BEFORE THE METRO COUNCIL

FOR THE PURPOSE OF ESTABLISHING CRITERIA TO DEFINE AND IDENTIFY REGIONALLY SIGNIFICANT WILDLIFE HABITAT AND ADOPTING A DRAFT MAP OF REGIONALLY SIGNIFICANT WILDLIFE HABITAT AREAS	))))))	RESOLUTION NO. 02-3177A Introduced by Councilor Susan McLain, Chair, Natural Resources Committee

WHEREAS, the Regional Framework Plan and Urban Growth Management Functional Plan (Functional Plan) state that Metro will undertake a program for protection of fish and wildlife habitat; and

WHEREAS, the Title 3, Section 5 of the Functional Plan sets forth actions anticipated by Metro Council that Metro would take in identifying, considering, and protecting regionally significant fish and wildlife habitat conservation areas; and

WHEREAS, Metro is applying the State Goal 5 administrative rule as the framework for identifying regionally significant fish and wildlife habitat areas; and

WHEREAS, Metro Council has determined that OAR 660-023-0090 (riparian corridors) and OAR 660-023-0110 (wildlife habitat) are the relevant State Goal 5 resources for Metro Council consideration of regional fish and wildlife habitat to be consistent with State Goal 5; and

WHEREAS, on December 13, 2001, Metro Council adopted Resolution No. 01-3141C for the purpose of establishing criteria to define and identify regionally significant fish habitat; and

WHEREAS, in public hearings before Metro Council Natural Resources Committee and in recommendations from the Metro Policy Advisory Committee (MPAC), Metro Technical Advisory Committee (MTAC), Metro Goal 5 Technical Advisory Committee (Goal 5 TAC) and the Water Resources Policy Advisory Committee (WRPAC) Metro Council was urged to complete the analysis of potential regionally significant wildlife habitat and combine that information with the mapping of regionally significant riparian corridors; and

WHEREAS, in Resolution No. 01-3141C, Metro Council directed staff to complete additional work necessary to inventory and map regional wildlife habitat and present that information to Metro Council in early 2002; and

WHEREAS, in response to Metro Council's direction, staff compiled a decision package similar to the package provided for Metro Council's consideration of regionally significant riparian corridors. That package included the following products:

- An analysis of existing Goal 5 data, reports and regulations from cities and counties. This information is contained in a November 20, 2001 memo from the Office of General Counsel on local Goal 5 data, reports and regulations and additional information concerning fish and wildlife habitat areas gathered and exchanged with local governments and agencies.
- A methodology and criteria for identifying wildlife habitat and maps applying those criteria to the region.

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OMA/KDH/kvw (08/09/02)

- A map(s), based on the regionwide wildlife habitat maps, identifying Goal 5 resource sites and Goal 5 "wildlife habitat" within those resource sites to serve as the basis for identifying regionally significant wildlife habitat.
- An inventory narrative including information on the location, quantity and quality of the potential resource sites identified on the map.
- A map(s) of potential significant resource sites containing wildlife habitat.
- A summary of recommended criteria for identifying and defining regionally significant wildlife habitat.
- A map(s) of potential resource sites containing wildlife habitat, which could be adopted as "regional resources" under the Goal 5 administrative rule. The map of resource sites is the map identified as Exhibit B of Resolution No. 01-3141C; and

WHEREAS, staff presented draft criteria to Metro Council Natural Resources Committee in February 2002 for identifying Goal 5 wildlife habitat based on information contained in "Metro's Scientific Literature Review for Goal 5;" and

WHEREAS, the Metro Council Natural Resources Committee held numerous public hearings and accepted public comment on the topic of regionally significant wildlife habitat including hearings on June 26, July 3, July 17, and July 31, 2002; and

WHEREAS, on June 7, 2002, the Goal 5 Technical Advisory Committee recommended that the June 4, 2002 draft of the Wildlife Habitat Criteria Matrix be adopted with the following modifications: 1) for each criterion, include references back to the Goal 5 Technical Report that directs the reader to the underlying science as documented in Metro's *Technical Report for Goal 5* dated January, 2002.; 2) for the "Connectivity and Proximity to Water Resources" criterion, the average distance of a patch from water sources such as streams, lakes and wetlands *within 320 feet of the patch* should be changed to *within 300 feet of the patch* (it is already mapped using the latter); and 3) for the "Habitats of Concern and Habitats for Unique and Sensitive Species" criterion, Metro should include information on the wetlands inventory layer addressing how it incorporated local wetlands inventory information. The Goal 5 TAC recommended that all inventoried wildlife habitat receiving a score of 2 through 9 including all Habitats of Concern should be identified as regionally significant wildlife habitat; and

WHEREAS, at their June 10 meeting, the Water Resources Policy Advisory Committee recommended that Metro accept the revised inventory of regionally significant riparian corridors and adopt Resolution No. 02-3176.; and that Metro accept the June 4, 2002 version of the Wildlife Habitat Criteria Matrix and the April 17, 2002 decision draft map as the inventory of significant wildlife habitat. At their July 15, 2002 meeting, the Water Resource Policy Advisory Committee recommended that Metro designate all wildlife habitat areas receiving a score of 1 through 9 including Habitat of Concern as regionally significant; and

WHEREAS, at their July 17, 2002 meeting, the Metro Technical Advisory Committee recommended adoption of the draft wildlife habitat criteria dated June 4, 2002; with the same modifications recommended by the Goal 5 TAC as listed above. In addition, they included the recommendation that in cases where Habitats of Concern have been designated solely on the basis of documented species use of a given area, biological survey data should be required as a minimum, for documentation; and

WHEREAS, at the July 24, 2002 meeting, the Metro Policy Advisory Committee recommended that the Metro Council adopt the recommendations as indicated in the Metro Technical Advisory Committee recommendation, including adoption of the draft Wildlife Habitat inventory map for those areas receiving a score of 2 through 9 including Habitats of Concern; and

WHEREAS, areas with a score of 1 in exhibit B, while not regionally significant Goal 5 resources as individual sites, are significant resource sites, and in the aggregate have multiple values that provide important elements of wildlife habitat, stormwater protection, urban forestry canopy and livability; now, therefore,

BE IT RESOLVED:

1. That Metro Council finds that the information in Exhibit A, including *Metro's Riparian Corridor and Wildlife Habitat Inventories*, dated July 2002, and *Metro's Scientific Literature Review for Goal 5*, dated January 2002, contain adequate information to determine the location, quantity and quality of wildlife habitat resources in the Metro region.

2. That Metro Council finds that sufficient data has been gathered and examined concerning local Goal 5 data, reports and regulations to comply with Title 3, Section 5(C)(2) of the Functional Plan.

3. That the Metro Council is relying on the same Goal 5 resource sites identified in Resolution No. 01-3141C as resource sites that contain Goal 5 wildlife habitat resources.

4. Metro Council accepts the Metro Council Natural Resources Committee, WRPAC, Goal 5 TAC, MTAC and MPAC recommendations that the resources shown on Exhibit B are significant "wildlife habitat" resources.

5. That Metro Council interprets the term "regionally significant" wildlife habitat as that term is used in Title 3 of the Functional Plan to be those Goal 5 wildlife habitat resources that qualify as "regional resources" under the Goal 5 administrative rule.

6. That the Metro Council adopts the criteria in Exhibit C, revised as recommended by the Metro Policy Advisory Committee cited above as criteria that define regionally significant wildlife habitat. A resource need not meet every criteria to be considered regionally significant.

7. That Metro Council has applied the criteria identified in Exhibit C to the information in Exhibits A and B to define regionally significant wildlife habitat as all areas scoring 2 through 9 including Habitats of Concern as identified in Exhibit D. The Metro Council recommends that areas scoring 1 be considered by local governments in their local Goal 5 process.

8. That staff is directed to produce a combined map reflecting Metro Council's regionally significant riparian corridor decision in Resolution No. 01-3141C and its decision on regionally significant wildlife habitat.

9. That the map of regionally significant riparian corridors and wildlife habitat that staff has been directed to produce will be a draft map which will be the basis for conducting subsequent steps in the Goal 5 process including the economic, social, environmental and energy consequences analysis and the Program to Achieve Goal 5.

10. Metro Council reserves the opportunity to minimally or substantially alter the draft map prior to adoption of a final map of regionally significant fish and wildlife habitat areas and Program to Achieve Goal 5, after public comment and review.

11. The draft map of regionally significant wildlife habitat will be subject to correction for accuracy until the Council reaches a final decision including the ESEE analysis and program choices which is anticipated in 2003. The Council directs the staff to review all new requests for map corrections during the ESEE and program steps of the regional fish and wildlife project, making changes where documentation of the presence or absence of a physical feature is demonstrated. In addition, staff is directed to develop a post adoption map correction process that may be adopted as an amendment to the Urban Growth Management Functional Plan.

12. The Metro Council's actions in this resolution are not final actions designating regionally significant fish and wildlife habitat areas or a final action to protect those areas through a Program to Achieve Goal 5.

ADOPTED by the Metro Council this 8th day of AUGUST 2002.

Susan McLain

Carl Hosticka, Presiding Officer

Deputy Presiding Officer

Approved as to Form:

Daniel B. Cooper, General Counsel

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OMA/KDH/kvw (08/09/02)

BEFORE THE METRO COUNCIL

FOR THE PURPOSE OF ESTABLISHING CRITERIA TO DEFINE AND IDENTIFY REGIONALLY SIGNIFICANT WILDLIFE HABITAT AND ADOPTING A DRAFT MAP OF REGIONALLY SIGNIFICANT WILDLIFE HABITAT AREAS	) RESOLUTION NO. 02-3177A) Introduced by Councilor Susan McLain, Chair, Natural Resources Committee

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WHEREAS, the Title 3, Section 5 of the Functional Plan sets forth actions anticipated by Metro Council that Metro would take in identifying, considering, and protecting regionally significant fish and wildlife habitat conservation areas; and

WHEREAS, Metro is applying the State Goal 5 administrative rule as the framework for identifying regionally significant fish and wildlife habitat areas; and

WHEREAS, Metro Council has determined that OAR 660-023-0090 (riparian corridors) and OAR 660-023-0110 (wildlife habitat) are the relevant State Goal 5 resources for Metro Council consideration of regional fish and wildlife habitat to be consistent with State Goal 5; and

WHEREAS, on December 13, 2001, Metro Council adopted Resolution No. 01-3141C for the purpose of establishing criteria to define and identify regionally significant fish habitat; and

WHEREAS, in public hearings before Metro Council Natural Resources Committee and in recommendations from the Metro Policy Advisory Committee (MPAC), Metro Technical Advisory Committee (MTAC), Metro Goal 5 Technical Advisory Committee (Goal 5 TAC) and the Water Resources Policy Advisory Committee (WRPAC) Metro Council was urged to complete the analysis of potential regionally significant wildlife habitat and combine that information with the mapping of regionally significant riparian corridors; and

WHEREAS, in Resolution No. 01-3141C, Metro Council directed staff to complete additional work necessary to inventory and map regional wildlife habitat and present that information to Metro Council in early 2002; and

WHEREAS, in response to Metro Council's direction, staff compiled a decision package similar to the package provided for Metro Council's consideration of regionally significant riparian corridors. That package included the following products:

- An analysis of existing Goal 5 data, reports and regulations from cities and counties. This information is contained in a November 20, 2001 memo from the Office of General Counsel on local Goal 5 data, reports and regulations and additional information concerning fish and wildlife habitat areas gathered and exchanged with local governments and agencies.
- A methodology and criteria for identifying wildlife habitat and maps applying those criteria to the region.

- A map(s), based on the regionwide wildlife habitat maps, identifying Goal 5 resource sites and Goal 5 "wildlife habitat" within those resource sites to serve as the basis for identifying regionally significant wildlife habitat.
- An inventory narrative including information on the location, quantity and quality of the potential resource sites identified on the map.
- A map(s) of potential significant resource sites containing wildlife habitat.
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- A map(s) of potential resource sites containing wildlife habitat, which could be adopted as "regional resources" under the Goal 5 administrative rule. The map of resource sites is the map identified as Exhibit B of Resolution No. 01-3141C; and

WHEREAS, staff presented draft criteria to Metro Council Natural Resources Committee in February 2002 for identifying Goal 5 wildlife habitat based on information contained in "Metro's Scientific Literature Review for Goal 5;" and

WHEREAS, the Metro Council Natural Resources Committee held numerous public hearings and accepted public comment on the topic of regionally significant wildlife habitat including hearings on June 26, July 3, July 17, and July 31, 2002; and

~~WHEREAS, MPAC recommended on March 27, 2002 ....~~

~~WHEREAS, MTAC recommended on March 20, 2002 ....~~

~~WHEREAS, WRPAC recommended on March 25, 2002 ....~~

~~WHEREAS, the Goal 5 TAC recommended on March 22, 2002 ....; now therefore~~

WHEREAS, on June 7, 2002, the Goal 5 Technical Advisory Committee recommended that the June 4, 2002 draft of the Wildlife Habitat Criteria Matrix be adopted with the following modifications: 1) for each criterion, include references back to the Goal 5 Technical Report that directs the reader to the underlying science as documented in Metro's *Technical Report for Goal 5* dated January, 2002.; 2) for the "Connectivity and Proximity to Water Resources" criterion, the average distance of a patch from water sources such as streams, lakes and wetlands *within 320 feet of the patch* should be changed to *within 300 feet of the patch* (it is already mapped using the latter); and 3) for the "Habitats of Concern and Habitats for Unique and Sensitive Species" criterion, Metro should include information on the wetlands inventory layer addressing how it incorporated local wetlands inventory information. The Goal 5 TAC recommended that all inventoried wildlife habitat receiving a score of 2 through 9 including all Habitats of Concern should be identified as regionally significant wildlife habitat; and

WHEREAS, at their June 10 meeting, the Water Resources Policy Advisory Committee recommended that Metro accept the revised inventory of regionally significant riparian corridors and adopt Resolution No. 02-3176.; and that Metro accept the June 4, 2002 version of the Wildlife Habitat Criteria Matrix and the April 17, 2002 decision draft map as the inventory of significant wildlife habitat. At their July 15, 2002 meeting, the Water Resource Policy Advisory Committee recommended that Metro designate all wildlife habitat areas receiving a score of 1 through 9 including Habitat of Concern as regionally significant; and

WHEREAS, at their July 17, 2002 meeting, the Metro Technical Advisory Committee recommended adoption of the draft wildlife habitat criteria dated June 4, 2002; with the same

modifications recommended by the Goal 5 TAC as listed above. In addition, they included the recommendation that in cases where Habitats of Concern have been designated solely on the basis of documented species use of a given area, biological survey data should be required as a minimum, for documentation; and

WHEREAS, at the July 24, 2002 meeting, the Metro Policy Advisory Committee recommended that the Metro Council adopt the recommendations as indicated in the Metro Technical Advisory Committee recommendation, including adoption of the draft Wildlife Habitat inventory map for those areas receiving a score of 2 through 9 including Habitats of Concern; and

WHEREAS, areas with a score of 1 in exhibit B, while not regionally significant Goal 5 resources as individual sites, are significant resource sites, and in the aggregate have multiple values that provide important elements of wildlife habitat, stormwater protection, urban forestry canopy and livability; now, therefore,

BE IT RESOLVED:

1. That Metro Council finds that the information in Exhibit A, including *Metro's*Riparian Corridor and Wildlife Habitat Inventory*ies*, dated ~~March~~ July 2002, and *Metro's Scientific Literature Review for Goal 5*, dated January 2002, contain adequate information to determine the location, quantity and quality of wildlife habitat resources in the Metro region.

2. That Metro Council finds that sufficient data has been gathered and examined concerning local Goal 5 data, reports and regulations to comply with Title 3, Section 5(C)(2) of the Functional Plan.

3. That the Metro Council is relying on the same Goal 5 resource sites identified in Resolution No. 01-3141C as resource sites that ~~identifies the resource sites in Exhibit B as Goal 5 resource sites~~ contain~~ing~~ Goal 5 wildlife habitat resources.

4. Metro Council accepts the Metro Council Natural Resources Committee, WRPAC, Goal 5 TAC, MTAC and MPAC recommendations that the resources shown on Exhibit B are significant "~~riparian corridor~~wildlife habitat" resources.

5. That Metro Council interprets the term "regionally significant" wildlife habitat as that term is used in Title 3 of the Functional Plan to be those Goal 5 wildlife habitat resources that qualify as "regional resources" under the Goal 5 administrative rule.

6. That the Metro Council ~~list of~~ adopts the criteria in Exhibit C, revised as recommended by the Metro Policy Advisory Committee cited above ~~are~~ as criteria that define regionally significant wildlife habitat. A resource need not meet every criteria to be considered regionally significant.

7. That Metro Council has applied the criteria identified in Exhibit C to the information in Exhibits A and B to define regionally significant wildlife habitat as all areas ~~identified in Exhibit B~~ scoring 2 through 9 including Habitats of Concern as identified in Exhibit D. The Metro Council recommends that areas scoring 1 be considered by local governments in their local Goal 5 process.

8. That staff is directed to produce a combined map reflecting Metro Council's regionally significant riparian corridor decision in Resolution No. 01-3141C and its decision on regionally significant wildlife habitat.

9. That the map of regionally significant riparian corridors and wildlife habitat that staff has been directed to produce will be a draft map which will be the basis for conducting subsequent steps in the Goal 5 process including the economic, social, environmental and energy consequences analysis and the Program to Achieve Goal 5.

10. Metro Council reserves the opportunity to minimally or substantially alter the draft map prior to adoption of a final map of regionally significant fish and wildlife habitat areas and Program to Achieve Goal 5, after public comment and review.

11. The draft map of regionally significant wildlife habitat will be subject to correction for accuracy until the Council reaches a final decision including the ESEE analysis and program choices which is anticipated in 2003. The Council directs the staff to review all new requests for map corrections during the ESEE and program steps of the regional fish and wildlife project, making changes where documentation of the presence or absence of a physical feature is demonstrated. In addition, staff is directed to develop a post adoption map correction process that may be adopted as an amendment to the Urban Growth Management Functional Plan.

12. The Metro Council's actions in this resolution are not final actions designating regionally significant fish and wildlife habitat areas or a final action to protect those areas through a Program to Achieve Goal 5.

ADOPTED by the Metro Council this ____ day of _____ 2002.

_____
Carl Hosticka, Presiding Officer

Approved as to Form:

_____
Daniel B. Cooper, General Counsel

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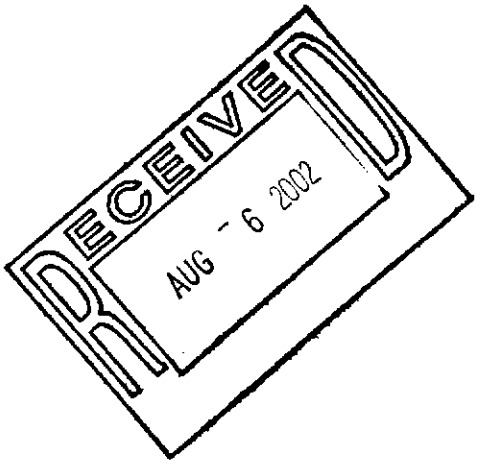
Exhibit A
Resolution 02-3177A

Contents:

- Metro's Riparian Corridor and Wildlife Habitat Inventories (preliminary draft, August 8, 2002)
- Memo dated July 29, 2002 entitled "Revisions to Metro's January 2002 Technical Report for Goal 5"
- Memo dated July 23, 2002 entitled "City of Hillsboro's Technical Review (Fishman report): Wildlife portion"
- Metro's Technical Report for Goal 5 plus appendices (includes revisions referred to in July 29, 2002 memo)



PRELIMINARY DRAFT

Metro's Riparian Corridor and Wildlife Habitat Inventories

AUGUST 8, 2002

PLEASE NOTE: This document (Exhibit A) was too large to scan in its entirety. To view the document, please contact the Council Archivist.

M E M O R A N D U M

METRO

Date: July 29, 2002
To: Andy Cotugno
From: Lori Hennings
Re: Revisions to Metro's January 2002 Technical Report for Goal 5

I am currently revising Metro's January 2002 Technical Report for Goal 5. These are primarily "housekeeping" issues, and none result in any suggested alterations to Metro's Wildlife Habitat Inventory process. Two of the changes include additional information to document the importance of river islands, deltas and hilltops to wildlife in general, and migrants in particular. A few of the items are in response to the City of Hillsboro's critique of Metro's Goal 5 Technical Report (as prepared by Paul Fishman on behalf of the City of Hillsboro; response attached). The last two bullet items deal with uncompleted items from the previous version. These are described below.

- **Page 59.** Incorporated the following additional information on river islands and deltas (at the end of the section entitled "Wildlife Use of Urban Riparian Corridors"):

  "River islands provide important habitat for many wildlife species, including an additional riparian area available to wildlife in the middle of a river (Thorp 1992). Large wood commonly accumulates on upstream ends of islands, where it influences meander cutoffs, provides cover for juvenile salmonids, and serves as habitat for invertebrate production (Naiman et al. 1992). Doppelt et al. (1993) comment that, "Debris and other physical blockages -- such as islands – contribute to the physical structure of large river systems by slowing water velocity and deflecting its course. As water is slowed and deflected, it pushes against the banks and into the soils underlying the adjacent floodplain, thereby contributing to the local water table."

  Thorp (1992) studied three islands on the Ohio River and found that that these islands had a significant positive effect on invertebrate density and diversity, related to changes in physical habitat structure within the river channel. Thorp commented:

  > 'Anthropogenic reductions in braiding, meandering, and snag abundance have diminished habitat heterogeneity of regulated rivers, factors directly influencing island formation, retentive capacity of the ecosystem, and community diversity. Habitat heterogeneity associated with riverine islands should, therefore, be of paramount importance to the ecosystem and may require special management protection...Islands have significant positive effects on invertebrate density and diversity that appear related to changes in physical habitat characteristics. Current velocity and substrate particle size are diminished in narrow channels between islands and shore, and areal extent of the littoral zone is enhanced within an otherwise deepwater region...Because of a relatively low exploitation by humans, islands probably enhance snag formation and input of organic matter, both factors having positive effects on macrofauna. Creation of selected riverine preserves near islands as a management tactic is recommended.'

  River deltas and islands create unique bottomland hardwood forest, including important cottonwood/willow communities, tree types that must be in close contact with the water table. Willow Flycatchers in the

southwestern US intensively use river deltas as stopover habitat during migration (Garcia-Hernandez et al. 2001). During migration, the majority of willow flycatchers preferred native broadleaf dominated areas near standing water, such as that found in deltas and many river islands; these areas produce an abundance of flying insects hatched from the enriched aquatic macroinvertebrate community. River deltas are known to provide important winter waterfowl habitat in the west (Fleskes et al. 2002). Bald Eagles commonly use Pacific Northwest river deltas and islands for breeding and foraging (Iverson et al. 1996).

The sand bars and mudflats in river deltas and islands are also vital to certain types of wildlife. Shorebirds rely on the barren and sandy areas in these areas, seeking invertebrates in the mud and silt; other research suggests that shorebirds may be particularly susceptible to human disturbance, thus making islands even more important (Andres 1994).

- **Page 75.** Revised Table 7 per Metro's July 23, 2002 staff response to the City of Hillsboro's critique (response attached). Note that this resulted in a few corrections but did not result in any recommended modifications to Metro's current Wildlife Habitat inventory process.

