multnomah county**Total acreage within Metro's boundary:** 8,949.5**Total acres within the riparian corridor:** 1,798.9

This site contains three percent of the area comprising Metro's jurisdictional boundary. The majority of the site (82 percent) falls within the City of Portland's boundaries; 16 percent is in Gresham, and one percent or less falls within Happy Valley and unincorporated Clackamas and Multnomah counties (Table G-26).

The road density in this site is 14.7 miles per square mile, falling within the third quartile (51 to 75 percent of maximum) compared to all other resource sites (Table G-2). The zoning is primarily single family residential, but multi-family residential and public space/open lands are also important land uses in this resource site (Table G-5). Nearly 1,500 building permits have been issued here since 1996 (Table A-2).

Riparian resources. Seventeen percent of this site is part of the riparian corridor inventory, ranking it next to last in Group G (Table 12). However, it contributes nearly two percent of the region's total riparian resources (Table 13).

This resource site contains 37 total stream miles, but because most of these (73 percent) are stream links, actual stream density is only 0.0011 miles per acre, ranking it last among all 27 resource sites (Tables 12 and G-3). More than a third of the non-piped stream miles are DEQ 303(d) listed (Table G-2). Anadromous fish are known to be present in approximately 3-1/2 stream miles (Table G-2). Four percent of the site is floodplain, and less than one percent is wetland (Tables G-2 and G-3). Forty-three percent of the floodplain is developed, second only to Site #24 among all 27 resource sites (Table 14).

Approximately 18 percent of this site's acreage within the riparian corridor inventory received primary scores for at least three of the five ecological functions, and more than 32 percent received at least one primary score (Table G-29). Approximately 68 percent of the site's riparian resources are limited to secondary functions. The highest percentage of land receiving a primary score was for *Bank stabilization and pollution control* and *Large wood and channel dynamics* (Table G-28; see also Table 4 and Appendix 5 for description of ecological functions mapping).

Wildlife habitat resources. Including Habitats of Concern, 18 percent of the lands in this site fall within the wildlife habitat inventory, ranking it 23rd among the 27 resource sites and seventh of the eight Group G resource sites (Table 16). Despite the relatively low proportion of wildlife habitat, what is there tends to be high-scoring; within model patches approximately 55 percent falls within the top third of the point range, the second highest proportion of the eight Group G resource sites; another 33 percent falls in the middle range (Table G-30). Of the four criteria in the GIS model, the highest proportion of acreage is in the middle size score category (55 percent), with another 35 percent in the lowest category (Table G-31). The acreage for the interior criterion all fell in the lowest score category (82 percent). This suggests that there are some long, linear habitat patches along streams in this resource site. The high total percentages for these two criteria suggest that most of the habitat resources within 300 ft of streams are

18281
forested, because low-structure patch types are not scored for these two criteria (see also Table G-32). In fact, most of the water resources for this site fell within the middle scoring range (68 percent), confirming what can be seen on the map. In keeping with this resource configuration, most of the acreage scored in the high range for connectivity (85 percent). This site ranks fourth high for connectivity relative to all 27 resource sites, and ranks second among the generally well-connected resource sites within Group G.

In general, this site can be characterized as having high quality wildlife habitat despite fairly intense urbanization. While there is little interior habitat the excellent connectivity and large patch sizes situated along waterways provide a very valuable wildlife habitat complex, and contribute important resources to the regional wildlife habitat system. As with other sites with these characteristics, this site is probably highly important to animals moving between patches, including both stopover and breeding territory for Neotropical migratory birds.

As with other Group G sites, conifer and hardwood forest are the predominant habitat types in this resource site (78 percent) (Table G-35). Wetlands cover one percent of the site's wildlife habitat, proportionally lower than the many of the 27 resource sites and ranking seventh among the eight resource sites in Group G. The site contributes 0.2 percent to the region's wetland resources, ranking 25th among the 27 resource sites.

Species of Concern. Four Species of Concern sighting locations fall within the site. Each sighting may include one or more species; if a species occurs more than once in the resource site it is only listed once here. These include the following species:

- Red-legged Frog
- Bald Eagle nest site
- *Rorippa columbiae* (sensitive plant species)
- *Sidalcea nelsoniana* (sensitive plant species)

There are very likely other Species of Concern using this resource site, particularly those relying on forested habitats and agricultural lands (see Table G-35). Examples of species likely to occur in this site may be found by referencing the species list in Appendix 7 and identifying the species with a double "XX" under the habitat. General species needs and potential reasons for their decline are identified in the *Sensitive Species Accounts* section above. More detailed information on all species' needs can be obtained through Johnson and O'Neil (2001).

Habitats of Concern.

The following Habitats of Concern are partially or wholly within this resource site. Using the Unique ID # (UID), please refer to Appendix 8 for information concerning each Habitat of Concern:

UID numbers: 12, 33, 126, 133, 134, 135, 136, 161

Resource site data tables: Riparian Corridors

Table G-26. Acres within resource site by jurisdiction.

Jurisdiction	Acres within subwatershed
Gresham	1,437.2
Happy Valley	78.9
Portland	7,358.3
Unincorporated Clackamas County	58.5
Unincorporated Multnomah County	16.6

Table G-27. Acres in Metro and riparian corridor.

Resource site	Total acres within Metro	Total acres within riparian corridor
Middle Johnson Creek	8,949.7	1,539.2

Table G-28. Number of acres within riparian corridor providing ecological function.

Resource site	Ecological function	Primary Value		Secondary Value	
		Acres*	% of Total**	Acres	% of Total
Middle Johnson Creek	Microclimate & shade	233.0	15.1%	549.5	35.7%
	Streamflow moderation & water storage	233.2	15.2%	1,281.3	83.2%
	Bank stabilization & pollution control	353.8	23.0%	81.6	5.3%
	Large wood & channel dynamics	431.5	28.0%	116.9	7.6%
	Organic material sources	271.9	17.7%	88.0	5.7%

*Number of acres scored within the riparian corridor for each function

**Percent of total acres within the riparian corridor

Table G-29. Breakdown of ecological scores.

Resource site	Ecological Score	Acres	% of Total Acres
Middle Johnson Creek	1 to 5	1,041.5	67.7%
	6 to 11	92.0	6.0%
	12 to 17	122.3	7.9%
	18 to 23	16.9	1.1%
	24 to 29	196.6	12.8%
	30	70.0	4.5%
	Total acres		1,539.2

Resource site data tables: Wildlife Habitat

Table G-30. Breakdown of total wildlife model patch scores.*

Resource site: Middle Johnson Creek	Number of acres in each wildlife score category									Total wildlife model patch acres in inventory
	1	2	3	4	5	6	7	8	9	
Model score	88.2	24.0	52.2	109.8	298.1	38.8	740.5	0.0	0.0	1,351.7
Percent of total	6.5%	1.8%	3.9%	8.1%	22.1%	2.9%	54.8%	0.0%	0.0%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table G-31. Breakdown of total wildlife patch model scores by criteria.*

Resource site: Middle Johnson Creek	Number of acres by score for each model criterion											Total wildlife model patch acres in inventory	
	Size ²			Interior ²			Water ³			Connectivity			
	1	2	3	1	2	3	1	2	3	1	2		3
	478.5	740.5	0.0	1,107.3	0.0	0.0	271.4	920.0	30.2	130.5	72.2	1,149.0	1,351.7
Percent of total acres in inventory	35.4%	54.8%	0.0%	81.9%	0.0%	0.0%	20.1%	68.1%	2.2%	9.7%	5.3%	85.0%	na

¹Does not include Habitats of Concern outside of model patches.

²These numbers do not add up to 100.0% because Type 2 patches (low structure vegetation within 300 feet of streams and wetlands) were not ranked for these criteria.

³These numbers do not add up to 100% because not all patches contained or were near water resources.

Table G-32. Breakdown of total wildlife model patch area by 2000 Metro photo interpretation landcover and known wetlands.*

Resource site: Middle Johnson Creek	Low structure vegetation within 300 feet of stream		Forested vegetation	Forested wetlands	Grass/shrub wetlands within 300 feet of a stream	Other wetlands	Total wildlife model patch acres in inventory
	Low structure vegetation/ intact topsoil	Non-forest woody vegetation					
Acres	127.6	5.0	1,208.2	4.6	0.0	6.2	1,351.7
Percent of total	9.4%	0.4%	89.4%	0.3%	0.0%	0.5%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table G-33. Total acres of inventoried wildlife habitat by type and total Species of Concern (SOCs).

Resource site: Middle Johnson Creek	Wildlife patches (acres)	HOCs inside Wildlife patches (acres)*	HOCs outside Wildlife patches (including wetlands <2 acres)	Total inventoried wildlife habitat acres	Total SOCs
Acres	1351.7	425.2	276.4	1628.1	4
Percent of total	83.0%	26.1%	17.0%	100.0%	N/A

*Habitats of Concern.

Table G-34. Total area of model patches and Habitats of Concern by 1998 Landsat Landcover Area.

Resource Site:	Total area of wildlife model patches	Total area of HOCs outside of modeled patches (including wetlands <2 acres)	Percent of total inventoried habitat
Middle Johnson Creek			
Landcover type:			
Water	0.77	0.0	0.0%
Barren	43.96	25.1	4.2%
Low structure agriculture	9.21	0.0	0.6%
High structure agriculture	0.00	0.0	0.0%
Deciduous closed canopy	259.65	8.8	16.5%
Mixed closed canopy	437.62	3.3	27.1%
Conifer closed canopy	337.67	0.2	20.8%
Deciduous open canopy	49.61	9.4	3.6%
Mixed open canopy	36.46	10.7	2.9%
Conifer open canopy	21.15	0.2	1.3%
Deciduous scattered canopy	35.08	11.2	2.8%
Mixed scattered canopy	25.67	10.7	2.2%
Conifer scattered canopy	16.39	0.0	1.0%
Closed canopy shrub	39.64	9.1	3.0%
Open canopy shrub	10.43	7.6	1.1%
Scattered canopy shrub	10.43	26.2	2.2%
Meadow/grass	17.95	154.0	10.6%
Not classified	0.00	0.0	0.0%
Total	1,351.69	276.4	100.0%

The table below provides estimates of each type of the habitats described in Metro’s Technical Report for Fish and Wildlife Habitat, based on Johnson and O’Neil’s (2001) habitat scheme. These numbers are provided for subwatershed comparison purposes and represent estimates of available habitat type. Several data types were used to compile this table, and the data sources vary in their precision. For example, the satellite data sources are less accurate than hand-digitized forest canopy cover. There is also slight overlap between certain habitat types. For example, Riparian Wetlands (RWET) are also partially included in Westside Lowland Coniferous Hardwood/Westside Oak and Douglas-fir (WLCH/WODF) because some wetlands also contain forest, and Open Water (WATR) is not always considered part of habitat patches. Therefore, the sums of these habitat types are slightly different from the “Total wildlife habitat acres in inventory” shown in Table 16. Nonetheless, these numbers provide a generalized means of comparing the quality and quantity of habitat available to wildlife among and between subwatersheds. Note also that the estimates for Westside Grasslands (WEGR) probably represent grasslands that are not native rather than true native grasslands, which are largely extirpated from the metro region.

Table G-35. Wildlife habitat availability¹ based on Johnson & O’Neil’s (2001) habitat types and species-habitat associations.

Resource site:	Habitat type						
	WATR ²	HWET ³	RWET ³	TOTWET ³	WLCH/WODF ⁴	WEGR	AGPA
Middle Johnson Creek							
Total acres	12.9	6.3	4.6	14.4	1,273.8	226.5	9.2
Percent of total	0.8%	0.4%	0.3%	0.9%	78.2%	13.9%	0.6%

¹See Table G-34 for land cover types and crosswalk to Johnson and O’Neil’s classification scheme.

²Note that patch type and data limitations result in an underestimation of open water habitats. For example, medium and small sized stream surfaces are excluded.

³Note that HWET and RWET do not represent the full suite of wetlands because some wetlands <2 acres were added in as Habitats of Concern, and some wetlands could not be associated with herbaceous or forested habitats. TOTWET represents the best estimate of all existing wetlands because it includes Habitats of Concern.

⁴Data limitations make it impossible to distinguish between these two habitat types at this time, and no comprehensive oak habitat survey has been conducted for the region. However, known oak habitats are also included in HOCs (see Appendix 10).

SITE #21: Lower Johnson Creek-Willamette River**Named streams:** Clackamas River, Willamette River**Communities within the subwatershed:** Gladstone, Lake Oswego, Oregon City, West Linn, unincorporated Clackamas County**Total acreage within Metro's boundary:** 5,950.2**Total acres within the riparian corridor:** 1,897.1

This site contains two percent of the area comprising Metro's jurisdictional boundary. About 40 percent of the site is in West Linn, 38 percent in unincorporated Clackamas County, and the remainder is in Gladstone (15 percent), Lake Oswego (seven percent) and Oregon City (less than one percent) (Table G-36).

At 14.9 road miles per square mile, this site's road density is similar to several other sites in Group G, placing it in the third quartile (51 to 75% of maximum) compared to all other resource sites (e.g., site #20, 22, 23, and 25) (Table G-2). Zoning is primarily single family residential (Table G-5). About 560 building permits have been issued in this site since 1996 (Table G-2).

Riparian resources. Thirty-two percent of this site is part of the riparian corridor inventory, ranking it in the middle of Group G (Table 12). It contributes two percent of the region's total riparian resources (Table 13).

This resource site contains 32 total stream miles, of which 23 percent are stream links. Non-piped stream density is 0.0041 miles per acre, the fourth highest of all 27 resource sites (Tables 12 and G-3). Sixteen percent of the non-piped stream miles are DEQ 303(d) listed (Table G-2). Anadromous fish are known to be present in approximately four stream miles (Table G-2). Low to medium gradient streams predominate (Table G-3). Twelve percent of the site is floodplain, and one percent is wetland (Tables G-2 and G-3). Approximately 10 percent of the floodplain is developed.

A substantial amount of riparian resources in this site received primary scores. Approximately 44 percent of this site's acreage within the riparian corridor inventory received primary scores for at least three of the five ecological functions, and more than 62 percent received at least one primary score (Table G-39). The highest percentage of land receiving a primary score was for *Large wood and channel dynamics*, followed by *Bank stabilization and pollution control*. *Streamflow moderation and water storage* was also an important primary function in this resource site (Table G-38; see also Table 4 and Appendix 5 for description of ecological functions mapping).

Wildlife habitat resources. Including Habitats of Concern, 25 percent of the lands in this site fall within the wildlife habitat inventory, ranking it 13th among the 27 resource sites and fourth of the eight Group G resource sites (Table 16). Within model patches, no acreage falls within the top third of the point range; however, 74 percent falls in the middle range (Table G-40). Of the four criteria in the GIS model, the highest proportion of acreage is in the middle size score category (55 percent), with another 35 percent in the lowest category (Table G-41). The majority of the mid-range scores fell west of the Willamette River, with less total habitat and more fragmentation east of the river.

The acreage for the size and interior criteria all fell in the lowest score category (94 and 72 percent, respectively). This suggests that there are some long, linear habitat patches in this resource site. The high total percentage for the size criterion suggests that most of the habitat resources within 300 ft of streams are forested, because low-structure patch types are not scored for this criterion (see also Table G-42). Most of the water resources for this site fell within the middle or high scoring range (54 and 27 percent, respectively). This is influenced by the fact that the largest habitat is much longer than it is wide, and most of the streams run perpendicular through the patch thus lowering the density of water resources in the site. The overall connectivity scores fell primarily in the middle (47 percent) and high (34 percent) range for the site. The habitat patches west of the Willamette River have excellent connectivity; preserving this connectivity will be essential to maintaining the integrity of habitat here. This patch also contains a narrow corridor of connectivity to Mary S. Young State Park and adjacent patches closer to the Willamette River, and maintaining or enhancing that connector is vital.

As with other Group G sites, conifer and hardwood forest are the predominant habitat types in this resource site (87 percent), but open water, at 23 percent, is a very important habitat resource (Table G-45). Wetlands cover nearly three percent of the site's wildlife habitat, proportionally lower than the many of the 27 resource sites and ranking seventh among the eight resource sites in Group G. The site contributes 0.4 percent to the region's wetland resources, ranking 22nd among the 27 resource sites.

In general, this site can be characterized as having relatively high quality wildlife habitat west of the Willamette River, with less habitat that is generally lower in quality east of the river (due to fragmentation and lack of water resources). On the east side of the river a relatively low proportion of the habitat is protected through parks and public lands, but this pattern is improved to the west, where the low scores in habitat interior are mitigated by strong connectivity and good water resources. The proximity to the river and connectivity make the western portion of this site highly important to wildlife movement and an important migratory resource.

Species of Concern. Four Species of Concern sighting locations fall within the site. Each sighting may include one or more species; if a species occurs more than once in the resource site it is only listed once here. These include the following species:

- Band-tailed Pigeon
- Red-legged Frog
- Great Blue Heron nest colony

There are very likely other Species of Concern using this resource site, particularly those relying on forested habitats and agricultural lands (see Table G-45). Examples of species likely to occur in this site may be found by referencing the species list in Appendix 7 and identifying the species with a double "XX" under the habitat. General species needs and potential reasons for their decline are identified in the *Sensitive Species Accounts* section above. More detailed information on all species' needs can be obtained through Johnson and O'Neil (2001).

Habitats of Concern.

The following Habitats of Concern are partially or wholly within this resource site. Using the Unique ID # (UID), please refer to Appendix 8 for information concerning each Habitat of Concern:

UID numbers: 117, 118, 119, 120, 145

Table G-36. Acres within resource site by jurisdiction.

Jurisdiction	Acres within subwatershed
Gladstone	921.0
Lake Oswego	402.3
Oregon City	0.3
West Linn	2,354.6
Unincorporated Clackamas County	2,272.0

Table G-37. Acres in Metro and riparian corridor.

Resource site	Total acres within Metro	Total acres within riparian corridor
Lower Johnson Creek	5,950.3	1,897.0

Table G-38. Number of acres within riparian corridor providing ecological function.

Resource site	Ecological function	Primary Value		Secondary Value	
		Acres*	% of Total**	Acres	% of Total
Lower Johnson Creek	Microclimate & shade	452.0	23.8%	674.8	35.6%
	Streamflow moderation & water storage	670.6	35.4%	1,134.3	59.8%
	Bank stabilization & pollution control	994.4	52.4%	66.0	3.5%
	Large wood & channel dynamics	1,079.1	56.9%	170.9	9.0%
	Organic material sources	479.7	25.3%	134.9	7.1%

*Number of acres scored within the riparian corridor for each function

**Percent of total acres within the riparian corridor

Table G-39. Breakdown of ecological scores.

Resource site	Ecological Score	Acres	% of Total Acres
Lower Johnson Creek	1 to 5	705.9	37.2%
	6 to 11	161.5	8.5%
	12 to 17	191.9	10.1%
	18 to 23	365.8	19.3%
	24 to 29	326.1	17.2%
	30	145.7	7.7%
	Total acres		1,897.0

Resource site data tables: Wildlife Habitat

Table G-40. Breakdown of total wildlife model patch scores.*

Resource site:	Number of acres in each wildlife score category									Total wildlife model patch acres in inventory
	1	2	3	4	5	6	7	8	9	
Lower Johnson Creek										
Model score	81.7	119.1	174.5	121.1	179.2	781.5	0.0	0.0	0.0	1,457.2
Percent of total	5.6%	8.2%	12.0%	8.3%	12.3%	53.6%	0.0%	0.0%	0.0%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table G-41. Breakdown of total wildlife patch model scores by criteria.*

Resource site:	Number of acres by score for each model criterion											Total wildlife model patch acres in inventory	
	Size ²			Interior ²			Water ³			Connectivity			
	1	2	3	1	2	3	1	2	3	1	2		3
Lower Johnson Creek													
	1,374.5	0.0	0.0	1,049.9	0.0	0.0	77.2	779.4	392.3	280.5	677.5	499.2	1,457.2
Percent of total acres in inventory	94.3%	0.0%	0.0%	72.1%	0.0%	0.0%	5.3%	53.5%	26.9%	19.2%	46.5%	34.3%	na

¹Does not include Habitats of Concern outside of model patches.

²These numbers do not add up to 100.0% because Type 2 patches (low structure vegetation within 300 feet of streams and wetlands) were not ranked for these criteria.

³These numbers do not add up to 100% because not all patches contained or were near water resources.

Table G-42. Breakdown of total wildlife model patch area by 2000 Metro photo interpretation landcover and known wetlands.*

Resource site:	Low structure vegetation within 300 feet of stream		Forested vegetation	Forested wetlands	Grass/shrub wetlands within 300 feet of a stream	Other wetlands	Total wildlife model patch acres in inventory
	Low structure vegetation/intact topsoil	Non-forest woody vegetation					
Lower Johnson Creek							
Acres	80.1	2.5	1,339.4	12.8	11.6	10.7	1,457.2
Percent of total	5.5%	0.2%	91.9%	0.9%	0.8%	0.7%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table G-43. Total acres of inventoried wildlife habitat by type and total Species of Concern (SOCs).

Resource site: Lower Johnson Creek	Wildlife patches (acres)	HOCs inside Wildlife patches (acres)*	HOCs outside Wildlife patches (including wetlands <2 acres)	Total inventoried wildlife habitat acres	Total SOCs
Acres	1457.2	247.7	14.0	1471.2	4
Percent of total	99.1%	16.8%	0.9%	100.0%	N/A

*Habitats of Concern.