- **Page 83.** Added the following verbiage documenting the local importance of hilltops to migratory birds:

  "However, certain upland habitats without connectivity to riparian areas may also be highly important to wildlife due to unique features such as topography. In the Portland metro region, vegetated hilltops provide key wildlife habitat, including migratory stopover habitats for many Neotropical migratory bird species (Houck 2002; see also Nehls 2002)."

- **Page 90.** Inserted Figure 11: historical vegetation map.

- **Appendices.** Revise Appendix 1 to reflect addition of Sharp-tailed Snake and other modifications (including corrections on scientific names, per Dr. Richard Forbes). Completed Appendix 6: Selected restoration activities and potential indicators of the effects of management activities.

M E M O R A N D U M

METRO

Date: July 23, 2002
To: Andy Cotugno, Paul Ketcham
From: Lori Hennings
Re: City of Hillsboro's Technical Review (Fishman report): Wildlife portion

You may recall that we received a critique of Metro's riparian corridor inventory prepared by Paul Fishman on behalf of the City of Hillsboro (report date November 2001, available online at http://www.fishenserv.com/metrog5/). Fishman and his staff reviewed Metro's Scientific Literature Review, now entitled "Metro's Technical Report for Goal 5," with special focus on Table 5 (now Table 7 in the January, 2002 science paper draft). At that time we opted to address only non-wildlife components of the critique, and did so in a document dated December 12, 2001 ("Staff Response to City of Hillsboro's Technical Review of Metro Goal 5 Riparian Corridor Program"). We focused on non-wildlife issues because the riparian corridor inventory significance decision was up before Council just a week after we received the critique, and the wildlife habitat component had been decoupled from the riparian inventory.

We are now approaching a final wildlife habitat model and have addressed the remaining criticisms. The attached table details staff response to these criticisms. Because Fishman's critique was riparian-focused, all of the criticisms relate to the Connectivity to Water criterion in our current Wildlife Habitat model. Although after careful review Fishman identified four errors (a relatively minor error rate, considering the volume of material staff covered), there is absolutely no evidence that we should alter any aspect of our existing Wildlife Habitat model. In fact, our 2001 field research validated all four of the criteria currently in the model, including the proximity to water criterion.

Thus I am recommending a few relatively minor changes to Table 7 and related textual information within the next draft of the science paper. As before, Fishman's critique and Metro's analysis of that critique will help strengthen our scientific approach, and our legal standing, in the future.

Please let me know if you have any questions.

cc: Mark Turpel

Staff response to wildlife-related riparian corridor width recommendation criticisms made by Paul Fishman on behalf of City of Hillsboro.

Reference	Table 7 (formerly Table 5) criterion	GIS model criterion	Fishman's criticism(s)	Metro Staff Response	Comments and relevance to GIS model
			smaller, densely vegetated streams may not provide the correct habitat for kingfisher."	region because the resource has been inventoried based on what currently exists. In some areas, development has already encroached well into that buffer distance and these structures are unlikely to be removed in the near future.	
Castelle et al. 1992	Terrestrial habitat	Connectivity to water	Fishman begins with the same argument given when criticizing use of the Knutsen and Naef (1997) reference, in that he would need to look up every reference used to validate its appropriate use. Minor arguments/dissuasions regarding many of the species' requirements in the reference.	Disagree. See comments under Knutsen and Naef reference, above, regarding revisiting source literature. Regarding Bald Eagles, the statement is made that: "Although bald eagles are found in the Metro region, most riparian areas do not provide habitat for this species." However, no documentation is provided. This documentation is critical because it controverts basic facts about Bald Eagles as being a riparian-dependent species. In fact, this species does utilize many riparian areas in the region for nesting, roosting and perching, as Metro's Species of Concern data layer indicates (primary data source from ongoing OSU Bald Eagle study data). Bald Eagles rely primarily on fish and waterfowl for food (Johnson and O'Neil 2001), and riparian areas provide vital habitat for such species.	**No action recommended.**
FEMAT 1993	Terrestrial habitat	Connectivity to water	Fishman states that Metro incorrectly inferred a riparian area width range of 100-600 ft when the correct inference would be 100-300. Further, Fishman states that "The riparian reserve buffer widths determined in the reference are based upon preserving habitat for species associated with late successional forests...Therefore, the riparian reserve buffer widths recommended in the reference are not directly applicable to the majority of streams in the Metro region."	Agree in part. Metro inadvertently picked up the upper limit of the buffer range to be 600 ft rather than 300 ft. There is a reference in the document for 600 ft (page V-35), but it refers to both sides of the stream. We will correct that error. However, buffers are intended to protect ecological functions in urban areas, where human impacts are much more severe than in old-growth forest, and therefore logically should be substantially wider than those in old growth forests if the same level of ecological function is to be provided. In any case, altering the recommended width from this reference in no way impacts Metro's current Wildlife Habitat GIS model, which considers connectivity to water within 300 ft of the water source.	**Correct the recommended range in Table 7 to read 100-300 ft rather than 100-600 ft.**
NRCS 1999	Terrestrial habitat	Connectivity to water	Fishman used a different reference than that used by Metro because he could not locate the reference "despite an extensive online search, phone calls to the NRCS and the Government bookstore." Fishman states that Metro used the recommended widths as one-sided when they should have been two-sided.	Agree in part. The 1995 reference used by Metro was a draft document and is not the same document as that reviewed by Fishman. To illustrate the differences in the document, the 1995 reference consisted of 14 pages, while the 1999 document has over 100 pages. The 1995 reference provides general buffer width guidance for selected wildlife species: "Widths below include the sum of buffer widths on one or both sides of water courses and may extend beyond riparian boundaries..." This statement is unclear , but Fishman is probably correct in his interpretation that it means *total* buffer width rather than one-sided width. In Knutsen and Naef's (1997) extensive literature review, the average one-sided buffer width recommendation for reptiles and amphibians is 153 ft (46.7 m); for deer it is 138 ft (42 m, including a much narrower recommendation for eastside deer); and for beaver it is 271 ft (82.6 m). These numbers apply to perpendicular distance from the stream, thus total width excludes the width of the stream. However, given that this document was a draft and not regionally-specific, staff recommends removing it from Table 7. Whether it is retained or not, this information does not change staff recommendations for the 300-ft proximity to water criterion, which is based on numerous other references with wider recommendations for a broad range of species and our own field data as cited.	**Remove this outdated reference from Table 7.**

Staff response to wildlife-related riparian corridor width recommendation criticisms made by Paul Fishman on behalf of City of Hillsboro.

Reference	Table 7 (formerly Table 5) criterion	GIS model criterion	Fishman's criticism(s)	Metro Staff Response	Comments and relevance to GIS model
Environment Canada 1998	Recommended riparian widths for fish and wildlife; Terrestrial habitat; Movement Corridors function.	Connectivity to water	Metro cited this reference as a buffer width recommendation for wildlife movement on one side of the stream, when in fact the reference meant the recommendation as *total* corridor width.	Agree. Quoted from Environment Canada's report: "Corridors designed to facilitate species movement should be a minimum of 100 metres wide, and corridors designed for specialist species should be a minimum of 500 metres wide. Studies have demonstrated that wider corridors are more effective at facilitating species movement." Note that this is not riparian-specific, thus if a stream is sufficiently wide or deep to be impassable to certain species, it is functionally a one-sided corridor.	**Correct Technical Report, including Table 7 (formerly Table 5).**
May 2000	General wildlife habitat; terrestrial habitat	Connectivity to water	Fishman states: "The basis for May's choice of a 328 ft wildlife buffer is unsubstantiated in his paper. Metro has cited the original text correctly, but the source document is unsound." And also: "The main focus of this article is on in-stream habitat rather than the adjacent riparian habitat. The article only devotes one paragraph and one table to the discussion of wildlife use of the stream-riparian ecosystem and riparian buffer widths for wildlife habitat."	Disagree. First, note that taking the average (using the midpoint if a range of widths is provided) for all terrestrial vertebrates listed in Dr. May's literature review yields a width of 325.8 ft (99.3 m), a difference of less than 2-1/2 feet - less than one percent of Metro's recommendation of 328 feet. Second, consider Dr. May's professional credentials. Christopher May, Ph.D., is an environmental science/engineering researcher at the Applied Physics Laboratory, College of Oceanography and Fisheries at the University of Washington. He is also an adjunct professor at Western Washington University, UW-Tacoma, The Evergreen State College and Seattle University. He has taught courses in stream ecology, conservation biology, salmonid ecology, water pollution and stormwater best management practices (BMPs). He is currently researching the effectiveness of stormwater BMPs in mitigating the ecological effects of urbanization on stream ecosystems. Dr. May's conclusions are based on peer review of his Pacific Northwest based research and thorough literature reviews Third, though the May paper does not include a major discussion of the literature for terrestrial wildlife, it does not negate the importance of the buffer widths obtained from those references.	**No action recommended.**
Knutson and Naef 1997	Terrestrial habitat	Connectivity to water	Fishman: "The reference does not make any new recommendations as to what buffer widths may be appropriate for Pacific Northwest riparian habitats...In order to determine if the reference was cited correctly, it would be necessary to go back to the references used by Knutson and Naef to determine the context in which the buffer recommendations were made..." And also: "No mention of willow flycatcher or western pond turtle or recommended buffer widths for these species was found in the reference..."	Disagree with first part, agree in part with second part. This was a literature review, designed to consolidate information rather than necessarily making new recommendations. The references used in the Knutsen and Naef paper, which was prepared for the Washington Department of Fish and Wildlife and was extensively peer-reviewed. The necessity of revisiting each cited paper to check for citation accuracy seems excessive, as it could be applied to every research paper that cites any other paper. We agree in part with Fishman's second comment – we found numerous mention of Neotropical migrants (the Willow flycatcher is one), but no specific reference to the Willow Flycatcher. Taking the average recommended widths from the Knutson and Naef paper (using the midpoint if a range of widths is provided) for Neotropical migrant species yields a width of 358 ft (109 m), as compared to Willow flycatcher's 123 ft. This approach would increase the width recommendation. With regard to Western pond turtle requirements, these are outlined in the paper's Appendix D, under "Amphibians and Reptiles." This table recommends avoiding disturbance within 400-500 meters (1,312-1,640 feet) around all bodies of water inhabited by Western pond turtles. Thus, the actual recommendation was 1,312-1,640 ft, not the 330 feet cited by Metro.	**No action recommended.**
Prose 1985	Terrestrial habitat	Connectivity to water	Fishman: "...belted kingfishers do not utilize all streams equally, and the reference also states that 'Vegetation along the margins of feeding waters has both positive and negative implications. Belted kingfishers are seldom seen on ponds or streams that are overgrown with thick vegetation that obscures vision...' " And: "...it seems obvious that it is not necessary to provide a 100 to 200 foot riparian buffer on all streams to allow for kingfisher roosting, since	Disagree. The statement that kingfishers do not utilize all streams equally is probably correct, but there is no scientific evidence cited in support. Metro is using the known scientific literature, most of it peer reviewed (e.g., Knutsen and Naef 1997; May 2000) as its foundation. In the Portland metropolitan region, Metro staff have routinely observed Belted kingfishers perched in very dense vegetation overhanging small streams, such as tributaries flowing into Fernhill Wetlands in Forest Grove, and look in such areas first to locate this species. With regard to the statement that "it seems obvious that it is not necessary to provide a 100 to 200 foot riparian buffer on all streams," Metro has not completed the program step which could include buffer regulations, but also will consider other options such as incentives, acquisition, education and stewardship programs. When Metro does address program choices it is likely that not all streams will receive that level of protection in our	**No action recommended.**

REVISED DRAFT

Metro's Technical Report for Goal 5

July 2002

Metro Region Species List: Purpose and Limitations

June 19, 2001

The purpose of Metro's Species List is threefold:

1. To identify fish and wildlife species that occur in the Metro region.
2. To identify the relative importance of various types of habitat to fish and wildlife species.
3. To provide a biologically meaningful way in which to describe the biodiversity of the Metro region.

THE LIST IS NOT A STATEMENT OF POLICY. In keeping with Metro's Streamside CPR Vision Statement, the focus of the list is on native fish and wildlife species whose historic ranges include the metropolitan area and whose habitats are or can be provided for in urban habitats. Urban habitats may never be conducive to significant populations of some species, such as black bear and cougar. Further analysis and Metro Council deliberation will help determine (to the extent possible) the type, amount, and location of fish and wildlife habitats that should be protected and/or restored. For example, landowner incentives will be developed for conservation purposes.

This list contains:

1. All known native vertebrate species that currently exist within the Metro region (the final version will include a map of area involved) for at least a portion of the year and could be found in the region through diligent search by a knowledgeable person. Vagrant species (those that do not typically occur every year) are not included on this list.
2. Extirpated (locally extinct) native vertebrate species known to have inhabited the region in the past.
3. Nonnative vertebrate species with established breeding populations in the region.

The species list is based on the opinion of more than two dozen local wildlife experts. The Oregon Natural Heritage Program (ORNHP), Endangered Species Act (ESA), and Oregon Department of Fish and Wildlife (ODFW) status categories were obtained from ORNHP's February, 2001 *Rare, Threatened and Endangered Plants and Animals of Oregon* publication. Habitat associations were obtained from Johnson and O'Neil's new book, *Wildlife Habitats and Relationships in Oregon and Washington.* The taxonomic standards for common and scientific names for birds is based on the American Ornithological Union Check-list. We are also developing a separate aquatic and terrestrial invertebrate list, but this will not be as comprehensive in scope as the vertebrate species list.

Upon completion, these lists will be available to the public through Metro's website. For questions or comments regarding this list, please contact Paul Ketcham (ketcham@metro.dst.or.us, phone 503/797-1726).

Metro Region Species List:
Key to Notations

* Indicates species that are non-native (also known as alien or introduced) to Metro region.

( ) Parentheses indicate a species that was historically present but was extirpated from the Metro region within approximately the last century.

1 **Code** (type of animal)
A = Amphibians
B = Birds
F = Fish
M = Mammals
R = Reptiles

2 **Migratory Status** (indicates trend for the majority of a given species in the Metro region):
A = Anadromous (fish; lives in the ocean, spawns in fresh water)
C = Catadromous (fish; lives in fresh water, spawns in the ocean)
M = Migrates through area without stopping for long time periods
N = Neotropical migratory species (birds; majority of individuals breeding in the Metro region migrate south of U.S./Mexico border for winter)
R = Permanent resident (lives in the area year-round)
S = Short-distance migrant (from elevational to regional migration, e.g., across several states)
W = Winters in the Metro region

3 **Federal Status** is based on current Endangered Species Act listings. **E** = Endangered, **T** = Threatened. Endangered taxa are those which are in danger of becoming extinct within the foreseeable future throughout all or a significant portion of their range. Threatened taxa are those likely to become endangered within the foreseeable future.
LE = Listed Endangered. Taxa listed by the U.S. Fish and Wildlife Service (USFWS) or the National Marine Fisheries Service (NMFS) as Endangered under the Endangered Species Act (ESA), or by the Departments of Agriculture (ODA) and Fish and Wildlife (ODFW) of the state of Oregon under the Endangered Species Act of 1987 (OESA).
LT = Listed Threatened. Taxa listed by the USFWS, NMFS, ODA, or ODFW as Threatened.
PE = Proposed Endangered. Taxa proposed by the USFWS or NMFS to be listed as Endangered under the ESA or by ODFW or ODA under the OESA.
PT = Proposed Threatened. Taxa proposed by the USFWS or NMFS to be listed as Threatened under the ESA or by ODFW or ODA under the OESA.
C = Candidate taxa for which NMFS or USFWS have sufficient information to support a proposal to list under the ESA, or which is a candidate for listing by the ODA under the OESA.
SoC = Species of Concern. Former C2 candidates which need additional information in order to propose as Threatened or Endangered under the ESA. These are species which USFWS is reviewing for consideration as Candidates for listing under the ESA.

4 **ODFW Status** (state status) is based on current Oregon Department of Fish and Wildlife "Oregon Sensitive Species List," 2001. See Federal Status (above) for definitions of LT and LE.
SC (Critical) = Species for which listing as threatened or endangered is pending; or those for which listing as threatened or endangered may be appropriate if immediate conservation actions are not taken. Also considered critical are some peripheral species which are at risk throughout their range, and some disjunct populations.
SV (Vulnerable) = Species for which listing as threatened or endangered is not believed to be imminent and can be avoided through continued or expanded use of adequate protective measures and monitoring. In some cases the population is sustainable, and protective measures

are being implemented; in others, the population may be declining and improved protective measures are needed to maintain sustainable populations over time.
SP (Peripheral or Naturally Rare) = Peripheral species refer to those whose Oregon populations are on the edge of their range. Naturally rare species are those which had low population numbers historically in Oregon because of naturally limiting factors. Maintaining the status quo for the habitats and populations of these species is a minimum requirement. Disjunct populations of several species which occur in Oregon should not be confused with peripheral.
SU (Undetermined Status): Animals in this category are species for which status is unclear. They may be susceptible to population decline of sufficient magnitude that they could qualify for endangered, threatened, critical or vulnerable status, but scientific study will be required before a judgement can be made.

5 **ORNHP Rank (ABI – Natural Heritage Network Ranks)**: ORNHP participates in an international system for ranking rare, threatened and endangered species throughout the world. The system was developed by The Nature Conservancy and is maintained by The Association for Biodiversity Information (ABI) in cooperation with Heritage Programs or Conservation Data Centers (CDCs) in all 50 states, in 4 Canadian provinces, and in 13 Latin American countries. The ranking is a 1-5 scale, primarily based on the number of known occurrences, but also including threats, sensitivity, area occupied, and other biological factors. On Metro's Species List the first ranking (**rank**/rank) is the Global Rank and begins with a "G". If the taxon has a trinomial (a subspecies, variety or recognized race), this is followed by a "T" rank indicator. A "Q" at the end of this ranking indicates the taxon has taxonomic questions. The second ranking (rank/**rank**) is the State Rank and begins with the letter "S". The ranks are summarized below.
1 = Critically imperiled because of extreme rarity or because it is somehow especially vulnerable to extinction or extirpation, typically with 5 or fewer occurrences.
2 = Imperiled because of rarity or because other factors demonstrably make it very vulnerable to extinction (extirpation), typically with 6-20 occurrences.
3 = Rare, uncommon or threatened, but not immediately imperiled, typically with 21-100 occurrences.
4 = Not rare and apparently secure, but with cause for long-term concern, usually more than 100 occurrences.
5 = Demonstrably widespread, abundant, and secure.
H = Historical Occurrence, formerly part of the native biota with the implied expectation that it may be rediscovered.
X = Presumed extirpated or extinct.
U = Unknown rank.
? = Not yet ranked, or assigned rank is uncertain.

6 **ORNHP List** is based on Oregon Natural Heritage Program data.
List 1 contains taxa that are threatened with extinction or presumed to be extinct throughout their entire range.
List 2 contains taxa that are threatened with extirpation or presumed to be extirpated from the state of Oregon. These are often peripheral or disjunct species which are of concern when considering species diversity within Oregon's borders. They can be very significant when protecting the genetic diversity of a taxon. ORNHP regards extreme rarity as a significant threat and has included species which are very rare in Oregon on this list.
List 3 contains species for which more information is needed before status can be determined, but which may be threatened or endangered in Oregon or throughout their range.
List 4 contains taxa which are of conservation concern but are not currently threatened or endangered. This includes taxa which are very rare but are currently secure, as well as taxa which are declining in numbers or habitat but are still too common to be proposed as threatened or endangered. While these taxa currently may not need the same active management attention as threatened or endangered taxa, they do require continued monitoring.

7 **Riparian Association** indicates use of any of the 4 water-based habitats. Single "X" in any habitat type (upland or water-associated) indicates general association; "XX" indicates close association, as per Johnson and O'Neil 2001.

8 **Habitat Types** based on Johnson and O'Neil (2001). These habitats are described more fully within the text of the upland and riparian chapters.
WLCH = Westside Lowlands Conifer-Hardwood Forest
WODF = Westside Oak and Dry Douglas-fir Forest and Woodlands
WEGR = Westside Grasslands
AGPA = Agriculture, Pasture and Mixed Environs
URBN = Urban and Mixed Environs
WATR = Open Water - Lakes, Rivers, Streams
HWET = Herbaceous Wetlands
RWET = Westside Riparian-Wetlands

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Appendix 1. ***DRAFT*** 06-07-02 Species list and habitat associations for species normally occurring within the Metro region. Study area is the Metro jurisdictional boundary plus

Code[1]	Common Name	Genus/Species	Migratory Status[2]	Federal Status[3]	ODFW Status[4]	ORNHP Rank[5]	ORNHP List[6]	Riparian Assn.[7]	Habitat Type[8]							
									WATR	HWET	RWET	WLCH	WODF	WEGR	AGPA	URBN
F	River Lamprey	*Lampetra ayresi*	A	SoC	None	G4/S4	4	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F	Western Brook Lamprey	*Lampetra richardsoni*	A	None	None	None	None	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F	Pacific Lamprey	*Lampetra tridentata*	A	SoC	SV	G5/S3	2	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F	White Sturgeon	*Acipenser transmontanus*	A	None	None	None	None	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F*	American Shad*	*Alosa sapidissima*	A	N/A - alien	N/A - alien	N/A - alien	N/A - alien	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F	Chiselmouth	*Acrocheilus alutaceus*	R	None	None	None	None	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F*	Goldfish*	*Carassius auratus*	R	N/A - alien	N/A - alien	N/A - alien	N/A - alien	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F*	Common Carp*	*Cyprinus carpio*	R	N/A - alien	N/A - alien	N/A - alien	N/A - alien	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F	Peamouth Chub	*Mylocheilus caurinus*	R	None	None	None	None	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
(F)	(Oregon Chub - extirpated from Metro area)	*Oregonichthys crameri*	R	LE	SC	G2/S2	1	(XX)	(XX)	(XX)	N/A	N/A	N/A	N/A	N/A	N/A
F	Northern Pikeminnow (Squawfish)	*Ptychocheilus oregonensis*	R	None	None	None	None	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F	Longnose Dace	*Rhynichthys cataractae*	R	None	None	None	None	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F	Leopard Dace	*Rhynichthys falcatus*	R	None	None	None	None	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F	Speckled Dace	*Rhynichthys osculus*	R	None	None	None	None	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F	Redside Shiner	*Richardsonius balteatus*	R	None	None	None	None	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F	Largescale Sucker	*Catostomus macrocheilus*	R	None	None	None	None	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F*	Brown Bullhead*	*Ameiurus nebulosus*	R	N/A - alien	N/A - alien	N/A - alien	N/A - alien	XX	XX	XX	N/A	N/A	N/A	N/A	N/A	N/A
F	Eulachon (Columbia River Smelt)	*Thaleichthys pacificus*	A	None	None	None	None	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F	Coastal Cutthroat Trout, SW WA/Col. R. ESU	*Oncorhynchus clarki clarki*	A	PT	SC	G4T2Q/S2	2	XX	XX	X	N/A	N/A	N/A	N/A	N/A	N/A
F	Coastal Cutthroat Trout, Upper Will. R. ESU	*Oncorhynchus clarki clarki*	A	SoC	None	G4T?Q/S3?	4	XX	XX	X	N/A	N/A	N/A	N/A	N/A	N/A
F	Chum Salmon, Columbia River ESU	*Oncorhynchus keta*	A	LT	SC	G5T2Q/S2	1	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F	Coho Salmon, Oregon Coast ESU	*Oncorhynchus kisutch*	A	LT	SC	G4T2Q/S2	1	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F	Coho Salmon, Lower Columbia R./Southwest Washington ESU	*Oncorhynchus kisutch*	A	C	LE	G4T2Q/S2	1	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F	Rainbow Trout (resident populations)	*Oncorhynchus mykiss*	R	None	None	None	None	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F	Steelhead (anadromous Rainbow Trout), Oregon Coast ESU	*Oncorhynchus mykiss*	A	C	SV	G5T2T3Q/S2S3	1	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F	Steelhead, Lower Columbia River ESU	*Oncorhynchus mykiss*	A	LT	SC	G5T2Q/S2	1	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F	Steelhead, Upper Willamette River ESU, winter run	*Oncorhynchus mykiss*	A	LT	SC	G5T2Q/S2	1	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F	Steelhead, Middle Columbia River ESU	*Oncorhynchus mykiss*	A	LT	SC/SV	G5T2Q/S2	1	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F	Steelhead, Snake River Basin ESU	*Oncorhynchus mykiss*	A	LT	SV	G5T2T3Q/S2S3	1	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F	Steelhead, Upper Columbia River ESU	*Oncorhynchus mykiss*	A	LE	None	G5T2Q/SU	None	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F	Sockeye Salmon, Snake River ESU	*Oncorhynchus nerka*	A	LE	None	G5T1Q/SX	1 - ex	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F	Chinook Salmon, Lower Columbia R. ESU	*Oncorhynchus tshawytscha*	A	LT	SC	G5T2Q/S2	1	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F	Chinook Salmon, Upper Will. R spring run	*Oncorhynchus tshawytscha*	A	LT	None	G5T2Q/S2	1	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F	Chinook Salmon, Snake River Fall-run ESU	*Oncorhynchus tshawytscha*	A	LT	LT	G5T1Q/S1	1	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F	Chinook Salmon, Snake River Spr/Sum.run	*Oncorhynchus tshawytscha*	A	LT	LT	G5T1Q/S1	1	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F	Chinook Salmon, Upper Col. R. Spring-run	*Oncorhynchus tshawytscha*	A	LE	None	G5T1Q/SU	None	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F	Mountain Whitefish	*Prosopium williamsoni*	R	None	None	None	None	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F	Sand Roller	*Percopsis transmontanus*	R	None	None	None	None	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F*	Mosquitofish*	*Gambusia affinis*	R	N/A - alien	N/A - alien	N/A - alien	N/A - alien	XX	XX	XX	N/A	N/A	N/A	N/A	N/A	N/A
F*	Three-spined Stickleback	*Gasterosteus aculeatus*	R	None	None	None	None	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A

Code[1]	Common Name[1]	Genus/Species	Migratory Status[2]	Federal Status[3]	ODFW Status[4]	ORNHP Rank[5]	ORNHP List[6]	Riparian Assn.[7]	Habitat Type[8]							
									WATR	HWET	RWET	WLCH	WODF	WEGR	AGRA	URBN
F	Prickly Sculpin	*Cottus asper*	R	None	None	None	None	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F	Reticulate Sculpin	*Cottus perplexus*	R	None	None	None	None	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F*	Green Sunfish*	*Lepomis cyanellus*	R	N/A - alien	N/A - alien	N/A - alien	N/A - alien	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F*	Pumpkinseed Sunfish*	*Lepomis gibbosus*	R	N/A - alien	N/A - alien	N/A - alien	N/A - alien	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F*	Warmouth*	*Lepomis gulosus*	R	N/A - alien	N/A - alien	N/A - alien	N/A - alien	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F*	Bluegill*	*Lepomis macrochirus*	R	N/A - alien	N/A - alien	N/A - alien	N/A - alien	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F*	Smallmouth Bass*	*Micropterus dolomieu*	R	N/A - alien	N/A - alien	N/A - alien	N/A - alien	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F*	Largemouth Bass*	*Micropterus salmoides*	R	N/A - alien	N/A - alien	N/A - alien	N/A - alien	XX	XX	X	N/A	N/A	N/A	N/A	N/A	N/A
F*	White Crappie*	*Pomoxis annularis*	R	N/A - alien	N/A - alien	N/A - alien	N/A - alien	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F*	Black Crappie*	*Pomoxis nigromaculatus*	R	N/A - alien	N/A - alien	N/A - alien	N/A - alien	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F*	Yellow Perch*	*Perca flavescens*	R	N/A - alien	N/A - alien	N/A - alien	N/A - alien	XX	XX	X	N/A	N/A	N/A	N/A	N/A	N/A
F*	Walleye*	*Stizostedion vitreum vitreum*	R	N/A - alien	N/A - alien	N/A - alien	N/A - alien	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
F	Starry Flounder	*Platichthys stellatus*	R	None	None	None	None	XX	XX	?	N/A	N/A	N/A	N/A	N/A	N/A
A	Northwestern Salamander	*Ambystoma gracile*	R	None	None	None	None	XX	XX	XX	XX	X	X	X	X	X
A	Long-toed Salamander	*Ambystoma macrodactylum*	R	None	None	None	None	XX	XX	XX	XX	X	X	X	X	X
A	Pacific Giant Salamander	*Dicamptodon tenebrosus*	R	None	None	None	None	XX			XX	X	X	X		X
A	Cope's Giant Salamander	*Dicamptodon copei*	R	None	SU	G3/S2	2	XX	X		XX	X				
A	Columbia Torrent Salamander	*Rhyacotriton kezeri*	R	None	SC	G3/S3	2	XX			XX	X				
A	Cascade Torrent Salamander	*Rhyacotriton cascadae*	R	None	SV	G3/S3	2	XX			XX	X				
A	Rough-skinned Newt	*Taricha granulosa*	R	None	None	None	None	XX	XX	XX	XX	X	X	X	X	X
A	Dunn's Salamander	*Plethodon dunni*	R	None	None	None	None	X			X	X	X			X
A	Western Red-backed Salamander	*Plethodon vehiculum*	R	None	None	None	None	X			X	X	X			X
A	Ensatina	*Ensatina eschscholtzii*	R	None	None	None	None	X			X	XX	X	X	X	X
A	Clouded Salamander	*Aneides ferreus*	R	None	SU	G3/S3	3					X	X		X	X
A	Oregon Slender Salamander	*Batrachoseps wrighti*	R	SoC	SU	G4/S3	1	X			X	X				
A	Western Toad	*Bufo boreas*	R	None	SV	G4/S4	4	XX	XX	XX	XX	X	X	X	X	X
A	Tailed Frog	*Ascaphus truei*	R	SoC	SV	G4/S3	2	XX			XX	X				
A	Pacific Chorus Frog (tree frog)	*Hyla regilla*	R	None	None	None	None	XX	XX	XX	XX	X	X	X	X	X
A	Northern Red-legged Frog	*Rana aurora aurora*	R	SoC	SV/SU	G4T4/S3	2	XX	XX	XX	XX	XX	X	X	X	X
(A)	(Oregon Spotted Frog - extirpated)	*Rana pretiosa*	R	C	SC	G2G3/S2	1	(XX)	(XX)	(XX)	(XX)	(X)	(X)	(X)	(X)	
A*	Bullfrog*	*Rana catesbeiana*	R	N/A - alien	N/A - alien	N/A - alien	N/A - alien	XX	XX	XX	XX	X	X	X	X	X
R*	Common Snapping Turtle*	*Chelydra serpentina*	R	N/A - alien	N/A - alien	N/A - alien	N/A - alien	XX	XX	XX	X				X	X
R	Painted Turtle	*Chrysemys picta*	R	None	SC	G5/S2	2	XX	XX	XX	X		X		X	X
R	Northwestern Pond Turtle	*Clemmys marmorata marmorata*	R	SoC	SC	G3T3/S2	1	XX	XX	XX	XX	X	XX	X	X	X
R*	Red-eared Slider*	*Trachemys scripta elegans*	R	N/A - alien	N/A - alien	N/A - alien	N/A - alien	XX	XX	XX	X				X	X
R	Northern Alligator Lizard	*Elgaria coerulea*	R	None	None	None	None	X			X	X	X	X		X
R	Southern Alligator Lizard	*Elgaria multicarinata*	R	None	None	None	None	X			X	X	X	X	X	X
R	Western Fence Lizard	*Sceloporus occidentalis*	R	None	None	None	None					X	X	X	X	X
R	Western Skink	*Eumeces skiltonianus*	R	None	None	None	None					X	X	X	X	X
R	Rubber Boa	*Charina bottae*	R	None	None	None	None	X			X	X		X	X	X
R	Racer	*Coluber constrictor*	R	None	None	None	None						X	X	X	X
R	Sharptail Snake	*Contia tenuis*	R	None	SV	G5/S3	4	X			X	X	X	X	X	X
R	Ringneck Snake	*Diadophis punctatus*	R	None	None	None	None	X			X	X	X	X	X	X

Code[1]	Common Name	Genus/Species	Migratory Status[2]	Federal Status[3]	ODFW Status[4]	ORNHP Rank[5]	ORNHP List[6]	Riparian Assn.[7]	Habitat Type[8]							
									WATR	HWET	RWET	WLCH	WODF	WEGR	AGPA	URBN
R	Gopher Snake	*Pituophis catenifer*	R	None	None	None	None						X	X	X	X
R	Western Terrestrial Garter Snake	*Thamnophis elegans*	R	None	None	None	None	X		X	X		X	X	X	X
R	Northwestern Garter Snake	*Thamnophis ordinoides*	R	None	None	None	None	X			X	X	X	X	X	X
R	Common Garter Snake	*Thamnophis sirtalis*	R	None	None	None	None	XX		XX	XX	X	X	X	X	X
B	Red-throated Loon	*Gavia stellata*	W / M	None	None	None	None	XX			XX					
B	Pacific Loon	*Gavia pacifica*	W / M	None	None	None	None	XX			XX					
B	Common Loon	*Gavia immer*	W / M	None	None	None	None	XX	X	XX						
B	Pied-billed Grebe	*Podilymbus podiceps*	S / N	None	None	None	None	XX	X	XX	X					
B	Horned Grebe	*Podiceps auritus*	W / M	None	SP	G5/S2B, S5N	2	XX	XX	XX						
B	Eared Grebe	*Podiceps nigricollis*	W	None	None	None	None	XX	XX	XX						
B	Western Grebe	*Aechmophorus occidentalis*	W	None	None	None	None	XX	XX	XX						
B	Clark's Grebe	*Aechmophorus clarkii*	W / M	None	None	None	None	XX	XX	XX						
B	Doubled-crested Cormorant	*Phalacrocorax auritus*	R / S	None	None	None	None	XX	XX	X	X					X
B	American Bittern	*Botaurus lentiginosus*	S / N	None	None	None	None	XX		XX					X	
B	Great Blue Heron	*Ardea herodias*	R	None	None	None	None	XX	XX	XX	XX	X	X	X	XX	X
B	Great Egret	*Ardea alba*	W / M	None	None	None	None	XX	XX	XX	XX	X	X	X	X	X
B	Green Heron	*Butorides virescens*	N / S	None	None	None	None	XX	X	XX	XX					
B	Black-crowned Night Heron	*Nycticorax nycticorax*	S	None	None	None	None	XX	XX	XX	X					
(B)	(California Condor - extirpated)	*(Gymnogyps californianus)*	R	LE	None	G1SX	1-ex	(X)			(X)			(X)		
B	Turkey Vulture	*Cathartes aura*	N	None	None	None	None	X		X	X	X	X	X	X	X
B	Greater White-fronted Goose	*Anser albifrons*	W / M	None	None	None	None	XX	XX	XX					XX	
B	Snow Goose	*Chen caerulescens*	W / M	None	None	None	None	XX	XX	XX					XX	
B	Ross's Goose	*Chen rossii*	W / M	None	None	None	None	XX	XX	XX					XX	
B	Canada Goose	*Branta canadensis*	VARIABLE	None	None	None	None	XX	XX	XX	X				XX	
B	Dusky Canada Goose	*Branta canadensis occidentalis*	W / M	None	None	G5T2T3/ S2N	4	XX	XX	XX	X				XX	
B	Aleutian Canada Goose (wintering)	*Branta canadensis leucopareia*	W / M	LT	LE	G5T3/S2N	1	XX	XX	XX	X				XX	
B	Trumpeter Swan	*Cygnus buccinator*	W / M	None	None	None	None	XX	XX	XX					XX	
B	Tundra Swan	*Cygnus columbianus*	W / M	None	None	None	None	XX	XX	XX					XX	
B	Wood Duck	*Aix sponsa*	S	None	None	None	None	XX	XX	X	XX	X			X	
B	Gadwall	*Anas strepera*	W / M	None	None	None	None	XX	XX	XX				X	X	
B	Mallard	*Anas platyrhynchos*	R	None	None	None	None	XX	X	XX	XX				X	X
B	Eurasian Wigeon	*Anas penelope*	W / M	None	None	None	None	XX	XX	X					X	
B	American Wigeon	*Anas americana*	W / M	None	None	None	None	XX	X	XX	X				XX	
B	Blue-winged Teal	*Anas discors*	W / M	None	None	None	None	XX	X	XX				X	XX	
B	Cinnamon Teal	*Anas cyanoptera*	N	None	None	None	None	XX	X	XX				X	XX	
B	Northern Shoveler	*Anas clypeata*	W / M	None	None	None	None	XX	XX	XX				X	X	
B	Northern Pintail	*Anas acuta*	W / M	None	None	None	None	XX	XX	XX					X	
B	Green-winged Teal	*Anas crecca*	S	None	None	None	None	XX	X	XX	X			X	X	
B	Canvasback	*Aythya valisineria*	W / M	None	None	None	None	XX	XX	XX						
B	Redhead	*Aythya americana*	W / M	None	None	None	None	XX	XX	XX						
B	Ring-necked Duck	*Aythya collaris*	W / M	None	None	None	None	XX	X	X	XX					
B	Greater Scaup	*Aythya marila*	W / M	None	None	None	None	XX	XX							
B	Lesser Scaup	*Aythya affinis*	W / M	None	None	None	None	XX	XX	XX						

Code[1]	Common Name	Genus/Species	Migratory Status[2]	Federal Status[3]	ODFW Status[4]	ORNHP Rank[5]	ORNHP List[6]	Riparian Assn.[7]	Habitat Type[8]							
									WATR	HWET	RWET	WLCH	WODF	WEGR	AGPA	URBN
B	Surf Scoter	*Melanitta perspicillata*	W / M	None	None	None	None	X	X							
B	Harlequin Duck	*Histrionicus histrionicus*	W / M	SoC	SU	G4/S2B, S3N	2	XX	XX		XX					
B	Bufflehead	*Bucephala albeola*	W / M	None	SU	G5/S2B,S5N	4	XX	XX	XX	X					
B	Common Goldeneye	*Bucephala clangula*	M	None	None	None	None	XX	XX	X						
B	Barrow's Goldeneye	*Bucephala islandica*	W / M	None	SU	G5/S3B,S3N	4	XX	XX	X						
B	Hooded Merganser	*Lophodytes cucullatus*	W / M	None	None	None	None	XX	XX	X	XX	XX				
B	Common Merganser	*Mergus merganser*	W / M	None	None	None	None	XX	XX		XX	XX				
B	Red-breasted Merganser	*Mergus serrator*	W / M	None	None	None	None	X	X							
B	Ruddy Duck	*Oxyura jamaicensis*	W / M	None	None	None	None	XX	XX	XX						
B	Osprey	*Pandion haliaetus*	N	None	None	None	None	XX	XX		X	X	X		X	X
B	White-tailed Kite (appears to be undergoing range expansion)	*Elanus leucurus*	W / M	None	None	G5/S1B, S3N	2	X			X	X		X	XX	
B	Bald Eagle[a]	*Haliaeetus leucocephalus*	S	LT[a]	LT	G4/S3B, S4N	2	XX	XX	X	X	X	X	X	X	X
B	Northern Harrier	*Circus cyaneus*	N	None	None	None	None	X		X	X			X	X	X
B	Sharp-shinned Hawk	*Accipiter striatus*	N	None	None	None	None	X		X		X	X	X	X	X
B	Cooper's Hawk	*Accipiter cooperii*	S	None	None	None	None	X		X	X	X	X	X	X	X
B	Northern Goshawk	*Accipiter gentilis*	W / M	SoC	SC	G5/S3	2	X		X	X	X	X			
B	Red-shouldered Hawk (appears to be undergoing range expansion)	*Buteo lineatus*	?	None	None	None	None	X			X	X			X	
B	Red-tailed Hawk	*Buteo jamaicensis*	S / N	None	None	None	None	X		X	X	X	X	X	XX	X
B	Rough-legged Hawk	*Buteo lagopus*	W / M	None	None	None	None	X		X	X	X	X	X	X	X
B	American Kestrel	*Falco sparverius*	S	None	None	None	None	X		X	X	X	X	X	X	X
B	Merlin	*Falco columbarius*	W / M	None	None	G5/S1B	2	X	X	X	X	X	X	X	X	X
B	American Peregrine Falcon	*Falco peregrinus anatum*	N	None	LE	G4T3/S1B	2	X	X	X	X	X	X	X	X	X
B*	Ring-necked Pheasant*	*Phasianus colchicus*	R	N/A - alien	N/A - alien	N/A - alien	N/A - alien	X		X	X	X	X	XX	XX	X
B	Ruffed Grouse	*Bonasa umbellus*	R	None	None	None	None	XX			XX	XX	X		X	
B	Blue Grouse	*Dendragapus obscurus*	R	None	None	None	None	X			X	XX	X			
B*	Wild Turkey*	*Meleagris gallopavo*	R	N/A - alien	N/A - alien	N/A - alien	N/A - alien	X			X	X	X	X	X	X
(B)	(Mountain Quail - extirpated)	*Oreortyx pictus*	R / S	SoC	SU	G5/S4?	4	(X)			(X)	(X)	(X)		(X)	(X)
B	California Quail	*Callipepla californica*	R	None	None	None	None	X		X	X	X	X	X	X	X
B	Virginia Rail	*Rallus limicola*	R / S	None	None	None	None	XX		XX					X	
B	Sora	*Porzana carolina*	S / N	None	None	None	None	XX		XX					X	
B	American Coot	*Fulica americana*	R / S	None	None	None	None	XX	XX	XX					X	X
B	Lesser Sandhill Crane	*Grus canadensis*	W / M	None	None	None	None	XX		XX					XX	
B	Black-bellied Plover	*Pluvialis squatarola*	M	None	None	None	None	X	X						XX	
B	American Golden-plover	*Pluvialis dominica*	W / M	None	None	None	None	X	X						XX	
B	Semipalmated Plover	*Charadrius semipalmatus*	M	None	None	None	None	XX	XX						X	
B	Killdeer	*Charadrius vociferus*	S / N	None	None	None	None	X		X	X	X	X	X	XX	X
B	Greater Yellowlegs	*Tringa melanoleuca*	W / M	None	None	None	None	XX	XX	XX	X			X	X	
B	Lesser Yellowlegs	*Tringa flavipes*	W / M	None	None	None	None	XX	XX	XX	X			X	X	
B	Solitary Sandpiper	*Tringa solitaria*	W / M	None	None	None	None	XX	XX	XX	XX			X	X	
B	Spotted Sandpiper	*Actitis macularia*	N	None	None	None	None	XX	X	X	XX				X	
B	Semipalmated Sandpiper	*Calidris pusilla*	W / M	None	None	None	None	XX	XX							

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									WATR	HWET	RWET	WLCH	WODF	WEGR	AGPA	URBN
B	Western Sandpiper	*Calidris mauri*	W / M	None	None	None	None	XX	XX	XX					X	
B	Least Sandpiper	*Calidris minutilla*	W / M	None	None	None	None	XX	X	XX					X	
B	Baird's Sandpiper	*Calidris bairdii*	W / M	None	None	None	None	XX	X	XX					X	
B	Pectoral Sandpiper	*Calidris melanotos*	W / M	None	None	None	None	XX	X	XX					X	
B	Dunlin	*Calidris alpina*	W / M	None	None	None	None	XX	XX	XX					XX	
B	Short-billed Dowitcher	*Limnodromus griseus*	W / M	None	None	None	None	X		X					X	
B	Long-billed Dowitcher	*Limnodromus scolopaceus*	W / M	None	None	None	None	XX	X	XX					XX	
B	Common Snipe	*Gallinago gallinago*	S / N	None	None	None	None	XX		XX				X	XX	
B	Wilson's Phalarope	*Phalaropus tricolor*	W / M	None	None	None	None	XX	X	X						
B	Red-necked Phalarope	*Phalaropus lobatus*	W / M	None	None	None	None	X	X							
B	Bonaparte's Gull	*Larus philadelphia*	M / W	None	None	None	None	XX	X						X	X
B	Mew Gull	*Larus canus*	W / M	None	None	None	None	XX	XX						X	X
B	Ring-billed Gull	*Larus delawarensis*	W / M	None	None	None	None	XX	XX	X					X	X
B	California Gull	*Larus californicus*	S	None	None	None	None	XX	XX	X					X	X
B	Herring Gull	*Larus agentatus*	W / M	None	None	None	None	XX	XX	X					X	X
B	Thayer's Gull	*Larus thayeri*	W / M	None	None	None	None	XX	XX	X					X	X
B	Western Gull	*Larus occidentalis*	R / S	None	None	None	None	X	X							XX
B	Glaucous Gull	*Larus hyperboreus*	W / M	None	None	None	None	XX	XX	X						X
B	Glaucous-winged Gull	*Larus glaucescens*	W / M	None	None	None	None	XX	X							XX
B	Caspian Tern	*Sterna caspia*	N	None	None	None	None	XX	XX	XX						
B	Forster's Tern	*Sterna forsteri*	M	None	None	None	None	XX	XX	XX						
B	Common Tern	*Sterna hirundo*	W / M	None	None	None	None	X	X							
B*	Rock Dove*	*Columba livia*	R	N/A - alien	N/A - alien	N/A - alien	N/A - alien							X	XX	XX
B	Band-tailed Pigeon	*Columba fasciata*	S	SoC	None	G5/S4	4	XX			XX	XX	XX		X	X
B	Mourning Dove	*Zenaida macroura*	S	None	None	None	None	XX			XX	X	X	X	XX	X
B	Barn Owl	*Tyto alba*	R / S	None	None	None	None	X		X	X		X	X	XX	X
B	Western Screech-Owl	*Otus kennicottii*	R	None	None	None	None	X		X	X	X	X		X	X
B	Great Horned Owl	*Bubo virginianus*	R	None	None	None	None	X		X	X	X	X	X	X	X
B	Northern Pygmy-Owl	*Glaucidium gnoma*	R	None	SC	G5/S4?	4	X		X	X	XX	X		X	X
(B)	(Northern Spotted Owl - extirpated from Metro region)	*(Strix occidentalis caurina)*	(S)	LT	LT	G3T3S3	1					(XX)	(X)			
B	Barred Owl	*Strix varia*	R	None	None	None	None	X			X	XX	X			X
B	Long-eared Owl	*Asio otus*	W / M	None	None	None	None	X		X		X	X	X	X	
B	Short-eared Owl	*Asio flammeus*	W / M	None	None	None	None	XX		XX				X	XX	
B	Northern Saw-whet Owl	*Aegolius acadicus*	R / S	None	None	None	None	X			X	XX	XX		X	X
B	Common Nighthawk (nearly extirpated)	*Chordeiles minor*	N	None	SC	G5/S5	4	X	X	X	X	X	X	X	X	X
B	Vaux's Swift	*Chaetura vauxi*	N	None	None	None	None	XX	XX	X	X	X	X	X		X
B	Anna's Hummingbird	*Calypte anna*	R	None	None	None	None	X			X	XX	X			X
B	Rufous Hummingbird	*Selasphorus rufus*	N	None	None	None	None	X		X	X	X	X	X	X	X
B	Belted Kingfisher	*Ceryle alcyon*	S	None	None	None	None	XX	XX		XX					
B	Lewis's Woodpecker (extirpated as breeding species)	*Melanerpes lewis*	W / M	SoC	SC	G5/S3B, S3N	4	X			X		XX	X	X	X
B	Acorn Woodpecker	*Melanerpes formicivorus*	R	SoC	None	G5/S3?	4						XX	X		X