Table G-44. Total area of model patches and Habitats of Concern by 1998 Landsat Landcover Area.

Resource Site: Lower Johnson Creek	Total area of wildlife model patches	Total area of HOCs outside of modeled patches (including wetlands <2 acres)	Percent of total inventoried habitat
Landcover type:			
Water	14.67	9.0	1.6%
Barren	44.55	1.0	3.1%
Low structure agriculture	0.00	0.0	0.0%
High structure agriculture	0.02	0.0	0.0%
Deciduous closed canopy	284.02	0.3	19.3%
Mixed closed canopy	357.25	0.5	24.3%
Conifer closed canopy	220.15	0.0	15.0%
Deciduous open canopy	154.66	0.4	10.5%
Mixed open canopy	102.28	0.5	7.0%
Conifer open canopy	25.25	0.1	1.7%
Deciduous scattered canopy	65.41	0.4	4.5%
Mixed scattered canopy	47.77	0.3	3.3%
Conifer scattered canopy	15.91	0.0	1.1%
Closed canopy shrub	53.58	0.7	3.7%
Open canopy shrub	22.79	0.2	1.6%
Scattered canopy shrub	21.89	0.2	1.5%
Meadow/grass	26.99	0.3	1.9%
Not classified	0.00	0.0	0.0%
Total	1,457.19	14.0	100.0%

The table below provides estimates of each type of the habitats described in Metro’s Technical Report for Fish and Wildlife Habitat, based on Johnson and O’Neil’s (2001) habitat scheme. These numbers are provided for subwatershed comparison purposes and represent estimates of available habitat type. Several data types were used to compile this table, and the data sources vary in their precision. For example, the satellite data sources are less accurate than hand-digitized forest canopy cover. There is also slight overlap between certain habitat types. For example, Riparian Wetlands (RWET) are also partially included in Westside Lowland Coniferous Hardwood/Westside Oak and Douglas-fir (WLCH/WODF) because some wetlands also contain forest, and Open Water (WATR) is not always considered part of habitat patches. Therefore, the sums of these habitat types are slightly different from the “Total wildlife habitat acres in inventory” shown in Table 16. Nonetheless, these numbers provide a generalized means of comparing the quality and quantity of habitat available to wildlife among and between subwatersheds. Note also that the estimates for Westside Grasslands (WEGR) probably represent grasslands that are not native rather than true native grasslands, which are largely extirpated from the metro region.

Table G-45. Wildlife habitat availability¹ based on Johnson & O’Neil’s (2001) habitat types and species-habitat associations.

Resource site: Lower Johnson Creek	Habitat type						
	WATR ²	HWET ³	RWET ³	TOTWET ³	WLCH/ WODF ⁴	WEGR	AGPA
Total acres	341.1	22.3	12.8	38.6	1,275.3	72.4	0.0
Percent of total	23.2%	1.5%	0.9%	2.6%	86.7%	4.9%	0.0%

¹See Table G-44 for land cover types and crosswalk to Johnson and O’Neil’s classification scheme.

²Note that patch type and data limitations result in an underestimation of open water habitats. For example, medium and small sized stream surfaces are excluded.

³Note that HWET and RWET do not represent the full suite of wetlands because some wetlands <2 acres were added in as Habitats of Concern, and some wetlands could not be associated with herbaceous or forested habitats. TOTWET represents the best estimate of all existing wetlands because it includes Habitats of Concern.

⁴Data limitations make it impossible to distinguish between these two habitat types at this time, and no comprehensive oak habitat survey has been conducted for the region. However, known oak habitats are also included in HOCs (see Appendix 10).

SITE #22: Lake Oswego subwatershed**Named streams:** Oswego Creek, Spring Brook Creek, Willamette River**Communities within the subwatershed:** Lake Oswego, Portland, unincorporated Clackamas county**Total acreage within Metro's boundary:** 4,168.7**Total acres within the riparian corridor:** 1,541.7**Other information:** One dam with unknown impacts to fish. One other barrier to fish passage present with no known fishway.

This site contains one percent of the area comprising Metro's jurisdictional boundary. Most of the site (94 percent) is in Lake Oswego, with the remainder in unincorporated Clackamas County (five percent) and the City of Portland (one percent) (Table G-46).

Road density in this site is 15.3 miles per square mile, placing it in the third quartile (51 to 75% of maximum) compared to all other resource sites (Table G-2). Single family residential is the dominant zoning pattern (Table G-5). About 420 building permits have been issued here since 1996 (Table G-2).

Riparian resources. Thirty-seven percent of this site is part of the riparian corridor inventory, ranking it in fourth of eight sites in Group G (Table 12). It contributes two percent of the region's total riparian resources (Table 13).

This resource site contains 23 total stream miles, of which 27 percent are stream links, suggesting moderately high amounts of piping and culverting. Non-piped stream density is 0.0041 miles per acre, placing it in the top quarter of all resource sites (Tables 12 and G-3). Low to medium gradient streams predominate (Table G-3). Seventeen percent of the non-piped stream miles are DEQ 303(d) listed (Table G-2). Anadromous fish are known to be present in less than one stream miles (Table G-2). Fourteen percent of the site is floodplain, and less than one percent is wetland (Tables G-2 and G-3). Approximately 13 percent of the floodplain is developed.

A substantial amount of riparian resources in this site received primary scores. Approximately 16 percent of this site's acreage within the riparian corridor inventory received primary scores for at least three of the five ecological functions, but nearly 55 percent received at least one primary score (Table G-49). The highest percentage of land receiving a primary score was for *Large wood and channel dynamics*, followed by *Streamflow moderation and water storage* (not surprising, given Oswego Lake's presence in the site) (Table G-48; see also Table 4 and Appendix 5 for description of ecological functions mapping).

Wildlife habitat resources. Including Habitats of Concern, 24 percent of the lands in this site fall within the wildlife habitat inventory, ranking it 14th among the 27 resource sites and fifth of the eight Group G resource sites (Table 16). Within model patches, less than one percent of the acreage falls within the top third of the point range; however, 78 percent falls in the middle range (Table G-50). Of the four criteria in the GIS model, by far the highest proportion of the acreage falls in the lowest size and interior score category (97 and 75 percent, respectively) (Table G-51). The high proportion of acreage accounted for in the size criterion indicates that nearly all of the lands within 300 ft of streams are forested, because low-structure patch types are not scored for

this criterion (see also Table G-52). Most of the water resources for this site fell within the middle or high scoring range (57 and 30 percent, respectively). The overall connectivity scores fell primarily in the high range (42 percent), with decreasing but still important proportions in the medium and low score categories (37 and 21 percent, respectively). The most substantial habitat patch is north of Oswego Lake and includes important areas of connectivity to the lake; preserving this connectivity will be essential to maintaining the integrity of habitat in this site. A smaller patch just south of the Lake is even more well connected to this important open water resource. Portions of each of these patches are protected by parks. Several other significant habitat patches provide important connectivity to adjacent resource sites.

As with other Group G sites, conifer and hardwood forest are the predominant habitat types in this resource site (89 percent). Open water is not fully accounted for in this site at just three percent, but this habitat type is undoubtedly also a very important habitat resource (Table G-55). Wetlands cover slightly more than one percent of the site's wildlife habitat, proportionally lower than the many of the 27 resource sites and ranking sixth among the eight resource sites in Group G. The site contributes 0.2 percent to the region's wetland resources, ranking 26th among the 27 resource sites.

In general, this site can be characterized as having moderate quality wildlife habitat, but with some important habitat patches connected to Oswego Lake and to adjacent watersheds. The proximity to the lake is important to wildlife species utilizing open water habitats. The lake is known to be important to Bald Eagles, Osprey and waterfowl; it contains substantial development along the shorelines, but also substantial habitat. Retention of as much habitat as possible (particularly tree canopy) should accompany further lakeshore development if maintaining wildlife habitat quality is desired. Habitat enhancement near the lake on developed lots and creating connectors between isolated habitat patches would improve habitat quality over existing conditions in this site.

Species of Concern. Proximity to a large water resource such as Oswego Lake is highly valuable to wildlife and provides for distinctive plant communities, and this is reflected by the high number of Species of Concern sighting locations (11) falling within the site. Each sighting may include one or more species; if a species occurs more than once in the resource site it is only listed once here. These include the following species:

- Bald Eagle
- Great Blue Heron nest colony
- *Cimicifuga elata* (plant species)
- *Delphinium leucophaeum* (plant species)
- *Sullivantia oregana* (plant species)

There are very likely other Species of Concern using this resource site, particularly those relying on forested habitats and agricultural lands (see Table G-55). Examples of species likely to occur in this site may be found by referencing the species list in Appendix 7 and identifying the species with a double "XX" under the habitat. General species needs and potential reasons for their decline are identified in the *Sensitive Species Accounts* section above. More detailed information on all species' needs can be obtained through Johnson and O'Neil (2001).

Habitats of Concern.

The following Habitats of Concern are partially or wholly within this resource site. Using the Unique ID # (UID), please refer to Appendix 8 for information concerning each Habitat of Concern:

UID numbers: 111 (barely touches this resource site from the south)

Resource site data tables: Riparian Corridors

Table G-46. Acres within resource site by jurisdiction.

Jurisdiction	Acres within subwatershed
Lake Oswego	3,914.3
Portland	57.8
Unincorporated Clackamas County	196.6

Table G-47. Acres in Metro and riparian corridor.

Resource site	Total acres within Metro	Total acres within riparian corridor
Lake Oswego	4,168.7	1,541.7

Table G-48. Number of acres within riparian corridor providing ecological function.

Resource site	Ecological function	Primary Value		Secondary Value	
		Acres*	% of Total**	Acres	% of Total
Lake Oswego	Microclimate & shade	268.9	17.4%	579.1	37.6%
	Streamflow moderation & water storage	524.0	34.0%	933.3	60.5%
	Bank stabilization & pollution control	323.0	21.0%	109.8	7.1%
	Large wood & channel dynamics	766.7	49.7%	104.4	6.8%
	Organic material sources	214.6	13.9%	76.7	5.0%

*Number of acres scored within the riparian corridor for each function

**Percent of total acres within the riparian corridor

Table G-49. Breakdown of ecological scores.

Resource site	Ecological Score	Acres	% of Total Acres
Lake Oswego	1 to 5	699.5	45.4%
	6 to 11	101.6	6.6%
	12 to 17	488.8	31.7%
	18 to 23	41.5	2.7%
	24 to 29	158.0	10.2%
	30	52.4	3.4%
	Total acres		1,541.7

Resource site data tables: Wildlife Habitat

Table G-50. Breakdown of total wildlife model patch scores.*

Resource site:	Number of acres in each wildlife score category									Total wildlife model patch acres in inventory
	1	2	3	4	5	6	7	8	9	
Lake Oswego										
Model score	42.0	49.7	124.7	61.0	78.3	648.3	0.0	1.3	0.0	1,005.3
Percent of total	4.2%	4.9%	12.4%	6.1%	7.8%	64.5%	0.0%	0.1%	0.0%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table G-51. Breakdown of total wildlife patch model scores by criteria.*

Resource site:	Number of acres by score for each model criterion												Total wildlife model patch acres in inventory
	Size ²			Interior ²			Water ³			Connectivity			
	1	2	3	1	2	3	1	2	3	1	2	3	
Lake Oswego	974.1	1.3	0.0	754.5	1.3	0.0	67.2	570.2	299.8	213.6	372.9	418.8	1,005.3
Percent of total acres in inventory	96.9%	0.1%	0.0%	75.1%	0.1%	0.0%	6.7%	56.7%	29.8%	21.2%	37.1%	41.7%	na

¹Does not include Habitats of Concern outside of model patches.

²These numbers do not add up to 100.0% because Type 2 patches (low structure vegetation within 300 feet of streams and wetlands) were not ranked for these criteria.

³These numbers do not add up to 100% because not all patches contained or were near water resources.

Table G-52. Breakdown of total wildlife model patch area by 2000 Metro photo interpretation landcover and known wetlands.*

Resource site:	Low structure vegetation within 300 feet of stream		Forested vegetation	Forested wetlands	Grass/shrub wetlands within 300 feet of a stream	Other wetlands	Total wildlife model patch acres in inventory
	Low structure vegetation/intact topsoil	Non-forest woody vegetation					
Lake Oswego							
Acres	27.2	2.7	965.2	5.3	0.1	4.8	1,005.3
Percent of total	2.7%	0.3%	96.0%	0.5%	0.0%	0.5%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table G-53. Total acres of inventoried wildlife habitat by type and total Species of Concern (SOCs).

Resource site: Lake Oswego	Wildlife patches (acres)	HOCs inside Wildlife patches (acres)*	HOCs outside Wildlife patches (including wetlands <2 acres)	Total inventoried wildlife habitat acres	Total SOCs
Acres	1005.3	0.1	3.0	1008.3	11
Percent of total	99.7%	0.0%	0.3%	100.0%	N/A

*Habitats of Concern.

Table G-54. Total area of model patches and Habitats of Concern by 1998 Landsat Landcover Area.

Resource Site: Lake Oswego	Total area of wildlife model patches	Total area of HOCs outside of modeled patches (including wetlands <2 acres)	Percent of total inventoried habitat
Landcover type:			
Water	12.52	0.1	1.2%
Barren	29.00	1.1	3.0%
Low structure agriculture	11.67	0.0	1.2%
High structure agriculture	0.09	0.0	0.0%
Deciduous closed canopy	194.29	0.4	19.3%
Mixed closed canopy	243.22	0.3	24.2%
Conifer closed canopy	229.59	0.3	22.8%
Deciduous open canopy	69.77	0.2	6.9%
Mixed open canopy	58.34	0.0	5.8%
Conifer open canopy	21.81	0.0	2.2%
Deciduous scattered canopy	34.34	0.1	3.4%
Mixed scattered canopy	25.13	0.0	2.5%
Conifer scattered canopy	19.39	0.1	1.9%
Closed canopy shrub	26.18	0.0	2.6%
Open canopy shrub	10.64	0.1	1.1%
Scattered canopy shrub	10.09	0.0	1.0%
Meadow/grass	9.19	0.2	0.9%
Not classified	0.00	0.0	0.0%
Total	1,005.26	3.0	100.0%

The table below provides estimates of each type of the habitats described in Metro's Technical Report for Fish and Wildlife Habitat, based on Johnson and O'Neil's (2001) habitat scheme. These numbers are provided for subwatershed comparison purposes and represent estimates of available habitat type. Several data types were used to compile this table, and the data sources vary in their precision. For example, the satellite data sources are less accurate than hand-digitized forest canopy cover. There is also slight overlap between certain habitat types. For example, Riparian Wetlands (RWET) are also partially included in Westside Lowland Coniferous Hardwood/Westside Oak and Douglas-fir (WLCH/WODF) because some wetlands also contain forest, and Open Water (WATR) is not always considered part of habitat patches. Therefore, the sums of these habitat types are slightly different from the "Total wildlife habitat acres in inventory" shown in Table 16. Nonetheless, these numbers provide a generalized means of comparing the quality and quantity of habitat available to wildlife among and between subwatersheds. Note also that the estimates for Westside Grasslands (WEGR) probably represent grasslands that are not native rather than true native grasslands, which are largely extirpated from the metro region.

Table G-55. Wildlife habitat availability¹ based on Johnson & O'Neil's (2001) habitat types and species-habitat associations.

Resource site: Lake Oswego	Habitat type						
	WATR ²	HWET ³	RWET ³	TOTWET ³	WLCH/ WODF ⁴	WEGR	AGPA
Total acres	30.0	4.9	5.3	13.1	897.4	30.3	11.8
Percent of total	3.0%	0.5%	0.5%	1.3%	89.0%	3.0%	1.2%

¹See Table G-54 for land cover types and crosswalk to Johnson and O'Neil's classification scheme.

²Note that patch type and data limitations result in an underestimation of open water habitats. For example, medium and small sized stream surfaces are excluded.

³Note that HWET and RWET do not represent the full suite of wetlands because some wetlands <2 acres were added in as Habitats of Concern, and some wetlands could not be associated with herbaceous or forested habitats. TOTWET represents the best estimate of all existing wetlands because it includes Habitats of Concern.

⁴Data limitations make it impossible to distinguish between these two habitat types at this time, and no comprehensive oak habitat survey has been conducted for the region. However, known oak habitats are also included in HOCs (see Appendix 10).

SITE #23: Tryon Creek subwatershed

Named streams: Forest Creek, Tryon Creek, Willamette River

Communities within the subwatershed: Lake Oswego, Portland, unincorporated Clackamas county, unincorporated Multnomah county

Total acreage within Metro's boundary: 4,356.4

Total acres within the riparian corridor: 1,972.8

This site contains one percent of the area comprising Metro's jurisdictional boundary. Sixty-eight percent of the site is in the City of Portland, with another 20 percent in Lake Oswego. The remainder is in unincorporated Clackamas (seven percent) and Multnomah (five percent) counties (Table G-56).

This site's road density of 14.6 miles per square miles places it in the third quartile (51 to 75% of maximum) compared to all other resource sites (Table G-2). Considering the amount of habitat preserved in Tryon Creek State Park and adjacent Marshall Park, combined with the average development intensity falling within the third quartile of all sites, the areas outside of the habitat patches may be considered highly developed. As with the majority of other resource sites in Group G, single family residential is the dominant zoning pattern (Table G-5). However, a relatively low number of building permits (285) have been issued in this site since 1996 (Table G-2).

Riparian resources. More than 45 percent of this site is part of the riparian corridor inventory, second only to Site #1 (Table 12). It contributes two percent of the region's total riparian resources (Table 13).

This resource site contains 24 total stream miles, of which 11 percent are stream links, suggesting relatively low amounts of piping and culverting (Table G-3). Non-piped stream density is 0.0048 miles per acre, the highest in Group G and also the highest of all 27 resource sites (Tables 12 and G-3). However, one quarter of the non-piped stream miles are DEQ 303(d) listed (Table G-2). Anadromous fish are known to be present in nearly three stream miles (Table G-2). Approximately 2-1/2 percent of the site is floodplain, and less than one percent is wetland (Tables G-2 and G-3). Approximately 34 percent of the floodplain is developed, the third highest of all 27 resource sites (Table 14).

Approximately 24 percent of this site's acreage within the riparian corridor inventory received primary scores for at least three of the five ecological functions, and 37 percent received at least one primary score (Table G-59). The highest percentage of land receiving a primary score was divided about equally between *Large wood and channel dynamics* and *Bank stabilization and pollution control* (Table G-58; see also Table 4 and Appendix 5 for description of ecological functions mapping).

Wildlife habitat resources. Including Habitats of Concern, 44 percent of the lands in this site fall within the wildlife habitat inventory, ranking it third among the 27 resource sites and second of the eight Group G resource sites – although it accounts for more habitat within the regional system than the first-ranked site within Group G (2.5 versus 1.9 percent, respectively; Table 16). Within model patches, a remarkable 84 percent of the acreage falls within the top third of the point range (Table G-60). Of the four criteria in the GIS model, by far the highest proportion of the acreage falls in the middle score category for size, interior, and water, while most of the

acreage falls in the tope score category for connectivity (84, 84, 91, and 88 percent, respectively) (Table G-61). The high proportion of acreage accounted for in the size criterion indicates that nearly all of the lands within 300 ft of streams are forested, because low-structure patch types are not scored for this criterion (see also Table G-62).

Conifer and hardwood forest strongly predominate habitat types in this resource site (93 percent) (Table G-65). Wetlands cover only 0.2 percent of the site's wildlife habitat, proportionally the lowest of the 27 resource sites. The site contributes little to the region's wetland resources, because wetlands are uncommon in the mid- to high-gradient habitats representative of this resource site.

In general, this highly developed site can be characterized as providing extraordinarily important interior habitat to the region's wildlife, with a substantial proportion protected by parks and public lands. Many Neotropical migratory birds breed in this site and also use it for important stopover habitat, and it abounds with deer, beaver, and other mammal sign. Tryon Creek State Park includes southern connectivity to the Willamette River through a narrow corridor. Many developed areas also contain very important tree cover, providing key connectivity from core areas such as Tryon Creek State Park to peripheral, but very important, habitats at the outer edge of large patches, such as Maricara Nature Park. Some of these areas along streams are steeply sloped and thus receive protection through Title 3. One drawback of this resource site is that it is not well connected with adjacent resource sites (except for Site #26), such as Resource Sites # 12, 14 and 22; increasing connectivity to these sites, primarily along streams, would be a valuable restoration activity. Retaining or improving existing tree canopy in developments connected to the parklands is another important factor that will influence the value of this site's habitat in the future.

Species of Concern. Three Species of Concern sighting locations fall within the site. Each sighting may include one or more species; if a species occurs more than once in the resource site it is only listed once here. These include the following species:

- Pileated Woodpecker
- Willow Flycatcher
- Northern Pygmy Owl

There are very likely other Species of Concern using this resource site, particularly those relying on forested habitats and agricultural lands (see Table G-65). Examples of species likely to occur in this site may be found by referencing the species list in Appendix 7 and identifying the species with a double "XX" under the habitat. General species needs and potential reasons for their decline are identified in the *Sensitive Species Accounts* section above. More detailed information on all species' needs can be obtained through Johnson and O'Neil (2001).

Habitats of Concern.