Code[1]	Common Name	Genus/Species	Migratory Status[2]	Federal Status[3]	ODFW Status[4]	ORNHP Rank[5]	ORNHP List[6]	Riparian Assn.[7]	Habitat Type[8]							
									WATR	HWET	RWET	WLCH	WODF	WEGR	AGPA	URBN
B	Red-breasted Sapsucker	*Sphyrapicus ruber*	S	None	None	None	None	X			X	X	X	X	X	X
B	Downy Woodpecker	*Picoides pubescens*	R	None	None	None	None	XX			XX	X	X		X	X
B	Hairy Woodpecker	*Picoides villosus*	R	None	None	None	None	X			X	X	X	X	X	X
B	Northern Flicker	*Colaptes auratus*	R	None	None	None	None	X			X	X	X	X	X	X
B	Pileated Woodpecker	*Dryocopus pileatus*	R	None	SV	G5/S4?	4	X			X	X	X		X	X
B*	Monk Parakeet*	*Myiopsitta monachus*	R	N/A - alien	N/A - alien	N/A - alien	N/A - alien	XX			XX		X		X	XX
(B)	(Yellow-billed Cuckoo; extirpated)	*Coccyzus americanus*	N	SoC	SC	G5/S1B	2	(XX)			(XX)					
B	Olive-sided Flycatcher	*Contopus cooperi (= borealis)*	N	SoC	SV	G5/S4	4	X			X	XX				
B	Western Wood-Pewee	*Contopus sordidulus*	N	None	None	None	None	X			X	X	X		X	X
B	Willow Flycatcher (western OR race)	*Empidonax traillii brewsteri*	N	None	SV	G5TU/S1B	4	XX			XX	X	X		X	X
B	Hammond's Flycatcher	*Empidonax hammondii*	N	None	None	None	None					X	X			
B	Dusky Flycatcher	*Empidonax oberholseri*	M	None	None	None	None	X			X	X	X			
B	Pacific-slope Flycatcher	*Empidonax dificilus*	N	None	None	None	None	X			X	XX	X			
B	Say's Phoebe	*Sayomis saya*	N	None	None	None	None							X	X	X
B	Western Kingbird	*Tyrannus verticalis*	N	None	None	None	None						X	X	X	X
B	Northern Shrike	*Lanius excubitor*	W / M	None	None	None	None	X		X				X	XX	
B	Cassin's Vireo	*Vireo cassinii*	N	None	None	None	None					X	XX			X
B	Hutton's Vireo	*Vireo huttoni*	R / S	None	None	None	None	X			X	X	XX		X	X
B	Warbling Vireo	*Vireo gilvus*	N	None	None	None	None	XX			XX	XX	X		X	X
B	Red-eyed Vireo	*Vireo olivaceus*	N	None	None	None	None	XX			XX	X				
B	Steller's Jay	*Cyanocitta stelleri*	R	None	None	None	None	X			X	X	X		X	X
B	Western Scrub-Jay	*Aphelocoma californica*	R	None	None	None	None	X			X	X	XX	X	X	X
B	Gray Jay	*Perisoreus canadensis*	R	None	None	None	None	X			X	X	X			X
B	American Crow	*Corvus brachyrhynchos*	R	None	None	None	None	X		X	X	X	X	X	XX	XX
B	Common Raven	*Corvus corax*	R	None	None	None	None	X		X	X	X	X	X	X	X
B	Streaked Horned Lark	*Eremophila alpestris strigata*	S	SoC	SC	G5T2/S2?	2							XX	X	X
B	Purple Martin	*Progne subis*	N	SoC	SC	G5/S3B	2	XX	XX	X	X	X	X	X		X
B	Tree Swallow	*Tachycineta bicolor*	N	None	None	None	None	XX	XX	XX	XX	X	X	X	X	X
B	Violet-green Swallow	*Tachycineta thalassina*	N	None	None	None	None	X	X	X	X	X	X	X	X	X
B	Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	N	None	None	None	None	XX	XX	XX	XX	X	X	X	X	X
B	Cliff Swallow	*Petrochelidon pyrrhonota*	N	None	None	None	None	XX	XX	X	XX	X	X	X	X	X
B	Barn Swallow	*Hirundo rustica*	N	None	None	None	None	XX	XX	XX	XX	X	X	X	XX	X
B	Black-capped Chickadee	*Poecile atricapilla*	R	None	None	None	None	X		X	X	X	X	X	X	X
B	Mountain Chickadee	*Poecile gambeli*	W / M	None	None	None	None	X			X	X	X			X
B	Chestnut-backed Chickadee	*Poecile rufescens*	R	None	None	None	None	X			X	X	X		X	X
B	Bushtit	*Psaltriparus minimus*	R	None	None	None	None	X			X	X	X		X	X
B	Red-breasted Nuthatch	*Sitta canadensis*	R	None	None	None	None	X			X	X	X		X	X
B	White-breasted Nuthatch	*Sitta carolinensis*	R	None	None	None	None	X			X		X	X	X	X
B	Brown Creeper	*Certhia americana*	R	None	None	None	None	X			X	X	X	X	X	X
B	Bewick's Wren	*Thryomanes bewickii*	R	None	None	None	None	X		X	X	X	X		X	X
B	House Wren	*Troglodytes aedon*	N	None	None	None	None	X			X	X	X	X	X	X
B	Winter Wren	*Troglodytes troglodytes*	R	None	None	None	None	X			X	X	X			X
B	Marsh Wren	*Cistothorus palustris*	N	None	None	None	None	XX		XX						

Code[1]	Common Name	Genus/Species	Migratory Status[2]	Federal Status[3]	ODFW Status[4]	ORNHP Rank[5]	ORNHP List[6]	Riparian Assn[7]	Habitat Type[8]							
									WATR	HWET	RWET	WLCH	WODF	WEGR	AGPA	URBN
B	American Dipper	*Cinclus mexicanus*	R / S	None	None	None	None	XX	XX	X	XX					
B	Golden-crowned Kinglet	*Regulus satrapa*	R	None	None	None	None	X			X	XX	X			X
B	Ruby-crowned Kinglet	*Regulus calendula*	W / M	None	None	None	None	X		X	X	X	X	X	X	X
B	Western Bluebird	*Sialia mexicana*	S	None	SV	G5/S4B, S4N	4					XX	XX	X	X	X
B	Townsend's Solitaire	*Myadestes townsendi*	W / M	None	None	None	None	X			X	X	X		X	X
B	Swainson's Thrush	*Catharus ustulatus*	N	None	None	None	None	X			X	X	X		X	X
B	Hermit Thrush	*Catharus guttatus*	S	None	None	None	None	X			X	X	X		X	X
B	American Robin	*Turdus migratorius*	S	None	None	None	None	X		X	X	X	X	X	X	X
B	Varied Thrush	*Ixoreus naevius*	W / M	None	None	None	None					XX	X		X	X
B*	European Starling*	*Sturnus vulgaris*	R / S	N/A - alien	N/A - alien	N/A - alien	N/A - alien	XX		X	XX	X	X	X	X	XX
B	American Pipit	*Anthus rubescens*	W / M	None	None	None	None	X		X				X	XX	
B	Cedar Waxwing	*Bombycilla cedrorum*	S	None	None	None	None	X		X	X	X	X		X	X
B	Orange-crowned Warbler	*Vermivora celata*	N	None	None	None	None	X			X	X	X	X	X	X
B	Nashville Warbler	*Vermivora ruficapilla*	N	None	None	None	None	X			X	X	X		X	
B	Yellow Warbler	*Dendroica petechia*	N	None	None	None	None	XX			XX					
B	Yellow-rumped Warbler	*Dendroica coronata*	S	None	None	None	None	X		X	X	X	X		X	X
B	Black-throated Gray Warbler	*Dendroica nigrescens*	N	None	None	None	None	XX			XX	XX	XX		X	X
B	Townsend's Warbler	*Dendroica townsendi*	S / N	None	None	None	None	X			X	X	X		X	X
B	Hermit Warbler	*Dendroica occidentalis*	N	None	None	None	None	X			X	XX	X			
B	MacGillivray's Warbler	*Oporornis tolmiei*	N	None	None	None	None	X			X	X	X		X	
B	Common Yellowthroat	*Geothlypis trichas*	N	None	None	None	None	XX		XX	XX	X	X	X		X
B	Wilson's Warbler	*Wilsonia pusilla*	N	None	None	None	None	XX			XX	XX	X		X	X
B	Yellow-breasted Chat	*Icteria virens*	N	SoC	SC	G5/S4?	4	XX			XX	X	X		X	
B	Western Tanager	*Piranga ludoviciana*	N	None	None	None	None	X			X	XX	XX			X
B	Spotted Towhee	*Pipilo maculatus*	R	None	None	None	None	X			X	X	XX		X	X
B	Chipping Sparrow	*Spizella passerina*	N	None	None	None	None	X			X	X	X	X	X	X
B	Oregon Vesper Sparrow	*Pooecetes gramineus affinis*	S / N	SoC	SC	G5T3/S2B, S2N	2							XX	XX	
B	Savannah Sparrow	*Passerculus sandwichensis*	S / N	None	None	None	None	X		X	X			XX	XX	X
B	Fox Sparrow	*Passerella iliaca*	W / M	None	None	None	None	X			X	X	X		X	X
B	Song Sparrow	*Melospiza melodia*	R	None	None	None	None	X		X	X	X	X	X	X	X
B	Lincoln's Sparrow	*Melospiza lincolnii*	S / N	None	None	None	None	XX		XX	XX	X			X	
B	Swamp Sparrow	*Melospiza georgiana*	W / M	None	None	None	None	XX		XX	XX				X	
B	White-throated Sparrow	*Zonotrichia albicollis*	W / M	None	None	None	None								X	X
B	Harris's Sparrow	*Zonotrichia querula*	W / M	None	None	None	None								X	X
B	White-crowned Sparrow	*Zonotrichia leucophrys*	S	None	None	None	None	X		X	X	X	X	X	X	X
B	Golden-crowned Sparrow	*Zonotrichia atricapilla*	R	None	None	None	None	X		X	X	X	X	X	X	X
B	Dark-eyed Junco	*Junco hyemalis*	S	None	None	None	None	X			X	X	X		X	X
B	Black-headed Grosbeak	*Pheucticus melanocephalus*	N	None	None	None	None	X			X	X	X		X	X
B	Lazuli Bunting	*Passerina amoena*	N	None	None	None	None	X			X	X	X	X	XX	X
B	Red-winged Blackbird	*Agelaius phoeniceus*	S	None	None	None	None	XX		XX	X			X	X	X
B	Tricolored Blackbird	*Agelaius tricolor*	S	SoC	SP	G3/S2B	2	XX		XX					X	

Code[1]	Common Name	Genus/Species	Migratory Status[2]	Federal Status[3]	ODFW Status[4]	ORNHP Rank[5,7]	ORNHP List[6]	Riparian Assn.[7]	Habitat Type[8]							
									WATR	HWET	RWET	WLCH	WODF	WEGR	AGPA	URBN
B	Western Meadowlark (extirpated as breeding species)	*Stumella neglecta*	W / M	None	SC	G5/S5	4	X		X				XX	XX	
B	Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	N	None	None	None	None	XX		XX					X	
B	Brewer's Blackbird	*Euphagus cyanocephalus*	S	None	None	None	None	X		X	X		X	X	XX	X
B	Brown-headed Cowbird	*Molothrus ater*	S / N	None	None	None	None	X		X	X	X	X	X	XX	X
B	Bullock's Oriole	*Icterus bullockii*	N	None	None	None	None	XX			XX		XX		X	X
B	Purple Finch	*Carpodacus purpureus*	S	None	None	None	None	XX			XX	X	XX		X	X
B	House Finch	*Carpodacus mexicanus*	R	None	None	None	None	X		X	X	X	X	X	XX	XX
B	Red Crossbill	*Loxia curvirostra*	R / S	None	None	None	None	X			X	X	X			X
B	Pine Siskin	*Carduelis pinus*	S	None	None	None	None	X		X	X	X	X		X	X
B	Lesser Goldfinch	*Carduelis psaltria*	S	None	None	None	None	XX			XX	X	XX	X	X	X
B	American Goldfinch	*Carduelis tristis*	S	None	None	None	None	X		X	X	X	X	X	X	X
B	Evening Grosbeak	*Coccothraustes vespertinus*	W / M	None	None	None	None	X			X	X	X			X
B*	House Sparrow*	*Passer domesticus*	R	N/A - alien	N/A - alien	N/A - alien	N/A - alien								XX	XX
M*	Virginia Opossum*	*Didelphis virginiana*	R	N/A - alien	N/A - alien	N/A - alien	N/A - alien	X			X	X	X	X	XX	XX
M	Vagrant Shrew	*Sorex vagrans*	R	None	None	None	None	X		X	X	X	X	X	X	X
M	Pacific Water Shrew	*Sorex bendirii*	R	None	None	None	None	XX		X	XX	X	X			
M	Water Shrew	*Sorex palustris*	R	None	None	None	None	XX			XX	X				
M	Trowbridge's Shrew	*Sorex trowbridgii*	R	None	None	None	None	X			X	XX	X		X	X
M	Shrew-mole	*Neurotrichus gibbsii*	R	None	None	None	None	X		X	X	XX	X		X	X
M	Townsend's Mole	*Scapanus townsendii*	R	None	None	None	None	X		X	X	X	X	X	X	X
M	Coast Mole	*Scapanus orarius*	R	None	None	None	None	X			X	XX	X	X	X	X
M	Yuma Myotis	*Myotis yumanensis*	R / S	SoC	None	G5/S3	4	XX	XX	XX	XX	X	X	X	X	X
M	Little Brown Myotis	*Myotis lucifugus*	R / S	None	None	None	None	X	X	X	X	X	X	X	X	X
M	Long-legged Myotis	*Myotis volans*	R / S	SoC	SU	G5/S3	4	X	X	X	X	XX	X	X	X	X
M	Fringed Myotis	*Myotis thysanodes*	R / S	SoC	SV	G4G5/S2?	2	X	X	X	X	X	X		X	X
M	Long-eared Myotis	*Myotis evotis*	R / S	SoC	SU	G5/S3	4	X	X	X	X	X	X	X	X	X
M	Silver-haired Bat	*Lasionycteris noctivagans*	L	SoC	SU	G5/S4?	4	X	X	X	X	XX	X	X	X	X
M	Big Brown Bat	*Eptesicus fuscus*	R / S	None	None	None	None	X	X	X	X	X	XX	X	XX	XX
M	Hoary Bat	*Lasiurs cinereus*	L	None	None	G5/S4?	4	X	X	X	X	X	X	X	X	X
M	Pacific Western Big-eared Bat	*Corynorhinus townsendii townsendii*	R / S	SoC	SC	G4T3T4/S2?	2	XX	XX	X	X	X	X	X	X	X
M	Brush Rabbit	*Sylvilagus bachmani*	R	None	None	None	None	X			X	X	X	X	X	X
M*	Eastern Cottontail*	*Sylvilagus floridanus*	R	N/A - alien	N/A - alien	N/A - alien	N/A - alien	X			X				X	X
M	Mountain Beaver	*Aplodontia rufa*	R	None	None	None	None	XX			XX	XX				
M	Townsend's Chipmunk	*Tamias townsendii*	R	None	None	None	None	X			X	XX	X			X
M	California Ground Squirrel	*Spermophilus beecheyi*	R	None	None	None	None					X	X	X	X	X
M*	Eastern Fox Squirrel*	*Sciurus niger*	R	N/A - alien	N/A - alien	N/A - alien	N/A - alien							XX	XX	XX
M*	Eastern Gray Squirrel*	*Sciurus carolinensis*	R	N/A - alien	N/A - alien	N/A - alien	N/A - alien						XX		X	XX
M	Western Gray Squirrel	*Sciurus griseus*	R	None	SU	G5/S4?	3					X	XX		X	X
M	Douglas' Squirrel	*Tamiasciurus douglasii*	R	None	None	None	None		XX	XX	X					
M	Northern Flying Squirrel	*Glaucomys sabrinus*	R	None	None	None	None	X			X	XX	XX			X
(M)	(Western pocket gopher)	*(Thomomys mazama)*	(R)	None	None	None	None					XX	XX	X	X	X

Code	Common Name[1]	Genus/Species	Migratory Status[2]	Federal Status[3]	ODFW Status[4]	ORNHP Rank[5]	ORNHP List[6]	Riparian Assn.[7]	Habitat Type[8]							
									WATR	HWET	RWET	WLCH	WODF	WEGR	AGPA	URBN
M	Camas Pocket Gopher	*Thomomys bulbivorus*	R	SoC	None	G3G4/S3 S4	3							XX	XX	X
M	American Beaver	*Castor canadensis*	R	None	None	None	None	XX	XX	XX	XX	X	X		X	X
M	Deer Mouse	*Peromyscus maniculatus*	R	None	None	None	None	XX		XX	XX	XX	XX	XX	XX	XX
M	Bushy-tailed Woodrat	*Neotoma cinerea*	R	None	None	None	None	X			X	XX	XX		XX	X
M	Western Red-backed Vole	*Clethrionomys californicus*	R	None	None	None	None	X			X	X				
M	Heather Vole	*Phenacomys intermedius*	R	None	None	None	None	X			X		X			
M	White-footed Vole	*Arborimus (= Phenacomys) albipes*	R	SoC	SU	G3G4/S3	4	XX			XX	XX				
M	Red Tree Vole	*Arborimus (= Phenacomys) longicaudus*	R	SoC	None	G3G4/S3S4	3	X			X	XX	XX			
M	Gray-tailed Vole	*Microtus canicaudus*	R	None	None	None	None							XX	XX	
M	Townsend's Vole	*Microtus townsendii*	R	None	None	None	None	XX		XX	X	X	X	X	X	
M	Long-tailed Vole	*Microtus longicaudus*	R	None	None	None	None	XX		XX	XX	X	X	X	X	
M	Creeping Vole	*Microtus oregoni*	R	None	None	None	None	X			X	X	X	X	X	X
M	Water Vole	*Microtus richardsoni*	R	None	None	None	None	X			X	X				
M	Common Muskrat	*Ondatra zibethicus*	R	None	None	None	None	XX	XX	XX	XX				X	X
M*	Black Rat*	*Rattus rattus*	R	N/A - alien	N/A - alien	N/A - alien	N/A - alien								X	XX
M*	Norway Rat*	*Rattus norvegicus*	R	N/A - alien	N/A - alien	N/A - alien	N/A - alien								X	XX
M*	House Mouse*	*Mus musculus*	R	N/A - alien	N/A - alien	N/A - alien	N/A - alien								XX	XX
M	Pacific Jumping Mouse	*Zapus trinotatus*	R	None	None	None	None	XX		X	XX	X	X		X	
M	Common Porcupine	*Erethizon dorsatum*	R	None	None	None	None	XX		X	XX	XX	XX		X	X
M*	Nutria*	*Myocastor coypus*	R	N/A - alien	N/A - alien	N/A - alien	N/A - alien	XX	XX	XX	XX				X	X
M	Coyote	*Canis latrans*	R	None	None	None	None	X		X	X	X	X	X	X	X
M	Red Fox	*Vulpes vulpes*	R	None	None	None	None	X			X	X	X	XX	X	X
M	Gray Fox	*Urocyon cinereoargenteus*	R	None	None	None	None	X			X	XX	X	X	X	
(M)	(Gray Wolf - extirpated)	*(Canis lupus)*	S	None	None	None	None	(X)			(X)	(X)	(X)	(X)		
M	Black Bear	*Ursus americanus*	S	None	None	None	None	X		X	X	X	X	X	X	X
(M)	(Grizzly Bear)	*(Ursus arctos)*	(R)	LT	None	G4/SX	2-ex	(X)			(X)	(X)		(X)		
M	Common Raccoon	*Procyon lotor*	R	None	None	None	None	XX	X	XX	XX	X	X	X	XX	XX
M	Ermine	*Mustela erminea*	R	None	None	None	None	X			X	X	X	X	X	
M	Long-tailed Weasel	*Mustela frenata*	R	None	None	None	None	X		X	X	X	X	X	X	X
M	Mink	*Mustela vison*	R	None	None	None	None	XX	XX	XX	XX	X	X	X	X	X
M	Striped Skunk	*Mephitis mephitis*	R	None	None	None	None	X		X	X	X	X	X	X	X
M	Western Spotted Skunk	*Spilogale gracilis*	R	None	None	None	None	X			X	X	X	X	X	X
M	Northern River Otter	*Lontra canadensis*	R	None	None	None	None	XX	XX	XX	XX					X
M	Mountain Lion (Cougar)	*Puma concolor*	S	None	None	None	None	X		X	X	X	X		X	X
M	Bobcat	*Lynx rufus*	S	None	None	None	None	X		X	X	X	X	X	X	X
M*	Domestic Cat (feral)*	*Felis domesticus*	R	N/A - alien	N/A - alien	N/A - alien	N/A - alien	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
M	California Sea Lion	*Zalophus californianus*	S	None	None	None	None	XX	XX							
M	Roosevelt Elk	*Cervus elaphus roosevelti*	S	None	None	None	None	X		X	X	X	X	X	X	X
(M)	(Columbian White-tailed Deer)	*(Odocoileus virginiana leucurus)*	(R)	LE	SV	G5T2QS2	1	(X)		(X)	(X)	(X)	(XX)	(X)	(X)	(X)
M	Mule Deer	*Odocoileus hemionus*	R	None	None	None	None	X		X	X	X	X	X	X	X

Code	Common Name	Genus/Species	Migratory Status	Federal Status	ODFW Status	ORNHP Rank	ORNHP List	Riparian Assn	Habitat Type							
									WATR	HWET	RWET	WLCH	WODF	WEGR	AGRA	URBN

[a] Bald eagle is currently proposed for de-listing at the federal level.