The following Habitats of Concern are partially or wholly within this resource site. Using the Unique ID # (UID), please refer to Appendix 8 for information concerning each Habitat of Concern:

UID numbers: 114

Resource site data tables: Riparian Corridors

Table G-56. Acres within resource site by jurisdiction.

Jurisdiction	Acres within subwatershed
Lake Oswego	876.9
Portland	2,958.2
Unincorporated Clackamas County	294.8
Unincorporated Multnomah County	226.5

Table G-57. Acres in Metro and riparian corridor.

Resource site	Total acres within Metro	Total acres within riparian corridor
Tryon Creek	4,356.5	1,972.8

Table G-58. Number of acres within riparian corridor providing ecological function.

Resource site	Ecological function	Primary Value		Secondary Value	
		Acres*	% of Total**	Acres	% of Total
Tryon Creek	Microclimate & shade	454.5	23.0%	1,119.1	56.7%
	Streamflow moderation & water storage	74.4	3.8%	1,850.2	93.8%
	Bank stabilization & pollution control	623.5	31.6%	83.4	4.2%
	Large wood & channel dynamics	651.9	33.0%	289.0	14.6%
	Organic material sources	441.3	22.4%	213.9	10.8%

*Number of acres scored within the riparian corridor for each function

**Percent of total acres within the riparian corridor

Table G-59. Breakdown of ecological scores.

Resource site	Ecological Score	Acres	% of Total Acres
Tryon Creek	1 to 5	1,239.8	62.8%
	6 to 11	162.2	8.2%
	12 to 17	97.0	4.9%
	18 to 23	44.8	2.3%
	24 to 29	389.9	19.8%
	30	39.1	2.0%
	Total acres		1,972.8

Resource site data tables: Wildlife Habitat

Table G-60. Breakdown of total wildlife model patch scores.*

Resource site:	Number of acres in each wildlife score category									Total wildlife model patch acres in inventory
	1	2	3	4	5	6	7	8	9	
Tryon Creek										
Model score	23.6	46.3	81.9	86.2	10.4	50.8	0.0	1,597.8	0.0	1,896.9
Percent of total	1.2%	2.4%	4.3%	4.5%	0.5%	2.7%	0.0%	84.2%	0.0%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table G-61. Breakdown of total wildlife patch model scores by criteria.*

Resource site:	Number of acres by score for each model criterion												Total wildlife model patch acres in inventory
	Size ²			Interior ²			Water ³			Connectivity			
	1	2	3	1	2	3	1	2	3	1	2	3	
Tryon Creek													
	219.1	1,597.8	0.0	67.6	1,597.8	0.0	44.3	1,716.4	74.8	94.3	139.2	1,663.4	1,896.9
Percent of total acres in inventory	11.6%	84.2%	0.0%	3.6%	84.2%	0.0%	2.3%	90.5%	3.9%	5.0%	7.3%	87.7%	na

¹Does not include Habitats of Concern outside of model patches.

²These numbers do not add up to 100.0% because Type 2 patches (low structure vegetation within 300 feet of streams and wetlands) were not ranked for these criteria.

³These numbers do not add up to 100% because not all patches contained or were near water resources.

Table G-62. Breakdown of total wildlife model patch area by 2000 Metro photo interpretation landcover and known wetlands.*

Resource site:	Low structure vegetation within 300 feet of stream		Forested vegetation	Forested wetlands	Grass/shrub wetlands within 300 feet of a stream	Other wetlands	Total wildlife model patch acres in inventory
	Low structure vegetation/intact topsoil	Non-forest woody vegetation					
Tryon Creek							
Acres	80.0	0.0	1,814.2	2.1	0.0	0.6	1,896.9
Percent of total	4.2%	0.0%	95.6%	0.1%	0.0%	0.0%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table G-63. Total acres of inventoried wildlife habitat by type and total Species of Concern (SOCs).

Resource site: Tryon Creek	Wildlife patches (acres)	HOCs inside Wildlife patches (acres)*	HOCs outside Wildlife patches (including wetlands <2 acres)	Total inventoried wildlife habitat acres	Total SOCs
Acres	1896.9	646.6	0.6	1897.5	3
Percent of total	100.0%	34.1%	0.0%	100.0%	N/A

*Habitats of Concern.

Table G-64. Total area of model patches and Habitats of Concern by 1998 Landsat Landcover Area.

Resource Site: Tryon Creek	Total area of wildlife model patches	Total area of HOCs outside of modeled patches (including wetlands <2 acres)	Percent of total inventoried habitat
Landcover type:			
Water	0.94	0.0	0.0%
Barren	32.05	0.4	1.7%
Low structure agriculture	0.00	0.0	0.0%
High structure agriculture	0.00	0.0	0.0%
Deciduous closed canopy	521.43	0.0	27.5%
Mixed closed canopy	649.81	0.0	34.2%
Conifer closed canopy	281.44	0.0	14.8%
Deciduous open canopy	112.95	0.0	6.0%
Mixed open canopy	79.98	0.0	4.2%
Conifer open canopy	11.48	0.0	0.6%
Deciduous scattered canopy	54.44	0.0	2.9%
Mixed scattered canopy	43.00	0.1	2.3%
Conifer scattered canopy	7.88	0.0	0.4%
Closed canopy shrub	52.16	0.0	2.7%
Open canopy shrub	16.53	0.0	0.9%
Scattered canopy shrub	13.02	0.0	0.7%
Meadow/grass	19.79	0.0	1.0%
Not classified	0.00	0.0	0.0%
Total	1,896.90	0.6	100.0%

The table below provides estimates of each type of the habitats described in Metro's Technical Report for Fish and Wildlife Habitat, based on Johnson and O'Neil's (2001) habitat scheme. These numbers are provided for subwatershed comparison purposes and represent estimates of available habitat type. Several data types were used to compile this table, and the data sources vary in their precision. For example, the satellite data sources are less accurate than hand-digitized forest canopy cover. There is also slight overlap between certain habitat types. For example, Riparian Wetlands (RWET) are also partially included in Westside Lowland Coniferous Hardwood/Westside Oak and Douglas-fir (WLCH/WODF) because some wetlands also contain forest, and Open Water (WATR) is not always considered part of habitat patches. Therefore, the sums of these habitat types are slightly different from the "Total wildlife habitat acres in inventory" shown in Table 16. Nonetheless, these numbers provide a generalized means of comparing the quality and quantity of habitat available to wildlife among and between subwatersheds. Note also that the estimates for Westside Grasslands (WEGR) probably represent grasslands that are not native rather than true native grasslands, which are largely extirpated from the metro region.

Table G-65. Wildlife habitat availability¹ based on Johnson & O'Neil's (2001) habitat types and species-habitat associations.

Resource site: Tryon Creek	Habitat type						
	WATR ²	HWET ³	RWET ³	TOTWET ³	WLCH/ WODF ⁴	WEGR	AGPA
Total acres	28.0	0.6	2.1	3.8	1,762.5	49.3	0.0
Percent of total	1.5%	0.0%	0.1%	0.2%	92.9%	2.6%	0.0%

¹See Table G-64 for land cover types and crosswalk to Johnson and O'Neil's classification scheme.

²Note that patch type and data limitations result in an underestimation of open water habitats. For example, medium and small sized stream surfaces are excluded.

³Note that HWET and RWET do not represent the full suite of wetlands because some wetlands <2 acres were added in as Habitats of Concern, and some wetlands could not be associated with herbaceous or forested habitats. TOTWET represents the best estimate of all existing wetlands because it includes Habitats of Concern.

⁴Data limitations make it impossible to distinguish between these two habitat types at this time, and no comprehensive oak habitat survey has been conducted for the region. However, known oak habitats are also included in HOCs (see Appendix 10).

SITE #24: Johnson Creek-Crystal Springs Creek subwatershed**Named streams:** Crystal Springs Creek, Johnson Creek, Veterans Creek**Communities within the subwatershed:** Happy Valley, Milwaukie, Portland, unincorporated Clackamas county, unincorporated Multnomah county**Total acreage within Metro's boundary:** 7,844.6**Total acres within the riparian corridor:** 1,309.7**Other information:** One barrier to fish passage present with unknown impacts.

This site contains three percent of the area comprising Metro's jurisdictional boundary. The majority of the site (63 percent) is in the City of Portland; 16 percent is in Milwaukie, 19 percent in unincorporated Clackamas County, and the remainder is in Happy Valley and unincorporated Multnomah County (about one percent each) (Table G-66).

This site has the highest road density of all resource sites, at 20.9 road miles per square mile (Table G-2). As with other highly urban resource sites, the dominant zoning is single family residential (Table G-5). About 1,000 building permits have been issued in this site since 1996 (Table G-2).

Riparian resources. Fifteen percent of this site is part of the riparian corridor inventory, ranking it last in Group G (Table 12). It contributes a little over one percent of the region's total riparian resources (Table 13).

This resource site contains 35 total stream miles, of which 59 percent are stream links, suggesting very high levels of piping and culverting (Table G-3). As a result, non-piped stream density is 0.0018 miles per acre, ranking it 25th of the 27 resource sites (Tables 12 and G-3). Reflecting the highly urban and modified nature of this resource site, 47 percent of non-piped stream miles are DEQ 303(d) listed (Table G-2). However, anadromous fish are known to be present in more than eight stream miles (Table G-2). Low to medium gradient streams predominate (Table G-3); approximately seven percent of the site is floodplain, and less than one percent is wetland (Tables G-2 and G-3). Approximately 52 percent of the floodplain is developed – the highest level of all 27 resource sites (Table 14).

Approximately 27 percent of this site's acreage within the riparian corridor inventory received primary scores for at least three of the five ecological functions, and 44 percent received at least one primary score (Table G-69). The highest percentage of land receiving a primary score was divided about equally between *Large wood and channel dynamics* and *Bank stabilization and pollution control* (Table G-68; see also Table 4 and Appendix 5 for description of ecological functions mapping). The developed floodplain component of this resource site resulted in high secondary *Streamflow moderation and water storage* percentages.

Wildlife habitat resources. Including Habitats of Concern, 10 percent of the lands in this site fall within the wildlife habitat inventory, ranking it last among the 27 resource sites; this is not surprising considering the site's highly developed nature (Table 16). Within model patches, only one tenth of one percent of the acreage falls within the top third of the point range, with 58 percent in the mid-range and the remainder in the lowest score category (Table G-70). Of the four criteria in the GIS model, virtually all of the acreage falls in the lowest score category for size and interior (Table G-71). The majority of acreage falls in the middle category for waterk

although substantial acreage is also in the highest and lowest categories; the connectivity scores fall primarily in the middle and low categories. Together, these factors add up to a fairly sparse, fragmented habitat system that is often typical of highly developed watersheds. The relatively high proportion of acreage accounted for in the size and interior criteria suggest that the majority of the lands within 300 ft of streams are forested, because low-structure patch types are not scored for these criteria (see also Table G-72).

Conifer and hardwood forest are predominant habitat types in this resource site (78 percent), but grasslands, wetlands and open water also contribute important habitat (Table G-75). Wetlands cover six percent of the site's wildlife habitat. The site contributes one-half of one percent to the region's wetland resources, ranking 21st among the 27 resource sites.

In general, this highly developed site can be characterized as providing relatively small amounts of habitat that is generally isolated and fragmented. However, the complex of natural areas comprised of Crystal Springs, Reed College Canyon and Westmoreland Golf Course provides important habitat to the site and is less than half a mile from Oaks Bottom, which has excellent water resources and connects to the Willamette River. Street and backyard trees provide a modest level of connectivity for birds between these natural areas. Johnson Creek and the Springwater Corridor provide key migratory bird stopover habitat; although these areas do not rate highly in the regional wildlife habitat inventory, they are locally very important to wildlife. Several relatively large habitat patches in site's eastern area, including Lincoln Memorial Park and Willamette National Cemetery, provide key habitat in this area and connect to Resource Site #20, following the Johnson Creek complex. Key wildlife habitat improvements in this area might include increasing the forest canopy cover throughout the resource site, including backyard and street trees, but particularly along waterways.

Species of Concern. One Species of Concern sighting location falls within the site. Each sighting may include one or more species; if a species occurs more than once in the resource site it is only listed once here. These include the following species:

- Great Blue Heron nesting colony

There are very likely other Species of Concern using this resource site, particularly those relying on forested habitats and agricultural lands (see Table G-75). Examples of species likely to occur in this site may be found by referencing the species list in Appendix 7 and identifying the species with a double "XX" under the habitat. General species needs and potential reasons for their decline are identified in the *Sensitive Species Accounts* section above. More detailed information on all species' needs can be obtained through Johnson and O'Neil (2001).

Habitats of Concern.

The following Habitats of Concern are partially or wholly within this resource site. Using the Unique ID # (UID), please refer to Appendix 8 for information concerning each Habitat of Concern:

UID numbers: 33, 127, 128, 130, 135

Resource site data tables: Riparian Corridors

185657

Table G-66. Acres within resource site by jurisdiction.

Jurisdiction	Acres within subwatershed
Happy Valley	78.5
Milwaukie	1,273.7
Portland	4,909.3
Unincorporated Clackamas County	1,494.5
Unincorporated Multnomah County	88.7

Table G-67. Acres in Metro and riparian corridor.

Resource site	Total acres within Metro	Total acres within riparian corridor
Johnson - Crystal Springs Creeks	7,844.6	1,176.5

Table G-68. Number of acres within riparian corridor providing ecological function.

Resource site	Ecological function	Primary Value		Secondary Value	
		Acres*	% of Total**	Acres	% of Total
Johnson - Crystal Springs Creeks	Microclimate & shade	167.7	14.3%	227.0	19.3%
	Streamflow moderation & water storage	306.3	26.0%	802.4	68.2%
	Bank stabilization & pollution control	400.3	34.0%	17.7	1.5%
	Large wood & channel dynamics	460.5	39.1%	47.4	4.0%
	Organic material sources	297.9	25.3%	40.1	3.4%

*Number of acres scored within the riparian corridor for each function

**Percent of total acres within the riparian corridor

Table G-69. Breakdown of ecological scores.

Resource site	Ecological Score	Acres	% of Total Acres
Johnson - Crystal Springs Creeks	1 to 5	653.0	55.5%
	6 to 11	76.7	6.5%
	12 to 17	134.5	11.4%
	18 to 23	28.8	2.4%
	24 to 29	216.8	18.4%
	30	66.7	5.7%
	Total acres		1,176.5

Resource site data tables: Wildlife Habitat

Table G-70. Breakdown of total wildlife model patch scores.*

Resource site:	Number of acres in each wildlife score category									Total wildlife model patch acres in inventory
	1	2	3	4	5	6	7	8	9	
Johnson - Crystal Springs Creeks										
Model score	74.9	157.6	110.1	78.5	334.5	54.1	1.1	0.0	0.0	810.8
Percent of total	9.2%	19.4%	13.6%	9.7%	41.3%	6.7%	0.1%	0.0%	0.0%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table G-71. Breakdown of total wildlife patch model scores by criteria.*

Resource site:	Number of acres by score for each model criterion												Total wildlife model patch acres in inventory
	Size ²			Interior ²			Water ³			Connectivity			
	1	2	3	1	2	3	1	2	3	1	2	3	
Johnson - Crystal Springs Creeks	592.9	0.9	0.0	407.5	0.0	0.0	147.1	371.1	173.2	324.5	344.4	141.9	810.8
Percent of total acres in inventory	73.1%	0.1%	0.0%	50.3%	0.0%	0.0%	18.1%	45.8%	21.4%	40.0%	42.5%	17.5%	na

¹Does not include Habitats of Concern outside of model patches.

²These numbers do not add up to 100.0% because Type 2 patches (low structure vegetation within 300 feet of streams and wetlands) were not ranked for these criteria.

³These numbers do not add up to 100% because not all patches contained or were near water resources.

Table G-72. Breakdown of total wildlife model patch area by 2000 Metro photo interpretation landcover and known wetlands.*

Resource site:	Low structure vegetation within 300 feet of stream		Forested vegetation	Forested wetlands	Grass/shrub wetlands within 300 feet of a stream	Other wetlands	Total wildlife model patch acres in inventory
	Low structure vegetation/intact topsoil	Non-forest woody vegetation					
Johnson - Crystal Springs Creeks							
Acres	217.0	0.0	551.8	13.4	12.0	16.5	810.8
Percent of total	26.8%	0.0%	68.1%	1.7%	1.5%	2.0%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table G-73. Total acres of inventoried wildlife habitat by type and total Species of Concern (SOCs).

Resource site: Johnson - Crystal Springs Creeks	Wildlife patches (acres)	HOCs inside Wildlife patches (acres)*	HOCs outside Wildlife patches (including wetlands <2 acres)	Total inventoried wildlife habitat acres	Total SOCs
Acres	810.8	91.4	7.7	818.5	1
Percent of total	99.1%	11.2%	0.9%	100.0%	N/A

*Habitats of Concern.

Table G-74. Total area of model patches and Habitats of Concern by 1998 Landsat Landcover Area.

Resource Site: Johnson - Crystal Springs Creeks	Total area of wildlife model patches	Total area of HOCs outside of modeled patches (including wetlands <2 acres)	Percent of total inventoried habitat
Landcover type:			
Water	10.43	0.1	1.3%
Barren	54.99	0.5	6.8%
Low structure agriculture	0.00	0.0	0.0%
High structure agriculture	0.00	0.0	0.0%
Deciduous closed canopy	142.65	0.8	17.5%
Mixed closed canopy	183.26	0.6	22.5%
Conifer closed canopy	78.44	1.0	9.7%
Deciduous open canopy	86.62	1.1	10.7%
Mixed open canopy	44.09	0.5	5.5%
Conifer open canopy	11.48	0.2	1.4%
Deciduous scattered canopy	45.23	0.5	5.6%
Mixed scattered canopy	27.49	0.2	3.4%
Conifer scattered canopy	10.33	0.1	1.3%
Closed canopy shrub	35.20	0.8	4.4%
Open canopy shrub	19.78	0.7	2.5%
Scattered canopy shrub	17.78	0.3	2.2%
Meadow/grass	43.06	0.2	5.3%
Not classified	0.00	0.0	0.0%
Total	810.83	7.7	100.0%

The table below provides estimates of each type of the habitats described in Metro's Technical Report for Fish and Wildlife Habitat, based on Johnson and O'Neil's (2001) habitat scheme. These numbers are provided for subwatershed comparison purposes and represent estimates of available habitat type. Several data types were used to compile this table, and the data sources vary in their precision. For example, the satellite data sources are less accurate than hand-digitized forest canopy cover. There is also slight overlap between certain habitat types. For example, Riparian Wetlands (RWET) are also partially included in Westside Lowland Coniferous Hardwood/Westside Oak and Douglas-fir (WLCH/WODF) because some wetlands also contain forest, and Open Water (WATR) is not always considered part of habitat patches. Therefore, the sums of these habitat types are slightly different from the "Total wildlife habitat acres in inventory" shown in Table 16. Nonetheless, these numbers provide a generalized means of comparing the quality and quantity of habitat available to wildlife among and between subwatersheds. Note also that the estimates for Westside Grasslands (WEGR) probably represent grasslands that are not native rather than true native grasslands, which are largely extirpated from the metro region.

Table G-75. Wildlife habitat availability¹ based on Johnson & O'Neil's (2001) habitat types and species-habitat associations.

Resource site: Johnson - Crystal Springs Creeks	Habitat type						
	WATR ²	HWET ³	RWET ³	TOTWET ³	WLCH/ WODF ⁴	WEGR	AGPA
Total acres	24.1	28.5	13.4	46.4	634.7	81.8	0.0
Percent of total	2.9%	3.5%	1.6%	5.7%	77.5%	10.0%	0.0%

¹See Table G-74 for land cover types and crosswalk to Johnson and O'Neil's classification scheme.

²Note that patch type and data limitations result in an underestimation of open water habitats. For example, medium and small sized stream surfaces are excluded.

³Note that HWET and RWET do not represent the full suite of wetlands because some wetlands <2 acres were added in as Habitats of Concern, and some wetlands could not be associated with herbaceous or forested habitats. TOTWET represents the best estimate of all existing wetlands because it includes Habitats of Concern.

⁴Data limitations make it impossible to distinguish between these two habitat types at this time, and no comprehensive oak habitat survey has been conducted for the region. However, known oak habitats are also included in HOCs (see Appendix 10).

SITE #25: Mount Scott Creek subwatershed

Named streams: Forest Creek, Johnson Creek, Kellogg Creek, Mount Scott Creek, Phillips Creek, Willamette River

Communities within the subwatershed: Gladstone, Happy Valley, Johnson City, Lake Oswego, Milwaukie, Portland, unincorporated Clackamas county, unincorporated Multnomah county

Total acreage within Metro’s boundary: 11,809.6

Total acres within the riparian corridor: 2,665.7

Other information: Three dams present, two with unknown impacts to fish, one with a present and functioning fishway.

This site contains four percent of the area comprising Metro’s jurisdictional boundary. Most of the site falls within three jurisdictions: unincorporated Clackamas County (67 percent), Milwaukie (15 percent) and Happy Valley (14 percent). Two percent is in unincorporated Multnomah County, with the remaining jurisdictions – Gladstone, Johnson City, Lake Oswego, and Portland – containing one percent or less of the site (Table G-76).

This site is similar in development intensity to Resource Sites #20-23, with a road density of 14.3 miles per square mile, falling in the third quartile (51 to 75 percent of maximum) compared to all other resource sites (Table G-2). Similar to those sites, single family residential zoning dominates (Table G-5). About 1,450 building permits have been issued here since 1996 (Table G-2).

Riparian resources. Approximately 23 percent of this site is part of the riparian corridor inventory, ranking it sixth of the eight resource sites in Group G (Table 12). However, because the site has a substantial amount of land within the Metro boundary, it contributes a relatively high amount (three percent) of the region’s riparian resources relative to all other resource sites (Table 13).

This resource site contains 47 total stream miles, of which 34 percent are stream links, suggesting moderately high levels of piping and culverting (Table G-3). Non-piped stream density is 0.0026 miles per acre; two of the eight sites in Group G contain lower stream densities (Tables 12 and G-3). Slightly more than two percent of non-piped stream miles are DEQ 303(d) listed (Table G-2). Anadromous fish are known to be present in more than nine stream miles (Table G-2). Six percent of the site is floodplain, and one percent is wetland (Table G-2). Twenty-one percent of the floodplain is developed, ranking this site sixth among all 27 resource sites (Table 14).

Nearly a third of this site’s acreage within the riparian corridor inventory received primary scores for at least three of the five ecological functions, and 46 percent received at least one primary score (Table G-79). Similar to Site #24, the highest percentage of land receiving a primary score was divided about equally between *Large wood and channel dynamics* and *Bank stabilization and pollution control* (Table G-78; see also Table 4 and Appendix 5 for description of ecological functions mapping). Sixty-eight percent of this site’s riparian corridor acreage received secondary scores for *Streamflow moderation and water storage*, and another 29 percent received secondary scores for *Microclimate and shade*.

Wildlife habitat resources. Including Habitats of Concern, 19 percent of the lands in this site fall within the wildlife habitat inventory, ranking it 21st among the 27 resource sites and sixth among the eight Group G sites (Table 16). Within model patches, only four percent of the acreage falls within the top third of the point range, although 68 percent falls in the mid-range (Table G-80). Of the four criteria in the GIS model, most of the acreage falls in the lowest score category for size and interior (Table G-81). Approximately half of the acreage falls in the middle category for water, with another 28 percent in the lowest score category; the connectivity scores fall primarily in the highest and middle categories. The proportion of acreage accounted for in the size and interior criteria suggest that a relatively small but significant amount of lands within 300 ft of streams are unforested, because low-structure patch types are not scored for these criteria (see also Table G-82).

Conifer and hardwood forest are predominant habitat types in this resource site (77 percent), but open water, grasslands and wetlands also contribute important habitat (Table G-85). Wetlands cover seven percent, the highest of the Group G sites. The site contributes two percent to the region's wetland resources, ranking 14th among the 27 resource sites.

In general, this site can be characterized as providing a moderate amount of wildlife habitat, of moderate quality; however, placed within the urbanized context, the existing habitat is very important to wildlife in that area. A majority of the habitat is aggregated into several relatively large patches, with some important interior habitat. Water resources are moderate, but connectivity is good relative to many other sites with similar development intensity. The key wildlife habitat sites are along or adjacent to streams, with relatively little protection through parks or public lands. Important upland habitat is provided by Mt. Talbert, with important migratory bird stopover habitat.

Species of Concern. Four Species of Concern sighting location falls within the site. Each sighting may include one or more species; if a species occurs more than once in the resource site it is only listed once here. These include the following species:

- Western Painted Turtles
- Pileated Woodpecker
- *Cimicifuga elata* (plant species)
- *Sidalcea nelsoniana* (plant species)

There are very likely other Species of Concern using this resource site, particularly those relying on forested habitats and agricultural lands (see Table G-85). Examples of species likely to occur in this site may be found by referencing the species list in Appendix 7 and identifying the species with a double "XX" under the habitat. General species needs and potential reasons for their decline are identified in the *Sensitive Species Accounts* section above. More detailed information on all species' needs can be obtained through Johnson and O'Neil (2001).

Habitats of Concern.

The following Habitats of Concern are partially or wholly within this resource site. Using the Unique ID # (UID), please refer to Appendix 8 for information concerning each Habitat of Concern:

UID numbers: 18, 21, 32, 116, 123, 124, 138, 162, 166

Resource site data tables: Riparian Corridors

Table G-76. Acres within resource site by jurisdiction.

Jurisdiction	Acres within subwatershed
Gladstone	111.7
Happy Valley	1,645.3
Johnson City	43.7
Lake Oswego	9.0
Milwaukie	1,824.6
Portland	12.4
Unincorporated Clackamas County	7,888.3
Unincorporated Multnomah County	274.6

Table G-77. Acres in Metro and riparian corridor.

Resource site	Total acres within Metro	Total acres within riparian corridor
Mount Scott Creek	11,809.8	2,662.6

Table G-78. Number of acres within riparian corridor providing ecological function.

Resource site	Ecological function	Primary Value		Secondary Value	
		Acres*	% of Total**	Acres	% of Total
Mount Scott Creek	Microclimate & shade	469.5	17.6%	780.3	29.3%
	Streamflow moderation & water storage	684.3	25.7%	1,807.3	67.9%
	Bank stabilization & pollution control	1,050.6	39.5%	103.5	3.9%
	Large wood & channel dynamics	1,031.6	38.7%	125.5	4.7%
	Organic material sources	573.9	21.6%	100.1	3.8%

*Number of acres scored within the riparian corridor for each function

**Percent of total acres within the riparian corridor

Table G-79. Breakdown of ecological scores.

Resource site	Ecological Score	Acres	% of Total Acres
Mount Scott Creek	1 to 5	1,428.8	53.7%
	6 to 11	202.8	7.6%
	12 to 17	217.1	8.2%
	18 to 23	282.8	10.6%
	24 to 29	331.4	12.4%
	30	199.8	7.5%
	Total acres		2,662.6

Resource site data tables: Wildlife Habitat

Table G-80. Breakdown of total wildlife model patch scores.*

Resource site:	Number of acres in each wildlife score category									Total wildlife model patch acres in inventory
	1	2	3	4	5	6	7	8	9	
Mount Scott Creek										
Model score	129.8	175.3	287.2	350.4	753.8	366.2	4.6	85.2	0.0	2,152.5
Percent of total	6.0%	8.1%	13.3%	16.3%	35.0%	17.0%	0.2%	4.0%	0.0%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table G-81. Breakdown of total wildlife patch model scores by criteria.*

Resource site:	Number of acres by score for each model criterion												Total wildlife model patch acres in inventory
	Size ²			Interior ²			Water ³			Connectivity			
	1	2	3	1	2	3	1	2	3	1	2	3	
Mount Scott Creek	1,694.6	89.8	0.0	1,208.0	85.2	0.0	600.6	1,064.9	308.9	546.8	697.1	908.5	2,152.5
Percent of total acres in inventory	78.7%	4.2%	0.0%	56.1%	4.0%	0.0%	27.9%	49.5%	14.3%	25.4%	32.4%	42.2%	na

¹Does not include Habitats of Concern outside of model patches.

²These numbers do not add up to 100.0% because Type 2 patches (low structure vegetation within 300 feet of streams and wetlands) were not ranked for these criteria.

³These numbers do not add up to 100% because not all patches contained or were near water resources.

Table G-82. Breakdown of total wildlife model patch area by 2000 Metro photo interpretation landcover and known wetlands.*

Resource site:	Low structure vegetation within 300 feet of stream		Forested vegetation	Forested wetlands	Grass/shrub wetlands within 300 feet of a stream	Other wetlands	Total wildlife model patch acres in inventory
	Low structure vegetation/intact topsoil	Non-forest woody vegetation					
Mount Scott Creek							
Acres	353.2	14.9	1,650.5	46.7	40.6	46.7	2,152.5
Percent of total	16.4%	0.7%	76.7%	2.2%	1.9%	2.2%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table G-83. Total acres of inventoried wildlife habitat by type and total Species of Concern (SOCs).

Resource site: Mount Scott Creek	Wildlife patches (acres)	HOCs inside Wildlife patches (acres)*	HOCs outside Wildlife patches (Including wetlands <2 acres)	Total inventoried wildlife habitat acres	Total SOCs
Acres	2152.5	544.1	50.5	2203.1	4
Percent of total	97.7%	24.7%	2.3%	100.0%	N/A

*Habitats of Concern.

Table G-84. Total area of model patches and Habitats of Concern by 1998 Landsat Landcover Area.

Resource Site: Mount Scott Creek	Total area of wildlife model patches	Total area of HOCs outside of modeled patches (including wetlands <2 acres)	Percent of total inventoried habitat
Landcover type:			
Water	8.28	7.6	0.7%
Barren	142.85	13.6	7.1%
Low structure agriculture	7.44	0.5	0.4%
High structure agriculture	0.00	0.0	0.0%
Deciduous closed canopy	368.33	2.9	16.9%
Mixed closed canopy	517.64	2.8	23.6%
Conifer closed canopy	282.66	0.8	12.9%
Deciduous open canopy	178.18	4.9	8.3%
Mixed open canopy	115.18	1.0	5.3%
Conifer open canopy	29.80	0.0	1.4%
Deciduous scattered canopy	109.53	1.2	5.0%
Mixed scattered canopy	70.02	1.0	3.2%
Conifer scattered canopy	19.29	0.3	0.9%
Closed canopy shrub	92.98	1.9	4.3%
Open canopy shrub	42.69	0.8	2.0%
Scattered canopy shrub	40.63	1.7	1.9%
Meadow/grass	127.05	9.5	6.2%
Not classified	0.00	0.0	0.0%
Total	2,152.53	50.5	100.0%

The table below provide s estimates of each type of the habitats described in Metro’s Technical Report for Fish and Wildlife Habitat, based on Johnson and O’Neil’s (2001) habitat scheme. These numbers are provided for subwatershed comparison purposes and represent estimates of available habitat type. Several data types were used to compile this table, and the data sources vary in their precision. For example, the satellite data sources are less accurate than hand-digitized forest canopy cover. There is also slight overlap between certain habitat types. For example, Riparian Wetlands (RWET) are also partially included in Westside Lowland Coniferous Hardwood/Westside Oak and Douglas-fir (WLCH/WODF) because some wetlands also contain forest, and Open Water (WATR) is not always considered part of habitat patches. Therefore, the sums of these habitat types are slightly different from the “Total wildlife habitat acres in inventory” shown in Table 16. Nonetheless, these numbers provide a generalized means of comparing the quality and quantity of habitat available to wildlife among and between subwatersheds. Note also that the estimates for Westside Grasslands (WEGR) probably represent grasslands that are not native rather than true native grasslands, which are largely extirpated from the metro region.

Table G-85. Wildlife habitat availability¹ based on Johnson & O’Neil’s (2001) habitat types and species-habitat associations.

Resource site: Mount Scott Creek	Habitat type						
	WATR ²	HWET ³	RWET ³	TOTWET ³	WLCH/ WODF ⁴	WEGR	AGPA
Total acres	222.6	87.2	46.7	147.0	1,705.6	222.3	7.9
Percent of total	10.1%	4.0%	2.1%	6.7%	77.4%	10.1%	0.4%

¹See Table G-84 for land cover types and crosswalk to Johnson and O’Neil’s classification scheme.

²Note that patch type and data limitations result in an underestimation of open water habitats. For example, medium and small sized stream surfaces are excluded.

³Note that HWET and RWET do not represent the full suite of wetlands because some wetlands <2 acres were added in as Habitats of Concern, and some wetlands could not be associated with herbaceous or forested habitats. TOTWET represents the best estimate of all existing wetlands because it includes Habitats of Concern.

⁴Data limitations make it impossible to distinguish between these two habitat types at this time, and no comprehensive oak habitat survey has been conducted for the region. However, known oak habitats are also included in HOCs (see Appendix 10).

H. Scappoose Creek

General watershed information

Resource sites in the Scappoose Creek Watershed include:

- Lower Willamette River subwatersheds
- Columbia Slough and Multnomah Channel subwatersheds (combined)

Watershed assessments and plans

- Bureau of Environmental Services, City of Portland, 2001. *Relationships Between Bank Treatment / Nearshore Development and Anadromous / Resident Fish in the Lower Willamette River*, City of Portland: Portland, Oregon.
- Bureau of Planning, 1991. City of Portland, *Balch Creek Watershed Protection Plan*, February, 8, 1991, City of Portland: Portland, Oregon.
- Bureau of Planning, City of Portland, 1990. *East Columbia Neighborhood Natural Resources Management Plan*, City of Portland: Portland, Oregon.
- Bureau of Planning, City of Portland, 1990. *Natural Resources Management Plan for Smith and Bybee Lakes, May 8, 1990*, City of Portland: Portland, Oregon.
- Bureau of Planning, City of Portland, 1991. *The Northwest Hills Natural Areas Protection Plan, July 31, 1991*, City of Portland: Portland, Oregon.
- Bureau of Planning, City of Portland, 1992. *The Southwest Hills Resource Protection Plan, January 23, 1992*, City of Portland: Portland, Oregon.
- Bureau of Planning, City of Portland, 1993. *The East Buttes, Terraces and Wetlands Conservation Plan, May 26, 1993*, City of Portland: Portland, Oregon.
- Bureau of Planning, City of Portland, 1994. *Skyline West Conservation Plan, September 21, 1994*, City of Portland: Portland, Oregon.
- Bureau of Planning, City of Portland, 1997. *Portland Environmental Handbook*, City of Portland: Portland, Oregon.
- Bureau of Planning, City of Portland, 2001. *Portland's Willamette River Atlas*, City of Portland: Portland, Oregon.
- Community and Economic Development Department, City of Gresham, 1988. *Inventory of Significant Natural Resources and Open Spaces*, City of Gresham: Gresham, Oregon.
- Lev, Esther, 2001. *Wildlife Habitat Inventory for the Willamette River*, Environmental Consulting: Portland, Oregon.
- Lower Columbia River Estuary Program, 1999. *Lower Columbia River Estuary Plan, Volumes 1-3*, Lower Columbia River Estuary Program: Portland, Oregon.
- Moses, Todd, 1993. *Stream Rehabilitation Concepts, Upper Fairview Creek, Gresham, Oregon*, Watershed Applications: Portland, Oregon.
- Portland Parks and Recreation, Bureau of Planning, City of Portland, 1995. *Forest Park, Natural Resources Management Plan*, City of Portland: Portland, Oregon.
- United States Geological Service (USGS), 2000. *Willamette Basin Ground-Water Study*, USGS: Portland, Oregon.
- USGS, 1995. *NAWQA Willamette Basin Study*, USGS: Portland, Oregon.
- Wells, Scott, 1997. *Columbia Slough Technical Report*, Portland State University: Portland, Oregon.
- Willamette Basin Task Force, Pacific Northwest River Basins Commission, 1969. *The Willamette Basin, Comprehensive Study of Water and Related Land Resources*, Pacific Northwest River Basins Commission: Portland, Oregon.

Willamette Basin Task Force, Pacific Northwest River Basins Commission, 1997. *The Willamette Basin, Recommendations to Governor John Kitzhaber*, Willamette River Basin Task Force: Portland, Oregon.

Willamette Restoration Initiative, 2001. *Restoring A River of Life, The Willamette Restoration Strategy Overview, February 2001*, Willamette Restoration Initiative: Portland, Oregon.

Willamette Restoration Initiative, 2001. *Restoring A River of Life, The Willamette Restoration Strategy – Recommendations for the Willamette Basin Supplement to the Oregon Plan for Salmon and Watersheds, February 2001*, Willamette Restoration Initiative: Portland, Oregon.

Watershed councils and related groups

Arnold Creek, Friends of, 4106 SW Vacuna Street, Portland 97219, 503-244-9958, Amanda Fritz

Balch Creek, Friends of, 5240 NW Cornell Road, Portland 97210, 503-297-3613, Eberhard Gloekler

Blue and Fairview Lakes Land Trust, 503667-4547, Jane Graybill

Blue Fairview Lakes , Friends of, 21130 NE Interlachen Lane, Interlachen 97024, (503) 667-4547, Jane Graybill

Citizens Interested in Bull Run, Inc. 503-665-4777, Frank Gearhart

Columbia Children's Arboretum Preservation Committee, 9509 NE 13th Ave., Portland 97211, Martha Johnson

Columbia Slough Watershed Council, 7040 NE 47th Ave., Portland 97218-1212, (503) 281-1132, FAX (503) 281-5187

Columbia Slough Program, City of Portland, Bureau of Environmental Services, 503-823-7268

Fairview Creek Watershed Group, 2115 SE Morrison St., Portland 97214, (503) 661-7612, FAX (503) 661-5296

Fairview Creek Watershed Council, PO Box 36, Fairview 97024, (503) 231-2270, Shannon Schmitt

Fairview Creek Watershed Conservation Group, PO Box 36, Fairview 97204, 503-669-6000, Gregory Dresden

Forest Park, Friends of, PO Box 2413, Portland 97208, 503-223-5449, Lee Kellogg

Lower Columbia WS Council, 12589 Hwy 30, Clatskanie 97016, 503-728-9015, Margaret Magruder

(Multnomah Channel) Friends of Retaining the Channel Environment, 13010 NW Marina Way, Portland 97231, 503-285-6756, Mark Valeske

Oaks Bottom Wildlife Refuge, 7516 SE 21st, Portland 97202, 503-654-8454, Martha Taylor

Oaks Bottom Management Committee, 2115 SE Morrison Street, Ste. 201, Portland 97214, 503-231-2270, Steve Fedje

Sauvie Island Conservancy, 19300 NW Sauvie Island Road, Portland 97231, 503-621-3049, Donna Matrazzo

Skyline Ridge, Citizens for Preservation of, 15400 NW McNamee Road, Portland 97231, 503-621-3564, Chris Foster

Smith and Bybee Lakes, Friends of, PO Box 83862, Portland 97283, 503-240-0233, Jeffrey Kee

West Hills Streams, Friends of, 6039 Knights Bridge Drive, Portland 97219, 503-246-0449, Liz Callison

Wetlands, Friends of, 503-253-6247, Alice Blatt

Willamette River Restoration Committee, 541-484-9466, Timothy Green

Data descriptions

Table H-1 provides information about the subwatersheds within each watershed, the HUC code, and the acres inside Metro's jurisdictional boundary. Keying in on the resource site number will show how the subwatersheds are aggregated into the resource sites listed above.

Both of the Resource Sites in Section H fall within the Scappoose Creek watershed. Resource Site #26 is comprised only of its namesake subwatershed, Lower Willamette River. Resource Site #27 combines the Columbia Slough and Multnomah Channel subwatersheds.

Tables H-1 and H-2 provide general description about the 5th field and 6th field HUCs. Below these tables are descriptions of the riparian and wildlife habitat resources resource site.

Watershed data tables

Table H-1. Watersheds (5th level HUC), subwatersheds (6th level HUC), and acres within Metro jurisdictional boundary.

Watershed (5th level HUC)	5th field HUC code	Resource site #	Subwatershed (6th level HUC)	6th field HUC code	Acres in Metro
Scappoose Creek	1709001202	26	Lower Willamette River	170900120201	32,899.0
		27	Columbia Slough	170900120202	53,571.9
			Multnomah Channel	170900120203	1,037.6

Table H-2. Resource sites: general information.

General information	Lower Willamette	Columbia Slough
Miles of DEQ 303(d) listed streams	13.3	43.3
Road density (road miles/square miles in subwatershed)	20.4	12.0
Miles of stream with known anadromous fish presence	13.3	21.7
Acres of hydrologically connected wetlands	262.2	3,298.1
Total acres of wetlands	262.2	3,329.7
Acres of floodplains (100 year FEMA + 1996 inundation area)	3,409.4	15,814.1
Acres of developed floodplains	317.8	993.8
Building permits since 1996 (number)	2,775.0	3,414.0

Table H-3. Characteristics of stream miles by resource site.

Resource site	Stream miles by channel type		Miles of stream links*	Miles of streams not categorized by channel type	Total stream miles
	Low to medium	High			
Lower Willamette River	17.9	27.2	31.9	10.0	87.0
Columbia Slough	81.5	6.7	33.7	23.7	145.5

*Stream links are links between surface streams and may be piped or culverted.

Table H-4. Riparian vegetation by resource site.

Resource site	Vegetation types within 300 feet of a stream (acres)			Forested vegetation >300 feet from a stream
	Low structure vegetation/intact topsoil	Non-forest woody vegetation	Forested vegetation	
Lower Willamette River	248.5	13.2	2,546.3	5,555.5
Columbia Slough	2,385.6	118.5	1,659.6	3,393.5

Table H-5. Regional zoning by resource site.

Resource site	Acres by zone within each resource site						
	Commercial	Industrial	Multi-family residential	Public/open space	Rural	Single family residential	Mixed use
Lower Willamette River	2,282.3	6,606.4	2,618.6	6,618.3	1,543.8	11,655.0	1,536.7
Columbia Slough	2,597.7	18,256.2	2,923.2	7,167.6	8,308.4	13,636.8	1,247.8

SITE #26: Lower Willamette River subwatershed

Named streams: Balch Creek, Doane Creek, Johnson Creek (west side), Marquam Gulch, Saltzman Creek, Willamette River

Communities within the subwatershed: Milwaukie, Portland, unincorporated Clackamas County, unincorporated Multnomah County

Total acreage within Metro's boundary: 32,899

Total acres within riparian corridor: 10,977.2

This site contains 11 percent of the area comprising Metro's jurisdictional boundary, surpassed only by Site #27, Columbia Slough. Ninety-five percent of the site falls within the City of Portland's boundaries; the remainder is in unincorporated Multnomah County (four percent), unincorporated Clackamas County (one percent), and Milwaukie (less than one percent) (Table H-6).