Appendix 1. ***DRAFT*** Portland Metro Region Invertebrate Species List (June 19, 2001)

Class	Order	Family	Genus	Species	Common name	Habitat, Ecoregion, County and/or Location	Source	Species at Risk?	Important Fish Prey?	Important Predator?	Important Pollinator?	Important Prey?	Other Important Functions?
Arachnida	Acari												
		Subfamily = Hydrocarinae			aquatic mites	Riffle samples in Clackamas tributaries and Tualatin River Basin	1						
Arachnida	Araneae												
		Agelenidae	*Tegenaria*	*agrestis*	House spider, Funnel weaver		2			X			
		Araneidae	*Argiope*	*aurantia*	Black & yellow garden spider	Tualatin Hills Nature Park	2			X			
		Clubionidae	*Cheiracanthium*	*sp*	Yellow sac spider		2			X			
		Linyphiidae	*Linyphia*	*marginata*	Filmy dome spider		2			X			
		Lycosidae	*Lycosa*	*sp.*	Wolf spider		2			X			
		Pholcidae	*Pholcus*	*phalangioides*	Ghost spider, Daddy long legs		2			X			
		Salticidae	*Dendryphantes*	*sp.*	Jumping spider		2			X			
		Salticidae	*Marptusa*	*sp.*	Jumping spider		2			X			
		Salticidae	*Salticus*	*scenicum*	Zebra spider		2			X			
		Thomisidae	*Misumena*	*vatia*	Red-spotted crab spider	Tualatin Hills Nature Park	2			X			
		Thomisidae	*Tibellus*	*spp*	Crab spider		2			X			
Arachnida	Opiliones												
		suborder = Palpatores			Harvestmen, Daddy Long Legs	Tualatin Hills Nature Park	2			X			*Detritivore (feeds on/breaks down dead organic matter)*
Arachnida	Pseudoscorpions												
					Pseudoscorpion	Tualatin Hills Nature park	2			X			
Bivalvia	Unionoida												
superfamily = Corbiculacea	order?	Corbiculidae	*Corbicula*	*sp*		Tualatin River Basin	3						
superfamily = Sphaeriacea	Order?	Sphaeriidae				Tualatin River Basin	3						
superfamily = Unionacea		Unionidae	*Anodonta*	*californiensis*	California floater (mussel)	Cty: Mult. Ecoreg: CR, WV, WC, EC, BM, BR	4	*S1? Federal species of concern*					*Filter organic debris from water, food for fish and other aquatic organisms*
superfamily = Unionacea		Unionidae				Tualatin River Basin	3						
superfamily = Unionacea		Unionidae?	*Unio*	*willamettensis*		Tualatin Hills Nature Park	2						
Chilopoda	Scutigeromorpha												
			Scutigera	*coleopterata*	House centipede		2						
Copepoda = (Subphylum = Crustacea)				*sp*		Tualatin River Basin	3						
Diplopoda													
			Harpaphe	*haydeniana*	Yellow & black forest millipede	Tualatin Hills Nature Park	2						*Detritivore*

Appendix 1. ***DRAFT*** Portland Metro Region Invertebrate Species List (June 19, 2001)

Class	Order	Family	Genus	Species	Common name	Habitat, Ecoregion, County, and/or Location	Source	Species at Risk?	Important to Native Prey?	Important Predator?	Important Pollinator?	Important Prey?	Other Important Functions?
Gastropoda	Mesogastropoda												
		Ancylidae	*Ferrissia*			Tualatin River Basin	3						
		Hydrobiidae				Tualatin River Basin	3						
		Pleuroceridae	*Juga*			Tualatin River Basin	3						
		Vitrinidae	*Oxychilus*	*alliarius*	Garlic glass snail	Tualatin Hills Nature Park	2						
		Pleuroceridae	*Juga*	*sp. nov.*	Brown juga (snail)	Cty: Mult. Ecoreg: WC	4	*S1. ORNHP List 2.*					
		Pleuroceridae	*Juga*	*hemphilli hemphilli*	Barren juga (snail)	Cty: Mult. Ecoreg: WV, WC	4	*S1. ORNHP List 1.*					
			Fluminicola	*columbiana (=F. fuscus)*	Columbia pebblesnail or spire snail	Cty: Mult. Ecoreg: WV, BM, CB	4	*S2. Federal species of concern. ORNHP List 3*					
			Lyogyrus	*sp. nov.*	Columbia duskysnail	Cty: Mult, Clac. Ecoreg: WV, WC, EC	4	*S2. ORNHP List1.*					
			Pristinicola (= Bythinella)	*hemphilli*	Pristine springsnail	Cty: Mult. Ecoreg: WC, EC, BM, CB	4	*S2? ORNHP List 3.*					
Gastropoda	Basommatophora												
		Lymnaeidae	*Fisherola*	*nuttalli*	Shortface lanx (snail) (= giant Columbia River limpet)	Cty: Mult. Ecoregion: WV, CB	4	*S2. List 2.*					
		Physidae	*Physella*	*columbiana*	Rotund physa (snail)	Cty: Mult. Ecoregion: CR, WV, WC	4	*SH. List 1.*					
		Physidae	*Physella*	*sp*		Tualatin River Basin	3						
		Planorbidae	*Vorticifex*	*neritoides*	Nerite ramshorn (snail)	Cty: Mult. Ecoregion: CR, WV, WC	4	*SH. List 3.*					
		Planorbidae				Tualatin River Basin	3						
Gastropoda	Stylommatophora												
		Arionidae	*Ariolimax*	*columbianus*	Banana slug	Tualatin Hills Nature Park	2						
		Arionidae	*Arion*	*ater*	Garden slug	Tualatin Hills Nature Park	2						
		Arionidae	*Hemphillia*	*malonei*	Malone jumping-slug	Cty: Mult, Clac. Ecoregion: WC	4	*S1. List 1.*					
		Arionidae	*Prophysaon*	*coeruleum*	blue-grey tail-dropper (slug)	Cty: Mult, Clac. Ecoregion: WV	4	*S1. List 2.*					
		Limacidae	*Deroceras*	*hesperium*	evening fieldslug	Cty: Clac. Ecoregion: CR, WV, WC	4	*S1. List 1.*					
		Polygyridae	*Cryptomastix*	*devia*	Puget Oregonian (snail)	Cty: Mult. Ecotregion: WV	4	*S1. List 3.*					
		Thysanophoridae	*Megomphix*	*hemphilli*	Oregon megomphix (snail)	Cty: Mult. Ecoregion: CR, WV	4	*S2. List 1.*					
Insecta	Coleoptera (Beetles)												
		Buprestidae	*Buprestis*	*aurulenta*	Golden buprestid beetle	Tualatin Hills Nature Park	2						
		Carabidae	*Acupalpus*	*punctulatus*	Marsh ground beetle	Cty: Wash. Ecoregion: WV	4	*S2? List 3.*					
		Carabidae	*Agonum*	*belleri*	Beller's ground beetle	Cty: Clac. Ecroregion: WC	4	*S1? List 2. Sp of concern.*					
		Carabidae	*Carabus*	*nemoralis*	European ground beetle	Tualatin Hills Nature Park	2						

Appendix 1. ***DRAFT*** Portland Metro Region Invertebrate Species List (June 19, 2001)

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		Carabidae	*Pterostichus*	*johnsoni*	Johnson's waterfall carabid beetle	Cty: Mult, Clac. Ecoregion: WC	4	*S4? List 4.*					
		Carabidae	*Scaphinotus*	*sp*	Snail eating beetle	Tualatin Hills Nature Park	2			X			*Feed on snails*
		Cerambycidae			Long-horned beetle	Tualatin Hills Nature Park	2						
		Chrysomelid			Leaf beetle	Tualatin Hills Nature Park	2						
		Chrysomelidae	Chrysolina	sp	Chrysolina beetle	Tualatin Hills Nature Park	2						
		Chrysomelidae	*Diabrotica*	*undecimpunctata*	Western spotted cucumber beetle	Tualatin Hills Nature Park	2						
		Chrysomelidae			Tortoise-shelled beetle	Tualatin Hills Nature Park	2						
		Cicindelidae	*Cicindela*	*oregona*	Tiger beetle	Metro area	5			X			
		Cicindelidae	*Cicindela*	*repanda*	Tiger beetle	Metro area	5			X			
		Cicindelidae	*Omus*	*audouini*	Tiger beetle	Metro area	5			X			
		Cicindelidae	*Omus*	*dejeani*	Tiger beetle	Metro area	5			X			
		Coccinellidae	*Hippodamia*	*convergens*	Convergent ladybird beetle	Tualatin Hills Nature Park	2						
		Coccinellidae			Fourteen-spotted ladybug	Tualatin Hills Nature Park	2			X			
		Curculionidae		*sp*	Weevils	Tualatin River Basin	3						
		Dytiscidae			predaceous diving beetles	Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3						
		Elmidae	*Ampumixis (L)*	*sp*	riffle beetle	Riffle samples in Clackamas tributaries.	1						
		Elmidae	*Cleptelmis*	*sp*	riffle beetle	Riffle samples in Clackamas tributaries.	*1*						
		Elmidae	*Heterlimnlius*	*sp*	riffle beetle	Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3						
		Elmidae	*Lara (L)*	*avara (from Tualatin)*	riffle beetle	Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3						
		Elmidae	*Narpus*	*sp*	riffle beetle	Riffle samples in Clackamas tributaries.	1						
		Elmidae	*Optioservus*	*sp*	riffle beetle	Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3						
		Elmidae	*Ordobrevia (L)*	*sp*	riffle beetle	Riffle samples in Clackamas tributaries.	1						
		Elmidae	*Zaitzevia*	*sp*	riffle beetle	Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3						
		Gyrinidae	*Gyrinus*	*sp*	Whirligig beetle	Tualatin Hills Nature Park	1						
		Haliplidae	*Haliplus*	*sp*	Crawling water beetle	Tualatin River Basin	3						
		Hydrophilidae	*Ametor*	*sp*	Water scavenger beetle	Tualatin River Basin	3						
		Mordellidae			Tumbling flower beetle	Tualatin Hills Nature Park	2				X		
		Nitidulidae			Sap beetles	Tualatin Hills Nature Park	2						
		Psephenidae	*Acneus(L)*	*sp*	water penny	Riffle samples in Clackamas tributaries.	1						
		Scarabaeidae	*Polyphylla*	*decimlineata*	Ten-lined June beetle	Tualatin Hills Nature Park	2						
		Scarabaeidae			Scarab beetle	Tualatin Hills Nature Park	2						
		Silphidae	*Nicrophorus*	*sp*	Burying beetle	Tualatin Hills Nature Park	2						*Detritivore (helps recycle animal carcasses)*

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Insecta	Diptera (flies)												
		Athericidae	*Atherix*	*sp*	no-see-ums	Tualatin River Basin	3						
		Athericidae	*Atherix*			Riffle samples in Clackamas tributaries.	1						
		Bibionidae			March flies	Tualatin Hills Nature Park	2						
		Blephariceridae			netwinged midges	Riffle samples in Clackamas tributaries.	1						
		Bombyliidae	*Bombylius*	*sp*	bee fly	Metro area	2						
		Ceratopogonidae	*Atrichopogon*	*spp*	no-see-ums	Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3						
		Chironomidae	*Tribe: Chironomini*	*sp*	midges	Tualatin River Basin	3		X				
		Chironomidae	*Tribe: Orthocladiinae*	*sp*	midges	Tualatin River Basin	3		X				
		Chironomidae	*Tribe: Prodiamesinae*	*sp*	midges	Tualatin River Basin	3		X				
		Chironomidae	*Tribe: Tanypodinae*	*sp*	midges	Tualatin River Basin	3		X				
		Chironomidae	*Tribe: Tanytarsini*	*sp*	midges	Tualatin River Basin	3		X				
		Chironomidae			midges	Riffle samples in Clackamas tributaries.	1		X				
		Culicidae			Mosquito	Tualatin Hills Nature Park	2		X				
		Dixidae	*Dixa*		Dixid midges	Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3		X				
		Dixidae	*Dixella*		Dixid midges	Riffle samples in Clackamas tributaries.	1		X				
		Dixidae	*Meringodixa*		Dixid midges	Riffle samples in Clackamas tributaries.	1		X				
		Dolichopodidae		*sp*	Long-legged fly	Tualatin River Basin	3						
		Empididae	*Chelifera*		dance fly	Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3						
		Empididae	*Clinocera*		dance fly	Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3						
		Empididae	*Hemerodromia*		dance fly	Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3						
		Empididae	*Oregoton*		dance fly	Riffle samples in Clackamas tributaries.	1						
		Empididae	*Wiedemannia*		dance fly	Riffle samples in Clackamas tributaries.	1						
		Ephydridae		*sp*	Shore fly	Tualatin River Basin	3						
		Pelechorynchidae	*Glutops*			Riffle samples in Clackamas tributaries.	1						
		Psychodidae	*Maruina*		Moth fly	Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3						

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		Psychodidae	*Pericoma*		Moth fly	Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3						
		Ptycopteridae	*Ptycoptera*	*sp*	Phantom crane fly	Tualatin River Basin	3						
		Sciomyzidae		*sp*	Marsh fly	Tualatin River Basin	3						
		Simuliidae	*Simulium*		Black flies	Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3						
		Stratiomyidae			Soldier flies	Riffle samples in Clackamas tributaries.	1						
		Syrphidae				Tualatin Hills Nature Park	2						
		Tabanidae	*Tabanus*	*sp*	Horse/Deer fly	Tualatin River Basin	3						
		Tachinidae		*spp*		Metro area	2						
		Therevidae			Stiletto fly	Tualatin Hills Nature Park	2						
		Tipulidae	*Antocha*		Crane fly	Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3						
		Tipulidae	*Cryptolabis*		Crane fly	Riffle samples in Clackamas tributaries.	1						
		Tipulidae	*Dicranota*		Crane fly	Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3						
		Tipulidae	*Hexatoma*		Crane fly	Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3						
		Tipulidae	*Limonia*		Crane fly	Riffle samples in Clackamas tributaries.	1						
		Tipulidae	*Molophilus*		Crane fly	Tualatin River Basin	3						
		Tipulidae	*Tipula*		Crane fly	Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3						
Insecta	Ephemeroptera (Mayflies)												
		Ameletidae	*Ameletus*			Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3		X				
		Baetidae	*Acentrella*			Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3		X				
		Baetidae	*Baetis*	*tricaudatus*		Tualatin River Basin	3		X				
		Baetidae	*Baetis*		blue-winged olive	Riffle samples in Clackamas tributaries.	1		X				
		Baetidae	*Centroptilum/Procloeon*			Riffle samples in Clackamas tributaries.	1		X				
		Baetidae	*Diphetor*			Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3		X				
		Ephemerellidae	*Attenella*			Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3		X				
		Ephemerellidae	*Caudatella*			Riffle samples in Clackamas tributaries.	1		X				
		Ephemerellidae	*Drunella*	*doddsi*		Tualatin River Basin	3		X				
		Ephemerellidae	*Drunella*	*pelosa*		Tualatin River Basin	3		X				

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		Ephemerellidae	*Drunella*		slate winged olive	Riffle samples in Clackamas tributaries.	1		X				
		Ephemerellidae	*Ephemerlla*		pale morning dun	Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3		X				
		Ephemerellidae	*Serratella*	*tibialis*		Tualatin River Basin	3		X				
		Ephemerellidae	*Serratella*			Riffle samples in Clackamas tributaries.	1		X				
		Ephemerellidae	*Timpanoga*			Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3		X				
		Heptageniidae	*Cinygma*			Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3		X				
		Heptageniidae	*Cinygmula*			Riffle samples in Clackamas tributaries.	1		X				
		Heptageniidae	*Epeorus*	*longimanus/deceptivus*		Tualatin River Basin	3		X				
		Heptageniidae	*Epeorus*		small yellow may	Riffle samples in Clackamas tributaries.	1		X				
		Heptageniidae	*Heptagenia/Nixe*		pale evening dun	Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3		X				
		Heptageniidae	*Ironodes*			Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3		X				
		Heptageniidae	*Rhithrogena*		western march brown	Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3		X				
		Leptophlebiidae	*Paraleptophlebia*		slate-winged mahogany dun	Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3		X				
Insecta	Hemiptera												
		Cercopidae			Spittle bug	Tualatin Hills Nature Park	2						
		Gerridae	*Gerris*	*remigis*	Water strider	Tualatin Hills Nature Park	2			X			
		Lygaeidae	*Lygaeus*	*kalmii*	Common milkweed bug	Tualatin Hills Nature Park	2						
		Pentatomidae	*Murgantia*	*histrionica*	Harlequin cabbage bug	Tualatin Hills Nature Park	2			X			
		Pentatomidae			Stink bug	Tualatin Hills Nature Park	2						
			Micracanthi	*schuhi*	Schuh's micracanthia shore bug	Cty: Clac. Ecoregion: WC	4	S?. List 3.					
Insecta	Homoptera												
		Aphididae	*Aphis*	*sp*	Aphid	Tualatin Hills Nature Park	2						
Insecta	Hymenoptera												
		Andrenidae	*Andrena*	*amphibola*		Mult, Clac, and/or Wash	6				X		
		Andrenidae	*Andrena*	*nivalis*		Mult, Clac, and/or Wash AND Portland	6				X		
		Andrenidae	*Andrena*	*prunorum prunorum*		Mult, Clac, and/or Wash AND Portland	6				X		
		Andrenidae	*Perdita*	*ciliata*		Mult, Clac, and/or Wash	6				X		
		Anthophoridae	*Mellisodes*	*sp*		Metro area	2				X		
		Apidae	*Apis*	*mellifera*	Honey bee	Metro area	2				X		
		Apidae	*Bombus*	*californicus*	Bumble bee	Metro area	2				X		

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		Apidae	*Bombus*	*caliginosus*	Bumble bee	Mult, Clac, and/or Wash AND Portland	6				X		
		Apidae	*Bombus*	*huntii*	Bumble bee	Metro area	2				X		
		Apidae	*Bombus*	*melanopygus*	Bumble bee	Mult, Clac, and/or Wash	6				X		
		Apidae	*Bombus*	*occidentalis*	Bumble bee	Mult, Clac, and/or Wash	6				X		
		Apidae	*Bombus*	*rufocinctus*	Bumble bee	Metro area	2				X		
		Apidae	*Bombus*	*sitkensis*	Bumble bee	Mult, Clac, and/or Wash	6				X		
		Apidae	*Bombus*	*ternarius*	Bumble bee	Tualatin Hills Nature Park	2				X		
		Apidae	*Bombus*	*vosnesenskii*	Bumble bee	Metro area	2				X		
		Apidae	*Ceratina*	*acantha*		Mult, Clac, and/or Wash AND Portland	6				X		
		Apidae	*Nomada*	*edwardsii edwardsii*		Mult, Clac, and/or Wash AND Portland	6				X		
		Apidae	*Psithyrus*	*fernaldae*		Mult, Clac, and/or Wash	6				X		
		Apidae	*Psithyrus*	*fernaldae*		Mult, Clac, and/or Wash	6				X		
		Apidae	*Synhalonia*	*edwardsii*		Mult, Clac, and/or Wash AND Portland	6				X		
		Apidae	*Synhalonia*	*frater lata*		Mult, Clac, and/or Wash	6				X		
		Chrysididae	*Chrysis*	*pacifica*	Pacific cuckoo wasp	Tualatin Hills Nature Park	2						
		Colletidae	*Colletes*	*sp*		Metro area	2				X		
		Colletidae	*Hylaeus*	*episcopalis episcopalis*		Mult, Clac, and/or Wash	6				X		
		Cynipidae		*sp*	Gall wasp	Tualatin Hills Nature Park	2						
		Formicidae		*spp*	Ants								
		Halictidae	*Agapostemon*	*femoratus*		Mult, Clac, and/or Wash AND Portland	6				X		
		Halictidae	*Agapostemon*	*texanus*		Mult, Clac, and/or Wash	6				X		
		Halictidae	*Dufourea*	*calochorti sculleni*		Mult, Clac, and/or Wash	6				X		
		Halictidae	*Dufourea*	*campanulae*		Mult, Clac, and/or Wash	6				X		
		Halictidae	*Halictus*	*sp*		Metro area	2				X		
		Halictidae	*Lasioglossum*	*mellipes*		Mult, Clac, and/or Wash AND Portland	6				X		
		Halictidae	*Lasioglossum*	*olympiae*		Mult, Clac, and/or Wash AND Portland	6				X		
		Megachilidae	*Megachile*	*brevis brevis*		Mult, Clac, and/or Wash	6				X		
		Megachilidae	*Osmia*	*atrocyanea*		Mult, Clac, and/or Wash	6				X		
		Megachilidae	*Osmia*	*bella*		Mult, Clac, and/or Wash	6				X		
		Megachilidae	*Osmia*	*exigua*		Mult, Clac, and/or Wash	6				X		
		Megachilidae	*Osmia*	*juxta*		Mult, Clac, and/or Wash	6				X		
		Megachilidae	*Osmia*	*kincaidii*		Mult, Clac, and/or Wash	6				X		
		Megachilidae	*Osmia*	*nigrifrons*		Mult, Clac, and/or Wash	6				X		
		Megachilidae	*Osmia*	*obliqua*		Mult, Clac, and/or Wash	6				X		
		Megachilidae	*Osmia*	*paradisica*		Mult, Clac, and/or Wash	6				X		
		Megachilidae	*Osmia*	*pensternonis*		Mult, Clac, and/or Wash	6				X		

Appendix 1. ***DRAFT*** Portland Metro Region Invertebrate Species List (June 19, 2001)

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		Megachilidae	*Osmia*	*texana*		Mult, Clac, and/or Wash	6				X		
		Megachilidae	*Osmia*	*trifoliama*		Mult, Clac, and/or Wash	6				X		
		Megachilidae	*Osmia*	*unca*		Mult, Clac, and/or Wash	6				X		
		Megachilidae	*Stelis*	*foederalis*		Mult, Clac, and/or Wash	6				X		
		Megachilidae	*Stelis*	*montana*		Mult, Clac, and/or Wash	6				X		
		Megachilidae	*Stelis*	*rusti*		Mult, Clac, and/or Wash	6				X		
		Megachilidae	*Stelis*	*subemarginata*		Mult, Clac, and/or Wash	6				X		
		Pompilidae		*sp*	Spider wasps	Metro area	2						
		Sphecidae		*sp*	Mud-dauber wasp	Metro area	2			X			
		Tenthredinidae	*Caliroa*	*cerasi*	Pear sawfly	Tualatin Hills Nature Park	2						
		Vespidae	*Polistes*	*sp*	Paper wasp	Metro area	2			X			
		Vespidae	*Vespula*	*maculata*	Bald-faced hornet	Tualatin Hills Nature Park	2			X			
		Vespidae	*Vespula*	*spp*	Yellow jacket					X			
Insecta	Isoptera												
				spp	Termites								
Insecta	Lepidoptera												
		Arctiidae	*Arctia*	*caja COMPLEX*	Garden/Great tiger moth	Cty: Clac, Wash	7						
		Arctiidae	*Cisseps*	*fulvicollis*	Yellow-collared scape moth	Cty: Clac, Wash	7						
		Arctiidae	*Clemensia*	*albata*	Little white lichen moth	Cty: Clac	7						
		Arctiidae	*Crambidia*	*casta*	Pearly-winged lichen moth	Cty: Clac	7						
		Arctiidae	*Ctenucha*	*multfaria*	none	Cty: Clac, Wash	7						
		Arctiidae	*Cycnia*	*oregonensis*	Oregon cycnis	Cty: Clac	7						
		Arctiidae	*Gnophaela*	*vermiculata*	none	Cty: Wash	7						
		Arctiidae	*Grammia*	*ornata*	Ornate tiger moth	Cty: Wash	7						
		Arctiidae	*Hemihyalea*	*edwardsii*	Edwards' glassywing	Cty: Wash	7						
		Arctiidae	*Hyphantria*	*cune*	Fall webworm moth	Cty: Clac	7						
		Arctiidae	*Leptarctia*	*californiae*	none	Cty: Mult, Clac	7						
		Arctiidae	*Lophocampa*	*argentata*	Silver-spotted tiger moth	Cty: Clac, Wash	7						
		Arctiidae	*Lophocampa*	*maculata*	Yellow-spotted tiger moth	Cty: Clac	7						
		Arctiidae	*Phragmatobia*	*fuliginosa*	Ruby tiger moth	Cty: Clac	7						
		Arctiidae	*Platyprepia*	*virginalis*	Ranchman's tiger moth	Cty: Mult, Wash	7						
		Arctiidae	*Pyrrharctia*	*isabella*	Banded woolybear	Cty: Mult, Clac, Wash	7						
		Arctiidae	*Spilosoma*	*pteridis*	none	Cty: Mult, Clac, Wash	7						
		Arctiidae	*Spilosoma*	*virginica*	Yellow woolybear moth	Cty: Mult, Clac, Wash	7						
		Arctiidae	*Tyria*	*jacobaeae*	Cinnabar moth	Cty: Clac; Tualatin Hills Nature Park	2,7						
		Danaidae	*Danaus*	*plexippus*	Monarch	Cty: Mult, Clac, Wash	8				X		*Amazing migrations!*
		Drepanidae	*Drepana*	*arcuata*	none	Cty: Clac	7						
		Drepanidae	*Drepana*	*bilineata*	none	Cty: Clac	7						
		Geometridae			Geometer moth	Tualatin Hills Nature Park	2						
		Hesperiidae	*Ambliscirtes*	*vialis*	Roadside skipper	Cty: Clac	8						
		Hesperiidae	*Atalopedes*	*campestris campestris*	Sachem	Cty: Mult, Clac, Wash.	8						
		Hesperiidae	*Carterocephalus*	*palaemon mandan*	Arctic skipper	Cty: Mult, Clac, Wash.	8						