This site is the second most highly developed of all resource sites, based on the road density of 20.4 road miles per square mile (Table H-2). Zoning is dominated by single family residential use, but industrial lands and public/open space also contribute substantial zoning acreages (Table H-5). Nearly 2,800 building permits have been issued here since 1996, although that number is not outstandingly high considering the resource site's contribution to the Metro boundary's land base (Table H-2).

Riparian resources. One-third of this site is part of the riparian corridor inventory (Table 12). Resource Site #26 contributes nearly 12 percent of the region's riparian corridor resources; together with the other Group H resource site, these two sites comprise a full third of the region's riparian inventory (Table 13).

This resource site contains 87 total stream miles, of which 37 percent are stream links, suggesting high levels of piping and culverting (Table H-3). Despite the strong contribution to regional riparian resources, non-piped stream density is only 0.0017 miles per acre; the site ranks second to last of all 27 resource sites in terms of stream density (Tables 12 and H-3). Twenty-four percent of non-piped stream miles are DEQ 303(d) listed (Table H-2). Anadromous fish are known to be present in more than thirteen stream miles (Table H-2). Stream gradients are mixed, but dominated by high gradients (Table H-3); however, ten percent of the site is floodplain, and one percent is wetland (Tables H-2 and H-3). Approximately ten percent of the floodplain is developed, a relatively low proportion given the site's development intensity.

Approximately 34 percent of this site's acreage within the riparian corridor inventory received primary scores for at least three of the five ecological functions, and 44 percent received at least one primary score (Table H-9). The highest percentage of land receiving a primary score was divided about equally between *Large wood and channel dynamics* and *Bank stabilization and pollution control* (Table H-8; see also Table 4 and Appendix 5 for description of ecological functions mapping). However, *Streamflow moderation and water storage* was also an important primary function in this site, and also provided very substantial secondary functions (70 percent of the site's riparian acreage included this secondary function).

Wildlife habitat resources. Including Habitats of Concern, 27 percent of the lands in this site fall within the wildlife habitat inventory, ranking it 11th among the 27 resource sites and first of the two Group H resource sites (Table 16). Within model patches, 78 percent of the acreage falls within the top third of the point range, ranking second among the 27 resource sites, behind Resource Site #23 (Tryon Creek) (Table 17).

Of the four criteria in the GIS model, 87 percent of the acreage falls in the lowest size score category, with another ten percent in the medium category (Table H-11). For habitat interior, the acreage falls primarily in the top category (66 percent), but nearly one quarter also falls within the lowest score category, with little in the middle class. That is because Forest Park comprises a substantial proportion of the habitat in this site, but much of the remainder consists of relatively small, isolated habitat patches east of the Willamette River. This site scores strongly in the middle score category for water (83 percent), but receives excellent scores for connectivity, with 89 percent of all acreage receiving the top score. Again, this is influenced by Forest Park. The total proportion of acreage accounted for in the size and interior criteria suggest that a relatively small amount of lands within 300 ft of streams are unforested, because low-structure patch types are not scored for these criteria (see also Table H-12).

Conifer and hardwood forest strongly predominate the habitat types in this resource site (92 percent), but open water is also an extremely important habitat type here (Table H-15). A relatively extensive series of oak woodlands are present in this site, identified through Habitats of Concern (based on local expert knowledge). Wetlands cover three percent of this site's wildlife habitat, slightly lower than the other Group H site; this number is negatively influenced by the large amount of habitat covered by Forest Park, a fairly steeply sloped area generally lacking in wetlands. This site contributes three percent to the region's wetland resources, ranking 8th among the 27 resource sites.

In general, this site can be characterized as providing a large amount of very high quality wildlife habitat. Forest Park is one of the most highly rated habitat patches in the entire urban region; it provides very extensive interior habitat for nesting Neotropical migrants and area-sensitive species, is likely a source habitat for species repopulation to other patches, and is an elk migratory corridor. A substantial portion of Forest Park and associated areas is also situated in Resource Site #27, to the north of this site. This resource site includes a long segment of the Willamette River, contributing important open water and riverine island habitat important to Bald Eagle, Osprey, waterfowl, shorebirds and migratory birds. This site is uniquely important to the region's wildlife.

Species of Concern. Twenty-three Species of Concern sighting location falls within the site, attesting to the site's importance in the regional wildlife habitat system. Each sighting may include one or more species; if a species occurs more than once in the resource site it is only listed once here. These include the following species:

- Pileated Woodpecker
- Band-tailed Pigeon
- Bald Eagle
- Peregrine Falcon
- Purple Martin
- Painted Turtle
- Western Meadowlark

- Bufflehead
- Dusky Canada Goose
- Merlin
- Western Pond Turtle
- Great Blue Heron nesting colony
- *Fluminicola fuscus* (plant species)
- *Rorippa columbiae* (plant species)

There are very likely other Species of Concern using this resource site, particularly those relying on forested habitats and open water (see Table H-15). Examples of species likely to occur in this site may be found by referencing the species list in Appendix 7 and identifying the species with a double "XX" under the habitat. General species needs and potential reasons for their decline are identified in the *Sensitive Species Accounts* section above. More detailed information on all species' needs can be obtained through Johnson and O'Neil (2001).

Habitats of Concern.

The following Habitats of Concern are partially or wholly within this resource site. Using the Unique ID # (UID), please refer to Appendix 8 for information concerning each Habitat of Concern:

UID numbers: 1, 2, 3, 4, 16, 22, 23, 24, 26, 27, 28, 29, 30, 31, 33, 49, 50, 75, 76, 77, 79, 81, 115, 129, 130, 132, 162, 167

Resource site data tables: Riparian Corridors

Table H-6. Acres within resource site by jurisdiction.

Jurisdiction	Acres within subwatershed
Milwaukie	66.8
Portland	31,240.2
Unincorporated Clackamas County	178.3
Unincorporated Multnomah County	1,413.8

Table H-7. Acres in Metro and riparian corridor.

Resource site	Total acres within Metro	Total acres within riparian corridor
Lower Willamette River	32,899.2	10,940.8

Table H-8. Number of acres within riparian corridor providing ecological function.

Resource site	Ecological function	Primary Value		Secondary Value	
		Acres*	% of Total**	Acres	% of Total
Lower Willamette River	Microclimate & shade	1,052.5	9.6%	4,345.5	39.7%
	Streamflow moderation & water storage	3,112.4	28.4%	7,693.0	70.3%
	Bank stabilization & pollution control	4,521.4	41.3%	2,430.3	22.2%
	Large wood & channel dynamics	4,453.8	40.7%	877.8	8.0%
	Organic material sources	1,140.5	10.4%	566.1	5.2%

*Number of acres scored within the riparian corridor for each function
 **Percent of total acres within the riparian corridor

Table H-9. Breakdown of ecological scores.

Resource site	Ecological Score	Acres	% of Total Acres
Lower Willamette River	1 to 5	6,080.8	55.6%
	6 to 11	460.3	4.2%
	12 to 17	689.8	6.3%
	18 to 23	2,582.0	23.6%
	24 to 29	944.9	8.6%
	30	183.1	1.7%
	Total acres	10,940.8	100.0%

Resource site data tables: Wildlife Habitat

Table H-10. Breakdown of total wildlife model patch scores.*

Resource site: Lower Willamette River	Number of acres in each wildlife score category									Total wildlife model patch acres in inventory
	1	2	3	4	5	6	7	8	9	
Model score	317.5	252.0	126.9	280.4	80.7	800.5	1,044.4	5,576.8	0.0	8,479.1
Percent of total	3.7%	3.0%	1.5%	3.3%	1.0%	9.4%	12.3%	65.8%	0.0%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table H-11. Breakdown of total wildlife patch model scores by criteria.*

Resource site: Lower Willamette River	Number of acres by score for each model criterion												Total wildlife model patch acres in inventory
	Size ²			Interior ²			Water ³			Connectivity			
	1	2	3	1	2	3	1	2	3	1	2	3	
	7,388.6	881.9	0.0	2,067.0	18.1	5,558.6	472.9	7,047.2	500.4	577.9	347.5	7,553.7	8,479.1
Percent of total acres in inventory	87.1%	10.4%	0.0%	24.4%	0.2%	65.6%	5.6%	83.1%	5.9%	6.8%	4.1%	89.1%	na

¹Does not include Habitats of Concern outside of model patches.

²These numbers do not add up to 100.0% because Type 2 patches (low structure vegetation within 300 feet of streams and wetlands) were not ranked for these criteria.

³These numbers do not add up to 100% because not all patches contained or were near water resources.

Table H-12. Breakdown of total wildlife model patch area by 2000 Metro photo interpretation landcover and known wetlands.*

Resource site: Lower Willamette River	Low structure vegetation within 300 feet of stream		Forested vegetation	Forested wetlands	Grass/shrub wetlands within 300 feet of a stream	Other wetlands	Total wildlife model patch acres in inventory
	Low structure vegetation/intact topsoil	Non-forest woody vegetation					
Acres	198.4	10.2	8,008.3	21.1	6.4	234.7	8,479.0
Percent of total	2.3%	0.1%	94.4%	0.2%	0.1%	2.8%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table H-13. Total acres of inventoried wildlife habitat by type and total Species of Concern (SOCs).

Resource site: Lower Willamette River	Wildlife patches (acres)	HOCs inside Wildlife patches (acres)*	HOCs outside Wildlife patches (including wetlands <2 acres)	Total inventoried wildlife habitat acres	Total SOCs
Acres	8479.1	5369.6	282.9	8761.9	23
Percent of total	96.8%	61.3%	3.2%	100.0%	N/A

*Habitats of Concern.

Table H-14. Total area of model patches and Habitats of Concern by 1998 Landsat Landcover Area.

Resource Site:	Total area of wildlife model patches	Total area of HOCs outside of modeled patches (including wetlands <2 acres)	Percent of total inventoried habitat
Lower Willamette River			
Landcover type:			
Water	220.27	17.1	2.7%
Barren	122.75	19.4	1.6%
Low structure agriculture	2.38	0.0	0.0%
High structure agriculture	0.00	0.0	0.0%
Deciduous closed canopy	2,106.15	56.4	24.7%
Mixed closed canopy	3,075.12	44.2	35.6%
Conifer closed canopy	1,725.21	16.3	19.9%
Deciduous open canopy	289.60	26.6	3.6%
Mixed open canopy	222.09	11.0	2.7%
Conifer open canopy	55.45	2.4	0.7%
Deciduous scattered canopy	201.47	20.2	2.5%
Mixed scattered canopy	116.33	11.7	1.5%
Conifer scattered canopy	37.48	2.8	0.5%
Closed canopy shrub	149.95	21.2	2.0%
Open canopy shrub	50.24	8.6	0.7%
Scattered canopy shrub	42.34	8.7	0.6%
Meadow/grass	61.32	16.4	0.9%
Not classified	0.93	0.0	0.0%
Total	8,479.09	282.9	100.0%

The table below provides estimates of each type of the habitats described in Metro's Technical Report for Fish and Wildlife Habitat, based on Johnson and O'Neil's (2001) habitat scheme. These numbers are provided for subwatershed comparison purposes and represent estimates of available habitat type. Several data types were used to compile this table, and the data sources vary in their precision. For example, the satellite data sources are less accurate than hand-digitized forest canopy cover. There is also slight overlap between certain habitat types. For example, Riparian Wetlands (RWET) are also partially included in Westside Lowland Coniferous Hardwood/Westside Oak and Douglas-fir (WLCH/WODF) because some wetlands also contain forest, and Open Water (WATR) is not always considered part of habitat patches. Therefore, the sums of these habitat types are slightly different from the "Total wildlife habitat acres in inventory" shown in Table 16. Nonetheless, these numbers provide a generalized means of comparing the quality and quantity of habitat available to wildlife among and between subwatersheds. Note also that the estimates for Westside Grasslands (WEGR) probably represent grasslands that are not native rather than true native grasslands, which are largely extirpated from the metro region.

Table H-15. Wildlife habitat availability¹ based on Johnson & O'Neil's (2001) habitat types and species-habitat associations.

Resource site:	Habitat type						
	WATR ²	HWET ³	RWET ³	TOTWET ³	WLCH/WODF ⁴	WEGR	AGPA
Lower Willamette River							
Total acres	2,497.9	241.1	21.1	262.2	8,020.4	187.6	2.4
Percent of total	28.5%	2.8%	0.2%	3.0%	91.5%	2.1%	0.0%

¹See Table H-14 for land cover types and crosswalk to Johnson and O'Neil's classification scheme.

²Note that patch type and data limitations result in an underestimation of open water habitats. For example, medium and small sized stream surfaces are excluded.

³Note that HWET and RWET do not represent the full suite of wetlands because some wetlands <2 acres were added in as Habitats of Concern, and some wetlands could not be associated with herbaceous or forested habitats. TOTWET represents the best estimate of all existing wetlands because it includes Habitats of Concern.

⁴Data limitations make it impossible to distinguish between these two habitat types at this time, and no comprehensive oak habitat survey has been conducted for the region. However, known oak habitats are also included in HOCs (see Appendix 10).

SITE #27: Columbia Slough subwatershed

Named streams: Arata Creek, Columbia River, Columbia Slough, Fairview Creek, Miller Creek, Multnomah Channel, Willamette River

Communities within the subwatershed: Fairview, Gresham, Maywood Park, Portland, Troutdale, Wood Village, unincorporated Multnomah County

Total acreage within Metro's boundary: 54,610 (combined Columbia Slough and Multnomah Channel)

Total acres within riparian corridor: 20,569.2

This site contains 18 percent of the area comprising Metro's jurisdictional boundary, the highest amount of any of the resource sites. Most of the site (71 percent) falls within the City of Portland's boundaries, but there are also portions in unincorporated Multnomah County (13 percent), Gresham (eight percent), Fairview (four percent), Troutdale (two percent), and one percent or less in Maywood Park and Wood Village (Table H-16).

Compared to the other site in Group H, this site is relatively undeveloped. Road density is 12.0 miles per square mile, placing this site within the second quartile (26 to 50 percent of maximum) compared to all other resource sites (Table H-2). Zoning is mixed in this resource site, but industrial is the most significant land base contributor, followed by substantial acreage zoned for single family residential, as well as rural and public/open space (Table H-5). More than 3,400 building permits have been issued here since 1996 (Table H-2).

Riparian resources. Thirty-seven percent of this site is part of the riparian corridor inventory (Table 12). This site contributes 22 percent of the region's riparian resources, far more than any other resource site in the Metro boundary (Table 13).

This resource site contains 87 total stream miles, of which 37 percent are stream links, suggesting high levels of piping and culverting (Table H-3). Despite the strong contribution to regional riparian resources, non-piped stream density is only 0.0020 miles per acre, ranking it 24th of the 27 resource sites. Nearly 40 percent of non-piped stream miles are DEQ 303(d) listed (Table H-2); however, this site is known to provide very important fish habitat, with anadromous fish known to be present in nearly 22 stream miles (Table H-2). Streams are predominantly low gradient, as indicated by the high proportion of floodplains, at 29 percent; six percent of the floodplains are developed. Six percent of the site's lands are also wetlands, contributing to off-channel fish-rearing habitat and other highly valuable aquatic resources (Table H-3).

Reflecting the strong riparian component of this resource site, approximately 56 percent of its acreage within the riparian corridor inventory received primary scores for at least three of the five ecological functions, and a remarkable 83 percent received at least one primary score (Table H-19). The highest percentage of land receiving a primary score was divided about equally between *Large wood and channel dynamics* and *Streamflow moderation and water storage*, each covering more than three-quarters of the inventory. However, *Bank stabilization and pollution control* also provided primary function to 60 percent of the site's riparian inventory (Table H-18; see also Table 4 and Appendix 5 for description of ecological functions mapping). Secondary functions in this site are relatively minimal because so much of the land is covered by primary ecological functions.

Wildlife habitat resources. Including Habitats of Concern, 21 percent of the lands in this site fall within the wildlife habitat inventory, ranking it 20th among the 27 resource sites and second of the two Group H resource sites (Table 16). Within model patches, 46 percent of the acreage falls within the top third of the point range, ranking sixth among the 27 resource sites and second to Site #27 in Group H (Table 17).

Of the four criteria in the GIS model, 59 percent of the acreage falls in the lowest size score category, with another ten percent in the medium category (Table H-21). For habitat interior, the acreage falls primarily in the lowest score category (36 percent), but portions fall within the middle and high ranges as well (20 and 12 percent, respectively). This site scores very well for water resources, with approximately equal proportions in the middle and high ranges (48 and 44 percent, respectively). The scores are also very good for connectivity, with 57 percent in the highest class and another 29 percent in the middle class. The total proportion of acreage accounted for in the size and interior criteria suggest that a modest amount of lands (approximately 20 percent) within 300 ft of streams are unforested, because low-structure patch types are not scored for these criteria (see also Table H-22).

Open water is a critically important habitat type in this resource site, covering an estimated 65 percent of wildlife habitat, substantially more than any of the other resource sites (Table H-25). Conifer and hardwood forest strongly predominate the habitat types in this resource site (92 percent), but open water is also an extremely important habitat type here (Table H-25). A relatively extensive series of oak woodlands are present in this site, identified through Habitats of Concern (based on local expert knowledge). Wetlands cover three percent of this site's wildlife habitat, slightly lower than the other Group H site; this number is negatively influenced by the large amount of habitat covered by Forest Park, a fairly steeply sloped area generally lacking in wetlands. This site contributes three percent to the region's wetland resources, ranking 8th among the 27 resource sites.

In general, this site can be characterized as providing a large amount of very high quality wildlife habitat. Forest Park is one of the most highly rated habitat patches in the entire urban region; it provides very extensive interior habitat for nesting Neotropical migrants and area-sensitive species, is likely a source habitat for species repopulation to other patches, and is an elk migratory corridor. A substantial portion of Forest Park and associated areas is also situated in Resource Site #27, to the north of this site. This resource site includes a long segment of the Willamette River, contributing important open water and riverine island habitat important to Bald Eagle, Osprey, waterfowl, shorebirds and migratory birds. This site is uniquely important to the region's wildlife.

Species of Concern. Twenty-three Species of Concern sighting location falls within the site, attesting to the site's importance in the regional wildlife habitat system. Each sighting may include one or more species; if a species occurs more than once in the resource site it is only listed once here. These include the following species:

- Pileated Woodpecker
- Band-tailed Pigeon
- Bald Eagle
- Peregrine Falcon
- Purple Martin

- Painted Turtle
- Western Meadowlark
- Bufflehead
- Dusky Canada Goose
- Merlin
- Western Pond Turtle
- Great Blue Heron nesting colony
- *Fluminicola fuscus* (plant species)
- *Rorippa columbiae* (plant species)

There are very likely other Species of Concern using this resource site, particularly those relying on forested habitats and open water (see Table H-15). Examples of species likely to occur in this site may be found by referencing the species list in Appendix 7 and identifying the species with a double "XX" under the habitat. General species needs and potential reasons for their decline are identified in the *Sensitive Species Accounts* section above. More detailed information on all species' needs can be obtained through Johnson and O'Neil (2001).

Species of Concern. Attesting to this site's importance to regional wildlife, 34 Species of Concern sighting location falls within the site. Each sighting may include one or more species; if a species occurs more than once in the resource site it is only listed once here. These include the following species:

- Western Painted Turtle
- Bald Eagle
- Oregon Vesper Sparrow
- Purple Martin
- Pacific Fisher
- Pileated Woodpecker
- Streaked Horned Lark
- Band-tailed Pigeon
- Bufflehead
- Western Pond Turtle
- Red-legged Frog
- Elk
- Northern Pygmy Owl
- Merlin
- Common Nighthawk
- Peregrine Falcon
- Western Meadowlark
- Great Blue Heron nesting colony
- *Cimicifuga elata* (plant species)

There are very likely other Species of Concern using this resource site, particularly those relying on forested habitats and agricultural lands (see Table H-25). Examples of species likely to occur in this site may be found by referencing the species list in Appendix 7 and identifying the species with a double "XX" under the habitat. General species needs and potential reasons for their decline are identified in the *Sensitive Species Accounts* section above. More detailed information on all species' needs can be obtained through Johnson and O'Neil (2001).

Habitats of Concern.

The following Habitats of Concern are partially or wholly within this resource site. Using the Unique ID # (UID), please refer to Appendix 8 for information concerning each Habitat of Concern:

UID numbers: 6, 8, 9, 15, 17, 20, 25, 34, 35, 48, 49, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 76, 78, 81, 84, 85, 86, 88, 89, 162, 164

Resource site data tables: Riparian Corridors

Table H-16. Acres within resource site by jurisdiction.

Jurisdiction	Acres within subwatershed
Fairview	2,263.1
Gresham	4,188.9
Maywood Park	107.5
Portland	38,966.3
Troutdale	1,219.7
Wood Village	604.7
Unincorporated Multnomah County	7,258.6

Table H-17. Acres in Metro and riparian corridor.

Resource site	Total acres within Metro	Total acres within riparian corridor
Columbia Slough	54,610.0	20,129.8

Table H-18. Number of acres within riparian corridor providing ecological function.