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		Hesperiidae	*Epargyreus*	*clarus californicus*	Silver-spotted skipper	Cty: Mult, Clac, Wash	8						
		Hesperiidae	*Erynnis*	*icelus*	Dreamy dusky wing	Cty: Clac, Wash	8						
		Hesperiidae	*Erynnis*	*persius ssp.*	Persius dusky wing	Cty: Mult, Clac, Wash	8						
		Hesperiidae	*Erynnis*	*propertius*	Propertius dusky wing	Cty: Mult	8						
		Hesperiidae	*Euphyes*	*vestris vestris*	Dun skipper	Cty: Clac.	8						
		Hesperiidae	*Hesperia*	*juba*	Juba skipper	Cty: Mult, Clac, Wash.	8						
		Hesperiidae	*Ochlodes*	*sylvanoides sylvanoides*	Woodland skipper	Cty: Mult, Clac, Wash.	8						
		Hesperiidae	*Polites*	*sonora siris*	Sonora skipper	Cty: Mult.	8						
		Hesperiidae	*Pyrgus*	*ruralis ruralis*	Two-banded checkered skipper	Cty: Mult, Clac, Wash	8						
		Lycaenidae	*Callophrys*	*perplexa perplexa*	? hairstreak	Cty: Clac, Wash	8						
		Lycaenidae	*Celastrina*	*argiolus echo*	Echo blue	Cty: Mult, Clac, Wash	8						
		Lycaenidae	*Everes*	*amyntula amyntula*	Western tailed blue	Cty: Mult, Clac, Wash	8						
		Lycaenidae	*Everes*	*comyntas comyntas*	Eastern tailed blue	Cty: Mult	8						
		Lycaenidae	*Glaucopsyche*	*lygdamus columbia*	Silvery blue	Cty: Mult, Clac.	8						
		Lycaenidae	*Icaricia*	*acmon acmon/lutzi*	Acmon blue	Cty: Mult, Clac.	8						
		Lycaenidae	*Incisalia*	*augustinus iroides*	Western brown elfin	Cty: Mult, Clac, Wash	8						
		Lycaenidae	*Incisalia*	*eryphon sheltonensis*	Western pine elfin	Cty: Wash	8						
		Lycaenidae	*Lycaena*	*helloides helloides*	Purplish copper	Cty: Mult, Clac, Wash	8						
		Lycaenidae	*Mitoura*	*grynea plicataria*	Cedar hairstreak	Cty: Mult, Clac, Wash	8						
		Lycaenidae	*Satyrium*	*saepium saepium*	Hedgerow hairstreak	Cty: Wash	8						
		Lycaenidae	*Strymon*	*melinus atrofasciatus*	Gray hairstreak	Cty: Mult	8						
		Noctuidae	*Schinia*	*vacciniae*	none	Cty: Clac	7						
		Noctuidae			Noctuid moth	Tualatin Hills Nature Park	2						
		Notodontidae	*Clostera*	*albosigma*	none	Cty: Clac	7						
		Notodontidae	*Clostera*	*apicalis*	none	Cty: Mult, Clac	7						
		Notodontidae	*Clostera*	*brucei*	none	Cty: Mult	7						
		Notodontidae	*Furcula*	*cinerea*	Gray furcula	Cty: Clac, Wash	7						
		Notodontidae	*Furcula*	*scolopendrina*	none	Cty: Clac, Wash	7						
		Notodontidae	*Gluphisia*	*lintneri*	none	Cty: Clac	7						
		Notodontidae	*Gluphisia*	*septentrionis*	none	Cty: Mult, Clac, Wash	7						
		Notodontidae	*Gluphisia*	*severa*	none	Cty: Mult, Clac	7						
		Notodontidae	*Nadata*	*gibbosa*	none	Cty: Mult, Clac	7						
		Notodontidae	*Notodonta*	*pacifica*	none	Cty: Clac	7						
		Notodontidae	*Oligocentria*	*semirufescens*	none	Cty: Clac	7						

Appendix 1. ***DRAFT*** Portland Metro Region Invertebrate Species List (June 19, 2001)

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		Notodontidae	*Pheosia*	*rimosa*	none	Cty: Clac	7						
		Notodontidae	*Schizura*	*ipomoeae*	none	Cty: Clac	7						
		Notodontidae	*Schizura*	*unicornis*	none	Cty: Clac, Wash	7						
		Nymphalidae	*Adelpha*	*bredowii californica*	California sister	Cty: Mult	8						
		Nymphalidae	*Boloria*	*epithore chermocki*	Western meadow fritillary	Cty: Clac, Wash	8						
		Nymphalidae	*Euphydryas*	*chalcedona colon*	Chalcedon checkerspot	Cty: Clac, Wash	8						
		Nymphalidae	*Limenitis*	*lorquini burrisoni*	Lorquin's admiral	Cty: Mult, Clac, Wash	8						
		Nymphalidae	*Nymphalis*	*antiopa antiopa*	Mourning cloak	Cty: Mult, Wash.	8						
		Nymphalidae	*Nymphalis*	*californica*	California tortoise shell	Cty: Mult, Clac, Wash	8						
		Nymphalidae	*Nymphalis*	*milberti milberti*	Milbert's tortoise shell	Cty: Mult, Clac.	8						
		Nymphalidae	*Phyciodes*	*mylitta mylitta*	Mylitta crescent	Cty: Mult, Clac, Wash	8						
		Nymphalidae	*Phyciodes*	*pulchellus pulchellus*	??	Cty: Clac.	8						
		Nymphalidae	*Polygonia*	*faunus rusticus*	Faun anglewing	Cty: Mult, Clac, Wash	8						
		Nymphalidae	*Polygonia*	*gracilis zephyrus*	Zephyr anglewing	Cty: Clac.	8						
		Nymphalidae	*Polygonia*	*progne silenus*	Dark anglewing	Cty: Mult, Clac.	8						
		Nymphalidae	*Polygonia*	*satyrus*	Satyr anglewing	Cty: Mult, Clac, Wash	8						
		Nymphalidae	*Speyeria*	*cybele pugetensis*	Great spangled fritillary	Cty: Mult, Clac, Wash	8						
		Nymphalidae	*Vanessa*	*annabella*	West coast painted lady	Cty: Mult, Clac, Wash	8						
		Nymphalidae	*Vanessa*	*atalanta rubria*	Red admiral	Cty: Mult, Clac.	8						
		Nymphalidae	*Vanessa*	*cardui*	Painted lady	Cty: Mult, Clac, Wash	8						
		Nymphalidae	*Vanessa*	*virginiensis*	American painted lady	Cty: Clac.	8						
		Oecophoridae	*Agonopterix*	*alstroemeriana*	none	Cty: Mult	7						
		Oecophoridae	*Agonopterix*	*nervosa*	none	Cty: Clac, Wash	7						
		Oecophoridae	*Agonopterix*	*rosaciliella*	none	Cty: Clac	7						
		Oecophoridae	*Batia*	*lunaris*	none	Cyt: Clac	7						
		Oecophoridae	*Depressaria*	*daucella*	none	Cty: Clac	7						
		Oecophoridae	*Depressaria*	*pastinacella*	none	Cty: Mult	7						
		Oecophoridae	*Hofmannophila*	*pseudospretella*	none	Cty: Mult, Clac	7						
		Oecophoridae	*Semioscopis*	*inornata*	none	Cty: Clac	7						
		Oecophoridae	*Semioscopis*	*megamicrella*	none	Cty: Clac	7						
		Oecophoridae	*Semioscopis*	*merricella*	none	Cty: Clac	7						
		Papilionidae	*Papilio*	*eurymedon*	Pale tiger swallowtail	Cty: Mult, Clac, Wash	8						
		Papilionidae	*Papilio*	*rutulus rutulus*	Western tiger swallowtail	Cty: Mult, Clac, Wash	8						
		Papilionidae	*Papilio*	*zelicaon zelicaon*	Anise swallowtail	Cty: Mult, Clac, Wash	8						
		Papilionidae	*Parnassius*	*clodius claudianus*	Clodius parnassian	Cty: Mult, Clac, Wash	8						
		Pieridae	*Anthocharis*	*sara flora*	Sara orange tip	Cty: Mult, Clac, Wash	8						
		Pieridae	*Colias*	*eurytheme*	Orange sulfur	Cty: Mult, Clac, Wash	8						
		Pieridae	*Colias*	*philodice eriphyle*	Clouded sulfur	Cty: Clac, Wash	8						
		Pieridae	*Neophasia*	*menapia menapia*	Pine white	Cty: Mult.	8						
		Pieridae	*Pieris*	*napi marginalis*	Mustard white	Cty: Mult, Clac, Wash	8						

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		Pieridae	*Pieris*	*occidentalis occidentalis*	Western white	Cty: Mult, Clac.	8						
		Pieridae	*Pieris*	*rapae*	Cabbage white	Cty: Mult, Clac, Wash	8						
		Saturniidae	*Antheraea*	*polyphemus*	Polyphemus moth	Cty: Clac; Deciduous hardwood forests, urban, orchards, wetlands	7						
		Saturniidae	*Hyalophora*	*euryalus*	Ceanothus silkmoth	Cty: Clac, Wash; Conifer forests and chaparral	7	*Not*					
		Satyridae	*Cercyonis*	*pegala ariane*	Large wood nymph	Cty: Mult, Clac, Wash	8						
		Satyridae	*Coenonympha*	*tullia eunomia*	Ringlet	Cty: Mult, Clac, Wash	8						
		Sphingidae	*Hemaris*	*thyshe*	Hummingbird clearwing	Cty: Clac; open and second growth habitat, gardens, suburbs	7						
		Sphingidae	*Hyles*	*lineata*	White-lined sphinx	Cty: Mult, Wash; open deserts, suburbs, and gardens	7						
		Sphingidae	*Paonias*	*excaecatus*	Blinded sphinx	Cty: Clac, Wash; Woods and suburbs	7						
		Sphingidae	*Proserpinus*	*flavofasciata*	Yellow-banded sphinx	Cty: Clac; meadows in coniferous forests	7						
		Sphingidae	*Smerinthus*	*cerisyi*	One-eyed sphinx	Cty: Mult, Clac, Wash; Valleys and streamsides	7						
		Sphingidae	*Sphinx*	*chersis*	Great ash sphinx	Cty: Clac, Wash; Woodlands and western scrublands	7						
		Sphingidae	*Sphinx*	*vashti*	Vashti sphinx	Cty: Clac, Wash; Montane woodlands and prairie streamcourses	7						
		Thyatiridae	*Ceranemota*	*crumbi*	none	Cty: Mult	7						
		Thyatiridae	*Ceranemota*	*fasciata*	none	Cty: Clac	7						
		Thyatiridae	*Euthyatira*	*lorata*	none	Cty: Clac	7						
		Thyatiridae	*Habrosyne*	*scripta*	none	Cty: Clac, Wash	7						
		Thyatiridae	*Pseudothyatira*	*cymatophorcides*	none	Cty: Clac, Wash	7						
			Lymantria	*dispar*	Gypsy Moth								
Insecta	Mantodea												
					Praying mantis					X			
Insecta	Megaloptera												
		Sialidae	*Sialis*	*sp*	alderfly	Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3						
Insecta	Neuroptera												
		Hemerobiidae	*Hemerobius*	*pacificus*	Pacific brown lacewing	Tualatin Hills Nature Park	2						
Insecta	Odonates												
		Aeshnidae	*Aeshna*	*californica*	California darner	Metro area	5			X			
		Aeshnidae	*Aeshna*	*multicolor*	Blue-eyed darner	Metro area	5			X			
		Aeshnidae	*Aeshna*	*palmata*	Paddle-tailed darner	Metro area	5			X			
		Aeshnidae	*Aeshna*	*umbrosa*	Shadow darner	Metro area	5			X			
		Aeshnidae	*Anax*	*junius*	Common green darner	Metro area	5			X			
		Calopterygidae	*Calopteryx*	*aequabilis*	River jewelwing	Cty: Clac.	9			X			

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		Coenagrionidae	*Amphiagrion*	*abbreviatum*	Western red damsel	Metro area	5			X			
		Coenagrionidae	*Argia*	*vivida*	Vivid dancer	Metro area	5			X			
		Coenagrionidae	*Enallagma*	*boreale*	Boreal bluet	Metro area	5			X			
		Coenagrionidae	*Enallagma*	*carunculatum*	Tule bluet	Metro area	5			X			
		Coenagrionidae	*Enallagma*	*cyathigerum*	Northern bluet	Metro area	5			X			
		Coenagrionidae	*Ischnura*	*cervula*	Pacific forktail	Metro area	5			X			
		Coenagrionidae	*Ischnura*	*erratica*	Swift forktail	Metro area	5			X			
		Coenagrionidae	*Ischnura*	*perparva*	Western forktail	Metro area	5			X			
		Corduliidae	*Cordulia*	*shurtleffii*	American emerald	Metro area	5			X			
		Corduliidae	*Epitheca*	*canis*	Beaverpond baskettail	Metro area	5			X			
		Corduliidae	*Epitheca*	*spinigera*	Spiny baskettail	Metro area	5			X			
		Gomphidae	*Octogomphus*	*specularis*	Grappletail	Metro area	5			X			
		Gomphidae	*Stylurus*	*olivaceus*	Olive clubtail	Metro area	5			X			
		Lestidae	*Archilestes*	*californica*	California spreadwing	Metro area	5			X			
		Lestidae	*Lestes*	*congener*	Spotted spreadwing	Metro area	5			X			
		Lestidae	*Lestes*	*disjunctus*	Common spreadwing	Metro area	5			X			
		Lestidae	*Lestes*	*unguiculatus*	Lyre-tipped spreadwing	Cty: Mult	9			X			
		Libellulidae	*Erythemis*	*collocata*	*Western pondhawk*	Metro area	5			X			
		Libellulidae	*Leucorrhinia*	*intacta*	*Dot-tailed whiteface*	Metro area	5			X			
		Libellulidae	*Libellula*	*forensis*	*Eight-spotted skimmer*	Metro area	5			X			
		Libellulidae	*Libellula*	*luctuosa*	*Widow skimmer*	Metro area	5			X			
		Libellulidae	*Libellula*	*pulchella*	*Twelve-spotted skimmer*	Metro area	5			X			
		Libellulidae	*Libellula*	*quadrimaculata*	*Four-spotted skimmer*	Metro area	5			X			
		Libellulidae	*Pachydiplax*	*longipennis*	*Blue dasher*	Metro area	5			X			
		Libellulidae	*Pantala*	*hymenaea*	*Spot-winged glider*	Metro area	5			X			
		Libellulidae	*Plathemis*	*lydia*	*Common whitetail*	Metro area	5			X			
		Libellulidae	*Sympetrum*	*corruptum*	*Variegated meadowhawk*	Metro area	5			X			
		Libellulidae	*Sympetrum*	*costiferum*	*Saffron-winged meadowhawk*	Metro area	5			X			
		Libellulidae	*Sympetrum*	*illotum*	*Cardinal meadowhawk*	Metro area	5			X			
		Libellulidae	*Sympetrum*	*madidum*	*Red-veined meadowhawk*	Metro area	5			X			
		Libellulidae	*Sympetrum*	*pallipes*	*Striped meadowhawk*	Metro area	5			X			
		Libellulidae	*Sympetrum*	*vicinum*	*Yellow-legged meadowhawk*	Metro area	5			X			
		Libellulidae	*Tramea*	*lacerata*	*Black saddlebags*	Metro area	5			X			
		Petaluridae	*Tanypteryx*	*hageni*	Black petaltail dragonfly	Cty: Clac. Ecoregion: KM, WC	4	*S3. List 4.*		X			
Insecta	Orthoptera												
		Acrididae			Bandwinged grasshopper	Tualatin Hills Nature Park	2						
Insecta	Plecoptera (Stoneflies)												
		Capniidae			winter stone	Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3		X				
		Chloroperlidae	*Paraperla*		little green stone	Riffle samples in Clackamas tributaries.	3		X				
		Chloroperlidae	*Plumiperla*			Tualatin River Basin	3		X				

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		Chloroperlidae	*Sweltsa*		little green stone	Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3		X				
		Leuctridae	*Despaxia*		needle-like stone	Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3		X				
		Leuctridae	*Moselia*		needle-like stone	Riffle samples in Clackamas tributaries.	1		X				
		Nemouridae	*Malenka*		little brown stone	Riffle samples in Clackamas tributaries.	1		X				
		Nemouridae	*Zapada*	*cinctipes*		Tualatin River Basin	3		X				
		Nemouridae	*Zapada*	*wahkeena*	Wahkeena Falls flightless stonefly	Cty: Mult. Ecoregion: WC	4	*S1. List 1. Sp of concern*	X				
		Nemouridae	*Zapada*		little brown stone	Riffle samples in Clackamas tributaries.	1		X				
		Peltoperlidae	*Yoraperla*		roach-like stone	Riffle samples in Clackamas tributaries.	1		X				
		Perlidae	*Calineuria*		golden stone	Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3		X				
		Perlidae	*Hesperoperla*		golden stone	Riffle samples in Clackamas tributaries.	1		X				
		Perlodidae	*Isoperla*		little yellow stone	Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3		X				
		Perlodidae	*Skwala*		yellow stone	Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3		X				
		Pteronarcidae	*Pteronarcella*			Riffle samples in Clackamas tributaries.	1		X				
		Pteronarcidae	*Pteronarcys*		giant stonefly	Riffle samples in Clackamas tributaries.	1		X				
Insecta	Trichoptera (Caddisflies)												
		Brachycentridae	*Amiocentrus*		american grannom	Riffle samples in Clackamas tributaries.	1		X				
		Brachycentridae	*Brachycentrus*		american grannom	Riffle samples in Clackamas tributaries.	1		X				
		Brachycentridae	*Eobrachycentrus*	*gelidae*	Mt. Hood brachycentrid caddisfly	Cty: Mult, Clac. Ecoregion: WC	4	*S2? List 3. Sp of concern.*	X				
		Brachycentridae	*Micrasema*			Riffle samples in Clackamas tributaries.	1		X				
		Glossosomatidae	*Glossosoma*		turtle case caddis	Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3		X				
		Hydropsychidae	*Arctopsyche*		filter feeding caddis	Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3		X				
		Hydropsychidae	*Cheumatopsyche*		filter feeding caddis	Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3		X				

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		Hydropsychidae	*Hydropsyche*		spotted sedge	Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3		X				
		Hydropsychidae	*Parapsyche*		filter feeding caddis	Riffle samples in Clackamas tributaries.	1		X				
		Hydroptilidae	*Hydroptila*		microcaddis/purse case	Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3		X				
		Hydroptilidae	*Ochrotrichia*	*alsea*	Alsea ochrotrichian micro caddisfly	Cty: Clac. Ecoregion: CR, WV, EC	4	*S2? List 3.*	X				
		Lepidostomatidae	*Lepidostoma*			Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3		X				
		Leptoceridae		*sp*		Tualatin River Basin	3		X				
		Limnephilidae	*Apatania (=Radema)*	*tavala*	Cascades apatanian caddisfly	Cty: Clac. Ecoregion: WC, EC, BM	4	*S2? List 3. Sp of concern.*	X				
		Limnephilidae	*Dicosmoecus*		fall caddis	Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3		X				
		Limnephilidae	*Ecclisomyia*			Tualatin River Basin	3		X				
		Limnephilidae	*Goera*			Tualatin River Basin	3		X				
		Limnephilidae	*Psychoglypha*			Tualatin River Basin	3		X				
		Philopotamidae	*Dolophilodes*			Riffle samples in Clackamas tributaries.	1		X				
		Philopotamidae	*Wormaldia*			Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3		X				
		Psychomiidae	*Psychomyia*			Riffle samples in Clackamas tributaries.	1		X				
		Rhyacophilidae	*Rhyacophila*	*Betteni gr.*	green rock worm	Tualatin River Basin	3		X				
		Rhyacophilidae	*Rhyacophila*	*Brunnea gr.*	green rock worm	Tualatin River Basin	3		X				
		Rhyacophilidae	*Rhyacophila*	*fenderi*	Fender's rhyacophilan caddisfly	Cty: Mult. Ecoregion: WV, KM	4	*S3? List 4.*	X				
		Rhyacophilidae	*Rhyacophila*	*Hylineata gr.*	green rock worm	Tualatin River Basin	3		X				
		Rhyacophilidae	*Rhyacophila*	*Lieftincki gr.*	green rock worm	Tualatin River Basin	3		X				
		Rhyacophilidae	*Rhyacophila*	*Sibirica gr.*	green rock worm	Tualatin River Basin	3		X				
		Rhyacophilidae	*Rhyacophila*		green rock worm	Riffle samples in Clackamas tributaries.	1		X				
		Uenoidae	*Farula*	*jewetti*	Mt. Hood farulan caddisfly	Cty: Mult, Clac. Ecoregion: WC, EC	4	*S1? List 3. Sp of concern.*	X				
		Uenoidae	*Neophylax*			Riffle samples in Clackamas tributaries and Tualatin River Basin	1,3		X				
		Uenoidae	*Neothremma*	*andersoni*	Columbia Gorge caddisfly	Cty: Mult. Ecoregion: WC	4	*S1 List 1. Sp of concern.*	X				
Malacostraca	Decapoda												
(Sub-phylum = Crustacea)			*Astacus*	*lenuisculus*	Crayfish	Tualatin Hills Nature Park	2					X	Detritivore
			Pacifasticus	*sp*		Tualatin River Basin	3						

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Malacostraca (Sub-phylum = Crustacea)	Isopoda				Pillbug	Tualatin Hills Nature Park	2						
					Sowbug	Tualatin Hills Nature Park	2						
			Caecidotea	*sp*		Tualatin River Basin	3						
Malacostraca (Sub-phylum = Crustacea)	Amphipoda		*Gammarus*	sp	Scuds or sideswimmers	Tualatin River Basin	3		X				
			Hyalella	*azteca*	Scuds or sideswimmers	Tualatin River Basin	3		X				
Ostracoda (Sub-phylum = Crustacea)				*sp*		Tualatin River Basin	3						
Miscellaneous													
Annelida	Hirudinea					Tualitin River Basin	3						
Annelida	Oligochaeta				Earthworms	Riffle samples in Clackamas tributaries.	1						
Annelida	Oligochaeta				aquatic worms	Riffle samples in Clackamas tributaries and Tualitin River Basin.	1,3						
Branchiobdellida					crayfish symbionts	Riffle samples in Clackamas tributaries.	1						
Nematoda						Riffle samples in Clackamas tributaries.	1						
Platyhelminthes	Turbellaria				flatworms, planaria	Riffle samples in Clackamas tributaries and Tualitin River Basin.	1,3						
			Hydra			Riffle samples in Clackamas tributaries.	1						

Sources:

1 Jeff Adams, Xerces Society
2 Matthew Shepherd, Xerces Society
3 Michael B. Cole (ABR, Inc) – mcole@abrinc.com
4 ORNHP website (http://listserv.abi.org/nhp/us/or/tabintro.htm)
5 Jim Johnson (contact suggested by Dennis Paulson) - jimjohn@teleport.com
6 Linda Kervin at USU (contacted by Jim Cane)
7 USGS Northern Prairie Wildlife Research Center (www.npwcr.usgs.gov/resource/distr/lepid/moths/or)
8 Dana N. R. Ross and the Evergreen Aurelians (OSU). Common names taken from Domfield, Ernst J., The Butterflies of Oregon.
9 http://www.ent.orst.edu/ore_dfly/

Appendix 2

Structural Conditions Analysis

Johnson and O'Neil (2001) provide a wildlife habitat classification scheme that correlates species with various habitat types and structural conditions. Structural conditions are a sub-category of habitat types. The species-habitat and species-structural relationships were based on scientific literature (when available) and professional opinion (probably more common). The primary utility of the information below is to provide a general guidance tool, based on native wildlife currently living in the Metro region, to aid on-the-ground activities such as habitat restoration.