Resource site	Ecological function	Primary Value		Secondary Value	
		Acres*	% of Total**	Acres	% of Total
Columbia Slough	Microclimate & shade	2,414.6	12.0%	1,582.3	7.9%
	Streamflow moderation & water storage	15,303.8	76.0%	4,570.4	22.7%
	Bank stabilization & pollution control	12,037.5	59.8%	791.6	3.9%
	Large wood & channel dynamics	15,864.7	78.8%	293.3	1.5%
	Organic material sources	3,541.1	17.6%	191.8	1.0%

*Number of acres scored within the riparian corridor for each function
 **Percent of total acres within the riparian corridor

Table H-19. Breakdown of ecological scores.

Resource site	Ecological Score	Acres	% of Total Acres
Columbia Slough	1 to 5	3,442.9	17.1%
	6 to 11	747.1	3.7%
	12 to 17	4,716.2	23.4%
	18 to 23	7,860.0	39.0%
	24 to 29	1,416.1	7.0%
	30	1,947.5	9.7%
	Total acres		20,129.8

Resource site data tables: Wildlife Habitat

Table H-20. Breakdown of total wildlife model patch scores.*

Resource site:	Number of acres in each wildlife score category									Total wildlife model patch acres in inventory
	1	2	3	4	5	6	7	8	9	
Columbia Slough										
Model score	262.1	713.2	1,254.2	978.9	577.5	1,441.6	1,270.8	1,786.3	1,331.3	9,615.9
Percent of total	2.7%	7.4%	13.0%	10.2%	6.0%	15.0%	13.2%	18.6%	13.8%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table H-21. Breakdown of total wildlife patch model scores by criteria.*

Resource site:	Number of acres by score for each model criterion											Total wildlife model patch acres in inventory	
	Size ²			Interior ²			Water ³			Connectivity			
	1	2	3	1	2	3	1	2	3	1	2		3
Columbia Slough	5,654.5	1,929.1	0.0	3,431.4	1,929.1	1,188.5	175.1	4,585.3	4,199.8	1,340.4	2,792.4	5,483.1	9,615.9
Percent of total acres in inventory	58.8%	20.1%	0.0%	35.7%	20.1%	12.4%	1.8%	47.7%	43.7%	13.9%	29.0%	57.0%	na

¹Does not include Habitats of Concern outside of model patches.

²These numbers do not add up to 100.0% because Type 2 patches (low structure vegetation within 300 feet of streams and wetlands) were not ranked for these criteria.

³These numbers do not add up to 100% because not all patches contained or were near water resources.

Table H-22. Breakdown of total wildlife model patch area by 2000 Metro photo interpretation landcover and known wetlands.*

Resource site:	Low structure vegetation within 300 feet of stream		Forested vegetation	Forested wetlands	Grass/shrub wetlands within 300 feet of a stream	Other wetlands	Total wildlife model patch acres in inventory
	Low structure vegetation/intact topsoil	Non-forest woody vegetation					
Columbia Slough							
Acres	1,965.3	67.0	4,334.2	504.7	359.8	2,384.9	9,615.8
Percent of total	20.4%	0.7%	45.1%	5.2%	3.7%	24.8%	100.0%

*Does not include Habitats of Concern outside of model patches.

Table H-23. Total acres of inventoried wildlife habitat by type and total Species of Concern (SOCs).

Resource site: Columbia Slough	Wildlife patches (acres)	HOCs inside Wildlife patches (acres)*	HOCs outside Wildlife patches (including wetlands <2 acres)	Total inventoried wildlife habitat acres	Total SOCs
Acres	9615.9	6380.7	2083.8	11699.7	34
Percent of total	82.2%	54.5%	17.8%	100.0%	N/A

*Habitats of Concern.

Table H-24. Total area of model patches and Habitats of Concern by 1998 Landsat Landcover Area.

Resource Site: Columbia Slough	Total area of wildlife model patches	Total area of HOCs outside of modeled patches (including wetlands <2 acres)	Percent of total inventoried habitat
Landcover type:			
Water	1,262.32	160.6	12.2%
Barren	1,087.46	678.1	15.1%
Low structure agriculture	114.51	20.0	1.1%
High structure agriculture	0.29	0.0	0.0%
Deciduous closed canopy	1,469.96	140.3	13.8%
Mixed closed canopy	1,297.42	59.8	11.6%
Conifer closed canopy	883.55	53.1	8.0%
Deciduous open canopy	444.31	72.2	4.4%
Mixed open canopy	206.99	18.6	1.9%
Conifer open canopy	71.39	8.2	0.7%
Deciduous scattered canopy	392.87	62.1	3.9%
Mixed scattered canopy	254.22	38.6	2.5%
Conifer scattered canopy	119.79	29.0	1.3%
Closed canopy shrub	284.14	71.0	3.0%
Open canopy shrub	169.54	48.0	1.9%
Scattered canopy shrub	255.46	46.0	2.6%
Meadow/grass	1,301.60	578.1	16.1%
Not classified	0.06	0.1	0.0%
Total	9,615.88	2083.8	100.0%

The table below provides estimates of each type of the habitats described in Metro’s Technical Report for Fish and Wildlife Habitat, based on Johnson and O’Neil’s (2001) habitat scheme. These numbers are provided for subwatershed comparison purposes and represent estimates of available habitat type. Several data types were used to compile this table, and the data sources vary in their precision. For example, the satellite data sources are less accurate than hand-digitized forest canopy cover. There is also slight overlap between certain habitat types. For example, Riparian Wetlands (RWET) are also partially included in Westside Lowland Coniferous Hardwood/Westside Oak and Douglas-fir (WLCH/WODF) because some wetlands also contain forest, and Open Water (WATR) is not always considered part of habitat patches. Therefore, the sums of these habitat types are slightly different from the “Total wildlife habitat acres in inventory” shown in Table 16. Nonetheless, these numbers provide a generalized means of comparing the quality and quantity of habitat available to wildlife among and between subwatersheds. Note also that the estimates for Westside Grasslands (WEGR) probably represent grasslands that are not native rather than true native grasslands, which are largely extirpated from the metro region.

Table H-25. Wildlife habitat availability¹ based on Johnson & O’Neil’s (2001) habitat types and species-habitat associations.

Resource site: Columbia Slough	Habitat type						
	WATR ²	HWET ³	RWET ³	TOTWET ³	WLCH/ WODF ⁴	WEGR	AGPA
Total acres	7,548.7	2,744.7	504.7	3,329.7	5,622.4	2,398.7	134.8
Percent of total	64.5%	23.5%	4.3%	28.5%	48.1%	20.5%	1.2%

¹ See Table H-24 for land cover types and crosswalk to Johnson and O’Neil’s classification scheme.

² Note that patch type and data limitations result in an underestimation of open water habitats. For example, medium and small sized stream surfaces are excluded.

³ Note that HWET and RWET do not represent the full suite of wetlands because some wetlands <2 acres were added in as Habitats of Concern, and some wetlands could not be associated with herbaceous or forested habitats. TOTWET represents the best estimate of all existing wetlands because it includes Habitats of Concern.

⁴ Data limitations make it impossible to distinguish between these two habitat types at this time, and no comprehensive oak habitat survey has been conducted for the region. However, known oak habitats are also included in HOCs (see Appendix 10).

Adequacy of information

The second step of the Goal 5 inventory process is to determine if the information collected for the inventory is adequate. According to the Goal 5 rule, the information about a particular Goal 5 resource site shall be deemed adequate if it provides the location, quantity and quality of the resource. A discussion of these three aspects of Metro's Goal 5 inventory follows.

Location

*Location information shall include a description or map of the resource area for each site (OAR 660-023-0030(3)(a)). Although this information must be sufficient to determine whether a resource exists on a particular site, the precise location of the resource need not be determined at this stage in the inventory process.*¹²

Information about location is sufficient if the local government develops a map that shows that a resource exists on a particular site. Riparian corridors and wildlife habitat have been mapped for the entire area within Metro's jurisdiction. The data for all 27 resource sites is summarized for ease of comparison in Tables 12-17 following this section. Metro's riparian corridor and wildlife habitat inventory maps depict the resource sites to the tax lot level. The inventory also describes the acres of each jurisdiction that fall within a resource site. Resource sites are based on subwatersheds using the Hydrologic Unit Code (HUC) system, as identified by the Natural Resources Conservation Service (NRCS).

The methodologies used to develop the riparian corridor inventory maps were described previously in the *Metro's Goal 5 Inventory Methodology* section of this document. Local jurisdictions, property owners, and other interested parties have extensively reviewed the inventory map. Map corrections have been made and continue to be made to more accurately depict location of the resource.

Quantity

Concerning quantity, Goal 5 requires local governments to estimate the relative abundance or scarcity of the resource (OAR 660-023-0030(c)).

Metro's stream modeling has indicated that the region has lost approximately 400 miles of streams (about 30 percent of the original) (Metro 1997). In addition, 213 miles are listed by the Department of Environmental Quality as water-quality limited (DEQ 1996). Eleven percent of the Metro region's natural areas were lost between 1989-1999, with accompanying adverse effects on watershed hydrology and wildlife habitat (Metro Parks and Greenspaces). The portion of the Willamette River running through the metro region is influenced not only by intensity of urbanization within its own watersheds, but also by cumulative effects from land use and

¹² Prior to amendment, OAR 660-016-0000(2) required a determination of site specific resource location, which included a description or map of the resource site's boundaries and the impact area, if different. For non-site specific resources, determination was to be as specific as possible. *Id.* However, OAR 660-023-0030(3)(a) does not distinguish between site specific and non-site specific resources. Rather, the new rule requires information about location to include a description or map of the resource and to be sufficient enough to conclude whether a resource exists on a particular site. *Id.*

activities upstream. Habitat loss, alteration, and significant increases in the amount of impervious land cover characterize the Metro region.

Information about quantity is adequate if it shows the relative abundance or scarcity of the resource. The number of streams, riparian corridors and upland vegetation lost that historically provided fish and wildlife habitat and the accompanying impacts of urbanization indicate that the riparian corridors and wildlife habitat remaining in this region are correspondingly important. Relative to what once existed, riparian corridor and wildlife habitat resources that were once abundant are now scarce.

The declining quantity and condition of riparian corridor resource is impacting the ability of native fish and wildlife to survive in this region. Thirteen salmonid runs are listed as Threatened or Endangered under the federal Endangered Species Act, and two of these are also listed by the state as Threatened or Endangered. Another run is listed as Endangered only at the state level. Out of the entire genus, only resident rainbow trout are not considered to be at risk. Salmonids are important as an indicator of watershed and riparian corridor health. In addition, 55 other vertebrate species are on the Sensitive Species list, relating directly to habitat loss and alteration in the metro region over time.

Metro's riparian corridor inventory identifies the location of riparian corridors and quantifies the acres within the riparian corridor and the number of stream miles by resource site, as shown in Table 12 below. Based on this inventory there is a total of 93,035 acres within the riparian corridor in the region and 855 miles of streams. In addition, there are approximately 8,524 acres of hydrologically connected wetlands and 35,008 acres of floodplains in the region.

Metro's wildlife habitat inventory identifies the location of wildlife habitat and quantifies the acres within wildlife habitat patches, as shown in Table 16 below. Based on this inventory there is a total of 75,200 acres within the wildlife habitat inventory, including modeled patches (71,359 acres) and Habitats of Concern (3,842 additional acres).

Quality

Quality information shall indicate a resource site's value relative to other known examples of the same resource (OAR 660-023-0030(3)(b)). Although regional comparison of resources is preferred, quality comparisons may be made for resource sites within the jurisdiction, if no other local examples exist (Id). Local governments shall consider any determinations about resource quality provided in available state or federal inventories.

Information about quality is adequate if it indicates "a resource site's value relative to other known examples of the same resource." Riparian corridors occur wherever there is a river, lake, stream or wetland. Wildlife habitat occurs where there are features including forest canopy, wetlands, streams and other water features, important low-structure vegetation areas, and areas that are functionally important such as wildlife passage corridors or migratory stopover areas; these are typically 2-acre patches or larger.

It is important to distinguish "condition" of the resource area from the Goal 5 rule requirement to consider a "site's relative value." The condition of riparian corridors and wildlife habitat in the Metro region varies based on past and present development impacts that may have disturbed the soil, vegetation and terrestrial ecosystem adjacent to streams and wetlands. However, the present

condition of the resource does not diminish its value relative to other identified resources. Metro's inventory includes an assessment of ecological function and habitat quality as well as providing specific data on the condition of riparian corridors and wildlife by resource site.

Riparian corridors. Metro's riparian corridor inventory approach considers the ecological functions of the riparian corridor and maps the landscape features providing that function. Areas are given a primary or secondary ecological function score based on widths identified in the scientific literature (see previous discussion of inventory methodology for more information). Metro conducted an extensive scientific literature review that describes the qualities necessary to have a healthy ecosystem for watersheds and riparian corridors (Metro 2002). The ecological function approach to the inventory takes the science and applies it in a practical way to map riparian corridors. This approach provides a tool to identify the resource and to consider relative ecological function within a resource site and across the region.

One comparison that may be made is to consider the amount of the region's total acres of riparian corridor that is found in each resource site. Table 13 below shows the acres of each site within the riparian corridor and the percent of the region's riparian corridors by resource site. Some sites containing a small percentage of the region's riparian corridors may have been more heavily impacted by urban development over the past 200 years than those with a higher percentage. Other sites in headwater areas – typically in the higher elevations – do not naturally contain large quantities of wetlands or floodplains (Table 14). Some sites that provide a high percentage of the region's riparian corridors may contain large areas of floodplains and wetlands. In some sites, substantial floodplain development has occurred. These data allow for adequate comparison of sites across the region.

Another method of comparing the ecological function provided by riparian corridors in resource sites across the region is to look at the ecological function score. Table 15 shows the percent of the riparian corridor receiving scores in five categories. Each site has the potential to receive a score of up to 30 (five primary scores – a primary receives a score of 6) and a minimum of one (a secondary receives a score of one). As can be seen in the table, Site 9: Lower Rock Creek-Tualatin River contains the highest percentage (21%) of area receiving a primary score for all five functions, while several sites contain riparian corridors in which only two percent of the area received a score of 30. Sites that contain high percentages of the riparian corridor that received a score of one through five (secondary scores) most likely contain large forest, agricultural and floodplain areas. Site 19: Kelly Creek includes the largest portion of the riparian corridor receiving a low score (74%) while Site #27: Columbia Slough includes the smallest portion at 17 percent.

Wildlife habitat. Metro's wildlife habitat approach considers the configuration of wildlife habitat within a regional context and maps the landscape features contributing to a high-quality system of regional wildlife habitat. Habitat patches are scored based on size, shape (interior habitat), connectivity to water, and connectivity to other natural areas, based on the information gained through the literature reviewed in Metro's Technical Report for Fish and Wildlife Habitat (Metro 2002). This approach provides a straightforward way to apply science to existing habitats based on GIS resources, as modified by adaptive management received via field studies. It allows valid comparison of the relative value of habitat patches, both within resource sites and across the entire region.

Similar to the riparian corridors inventory, one comparison that may be made is to consider the amount of the region's total acres of wildlife habitat that is found in each resource site. Table 16 below shows the acres of each site within the wildlife habitat inventory and the percent of the region's habitat by resource site. Referring back to Table 8 in Metro's Technical Report for Fish and Wildlife Habitat, every major watershed has experienced substantial loss of closed canopy forest from historic levels; however, some have lost more than others. Some sites containing a small percentage of wildlife habitat may have been more heavily impacted by urban development over the past 200 years than those with a higher percentages. These numbers may reflect overall habitat loss – as with the highly developed Johnson Creek/Crystal Springs site – or conversion to agriculture or other land uses, as in the McKay Creek subwatershed (Table 16). These data allow for adequate comparison of sites across the region.

Another method of comparing the relative value or quality of wildlife habitat in resource sites across the region is to look at the wildlife model score. Table 17 shows the percent of the wildlife habitat receiving scores, from a range of one (low-scoring) to nine. Site #23 (Tryon Creek) contains the highest percentage (84%) of area receiving wildlife scores in the top third of the scoring range, while sites such as #21 (Lower Johnson Creek – Willamette River) and #10 (Middle Tualatin River – Gordon Creek) rank 26th and 27th among the resource sites, respectively. The sites on the lower end of the point scale typically contain more fragmented wildlife habitat resources and a lesser amount of forest canopy cover compared to higher-scoring sites.

In addition to the riparian corridor and wildlife habitat data described above, Metro's inventory includes information on the condition of riparian corridors by resource site. The *Site Analysis* section provides a summary of each data item. The inventory includes regionally consistent data for:

- Miles of DEQ 303(d) listed streams,
- Road density (road miles/square miles in subwatershed),
- Miles of stream with known anadromous fish presence,
- Acres of hydrologically connected wetlands,
- Acres of floodplains (100-year FEMA + 1996 inundation area),
- Building permits since 1996 (number),
- Characteristics of stream miles by resource site, and riparian vegetation by resource site.

Table 12. Quantity of riparian corridor resources in Metro region by resource site.

Resource site#	Resource site name	Total acres in Metro's Boundary	Total acres in riparian corridor	Percent of site in riparian corridor	Non-piped stream miles in resource site
1	Lower Sandy River-Columbia River	5,712.3	3,498.3	61.2%	23.6
2	Beaver Creek-Sandy River	10,336.6	3,666.8	35.5%	34.7
3	Willamette River-Boeckman Creek	7,616.8	2,248.1	29.5%	22.2
4	Willamette River-Lower Tualatin River	11,403.7	4,172.2	36.6%	35.5
5	Council Creek	5,708.2	1,142.4	20.0%	15.8
6	McKay Creek	3,842.7	635.8	16.5%	8.3
7	Middle Rock Creek-Tualatin River	7,300.2	2,390.8	32.7%	27.8
8	Beaverton Creek	24,297.0	5,788.0	23.8%	81.1
9	Lower Rock Creek-Tualatin River	8,717.3	1,736.4	19.9%	25.1
10	Middle Tualatin River-Gordon Creek	4,347.3	941.5	21.7%	15.3
11	Lower Tualatin River-Lake Oswego Canal	15,231.1	5,830.7	38.3%	56.3
12	Upper and Middle Fanno Creek	11,183.5	2,651.7	23.7%	38.6
13	Summer Creek	3,769.1	855.6	22.7%	14.1
14	Lower Fanno Creek	8,453.8	1,864.0	22.0%	29.4
15	Rock Creek (south Washington Co.)	4,239.3	1,102.2	26.0%	10.9
16	Richardson Creek	6,465.5	2,271.8	35.1%	30.1
17	Rock Creek-Clackamas River	11,120.7	4,177.9	37.6%	44.3
18	Johnson Creek-Sunshine Creek	12,372.9	4,777.5	38.6%	45.2
19	Kelley Creek	3,175.6	1,423.1	44.8%	12.1
20	Middle Johnson Creek	8,949.7	1,539.2	17.2%	10.0
21	Lower Johnson Creek-Willamette River	5,950.3	1,897.0	31.9%	24.5
22	Lake Oswego	4,168.7	1,541.7	37.0%	16.9
23	Tryon Creek	4,356.5	1,972.8	45.3%	21.1
24	Johnson Creek-Crystal Springs	7,844.6	1,176.5	15.0%	14.3
25	Mount Scott Creek	11,809.8	2,662.6	22.5%	31.0
26	Lower Willamette River	32,899.2	10,940.8	33.3%	55.1
27	Columbia Slough	54,610.0	20,129.8	36.9%	111.8
Total		295,882.5	93,035.4	na	854.9

Table 13. Percent of the region's riparian corridors by resource site.

Resource site#	Resource site name	Acres of resource site in riparian corridor	Percent of region's riparian corridors in resource site
1	Lower Sandy River-Columbia River	3,498.3	3.8%
2	Beaver Creek-Sandy River	3,666.8	3.9%
3	Willamette River-Boeckman Creek	2,248.1	2.4%
4	Willamette River-Lower Tualatin River	4,172.2	4.5%
5	Council Creek	1,142.4	1.2%
6	McKay Creek	635.8	0.7%
7	Middle Rock Creek-Tualatin River	2,390.8	2.6%
8	Beaverton Creek	5,788.0	6.2%
9	Lower Rock Creek-Tualatin River	1,736.4	1.9%
10	Middle Tualatin River-Gordon Creek	941.5	1.0%
11	Lower Tualatin River-Lake Oswego Canal	5,830.7	6.3%
12	Upper and Middle Fanno Creek	2,651.7	2.9%
13	Summer Creek	855.6	0.9%
14	Lower Fanno Creek	1,864.0	2.0%
15	Rock Creek (south Washington Co.)	1,102.2	1.2%
16	Richardson Creek	2,271.8	2.4%
17	Rock Creek-Clackamas River	4,177.9	4.5%
18	Johnson Creek-Sunshine Creek	4,777.5	5.1%
19	Kelley Creek	1,423.1	1.5%
20	Middle Johnson Creek	1,539.2	1.7%
21	Lower Johnson Creek-Willamette River	1,897.0	2.0%
22	Lake Oswego	1,541.7	1.7%
23	Tryon Creek	1,972.8	2.1%
24	Johnson Creek-Crystal Springs	1,176.5	1.3%
25	Mount Scott Creek	2,662.6	2.9%
26	Lower Willamette River	10,940.8	11.8%
27	Columbia Slough	20,129.8	21.6%
Total		93,035.4	100.0%

Table 14. Percent developed floodplain by resource site.