Metro has developed a vertebrate species list that includes all known species occurring regularly in the region. We used Johnson and O'Neil's species-structural relationships to estimate the relative importance of each condition to amphibians, reptiles, birds and mammals (by group) on our species list. A species' use of structural conditions may fall within one of four categories: (1) does not use, (2) is known to occur in, (3) regularly uses, or (4) is closely associated with the structural condition. We assigned point values for each category: 0 points for no use, 1 point for known occurrence, 3 points for regular use, and 5 points for close associations. We summed the points for each structural condition then ranked them in order of importance for (1) all vertebrates on Metro's list (excluding fish), and (2) each group of species (e.g., amphibians, etc.). Highest-ranking structures associated with each group are discussed below.

Amphibians

The 16 amphibian species that live in the Metro region appear to rely on shrub structural conditions S20, S17, S19, S16, S2, S18 and S15, in that order (Table A1). These categories primarily describe tall shrub habitats with varying amounts of cover, although S2 describes a grassland condition. The forested structural conditions important to this group (including F26, F25, F24, F22, F21 and F16) appear to involve large trees and moderate to heavy canopy closure, possibly reflecting their need for woody debris on the forest floor. Amphibian species in the Metro region tend to use agricultural conditions A5 (unimproved pasture) and A2 (improved pasture), and decline with urbanization (category U3 received a score of zero).

Reptiles

The Metro region's 13 native reptile species relate most strongly to tall shrub conditions with open overstories (conditions S15, S16, S17) and grassland habitats (S1 and S2). Shrub condition S6, describing low shrub habitats with closed cover, also appear important. The most important forested conditions include sparse to moderate canopy cover and smaller tree size (F6, F1, F17, F14, and F3), reflecting these species' tendency toward more open terrain. Structure F1 describes grasslands with less than 10% canopy cover. Reptiles appear to use agricultural conditions A4 and A5 most frequently, describing modified grasslands and unimproved pastures. Urbanization patterns were similar to amphibians, with heaviest use of U1, less so in U2, and no use of condition U3.

Birds

Shrub conditions S16 and S17, describing tall, mature or old open shrub habitats, may be most important to the region's 211 native bird species. Grasslands with moderate or heavy grass cover (S2 and S1) also appear important, followed closely by S6, describing low, heavily covered

shrub habitats. The mature shrub conditions probably reflect the importance of complex vegetation structure for bird cover, nesting and feeding; the importance of S2 and S1 may be explained by the reliance of seed-eating birds such as sparrows, some warblers, and ground-dwelling birds such as quail and Western Meadowlarks, on grassland habitats. There are many forest structures that appear important to birds, but the three top-ranking structures included large tree single story open canopy (F14), medium tree single story open canopy (F11), and large tree multi-story open canopy (F23). In general, larger trees with open to moderate canopy cover appear most important.

Mammals

The shrub structural conditions that appear most important to the Metro region's 53 mammal species include grasslands (S2 and S1), low closed shrub (S6), and tall, mature or old shrubs with open cover (S17, S16 and S15). The highest ranking forested conditions include large or giant trees with open to moderate canopy cover (F23, F24, F14, F26 and F15), possibly reflecting many small mammals' dependence on woody debris on the forest floor. Mammals in the Metro region appear to use all five agricultural habitats, in decreasing order for A5, A3, A2, A1 and A4. They also occur in all urban conditions (U1, U2 and U3), but quickly decline with urbanization.

All Species

Overall, the most important shrub conditions to the Metro region's 293 non-fish vertebrate species appear to include grasslands with a high amount of grass cover (S2), tall open mature or old shrubs, (S16, S17), grasslands with lower amounts of cover (S1), and low, closed canopy shrub habitats (S6). Significantly, 14 of the forested conditions received higher scores than the highest shrub condition (F14, F23, F11, F24, F26, F15, F20, F8, F21, F12, F17, F5, F25 and F3), suggesting the importance of forest to wildlife in the region; however, shrubs are likely also important. In general, larger trees with open to moderate canopy and a variety of stories (canopy layers) appear to receive the most wildlife use. Agricultural conditions used most widely include unimproved and improved pastures, while modified grasslands appear least important. Overall, species' use of habitats declines with urbanization.

Appendix 2

Overview of Johnson and O'Neil's (2001)

Structural Conditions Classifications

Shrubland and Grassland structural conditions. All shrub and grassland structural conditions contain less than 10 percent tree canopy cover; structures containing more than 10 percent canopy are considered forest. The shrubland and grassland structural conditions are based upon shrub height, percent shrub cover (or percent grass/forb cover), and shrub age class, as follows:

Shrub Height	
Low	≤ 0.5 m (1.6 ft)
Medium	0.5-2.0 m (1.6-6.4 ft)
Tall	2.0-5.0 m (6.5-16.5 ft)
Percent Shrub Cover	
Open	10-69% shrub cover
Closed	70-100% shrub cover
Shrub Age Class	
Seedling/Young	Negligible crown decadence
Mature	≤ 25% crown decadence
Old	26-100% crown decadence

Forest structural conditions. The forest structural conditions described in Table A1 below are based on tree size (diameter at breast height, or dbh), percent canopy cover (or percent grass/forb cover), and the number of canopy layers present, as follows:

Tree Size (diameter at breast height, or dbh)	
Shrub/Seedling	< 2.5 cm (1")
Sapling/Pole	2.5 – 24 cm (1-9")
Small Tree	25-37 cm (10-14")
Medium Tree	38-49 cm (15-19")
Large Tree	50-75 cm (20-29")
Giant Tree	> 75 cm (30")
Percent Canopy Cover	
Open	10-39%
Moderate	40-69%
Closed	70-100%
Number of Canopy Layers	
Single Story	1 stratum
Multi-story	2 or more strata

Appendix 2

Table A1. Description of Johnson and O'Neil's (2001) Structural Conditions classifications.

Code	Structural Condition	Description	Metro Land Cover Class(es)
SHRUBLAND AND GRASSLAND STRUCTURAL CONDITIONS			
S1	Grass/Forb – Open	Grasslands that have <10% shrub cover and < 10% tree canopy cover. Grasses and forbs cover less than 70% of the ground, and bare ground is evident.	Meadow/Grass
S2	Grass/Forb – Closed	Grasslands that have <10% shrub cover and <10% tree canopy cover. Grasses and forbs cover >70% of the ground.	Meadow/Grass
S3	Low Shrub/ Open Shrub Overstory – Seedling/ Young	Shrublands with shrubs < 0.5 m (1.6 ft) tall and shrub canopy cover >10% and <70%. May have <10% tree canopy cover. Areas with <10% shrub cover are categorized as Grass/Forb. These are post-disturbance regenerating shrublands dominated by seedlings or young shrubs. Mature, legacy shrubs may persist from pre-disturbance, but occur as scattered singles or widely scattered clumps. Crown decadence is negligible.	Scattered and Open Canopy Shrub
S4	Low shrub – Open Shrub Overstory-Mature	Shrublands with shrubs < 0.5 m (1.6 ft) tall and shrub canopy cover >10% and <70%. May have <10% tree canopy cover. Areas with less than 10% shrub cover are categorized as Grass/Forb. Crown decadence is ≤ 25%.	Scattered and Open Canopy Shrub
S5	Low shrub – Open Shrub Overstory – Old	Shrublands with shrubs < 0.5 m (1.6 ft) tall and shrub canopy cover >10% and <70%. May have <10% tree canopy cover. Areas with less than 10% shrub cover are categorized as Grass/Forb. Crown decadence is > 25%.	Scattered and Open Canopy Shrub
S6	Low shrub - Closed Shrub Overstory - Seedling/ Young	Shrublands with shrubs < 0.5 m (1.6 ft) tall and shrub canopy cover >70%. May have <10% tree canopy cover. These are post-disturbance regenerating shrublands dominated by seedlings or young shrubs. Mature, legacy shrubs may persist from before the disturbance, but occur as scattered singles or widely scattered clumps. Crown decadence is negligible.	Closed Canopy Shrub
S7	Low shrub - Closed Shrub Overstory – Mature	Shrublands with shrubs < 0.5 m (1.6 ft) tall and shrub canopy cover >70%. May have <10% tree canopy cover < 10%. Crown decadence is ≤ 25%.	Closed Canopy Shrub
S8	Low shrub - Closed Shrub Overstory - Old	Shrublands with shrubs < 0.5 m (1.6 ft) tall and shrub canopy cover >70%. May have <10% tree canopy cover. Crown decadence is > 25%.	Closed Canopy Shrub
S9	Medium shrub - Open Shrub Overstory - Seedling/ Young	Shrublands with shrubs 0.5 - 2.0 m tall (1.6 - 6.5 ft.) and shrub canopy cover >10% and <70%. May have < 10% tree canopy cover (areas with less than > 10% shrub cover are categorized as Grass/Forb). These are post-disturbance regenerating shrublands dominated by seedlings or young shrubs. Mature, legacy shrubs may persist from pre-disturbance, but occur as scattered singles or widely scattered clumps. Crown decadence is negligible.	Scattered and Open Canopy Shrub

Appendix 2

S10	Medium shrub - Open Shrub Overstory – Mature	Shrublands with shrubs 0.5 - 2.0 m tall (1.6 - 6.5 ft.) and shrub canopy cover >10% and <70%. May have < 10% tree canopy cover. Areas with less than 10% shrub cover are categorized as Grass/Forb. Crown decadence is ≤ 25%.	Scattered and Open Canopy Shrub
S11	Medium shrub - Open Shrub Overstory - Old	Shrublands with shrubs 0.5 - 2.0 m tall (1.6 - 6.5 ft.) and shrub canopy cover >10% and <70% and may have < 10% tree canopy cover. Areas with less than 10% shrub cover are categorized as Grass/Forb. Crown decadence is > 25%.	Scattered and Open Canopy Shrub
S12	Medium shrub - Closed Shrub Overstory- Seedling/ Young	Shrublands with shrubs .5 - 2.0 m tall (1.6 - 6.5 ft.) and shrub canopy cover >70%, and may have < 10% tree canopy cover. These are post-disturbance regenerating shrublands dominated by seedlings or young shrubs. Mature, legacy shrubs may persist from before the disturbance, but occur as scattered singles or widely scattered clumps. Crown decadence is negligible.	Closed Canopy Shrub
S13	Medium shrub - Closed Shrub Overstory – Mature	Shrublands with shrubs .5 - 2.0 m tall (1.6 - 6.5 ft.) and shrub canopy cover >70%, and may have < 10% tree canopy cover. Crown decadence is ≤ 25%.	Closed Canopy Shrub
S14	Medium shrub - Closed Shrub Overstory – Old	Shrublands with shrubs .5 - 2.0 m tall (1.6 - 6.5 ft.) and shrub canopy cover >70%, and may have < 10% tree canopy cover. Crown decadence is > 25%.	Closed Canopy Shrub
S15	Tall shrub - Open Shrub Overstory - Seedling/ Young	Shrublands with shrubs > 2.0 m and <5.0 m tall (6.6 - 16.5 ft) and shrub canopy cover >10% and <70%, and may have < 10% tree canopy cover. Areas with less than 10% shrub cover are categorized as Grass/Forb . These are post-disturbance regenerating shrublands dominated by seedlings or young shrubs. Mature, legacy shrubs may persist after the disturbance, but occur as scattered singles or clumps. Crown decadence negligible.	Scattered and Open Canopy Shrub
S16	Tall shrub - Open Shrub Overstory – Mature	Shrublands with shrubs > 2.0 m and <5.0 m tall (6.6 - 16.5 ft) and shrub canopy cover >10% and <70% and may have < 10% tree canopy cover. Areas with less than 10% shrub cover are categorized as Grass/Forb. Crown decadence is ≤ 25%.	Scattered and Open Canopy Shrub
S17	Tall shrub – Open Shrub Overstory – Old	Shrublands with shrubs > 2.0 m and <5.0 m tall (6.6 - 16.5 ft) and shrub canopy cover >10% and <70%, and may have tree canopy cover < 10%. Areas with less than 10% shrub cover are categorized as Grass/Forb. Crown decadence is > 25%.	Scattered and Open Canopy Shrub
S18	Tall shrub - Closed Shrub Overstory - Seedling/ Young	Shrublands with shrubs > 2.0 m and <5.0 m tall (6.6 - 16.5 ft) and shrub canopy cover >70%, and may have tree canopy cover < 10%. These are post-disturbance regenerating shrublands dominated by seedlings or young shrubs. Mature, legacy shrubs may persist from before the disturbance, but occur as scattered singles or widely scattered clumps. Crown decadence is negligible.	Closed Canopy Shrub

Appendix 2

S19	Tall shrub - Closed Shrub Overstory – Mature	Shrublands with shrubs > 2.0 m and <5.0 m tall (6.6 - 16.5 ft) and shrub canopy cover >70%, and may have tree canopy cover < 10%. Crown decadence is ≤25%.	Closed Canopy Shrub
S20	Tall shrub - Closed Shrub Overstory – Old	Shrublands with shrubs > 2.0 m and <5.0 m tall (6.6-16.5 ft) and shrub canopy cover >70%, and may have < 10% tree canopy cover. Crown decadence is > 25%.	Closed Canopy Shrub
FOREST STRUCTURAL CONDITIONS			
F1	Grass/Forb – Open	Grass/Forb dominated with <70% coverage by grasses and forbs. Shrubs and small seedlings may be present, but do not dominate stand, (seedlings <10% canopy cover), and there can be remnant trees (trees remaining from the previous stand) that can provide <10% canopy cover.	Meadow/Grass
FS	Grass/Forb – Closed	Grass/Forb dominated with >70% coverage by grasses and forbs. Shrubs and small seedlings may be present, but do not dominate stand, (seedlings <10% canopy cover), and there can be remnant trees (trees remaining from the previous stand) that can provide <10% canopy cover.	Meadow/Grass
F3	Shrub/ Seedling – Open	Seedlings are large enough to add structure to the stand but are small enough that the structure is similar to shrubs and may have remnant trees (trees remaining from the previous stand) that can provide <10% canopy cover. There is <70% cover of shrubs or seedlings. Tree size has <1" dbh, and there is only a single canopy stratum.	Scattered and Open Canopy Shrub
F4	Shrub/ Seedling – Closed	Seedlings are large enough to add structure to the stand but are small enough that the structure is similar to shrubs. Remnant trees (trees remaining from the previous stand) can provide <10% canopy cover. There is >70% cover of shrubs or seedlings. Tree size has <1" dbh, and there is only a single canopy stratum.	Closed Canopy Shrub
F5	Sapling/Pole – Open	The canopy is open enough that understory vegetation may be abundant. Remnant trees (trees remaining from the previous stand) can provide <10% canopy cover. There is 10-39% cover of sapling and pole sized trees. Tree size is 1"-9" dbh, and there is a single canopy stratum.	Deciduous, Mixed and Conifer Scattered Canopy Forest Deciduous, Mixed and Conifer Open Canopy Forest Forested Riparian Forested Wetland
F6	Sapling/Pole – Moderate	Understory development is hampered by available light and moisture. Remnant trees (trees remaining from the previous stand) can provide <10% canopy cover. There is 40-69% cover of sapling and pole sized trees. Tree size is 1"-9" dbh, and there is a single canopy stratum.	Deciduous, Mixed and Conifer Open Canopy Forest Forested Riparian Forested Wetland
F7	Sapling/Pole – Closed	The understory is depauperate or absent. Remnant trees (trees remaining from the previous stand) can provide <10% canopy cover. There is > 70% cover of sapling and pole sized trees. Tree size is 1"- 9" dbh and there is a single canopy stratum.	Deciduous, Mixed and Conifer Closed Canopy Forest Forested Riparian Forested Wetland

Appendix 2

F8	Small Tree – Single Story – Open	A grass/forb or shrub understory may be present. Remnant trees (trees remaining from the previous stand) can provide <10% canopy cover. There is 10-39% cover of small trees, with <10% cover of other tree sizes. Tree size is 10-14" dbh, and there is a single canopy stratum.	Deciduous, Mixed and Conifer Scattered Canopy Forest Deciduous, Mixed and Conifer Open Canopy Forest Forested Riparian Forested Wetland
F9	Small Tree – Single Story – Moderate	Some grass/forb or shrub understory may be present. Remnant trees (green trees remaining from the previous stand) can provide <10% canopy cover. There is 40-69% cover of small trees with <10% cover of other sized trees. Tree size is 10-14" dbh, and there is a single canopy stratum.	Deciduous, Mixed and Conifer Open Canopy Forest Forested Riparian Forested Wetland
F10	Small Tree – Single Story – Closed	Grass/Forb or shrub understory minor or absent. Remnant trees (trees remaining from the previous stand) can provide <10% canopy cover. There is > 70% cover of small trees, with <10% cover of other sized trees. Tree size is 10-14" dbh, and there is a single canopy stratum.	Deciduous, Mixed and Conifer Closed Canopy Forest Forested Riparian Forested Wetland
F11	Medium Tree – Single Story – Open	A grass/forb or shrub understory may be present. Remnant trees (trees remaining from the previous stand) can provide <10% canopy cover. There is 10-39% cover of medium trees, with <10% cover of other sized trees. Tree size is 15-19" dbh, and there is a single canopy stratum.	Deciduous, Mixed and Conifer Scattered Canopy Forest Deciduous, Mixed and Conifer Open Canopy Forest Forested Riparian Forested Wetland
F12	Medium Tree – Single Story – Moderate	Grass/Forb or shrub understory may be present. Remnant trees (trees remaining from the previous stand) can provide <10% canopy cover. There is 40-69% cover of medium trees with <10% cover of other sized trees. Tree size is 15-19" dbh, and there is a single canopy stratum.	Deciduous, Mixed and Conifer Open Canopy Forest Forested Riparian Forested Wetland
F13	Medium Tree – Single Story – Closed	A grass/forb or shrub understory may be present. Remnant trees (trees remaining from the previous stand) can provide <10% canopy cover. There is >70% cover of medium trees with <10% cover of other sized trees. Tree size is 15-19" dbh, and there is a single canopy stratum.	Deciduous, Mixed and Conifer Closed Canopy Forest Forested Riparian Forested Wetland
F14	Large Tree – Single Story – Open	Grasses, shrubs, and/or seedlings may occur in the understory. There is 10-39% cover of large and/or giant size trees with <10% cover of other sized trees. Tree size is 20"-29" dbh, and there is a single canopy stratum.	Deciduous, Mixed and Conifer Scattered Canopy Forest Deciduous, Mixed and Conifer Open Canopy Forest Forested Riparian Forested Wetland
F15	Large Tree – Single Story – Moderate	Some grass/forb or shrub understory may be present. There is 40-69% cover of large and/or giant trees with <10% cover of other sized trees. Tree size is 20"-29" dbh, and there is a single canopy stratum.	Deciduous, Mixed and Conifer Open Canopy Forest Forested Riparian Forested Wetland
F16	Large Tree – Single Story – Closed	Grasses, shrubs, and/or seedlings may occur in the understory. There is >70% cover of large and/or giant trees with <10% cover of other sized trees. Tree size is 20"-29" dbh, and there is a single canopy stratum.	Deciduous, Mixed and Conifer Closed Canopy Forest Forested Riparian Forested Wetland

Appendix 2

F17	Small Tree – Multi-story – Open	These stands have an overstory of small trees with a distinct subcanopy of saplings and/or poles. Scattered larger trees may be present but make up less than 10% canopy cover. Grass/forb or shrub understory may be present. There is 10-39% total canopy cover dominated by small trees, at least 10% or more canopy cover of 1 or more other smaller tree sizes. Tree size is 10"-14" dbh, and there are two or more canopy strata.	Deciduous, Mixed and Conifer Scattered Canopy Forest Deciduous, Mixed and Conifer Open Canopy Forest Forested Riparian Forested Wetland
F18	Small Tree – Multi-story – Moderate	These stands have an overstory of small trees with a distinct subcanopy of saplings and/or poles. Scattered larger trees may be present but make up less than 10% canopy cover. Grass/forb or shrub understory may be present, but is probably limited. There is 40-69% total canopy cover dominated by small trees, at least 10% or more canopy cover of 1 or more other smaller tree sizes. Tree size is 10"-14" dbh, and there are two or more canopy strata.	Deciduous, Mixed and Conifer Open Canopy Forest Forested Riparian Forested Wetland
F19	Small Tree – Multi-story – Closed	These stands have an overstory of small trees with a distinct subcanopy of saplings and/or poles. Scattered larger trees may be present but make up less than 10% canopy cover. Grass/forb or shrub understory extremely limited or absent. There is >70% total canopy cover dominated by small trees, at least 10% or more canopy cover of 1 or more other smaller tree sizes. Tree size is 10-14" dbh, and there are two or more canopy strata.	Deciduous, Mixed and Conifer Closed Canopy Forest Forested Riparian Forested Wetland
F20	Medium Tree – Multi-story – Open	These stands have an overstory of medium trees with a distinct subcanopy of smaller trees. Scattered larger trees may be present but make up less than 10% canopy cover. Grass/forb or shrub understory may be present, but is probably limited. There is 10-39% total canopy cover dominated by medium trees, at least 10% or more canopy cover of 1 or more smaller tree sizes. Tree size is 15"-19" dbh, and there are two or more canopy strata.	Deciduous, Mixed and Conifer Scattered Canopy Forest Deciduous, Mixed and Conifer Open Canopy Forest Forested Riparian Forested Wetland
F21	Medium Tree – Multi-story – Moderate	These stands have an overstory of medium trees with a distinct subcanopy of smaller trees. Scattered larger trees may be present but make up less than 10% canopy cover. Grass/forb or shrub understory may be present, but is probably limited. There is 40-69% total canopy cover dominated by medium trees, at least 10% or more canopy cover of 1 or more smaller tree sizes. Tree size is 15"-19" dbh, and there are two or more canopy strata.	Deciduous, Mixed and Conifer Open Canopy Forest Forested Riparian Forested Wetland
F22	Medium Tree – Multi-story – Closed	These stands have an overstory of medium trees with a distinct subcanopy of smaller trees. Scattered larger trees may be present but make up less than 10% canopy cover. Grass/forb understory may be present, but is probably limited. There is >70% total canopy cover dominated by medium trees, at least 10% or more canopy cover of 1 or more smaller tree sizes. Tree size is 15"- 19" dbh, and there are two or more canopy strata.	Deciduous, Mixed and Conifer Closed Canopy Forest Forested Riparian Forested Wetland