Resource site#	Resource site name	Floodplain Acres	Developed Floodplain Acres	Percent Developed Floodplain
1	Lower Sandy River-Columbia River	1,563.8	40.8	2.6%
2	Beaver Creek-Sandy River	2,173.0	59.6	2.7%
3	Willamette River-Boeckman Creek	411.2	32.8	8.0%
4	Willamette River-Lower Tualatin River	1,172.3	229.4	19.6%
5	Council Creek	626.0	24.2	3.9%
6	McKay Creek	344.9	26.4	7.7%
7	Middle Rock Creek-Tualatin River	239.2	8.2	3.4%
8	Beaverton Creek	1,246.1	421.9	33.9%
9	Lower Rock Creek-Tualatin River	854.3	16.6	1.9%
10	Middle Tualatin River-Gordon Creek	83.7	13.5	16.1%
11	Lower Tualatin River-Lake Oswego Canal	1,132.0	283.1	25.0%
12	Upper and Middle Fanno Creek	517.5	107.8	20.8%
13	Summer Creek	61.8	7.0	11.3%
14	Lower Fanno Creek	829.0	87.8	10.6%
15	Rock Creek (south Washington Co.)	315.0	22.8	7.2%
16	Richardson Creek	0.0	0.0	0.0%
17	Rock Creek-Clackamas River	761.9	87.1	11.4%
18	Johnson Creek-Sunshine Creek	346.8	11.8	3.4%
19	Kelley Creek	34.4	1.2	3.5%
20	Middle Johnson Creek	378.9	164.4	43.4%
21	Lower Johnson Creek-Willamette River	717.1	74.6	10.4%
22	Lake Oswego	590.2	75.8	12.8%
23	Tryon Creek	107.7	37.1	34.4%
24	Johnson Creek-Crystal Springs	572.0	295.4	51.6%
25	Mount Scott Creek	706.5	149.6	21.2%
26	Lower Willamette River	3,409.4	317.8	9.3%
27	Columbia Slough	15,814.1	993.8	6.3%
Total		35,008.9	3,590.3	10.3%

Table 15. Percent of riparian corridor by ecological function score by resource site (excludes Habitats of Concern outside of model patches).

Resource site#	Resource site name	Ecological function score					
		1 to 5	6 to 11	12 to 17	18 to 23	24 to 29	30
1	Lower Sandy River-Columbia River	37.4%	7.2%	16.0%	19.6%	11.1%	8.8%
2	Beaver Creek-Sandy River	24.7%	5.1%	12.1%	34.4%	13.2%	10.5%
3	Willamette River-Boeckman Creek	47.1%	12.8%	8.7%	9.0%	14.3%	8.1%
4	Willamette River-Lower Tualatin River	54.7%	7.0%	7.6%	15.8%	9.8%	5.1%
5	Council Creek	27.1%	9.3%	26.1%	4.7%	24.1%	8.7%
6	McKay Creek	28.7%	8.8%	18.9%	3.1%	23.8%	16.7%
7	Middle Rock Creek-Tualatin River	57.8%	10.7%	4.7%	3.6%	17.9%	5.2%
8	Beaverton Creek	54.6%	8.2%	7.8%	2.1%	20.3%	6.9%
9	Lower Rock Creek-Tualatin River	21.9%	9.4%	20.1%	3.2%	24.7%	20.7%
10	Middle Tualatin River-Gordon Creek	57.9%	10.1%	10.3%	5.2%	14.0%	2.6%
11	Lower Tualatin River-Lake Oswego Canal	58.1%	8.6%	6.4%	5.1%	15.2%	6.6%
12	Upper and Middle Fanno Creek	53.6%	7.4%	7.7%	1.3%	23.9%	6.1%
13	Summer Creek	50.2%	10.6%	7.4%	3.1%	22.2%	6.3%
14	Lower Fanno Creek	34.5%	6.3%	15.8%	5.0%	22.7%	15.6%
15	Rock Creek (south Washington Co.)	42.3%	12.0%	8.4%	2.2%	21.8%	13.3%
16	Richardson Creek	60.4%	13.7%	4.9%	8.5%	10.8%	1.8%
17	Rock Creek-Clackamas River	56.8%	8.8%	8.4%	6.7%	14.6%	4.8%
18	Johnson Creek-Sunshine Creek	69.0%	7.8%	3.5%	2.9%	12.5%	4.3%
19	Kelley Creek	73.5%	8.3%	2.3%	2.4%	11.5%	2.0%
20	Middle Johnson Creek	67.7%	6.0%	7.9%	1.1%	12.8%	4.5%
21	Lower Johnson Creek-Willamette River	37.2%	8.5%	10.1%	19.3%	17.2%	7.7%
22	Lake Oswego	45.4%	6.6%	31.7%	2.7%	10.2%	3.4%
23	Tryon Creek	62.8%	8.2%	4.9%	2.3%	19.8%	2.0%
24	Johnson Creek-Crystal Springs	55.5%	6.5%	11.4%	2.4%	18.4%	5.7%
25	Mount Scott Creek	53.7%	7.6%	8.2%	10.6%	12.4%	7.5%
26	Lower Willamette River	55.6%	4.2%	6.3%	23.6%	8.6%	1.7%
27	Columbia Slough	17.1%	3.7%	23.4%	39.0%	7.0%	9.7%
Totals		44.3%	6.9%	12.1%	16.7%	13.1%	6.9%

Table 16. Quantity of wildlife habitat resources in Metro region by resource site.

Resource site#	Resource site name	Total acres In Metro's Boundary	Total acres in wildlife patches	% of site in wildlife patches	Total acres HOCs inside patches	% of site in HOCs inside patches	Total acres HOCs outside patches	% of site in HOCs outside patches	Total acres of inventoried wildlife habitat	% of region's inventoried wildlife habitat in resource site
1	Lower Sandy River-Columbia River	5,712.3	2,490.4	43.6%	1,894.2	33.2%	392.6	6.9%	2,883.1	3.8%
2	Beaver Creek-Sandy River	10,336.6	2,118.3	20.5%	943.7	9.1%	317.3	3.1%	2,435.6	3.2%
3	Willamette River-Boeckman Creek	7,616.8	2,041.0	26.8%	273.7	3.6%	20.0	0.3%	2,061.0	2.7%
4	Willamette River-Lower Tualatin River	11,403.7	3,232.5	28.3%	767.8	6.7%	7.7	0.1%	3,240.3	4.3%
5	Council Creek	5,708.2	901.4	15.8%	230.4	4.0%	11.1	0.2%	912.5	1.2%
6	McKay Creek	3,842.7	482.7	12.6%	74.6	1.9%	1.6	0.0%	484.4	0.6%
7	Middle Rock Creek-Tualatin River	7,300.2	2,349.0	32.2%	234.4	3.2%	19.4	0.3%	2,368.4	3.1%
8	Beaverton Creek	24,297.0	5,146.4	21.2%	529.0	2.2%	80.0	0.3%	5,226.4	6.9%
9	Lower Rock Creek-Tualatin River	8,717.3	1,608.2	18.4%	314.7	3.6%	9.2	0.1%	1,617.4	2.2%
10	Middle Tualatin River-Gordon Creek	4,347.3	904.3	20.8%	214.1	4.9%	45.1	1.0%	949.4	1.3%
11	Lower Tualatin River-Lake Oswego Canal	15,231.1	5,345.8	35.1%	1,019.2	6.7%	8.6	0.1%	5,354.4	7.1%
12	Upper and Middle Fanno Creek	11,183.5	2,501.3	22.4%	200.7	1.8%	21.0	0.2%	2,522.3	3.4%
13	Summer Creek	3,769.1	818.6	21.7%	91.8	2.4%	13.7	0.4%	832.3	1.1%
14	Lower Fanno Creek	8,453.8	1,509.8	17.9%	263.5	3.1%	23.6	0.3%	1,533.4	2.0%
15	Rock Creek (south Washington Co.)	4,239.3	1,031.5	24.3%	661.0	15.6%	40.9	1.0%	1,072.5	1.4%
16	Richardson Creek	6,465.5	2,208.1	34.2%	436.3	6.7%	4.5	0.1%	2,212.6	2.9%
17	Rock Creek-Clackamas River	11,120.7	3,755.2	33.8%	675.9	6.1%	6.6	0.1%	3,761.7	5.0%
18	Johnson Creek-Sunshine Creek	12,372.9	4,734.6	38.3%	248.7	2.0%	87.7	0.7%	4,822.3	6.4%
19	Kelley Creek	3,175.6	1,410.0	44.4%	330.0	10.4%	12.1	0.4%	1,422.0	1.9%
20	Middle Johnson Creek	8,949.7	1,351.7	15.1%	425.2	4.8%	276.4	3.1%	1,628.1	2.2%
21	Lower Johnson Creek-Willamette River	5,950.3	1,457.2	24.5%	247.7	4.2%	14.0	0.2%	1,471.2	2.0%
22	Lake Oswego	4,168.7	1,005.3	24.1%	0.1	0.0%	3.0	0.1%	1,008.3	1.3%
23	Tryon Creek	4,356.5	1,896.9	43.5%	646.6	14.8%	0.6	0.0%	1,897.5	2.5%
24	Johnson Creek-Crystal Springs	7,844.6	810.8	10.3%	91.4	1.2%	7.7	0.1%	818.5	1.1%
25	Mount Scott Creek	11,809.8	2,152.5	18.2%	544.1	4.6%	50.5	0.4%	2,203.1	2.9%
26	Lower Willamette River	32,899.2	8,479.1	25.8%	5,369.6	16.3%	282.9	0.9%	8,761.9	11.7%
27	Columbia Slough	54,610.0	9,615.9	17.6%	6,380.7	11.7%	2,083.8	3.8%	11,699.7	15.6%
Total		295,882.5	71,358.7	24.1%	23,108.9	7.8%	3,841.7	1.3%	75,200.3	100.0%

Table 17. Percent of wildlife patch by wildlife model score and resource site (excludes Habitats of Concern).

Resource site#	Resource site name	Wildlife Model Score								
		1	2	3	4	5	6	7	8	9
1	Lower Sandy River-Columbia River	0.1%	0.4%	7.8%	15.6%	6.1%	5.4%	64.6%	0.0%	0.0%
2	Beaver Creek-Sandy River	0.6%	5.9%	24.5%	14.3%	15.9%	23.7%	15.2%	0.0%	0.0%
3	Willamette River-Boeckman Creek	1.8%	6.3%	17.7%	13.8%	20.4%	15.7%	13.6%	10.7%	0.0%
4	Willamette River-Lower Tualatin River	1.3%	7.3%	11.9%	5.9%	11.5%	53.7%	0.9%	7.4%	0.0%
5	Council Creek	2.6%	6.2%	35.0%	10.3%	15.9%	12.7%	17.1%	0.0%	0.0%
6	McKay Creek	4.2%	11.2%	31.7%	14.1%	8.4%	20.2%	4.5%	5.8%	0.0%
7	Middle Rock Creek-Tualatin River	1.3%	6.0%	13.9%	12.5%	4.1%	5.7%	1.9%	54.6%	0.0%
8	Beaverton Creek	4.8%	8.3%	9.3%	13.8%	10.0%	13.6%	4.7%	35.5%	0.0%
9	Lower Rock Creek-Tualatin River	3.3%	7.4%	13.1%	6.0%	8.5%	20.4%	19.9%	21.5%	0.0%
10	Middle Tualatin River-Gordon Creek	6.1%	14.3%	20.2%	19.7%	23.0%	16.6%	0.0%	0.0%	0.0%
11	Lower Tualatin River-Lake Oswego Canal	2.4%	2.7%	13.3%	12.7%	8.4%	40.0%	4.2%	16.2%	0.0%
12	Upper and Middle Fanno Creek	5.4%	6.0%	10.7%	12.3%	28.8%	31.3%	0.3%	5.2%	0.0%
13	Summer Creek	2.4%	11.0%	10.9%	21.6%	40.0%	10.5%	3.6%	0.0%	0.0%
14	Lower Fanno Creek	8.1%	8.4%	10.7%	22.0%	24.4%	20.6%	5.8%	0.0%	0.0%
15	Rock Creek (south Washington Co.)	2.6%	0.8%	11.5%	19.6%	3.7%	55.7%	6.0%	0.0%	0.0%
16	Richardson Creek	0.4%	3.8%	29.2%	23.5%	4.1%	18.5%	2.7%	17.9%	0.0%
17	Rock Creek-Clackamas River	1.1%	6.1%	18.5%	14.2%	14.1%	15.3%	29.0%	1.8%	0.0%
18	Johnson Creek-Sunshine Creek	0.6%	2.8%	14.0%	14.9%	16.4%	27.4%	23.9%	0.0%	0.0%
19	Kelley Creek	1.0%	1.1%	16.6%	9.1%	5.5%	23.5%	43.2%	0.0%	0.0%
20	Middle Johnson Creek	6.5%	1.8%	3.9%	8.1%	22.1%	2.9%	54.8%	0.0%	0.0%
21	Lower Johnson Creek-Willamette River	5.6%	8.2%	12.0%	8.3%	12.3%	53.6%	0.0%	0.0%	0.0%
22	Lake Oswego	4.2%	4.9%	12.4%	6.1%	7.8%	64.5%	0.0%	0.1%	0.0%
23	Tryon Creek	1.2%	2.4%	4.3%	4.5%	0.5%	2.7%	0.0%	84.2%	0.0%
24	Johnson Creek-Crystal Springs	9.2%	19.4%	13.6%	9.7%	41.3%	6.7%	0.1%	0.0%	0.0%
25	Mount Scott Creek	6.0%	8.1%	13.3%	16.3%	35.0%	17.0%	0.2%	4.0%	0.0%
26	Lower Willamette River	3.7%	3.0%	1.5%	3.3%	1.0%	9.4%	12.3%	65.8%	0.0%
27	Columbia Slough	2.7%	7.4%	13.0%	10.2%	6.0%	15.0%	13.2%	18.6%	13.8%
Totals		2.9%	5.5%	12.5%	11.6%	11.4%	20.9%	13.2%	20.2%	1.9%

Summary

The discussion above describes how Metro's Goal 5 inventories for riparian corridors and wildlife habitat meet the requirements of the Goal 5 rule by including regionally consistent information on the location, quantity and quality of resources in the region; fieldwork adds credibility to the inventory methods. Based on this, Metro's inventory is determined to be adequate for purposes of making a significance decision.

Determining regionally significant resources

Goal 5 legal requirements

If the information gathered about a resource site is considered adequate, the Goal 5 process then calls for a determination of whether a resource site is "significant." Significance is determined based upon the location, quantity and quality of the resource. Some of the criteria for determining significance are found in the rules governing specific Goal 5 resources. Local governments also may rely on "any additional criteria adopted by the local government" (OAR 660-023-0030(4)(c)). This represents a broad delegation of authority from the Land Conservation and Development Commission (LCDC) to local governments to add criteria to determine the significance of resource sites.

Identifying significant riparian resources

All of the areas mapped as providing function to the riparian corridor are ecologically significant. As discussed thoroughly in Metro's Technical Report for Fish and Wildlife Habitat, April 2005, activities throughout the entire watershed impact the health of the riparian corridor and the streams, thus affecting the quality of the habitat for fish and wildlife. The biological integrity of the riparian corridor depends, in part, on the width and condition of the riparian area, which dictates stream functions and ultimately the type of plant and animal species that can live in and around streams. Based on the previously described functional approach and consistent with Goal 5 TAC recommendations, Metro staff proposed defining the riparian corridor for purposes of the Goal 5 inventory as any site that receives a primary or secondary ecological function score¹³.

A landscape perspective of riparian corridors as contiguous, interconnected, and dynamic systems within a nested array of watersheds is critical in determining the significance of a specific riparian corridor. Metro's Technical Report for Fish and Wildlife Habitat identifies and discusses the ecosystem functions of riparian corridors. It emphasizes the value of the connectivity of the linear stream system across the landscape and the width of the riparian corridor as essential components for providing the properly functioning habitat for fish and wildlife. Each riparian corridor is important to enable a properly functioning network of streams and rivers to support fish and wildlife in the Metro region.

¹³ The riparian corridor is defined based on five functions: microclimate and shade; streamflow moderation and water storage; bank stabilization, sediment and pollution control; large wood and channel dynamics; and organic material sources.

Scientific basis

To the maximum extent possible, all perennial, intermittent and ephemeral streams should be protected from surrounding land use activities by a buffer (May 2000). The effectiveness of a riparian corridor protection program depends on the percentage of stream miles that are protected; the more miles protected, the more effective a program will be (Wenger 1999). As stated by Fischer et al. (2000): "Continuous buffers are more effective at moderating stream temperatures, reducing gaps in protection from non-point source pollution, and providing better habitat and movement corridors for wildlife."

Several functions important for fish and wildlife are influenced by the entire system of streams. For instance, nearly half of the large woody debris found in low gradient streams is delivered from upstream sources (Pollock and Kennard 1998). Studies have also found that the temperature of streams is influenced not only by the condition of adjacent forest but also by upland forest conditions and upstream conditions (Pollock and Kennard 1998). The hydrologic regime of a stream at any given point is directly related to development patterns and activities in all hydrologically connected upstream drainages (Wigmosta et al. 1994; Booth 2000).

The entire stream network functions as a system, thus removing the connection between intermittent and perennial streams may have detrimental consequences to the physical and biological components of stream ecosystems, particularly in the long term (FEMAT 1993). Naiman et al. (1992) stated that intermittent streams are an important, often overlooked, component of aquatic ecosystems.

Riparian buffers are especially important along the small headwater streams that typically make up the majority of stream miles in any basin (Osborne and Kovacic 1993; Binford and Bucheneau 1993; Hubbard and Lowrance 1994; Lowrance et al. 1997; May et al. 1997a; Fischer et al. 2000). These smaller streams have more interaction with the land and riparian vegetation plays an integral role in reducing sediment and other pollutants, maintaining temperature regimes, and providing large woody debris and other organic inputs (FEMAT 1993). Riparian buffers along larger streams have less of an impact on water quality, however they often are longer and wider thus providing better wildlife habitat (Fischer et al. 2000).

In urban areas the functions of the aquatic ecosystem are altered, as described in the previous section. Increased urbanization causes an increase in negative inputs such as contaminants, sediments and stormwater flow, and also reduces the amount of large woody debris and other organic inputs required for the survival of aquatic life (Booth et al. 1997; Todd 2000). Johnson and Ryba (1992) stated that "a large buffer in an area of high-intensity land use... is more essential than in low-intensity land use areas." FEMAT (1993) recommends 91 m (300 ft) on each side of fish bearing streams in a forested landscape, as well as protecting permanently flowing non-fish bearing streams; constructed ponds, reservoirs, and all wetlands greater than one acre; all lakes and natural ponds; and seasonal or intermittent streams, smaller wetlands, and unstable areas to a lesser extent. The protection of all of these areas is crucial to maintaining habitat for aquatic and riparian-associated wildlife. In an urban area, with the greater impacts associated with urbanization, a protection scheme of less than that recommended by FEMAT in the forested landscape may not be sufficient to fully provide fish and wildlife habitat.

Identifying regionally significant riparian resources

The Goal 5 rule includes language specific to Metro that allows the protection of regional resources. The rule states that a “regional resource is a site containing a significant Goal 5 resource...” (OAR 660-23-080 (1)(b)). The regional resources must be identified on a map adopted by Metro ordinance. This language implies that Metro has considerable leeway in defining a regional resource. Title 3 Section 5 states that Metro will protect “regionally significant resources.” Therefore, Metro is considering “regionally significant resources” and “regional resources” to be synonymous. Metro’s Regional Framework Plan also calls for protection of “regionally significant parks, natural areas, open spaces, trails and greenways” in Section 3.2.

There are many alternative methodologies that could be selected to identify “regionally significant resources.” In October 2000 the Metropolitan Policy Advisory Committee (MPAC), a body that consists of elected officials representing the cities and counties within the Metro region, adopted a Vision Statement that included a vision, goal, and objectives. The language in the Vision Statement reflects the many regional, state, and federal policies that have guided Metro in developing a strategy for protecting fish and wildlife habitat. The vision and goal as described in the document are:

Vision: Our region places a high priority on the protection of its streams, wetlands and floodplains to maintain access to nature; sustain and enhance native fish and wildlife species and their habitats; mitigate high storm flows and maintain adequate summer flows; provide clean water; and create communities that fully integrate the built and natural environment. As ribbons of green, stream and river corridors maintain connections with adjacent upland habitats, form an interconnected mosaic of urban forest and other fish and wildlife habitat, and contribute significantly to our region’s livability. The RUGGOs state that the region should “Manage watersheds to protect and ensure to the maximum extent practicable the integrity of streams, wetlands and floodplains, and their multiple biological, physical, and social values,” as well as that “A region-wide system of linked significant wildlife habitats should be developed. This system should be preserved, restored where appropriate, and managed to maintain the region’s biodiversity.”

Goal: The overall goal is to conserve, protect and restore a continuous ecologically viable streamside corridor system, from the streams’ headwaters to their confluence with others streams and rivers, and with their floodplains in a manner that is integrated with the surrounding urban landscape. This system will be achieved through conservation, protection and appropriate restoration of streamside corridors through time.

Table 18 below shows several alternatives for identifying regionally significant riparian corridors, a brief discussion of each alternative, and an assessment of how well each alternative meets the criteria for identifying regionally significant resources (below). These options were considered by staff, various advisory committees, the executive officer, and the Council, in that order. Staff recommended retaining all areas receiving one or more primary functions as regionally significant. However, after much discussion the Metropolitan Technical Advisory Committee (MTAC) recommended retaining everything on the map as regionally significant. The discussion below, regarding the assessment of criteria for identifying regionally significant riparian corridors, follows the thought process providing the basis for Metro’s decision.

1. **Science-based** means that the option is compatible with the information presented in Metro’s Technical Report for Fish and Wildlife Habitat, and that it is likely to provide some level of protection for each of the five identified Ecological Functional Values addressed in Metro’s GIS model.

2. **Watershed approach** implies that the option provides resource protection with the minimum spatial unit considered being a watershed. This is consistent with Metro's Regional Urban Growth Goals and Objectives (RUGGOs) Objective 12 and Metro's Regional Framework Plan (RFP) section 4.13, dealing with watershed management and regional water quality, and is an important component of master planning because conditions in one part of the watershed may be influenced by activities in all other parts of the watershed.
3. **Protects hydrology** within this context suggests that an option will help protect existing hydrologic function from further human-induced alteration. In urbanized watersheds, altered hydrology is a fundamental pathway to ecological and biological degradation. However, it is important to recognize that hydrology in many of the region's watersheds is already substantially altered, and restoration of more natural hydrological regimes will require programs that address the fundamental impacts on hydrology, such as impervious surfaces and piping of stormwater runoff directly to streams.
4. **Promotes connectivity:** Connectivity refers to how tributaries are connected to larger rivers, how groundwater interacts with surface water, how water moves among streams, wetlands and floodplains, and how fish and wildlife move among watershed components (aquatic and terrestrial). The ecological health of a watershed (and its wildlife) depends in part on the connectivity between and among streams and other water resources, as well as the riparian area, over space and time. Well-connected streams and riparian buffers serve as movement corridors for wildlife and plants, allowing re-population of extirpated species, gene flow over space, and dispersal and migration corridors. Metro's Vision Statement reiterates our commitment to regional connectivity: "As ribbons of green, stream and river corridors maintain connections with adjacent upland habitats, form an interconnected mosaic of urban forest and other fish and wildlife habitat, and contribute significantly to our region's livability."
5. **Multispecies benefits** implies protection of vertebrate and invertebrate biological diversity (not just fish). This is consistent with Metro's RUGGOs stating that the region should "Manage watersheds to protect and ensure to the maximum extent practicable the integrity of streams, wetlands and floodplains, and their multiple biological, physical, and social values." To protect the region's biodiversity, options with multispecies benefits provide a more holistic ecological approach, and may help prevent future Endangered Species Act listings of other species.
6. **Restoration potential:** alternatives addressing this criterion will address certain areas within and near the riparian corridor that may be currently degraded, but are important to wildlife and hydrology and could be restored to increase ecological function. While not required by Goal 5, restoration of such areas is consistent with Metro's RUGGOs and Vision Statement and would likely result in higher levels of ecological function, increase the potential for ESA compliance, and decrease the potential for future ESA listings.
7. **Meets Goal 5 requirements:** alternatives likely to be in compliance with the rules outlined in the Goal 5 rule.
8. **Meets the goals in the Vision Statement:** alternatives that support the goals outlined in Metro's Vision Statement.
9. **Likely to address ESA requirement:** alternatives that are likely to be consistent with National Marine Fisheries Services' matrix of Pathways and Indicators and what is necessary to protect critical fish habitat.

Each alternative in Table 18 is evaluated based on how well it meets all nine of the above criteria for identifying regionally significant resources. Metro staff applied the information in Metro's

Technical Report for Fish and Wildlife Habitat and best professional judgment in evaluating each alternative against the criteria.

Table 18. Alternatives for determining regionally significant riparian corridors.

Alternatives for determining regional significance	Discussion	Criteria for identifying regionally significant resources							
		Science-based	Watershed approach	Protects hydrology	Promotes connectivity	Multispecies benefits	Restoration potential	Meets state Goal 5 requirements	Meets the goals in the Vision Statement
1. Identifying all areas within Metro's defined riparian corridor as significant regional resources.	A wealth of scientific literature describes the important functions and values of riparian corridors for fish and wildlife habitat. Federal, State, local and Metro policy also identifies the importance of riparian corridors, while public opinion indicates high value placed on streams as well. Protecting riparian corridors is an important part of a salmonid recovery strategy for the Metro region, in response to the ESA listings. While not every riparian corridor in the region contains a salmon-bearing stream, this does not negate the importance of every riparian corridor in the larger picture of salmonid fish populations and habitat for other fish and wildlife species. While some riparian corridors may currently be degraded, the resource still may be deemed significant due to its restoration and enhancement potential. This option provides the most potential for protecting and restoring fish and wildlife habitat in the Metro region.	4	4	4	4	4	4	4	4
2. Identifying all areas receiving an ecological function score of 3 or more within Metro's defined riparian corridor as significant regional resources.	This alternative would reduce the amount of land that would fall within the area identified as being a regional resource by omitting areas receiving secondary scores for either the water storage or microclimate functions. Forest patches receive a secondary score for microclimate between 101-780 feet from a stream and for water storage until there is a break in the patch.	4	4	?	?	4	4	4	4
3. Identifying all areas receiving an ecological function score of 6 or more within Metro's defined riparian corridor as significant regional resources.	All of the sites receiving an ecological function score provide an important contribution to fish and wildlife habitat. However, the areas receiving primary ecological function scores are the most critical to maintain and restore healthy streams and riparian corridors. Most of the widths delineating primary ecological functions are based on a minimum corridor width identified in the science. As long as vegetation is present, this alternative results in a 150-ft corridor without the presence of steep slopes, which extend it to 200 ft. The minimum corridor width is 50 ft. Based on Metro's Technical Review for Goal 5, this alternative depicts the minimum area likely to provide the basis for a scientifically sound decision.	4	4	?	?	4	?	4	4
4. Identifying all areas receiving an ecological function score of 12 or more within Metro's defined riparian corridor as significant regional resources.	This alternative would identify all sites that receive two or more primary ecological function scores as regional resources. The result of this alternative would be a 100-ft corridor (with vegetation present) up to 150 ft with steep slopes, or a 50-ft default for bank stabilization and channel migration. While this alternative may meet state Goal 5 requirements, it is not likely to meet the Council adopted Vision Statement or federal ESA requirements. This option fails to adequately safeguard the full suite of riparian functions necessary to protect fish and wildlife habitat and water quality, such as Ecological Functional Values that often extend spatially beyond the limits outlined here (e.g., Microclimate and Shade, Streamflow Moderation and Water Storage). Ecologically important but degraded areas (e.g., unvegetated but undeveloped areas that could be restored) would be excluded.	4	4	?	?	4	?	4	

Alternatives for determining regional significance	Discussion	Criteria for identifying regionally significant resources								
		Science-based	Watershed approach	Protects hydrology	Promotes connectivity	Multispecies benefits	Restoration potential	Meets state Goal 5 requirements	Meets the goals in the Vision Statement	Likely to address ESA requirements
5. Identifying only the riparian corridors on fish-bearing streams as regional resources.	This option only addresses the symptoms of ecological degradation (endangered species), not the causes, and is narrowly focused on fish. The data and maps depicting fish-bearing streams are inadequate for the Metro region and therefore using this criterion could exclude many miles of fish-bearing streams, resulting in inconsistent resource protection. It also excludes streams that could bear fish if structural blockages were altered or removed, as well as non-fish-bearing streams that add cold water, large wood, and nutrients that feed into fish-bearing streams. This option is unlikely to adequately protect any of the identified Ecological Functional Values on a regional basis.	4					?	4		
6. Identifying only the riparian corridors with high quality habitat as regional resources.	There is no comprehensive database or map of riparian corridor habitat quality for the Metro region. Riparian corridor habitat assessments have been conducted for only selected watersheds around the region. In addition, "high quality" is a judgement call. This project does not exclusively focus on the quality of the riparian corridor habitat because its goals are to protect, restore and conserve riparian corridors regardless of their current condition. If this option were chosen, it would result in identifying a limited and potentially inadequate number of riparian corridor miles as regional resources, and would not adequately protect the identified Ecological Functional Values on a regional basis.					4		4		
7. Identifying only the riparian corridors with designated threatened, endangered or sensitive fish and wildlife species present as regional resources.	This option only addresses the symptoms of ecological degradation (endangered species), not the causes, and is narrowly focused on species that are already at risk. The goal described in the Vision Statement is to protect, conserve and restore riparian corridors for all fish and wildlife species that use these corridors for food, shelter, protection and as travel corridors in the Metro region. Lack of comprehensive, consistently collected data would result in inconsistent and inadequate resource protection under this option. This project has used a multi-species approach in order to ensure that the greatest numbers of species are protected. If this option were chosen, it would fail to protect the identified Ecological Functional Values in the region.					4		4		
8. Identifying only the riparian corridors currently protected by cities and counties as significant regional resources.	Metro's analysis of Goal 5 fish and wildlife habitat protection programs in the region revealed that Goal 5 protection varies significantly from high levels of protection to little or no protection. Current individual Goal 5 programs do not add up to a regionally consistent or comprehensive protection program for riparian corridor fish and wildlife habitat. If this option were chosen, it would not result in adequate protection of the identified Ecological Functional Values at the regional level.				?	4	?	4		

Based on the policies included in the Vision Statement and Goal 5 TAC recommendations, Metro used the ecological functions approach to identify regionally significant resources. As described previously, this approach combines GIS mapping technology, scientific recommendations, and fieldwork for an inventory that encompasses the entire Metro region. The approach provides adequate information on the location, quantity, and quality of the riparian corridor resources in the region. On the basis of all of the information considered, based on the criteria describe above and on advice Metro received from its advisory committees, Metro designates all of the identified riparian inventory as regionally significant.

Identifying significant wildlife habitat resources

All of the areas mapped as providing wildlife habitat are biologically significant. As discussed in Metro's Technical Report for Fish and Wildlife Habitat, wildlife habitat loss has been pervasive in our region and has resulted in widespread fragmentation and degradation of remaining habitats. Several habitat types and numerous wildlife species are formally recognized to be at-risk by natural resources agencies in our region.

Important guidelines in developing a conservation plan for wildlife habitat are: large habitat patches are better than small patches; small patches of unique habitat are worth saving; connectivity to other patches is important; and connectivity and/or proximity to water resources is valuable. These factors help determine habitat quality, thus they play key roles in what species can utilize habitat patches and persist over the long term in our region.

A substantial portion of existing wildlife habitat in the region was excluded from Metro's wildlife habitat inventory at the outset. For example, our inventory focused on patches with closed forest canopy, with low-structure vegetation only appearing in the inventory if it is within 300 feet of a waterway. The inventory also set a minimum patch size of 2 acres (except for wetlands). Thus, upland forested patches that were not in closed canopy conditions were excluded, as were most low-structure patches further than 300 feet from water sources and most patches smaller than 2 acres. Taking this into account and considering the substantial losses of natural cover over time, each habitat patch in the inventory may be important to enable a properly functioning habitat network to support the long-term persistence of wildlife in the Metro region.

landscape perspective of wildlife habitats as contiguous, interconnected, and dynamic systems within a nested array of watersheds is critical in determining the significance of a specific habitat patch. Metro's Technical Report for Fish and Wildlife Habitat identifies and discusses the ecosystem functions of wildlife habitats. It emphasizes the value of connectivity across the landscape as an essential component for providing properly functioning habitat for wildlife. Based on the previously described inventory approach and consistent with Goal 5 TAC recommendations, Metro staff proposed defining wildlife habitat for purposes of the Goal 5 inventory as any site that receives a score of one or more on the wildlife habitat GIS model scoring system (described in Table 7 on page 26 of this report), or any site that has been mapped as a Habitat of Concern.

Scientific basis

Urban environments have similar ecological problems worldwide, including habitat loss, fragmentation, damage and simplification (instream and terrestrial); introduced species; and human disturbance (see Metro's Technical Report for Fish and Wildlife Habitat, Impacts of Urbanization section). Native vegetation plays a critical role in a watershed, particularly the longitudinal and lateral connectivity of the riparian corridor but also within specific upland habitat types such as oak. Downed wood and snags (or large woody debris), frequently found in natural ecosystems but often lacking in disturbed environments, are crucial in providing high quality habitat in both aquatic and terrestrial ecosystems; many at-risk species in our region depend on large wood to meet their life-history needs.

The characteristics that Metro has incorporated into its wildlife habitat inventory are designed to conserve the features known to be most critical to a healthy regional system of wildlife habitats. The importance of these characteristics are reviewed in Metro's Technical Report for Fish and Wildlife Habitat, April 2005.

For example, large habitat patches typically contain more large wood, fewer nonnative plants and animals, and better three-dimensional structure than smaller patches. Patch shape also influences these factors. Between-patch connectivity along streams provides both water and passage to wildlife, allowing post-breeding dispersal and natural reintroduction of locally extirpated species. The wildlife habitat inventory represents a regional “backbone” of habitats that have the potential to support healthy, productive and diverse wildlife populations as the region’s human population increases over time. This habitat system’s value could be further increased by building additional connectivity and improving native conditions through carefully planned habitat restoration; our regional approach to evaluating wildlife habitats provides an excellent opportunity to identify key restoration sites based that may disproportionately, positively influence conditions for wildlife.

Identifying regionally significant wildlife habitat resources

The Goal 5 rule includes language specific to Metro that allows the protection of regional resources. The rule states that a “regional resource is a site containing a significant Goal 5 resource...” (OAR 660-23-080 (1)(b)). The regional resources must be identified on a map adopted by Metro ordinance. This language implies that Metro has considerable leeway in defining a regional resource. Title 3 Section 5 states that Metro will protect “regionally significant resources.” Based on habitat loss over time, it could validly be argued that all habitats identified in the inventory are regionally significant and contribute to the vitality of the region’s wildlife. However, smaller, more isolated habitat patches lacking in water resources generally provide less value to wildlife than larger, well-connected patches with water; fieldwork confirms what the scientific literature tells us.

There are many alternative methodologies that could be selected to identify “regionally significant resources.” Metro’s goals in identifying regionally significant wildlife habitats are to meet the vision, goals and objectives in the Vision Statement endorsed by MPAC (described in the regional significance section for riparian corridors, above) and to comply with the Goal 5 rule. The Regional Significance decision should aim for “A region-wide system of linked significant wildlife habitats should be developed. This system should be preserved, restored where appropriate, and managed to maintain the region’s biodiversity.” (Vision Statement)

Table 19 below shows several alternatives for identifying regionally significant riparian corridors, a brief discussion of each alternative, and an assessment of how well each alternative meets the criteria for identifying regionally significant resources (below). These options were considered by staff, various advisory committees, the executive officer, and the Council, in that order.

Each alternative in Table 19 below is evaluated based on how well it meets all five of the criteria for identifying regionally significant wildlife habitat resources. Metro staff applied the information in Metro’s Technical Report for Fish and Wildlife Habitat and best professional judgement in evaluating each alternative against the criteria.

- 1. Meets Goal 5 requirements:** alternatives likely to be in compliance with the rules outlined in the Goal 5 rule.
- 2. Meets the goals in the Vision Statement:** alternatives that support the goals outlined in Metro’s Vision Statement.

3. **Supports the goals in ODFW's Wildlife Diversity Plan:** Options meeting this criterion should directly support a goal, priority, or strategy stated in ODFW's Wildlife Diversity Plan (ODFW 1993). The Goal 5 rule states that when gathering information regarding wildlife habitat under the standard inventory process in OAR 660-23-030(2), local governments shall obtain current habitat inventory from ODFW and other state and federal agencies. Because such habitat information is limited, Metro has also incorporated ODFW's wildlife diversity goals for the state into the Goal 5 inventory process. The stated goal of ODFW's Wildlife Diversity Plan is: "To maintain Oregon's wildlife diversity by protecting and enhancing populations and habitats of native wildlife at self-sustaining levels throughout natural geographic ranges." The Plan also recognizes that habitat is most often the key to maintaining wildlife populations, and that a multi-species, ecosystem-based approach to research and management should be used whenever possible. Metro's vertebrate species list (Appendix 7) identifies wildlife species that are native to this region (e.g., species whose natural geographic ranges fall within the metro area). Options with a high level of agreement with this criterion should: (1) be science-based, (2) consider at least a watershed approach, and (3) pay particular attention to the protection of at-risk habitats and species (including groups of at-risk species such as Neotropical migratory birds), as manifested in the Habitats of Concern and through patch size and connectivity issues.
4. **Consistent with Metro's Technical Report for Fish and Wildlife Habitat** means that the option is compatible with the information presented in Metro's Goal 5 Technical Review (scientific literature review), and that it is likely to qualitatively differentiate habitat patches based on each of the four identified habitat characteristics addressed in Metro's GIS model (patch size, shape, connectivity to other patches, and water resources).
5. **Ecosystem approach:** ODFW's Wildlife Diversity Plan recognizes that a multi-species, ecosystem-based approach to research and management should be used whenever possible, stating that:

...Maintaining wildlife diversity means maintaining the full array of native species and populations of those species. To this end, the Plan calls for a multi-species, ecosystem-based approach whenever possible...An ecosystem approach to wildlife management represents (in its broadest sense) a philosophy of natural resource management that emphasizes sustaining ecological values and functions while deriving socially-defined benefits. Ecosystem management considers all natural components, both biological and physical, rather than focusing on single species or groups of species. (ODFW 1993)

ODFW does not provide a spatially explicit definition of ecosystem, but states that ecosystem management assumes that by preserving adequate amounts, quality and connectivity of habitat, all wildlife species will be maintained. The metro region is largely contained within ODFW's recognized Western Interior Valleys physiographic province, and forms a cohesive ecosystem unit via the influences of the greater Portland region's urbanization patterns, which exert varying (but predictable) degrees of human influence along the urban-rural gradient. Alternatives supporting this criterion should consider the region's wildlife habitats as a cohesive, interrelated system.

6. **Promotes sensitive species/habitat conservation:** the Goal 5 rule states that when gathering information regarding wildlife habitat under the standard inventory process in OAR 660-23-030(2), local governments shall obtain current habitat inventory from ODFW and other state and federal agencies, including at least the following:
- Threatened, endangered, and sensitive wildlife species habitat information;
 - Sensitive bird site inventories; and
 - Wildlife species of concern and/or habitats of concern identified and mapped by ODFW...
- Sensitive, or at-risk, species and habitats are also identified as priorities by ODFW. Note that neither ODFW nor any other agency has systematically mapped species or habitats of concern specifically for the metro region. Partial information is available from a variety of sources, and Metro used such data

to incorporate site-specific sensitive species information into the Habitats of Concern layer (for example, know native turtle nesting and crossing areas). Although site-specific species information is limited, many sensitive species are habitat specialists relying on sensitive habitats, such as riparian or grasslands; regional loss of these habitats contributes to these sensitive species' decline. The Habitats of Concern layer includes all of the sensitive habitat information that Metro has received (verified using aerial photos and GIS data) and that meet our definition of Habitats of Concern (based on ODFW, USFWS, Partners in Flight, and the Oregon Biodiversity Project), including: priority conservation habitats (based on ODFW, USFWS, the Oregon Biodiversity Project, and the Oregon/Washington chapter of Partners in Flight); riverine islands and deltas; and patches providing unique or critical wildlife functions, such as migration corridors and stopover habitat, inter-patch connectors, and biologically or geologically unique areas habitat vital for a sensitive species. Alternatives supporting this criterion should include the full known extent of the Habitats of Concern layer.

- 7. **Maintains existing connectivity:** Metro's RUGGOs state that, "A region-wide system of linked significant wildlife habitats should be developed. This system should be preserved, restored where appropriate, and managed to maintain the region's biodiversity." Connectivity in the wildlife habitat context refers to how well fish and wildlife can move among watershed components (aquatic and terrestrial). The ecological health of a watershed and its wildlife depends in part on the connectivity between and among streams and other water resources, as well as the riparian area and upland habitats, over space and time. Well-connected streams, riparian buffers, and upland patches serve as movement corridors for wildlife and plants, allowing re-population of extirpated species, gene flow over space, and migration and dispersal corridors. Within Metro's wildlife habitat inventory, many patches providing important connectivity corridors are not forested, but consist of low-structure vegetation, including agricultural lands; in addition to connectivity, these habitats are very important to wildlife species dependent on non-forested habitats, such as grassland bird and mammal species. Alternatives resulting in significant reduction of existing connectivity, such as substantial omission of low-structure connector patches or options failing to consider connectivity, would not meet this criterion (and would also reduce the amount of available grassland and shrub habitat in the inventory).
- 8. **Maximizes restoration potential:** alternatives addressing this criterion will address certain areas that may be currently degraded, but are important to wildlife and could be restored to increase wildlife habitat functions and value. The more lower-scoring areas included as regionally significant, the more restoration potential exists in a regional wildlife habitat plan, in terms of improving both habitat quality and connectivity. For example, low-structure vegetation within 300' of streams, or small "stepping-stone" upland habitats providing important inter-patch connectivity for birds, could be enhanced with native plants or improved with connectivity in mind. While not required by Goal 5, restoration of such areas is consistent with Metro's RUGGOs and Vision Statement as well as ODFW's Wildlife Diversity Plan, and would likely result in higher levels of ecological function, increase the potential for retaining sensitive species, and decrease the potential for future ESA listings. Alternatives supporting this criterion would be more inclusive of smaller connector patches, regardless of their current condition.