Appendix 2

F23	Large Tree – Multi-story – Open	These stands have an overstory of large or giant sized trees with one or more distinct canopy layers of smaller trees. Stands > 40% cover of giant trees are classified in the "Giant, multi-storied" stage. In westside forests, stands dominated by large trees, usually have giant trees scattered in the stand, with lower numbers in eastside forests. Grass/Forb or shrub understory often present, especially in canopy gaps. There is 10-39% total canopy cover, with at least 10% or more canopy cover from large and/or giant trees and another 10% or more canopy cover from 1 or more smaller tree size classes. Tree size is 20"-29" dbh, and there are two or more canopy strata.	Deciduous, Mixed and Conifer Scattered Canopy Forest Deciduous, Mixed and Conifer Open Canopy Forest Forested Riparian Forested Wetland
F24	Large Tree – Multi-story – Moderate	These stands have an overstory of large or giant sized trees with one or more distinct canopy layers of smaller trees. Stands > 40% cover of giant trees are classified in the "Giant, multi-storied" stage. In westside forests, stands dominated by large trees, usually have giant trees scattered in the stand, with lower numbers in eastside forests. Grass/Forb or shrub understory often present, especially in canopy gaps. There is 40-69% total canopy cover, at least 10% or more canopy cover from large trees with another 10% or more canopy cover from 1 or more smaller tree size classes. Tree size is 20"-29" dbh, and there are two or more canopy strata.	Deciduous, Mixed and Conifer Open Canopy Forest Forested Riparian Forested Wetland
F25	Large Tree – Multi-story – Closed	Overstory of large or giant sized trees with one or more distinct canopy layers of smaller trees. Stands > 40% cover of giant trees are classified in the "Giant, multi-storied" stage. In westside forests, stands dominated by large trees usually have giant trees scattered in the stand. Grass/Forb or shrub understory often present, especially in canopy gaps. There is >70% total canopy cover, ≥ 10% canopy cover from large trees with another 10% or more canopy cover from 1 or more smaller tree size classes. There are at least two canopy strata.	Deciduous, Mixed and Conifer Closed Canopy Forest Forested Riparian Forested Wetland
F26	Giant Tree – Multi-story	These stands have an overstory of giant sized trees with one or more distinct canopy layers of smaller trees. Stands with <40% canopy cover are classified in the "large tree – multi-story - open", stage. There is > 40% canopy cover. Tree size is > 30" dbh, and there are two or more canopy strata.	Deciduous, Mixed and Conifer Open Canopy Forest Deciduous, Mixed and Conifer Closed Canopy Forest Forested Riparian Forested Wetland
AGRICULTURAL STRUCTURAL CONDITIONS			
A1	Cultivated Cropland	Farmland used to produce annual crops such as vegetables and herbs. Characterized by bare soil and plant debris either in the field or along the periphery. Tends to be along bottomland areas of streams and rivers and areas with a sufficient source of irrigation. Farmland used for production of annual grasses such as wheat, oats, barley and rye is characterized by upland and rolling hill terrain, generally without irrigation. Similar to row crops in pesticide use, irrigation and preparation/harvest. This category includes a wide range of soil conservation practices.	Low Structure Agriculture

Appendix 2

A2	Improved Pasture	Farmland used for the production of perennial grass such as grass seed and hay. Perennial grass is generally grown without irrigation. Perennial crops are treated the same way in regard to the general application of pesticides and cultural techniques.	Low Structure Agriculture
A3	Orchards/ Vineyards/ Nursery	Farmland used tree fruits (apples, peaches, pears, hazelnuts), vineyards (grapes), berries (strawberries, raspberries, blueberries, blackberries), Christmas trees, and nursery stock (ornamental container and greenhouse operations). Generally located in upland areas with access to a high volume of irrigation. The use of chemicals in non-food crops, such as Christmas tree and nursery stock, is considerably different both in materials and time of applications.	High Structure Agriculture
A4	Modified Grasslands	Annual or introduced perennial grasslands. Annual grasslands (and areas of introduced forbs) are often dominated by one or two introduced annuals comprising most of the vegetation. Perennial grasslands are usually dominated by a single planted bunchgrass with introduced annuals and weedy forbs between the bunches. Some environments support rhizomatous perennial grasses. These areas occur mostly on uplands but also include riparian bottomlands that are dominated by non-native grasses.	Low Structure Agriculture
A5	Unimproved Pasture	Farmland lacking active management such as fertilizer application, irrigation or weed control. May be grazed by livestock. May include uncut hay, organic debris from the previous season, uncut standing dead grass, exotic plants like tansy ragwort, thistle, Himalayan blackberry and their debris, patches of shrubs such as hawthorn, snowberry, spirea, poison oak, and encroachment by various tree species. Includes lands designated within the Conservation Reserve Program (CRP) and areas planted with crested wheatgrass (*Apropyron cristatum*).	Low Structure Agriculture
URBAN LAND USE/LAND COVER			
U1	Urban Low Density	Based on the level of urban development as determined by the % of land surface covered by impervious materials. Includes surfaces covered by 10-29% of impervious material. Examples include rural residential areas, large-lot housing (≥ 1 acre).	TIA within Metro region watersheds is unknown. Street density could substitute (see text).
U2	Urban Medium Density	Based on the level of urban development as determined by the percent of land surface covered by impervious materials. Includes surfaces that are covered with 30-59% of impervious material. Examples include single family housing areas (lot size < 1 acre), suburban development.	TIA within Metro region watersheds is unknown. Street density could substitute (see text).
U3	Urban High Density	Based on level of urban development as determined by % of land surface covered by impervious materials. Includes surfaces covered by ≥60% impervious material. Examples include core downtown Portland area, shopping malls and industrial areas, high density housing such as apartment buildings, and transportation corridors such as highways and freeways.	TIA within Metro region watersheds is unknown. Street density could substitute (see text).

Appendix 3. Plant species that typically dominate each habitat type in the Metro region. The last column includes a cross-walk between Johnson and O'Neil's (2001) habitat type classifications and Metro's GIS land cover data.

Habitat Type	Dominant or Typical Canopy Species	Dominant or Typical Shrub Species	Dominant or Typical Herbaceous Species	Metro/ONHP's GIS Habitat Type Classifications (based on land cover)
Westside Lowlands Conifer-hardwood Forest	Western hemlock (*Tsuga heterophylla*) Douglas-fir (*Pseudotsuga menziesii*) Western redcedar (*Thuja plicata*) Red alder (*Alnus rubra*) Bigleaf maple (*Acer macrophyllum*)	Salal (*Gaultheria shallon*) Dwarf Oregongrape (*Mahonia nervosa*) Vine maple (*Acer circatum*) Pacific rhododendron (*Rhododendron macrophyllum*) Salmonberry (*Rubus spectabilis*) Trialing blackberry (*Rubus ursinus*) Red elderberry (*Sambucus racemosa*) Oval-leaf huckleberry (*Vaccinium ovalifolium*) Red huckleberry (*Vaccinium parvifolium*)	Swordfern (*Polystichum munitum*) Oregon oxalis (*Oxalis oregana*) Deerfern (*Blechnum spicant*) Bracken fern (*Pteridium aquilinum*) Vanillaleaf (*Achlys triphylla*) Twinflower (*Linnaea borealis*) False lily-of-the-valley (*Maianthemum dilatatum*) Western springbeauty (*Claytonia siberica*) Foamflower (*Tiarella trifoliata*) Inside-out flower (*Vancouveria hexandra*)	Deciduous closed canopy forest Mixed closed canopy forest Conifer closed canopy forest Deciduous open canopy forest Mixed open canopy forest Conifer open canopy forest
Westside Oak and Dry Douglas-fir Forest and Woodlands	Douglas-fir (*Pseudotsuga menziesii*) Oregon white oak (*Quercus garryana*) Pacific madrone (*Arbutus menziesii*) Grand fir (*Abies grandis*) Oregon ash (*Fraxinus latifolia*) occasionally co-dominant with white oak in riparian stands	Oceanspray (*Holodiscus discolor*) Baldhip rose (*Rosa gymnocarpa*) Poison-oak (*Toxicodendron diversiloba*) Serviceberry (*Amelanchier alnifolia*) Hazelnut (*Corylus cornuta*) Trailing blackberry (*Rubus ursinus*) Indian plum (*Oemleria cerasiformis*) Snowberry (*Symphocarpus albus* and *S. mollis*) **When conifers are important in canopy:** Salal Dwarf Oregongrape Pacific rhododendron Hairy honeysuckle Evergreen huckleberry	Western fescue (*Festuca occidentalis*) Alaska oniongrass (*Melica subulata*) Blue wildrye Long-stolon sedge (*Carex inops*) Sword fern Bracken fern Kentucky bluegrass (*Poa pratensis*) is a major non-native dominant in oak woodland understories.	Deciduous closed canopy forest Mixed closed canopy forest Deciduous open canopy forest Mixed open canopy forest Deciduous scattered canopy forest Mixed scattered canopy forest
Westside Grasslands	Common savanna tree species: Douglas-fir Oregon white oak Ponderosa pine (*Pinus ponderosa*)	Common native shrubs: Common snowberry Nootka rose (*Rosa nutkana*) Poison-oak Serviceberry Most common shrub: Exotic Scot's broom (frequently forms open stands over grass)	Roemer's fescue (*Festuca idahoensis* var. *roemeri*) Red fescue (*Festuca rubra*) California oatgrass (*Danthonia californica*) Common camas (*Camassia quamash*) Bracken fern Long-stolon sedge (*Carex inops*) **Major exotic dominants:** Colonial bentgrass (*Agrostis capillaris*) Sweet vernalgrass (*Anthoxanthum odoratum*) Kentucky bluegrass Tall oatgrass (*Arrhenatherum elatius*) Medusahead (*Taeniatherum caput-medusae*) Tall fescue (*Festuca arundinacea*) *Soft brome* (Bromus mollis)	Meadow/grass Open canopy shrub Scattered canopy shrub

Appendix 3 (continued).

Agriculture, Pasture and Mixed Environs	Varies substantially; cultivated croplands include > 50 species of annual and perennial plants in Oregon and Washington. Includes hayfields, pastures, and USDA Conservation Reserve Program lands.	N/A	N/A	Ag riparian? Ag wetland? Barren and sparsely vegetated Low structure agriculture High structure agriculture Meadow/grass (representing pastures)
Urban and Mixed Environs	Extremely variable; often dominated by non-native species.	Extremely variable; often dominated by non-native species.	Extremely variable; often dominated by non-native species.	Barren and sparsely vegetated Deciduous scattered canopy forest? Mixed scattered canopy forest? Conifer scattered canopy forest? Open canopy shrub? Scattered canopy shrub? Closed canopy shrub?
Open Water – Lakes, Rivers, Streams	N/A	N/A	N/A	Water/deep water Deep water Open riparian Open wetland? Urban wetland?
Herbaceous Wetlands	N/A	N/A	Bulrush (*Scirpus* spp.) Cattails Sedges (*Carex* spp.) Rushes (*Juncus* spp.) Spike rushes (*Eleocharis* spp.) American sloughgrass (*Beckmannia syzigachne*) Bluejoint reedgras (*Calamagrostis canadensis*) Mannagrass (*Glyceria* spp.) Tufted hairgrass (*Deschampsi caespitosa*) **Rooted and floating aquatic plants:** Yellow pond lily (*Nuphar lutea*) Pondweed (*Potamogeton* spp.) Duckweed (*Lemna minor*) Water-meals (*Wolffia* spp.) **Permanent and semi-permanent standing water:** Pacific water parsley (*Oenanthe sarmentosa*) Buckbean (*Menyanthes trifoliata*) Water star-warts (*Callitriche* spp.) Bladderworts (*Utricularia* spp.) **Introduced grasses/forbs that can dominate:** Reed canary grass (*Phalaris arundinacea*) Tall fescue (*Festuca arundinacea*) Kentucky bluegrass Bittersweet (climbing) nightshade (*Solanum dulcamara*) Purple loosestrife (*Lythrum salicaria*) Poison hemlock (*Conium maculatum*)	Ag wetland Open wetland Urban wetland

Appendix 3 (continued).

Westside Riparian-wetlands	Red alder Black cottonwood (*Populus balsamifera* ssp. *trichocarpa*) Bigleaf maple Oregon Ash Pacific willow (*Salix lucida* ssp. Oregon white oak Western redcedar Western hemlock (*Tsuga heterophylla*) Grand fir Douglas-fir (relatively uncommon)	Willow species (*Salix sitchensis, S. hookeriana*) Douglas' spirea (*Spriea douglasii*) Red-osier dogwood (*Cornus sericea*) Western crabapple (*Malus fusca*) Salmonberry (*Rubus spectabilis*) Stink current (*Ribes bracteosum*) Devil's-club (*Oplopanax horridum*) Vine maple (*Acer circinatum*) Salal Thimbleberry (*Rubus parviflorus*) Common snowberry (*Symphoricarpos albus*) Hazelnut (*Corylus cornuta*) Pacific ninebard (*Physocarpus capitatus*)	Slough sedge (*Carex obnupta*) Dewey sedge (*C. deweyana*) Skunk-cabbage (*Lysichiton americanus*) Coltsfoot (*Petasites frigidus*) Hedge-nettle (*Stachys* spp.) Ladyfern (*Athrium filix-femina*) Youth-on-age (*Tolmiea menziesii*) Oxalis (*Oxalis oregona, O. Trillifolia*) Stinging nettle (*Urtica dioica*) Swordfern (*Polystichum munitum*) Field horsetail (*Equisetum arvense*)	Forested riparian Forested wetland

Appendix 4. Review of key findings of urban stream studies examining the relationship of urbanization on stream quality.

Reference	Location	Biological Parameter	Key Finding
Benke, Willeke, Parrish and Stites 1981	Atlanta	Aquatic insects	Negative relationship between number of insect species and urbanization in 21 streams
Black and Veatch 1994	Maryland	Fish/insects	Fish, insect and habitat scores were all ranked as poor in 5 subwatersheds that were greater than 30% TIA
Booth 1991	Seattle, WA	Fish habitat / channel stability	Channel stability and fish habitat quality declined rapidly after 10% TIA
Booth et al. 1996	Washington	Aquatic habitat	There is a decrease in the quantity of large woody debris found in urban streams at around 10% TIA
Couch et al. 1997	Atlanta, Georgia	Fish, habitat	As watershed population density increased, there was a negative impact on urban fish and habitat
Crawford & Lenat 1989	North Carolina	Aquatic insects and fish	A comparison of three stream types found urban streams had lowest diversity and richness
Galli 1991	Maryland	Stream temperature (aquatic habitat)	Stream temperature increased directly with subwatershed impervious cover
Galli 1994	Maryland	Brown trout	Abundance and recruitment of brown trout declined sharply at 10-15% TIA
Garie and McIntosh 1986	New Jersey	Aquatic insects	Drop in insect taxa from 13 to 4 noted in urban streams
Hicks and Larson 1997	Connecticut	Aquatic insects	A significant decline in various indicators of wetland aquatic macroinvertebrate community health was observed as TIA increased to levels of 8-9%
Horner et al. 1996	Puget Sound, Washington	Insects, fish, water quality, riparian zone	Steepest decline of biological functioning after 6% TIA. There was a steady decline, with approximately 50% of initial biotic integrity at 45% TIA
Jones and Clark 1987	Northern Virginia	Aquatic insects	Urban streams had sharply lower diversity of aquatic insects when human population density exceeded 4 persons/acre (estimated 10-25% TIA)
Jones et al. 1996	Northern Virginia	Aquatic insects and fish	Unable to show improvements at 8 sites downstream of BMPs as compared to reference conditions
Klein 1979	Maryland	Aquatic insects/fish	Macroinvertebrate and fish diversity declines rapidly after 10% TIA
Limburg and Schmidt 1990	New York	Fish spawning	Resident and anadromous fish eggs and larvae declined sharply in 16 tributary streams greater than 10% TIA
Luchetti and Fuersteburg 1993	Seattle	Fish	Marked shift from less tolerant coho salmon to more tolerant cutthroat trout populations noted at 10-15% TIA at 9 sites
MacRae 1996	British Columbia	Stream channel stability (aquatic habitat)	Urban stream channels often enlarge their cross-sectional area by a factor of 2 to 5. Enlargement begins at relatively low levels of TIA.
Maxted and Shaver 1996	Delaware	Aquatic insects and habitat	No significant differences in biological and physical metrics for 8 BMP sites versus 31 sites without BMPs (with varying TIA)
May et al. 1997	Washington	Insects, fish, water quality, riparian zone	Physical and biological stream indicators declined most rapidly during the initial phase of the urbanization process as the TIA exceeded the 5-10% range
MWCOG 1992	Washington, D.C.	Aquatic insects and fish	There was a significant decline in the diversity of aquatic insects and fish at 10% TIA
Pedersen and Perkins 1986	Seattle	Aquatic insects	Macroinvertebrate community shifted to chironomid, oligochaetes and amphipod species tolerant of unstable conditions.

Appendix 4 (continued).

Richards et al. 1993	Minnesota	Aquatic insects	As watershed development levels increased, the macroinvertebrate community diversity decreased
Schueler and Galli 1992	Maryland	Fish	Fish diversity declined sharply with increasing TIA; loss in diversity began at 10-12% TIA
Schueler and Galli 1992	Maryland	Aquatic insects	Insect diversity metrics in 24 subwatersheds shifted from good to poor over 15% TIA
Shaver, Maxted, Curtis and Carter 1995	Delaware	Aquatic insects	Insect diversity at 19 stream sites dropped sharply at 8 to 15% TIA.
Shaver, Maxted, Curtis and Carter 1995	Delaware	Habitat quality	Strong relationship between insect diversity and habitat quality; majority of 53 urban streams had poor habitat
Steedman 1988	Ontario	Aquatic Insects	Strong negative relationship between biotic integrity and increasing urban land use/riparian condition at 209 stream sites. Degradation begins at about 10% TIA
Steward 1983	Seattle	Salmon	Marked reduction in coho salmon population noted at 10-15% TIA at 9 sites
Taylor 1993	Seattle	Wetland plants / amphibians	Mean annual water fluctuation was inversely correlated to plant and amphibian density in urban wetlands. Sharp declines noted over 10% TIA
Taylor et al. 1995	Washington	Wetland water quality	There is a significant increase in water level fluctuation, conductivity, fecal coliform bacteria, and total phosphorus in urban wetlands as TIA exceeds 3.5%
Trimble 1997	California	Sediment loads (aquatic habitat)	About 2/3 of sediment delivered into urban streams comes from channel erosion
U.S. EPA 1983	National	Water quality / pollutant concentration	Annual phosphorus, nitrogen, and metal loads increased in direct proportion with increasing TIA
Weaver 1991	Virginia	Fish	As watershed development increased to about 10%, fish communities simplified to more habitat and trophic generalists
Yoder 1991	Ohio	Aquatic insects / fish	100% of 40 urban sites sampled had fair to very poor index of biotic integrity scores

Sources: Schueler 1994, Caraco et al. 1998

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SOCIETY FOR ECOLOGICAL RESTORATION

Guidelines for Developing and Managing Ecological Restoration Projects

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The following guidelines are suggested for conceiving, organizing, conducting, and assessing ecological restoration projects. Adherence to these guidelines will reduce errors of omission and commission that compromise project quality. The guidelines are applicable to any ecosystem, terrestrial or aquatic. They are useful in any context -- public works projects, stewardship programs, mitigation projects, private land initiatives, etc. The guidelines are generic and were developed as essential background for managers, policy makers, and the interested public as well as for professional and volunteer restoration practitioners. Design issues and the details for planning and implementing restoration projects lie beyond the scope of these guidelines. We leave such complexities to the authors of manuals and the presenters of workshops who address these topics.

The mission of every ecological restoration project is to reestablish a functional ecosystem of a designated type that contains sufficient biodiversity to continue its maturation by natural processes and to evolve over longer time spans in response to changing environmental conditions. The two attributes of biodiversity that are most readily attained by restoration are species richness and community structure. The restoration ecologist must assure adequate species composition and species abundance to allow the development of suitable community structure and to initiate characteristic ecosystem processes. Concomitantly, the restorationist must provide appropriate physical conditions to sustain these species.

If restoration cannot be fully achieved, then the project should be re-designed as *rehabilitation*, which we define as any ecologically beneficial treatment short of full restoration. Management actions that cause ecological damage do not qualify as restoration. Unfortunately, *restoration* is applied inappropriately to projects that sacrifice biodiversity and impair ecological functions to accomplish single-species management or to attain economic objectives. Continued indiscriminate use will cause *ecological restoration* to lose its meaning as a creditable conservation strategy. Restoration projects can accommodate particular species and can satisfy economic objectives as long as ecosystem integrity is not compromised.

Once a project site is restored, it may require periodic management, as do many other natural areas, to maintain ecosystem health in response to continuing human-mediated impacts. These guidelines do not address post-project management specifically, although some of the guidelines are readily adaptable for that purpose.

The project guidelines are numbered for convenience; they do not necessarily have to be initiated in numerical order. We recommend that a narrative be written in response to the issues raised in each guideline. Collectively, these narratives will comprise a comprehensive guidance document for planning and executing the project.

CONCEPTUAL PLANNING

Conceptual planning identifies the reasons why restoration is needed and the general strategy for conducting it. Conceptual planning is conducted when restoration appears to be a feasible option but before a decision has been

made to exercise that option. The written conceptual plan captures the essence and character of the potential restoration.

1. Identify the project site location and its boundaries. Project boundaries are delineated, preferably on a large-scale aerial photograph and also on soil and topographic maps that show the watershed and other aspects of the surrounding landscape.

2. Identify ownership. The name and address of the landowner is given. If an organization or institution owns or manages the land, the names and titles of key personnel are listed. The auspices under which the project will be conducted are noted – public works, mitigation, etc.

3. Identify the need for restoration. Tell what happened at the site that warrants restoration. State the intended benefits of restoration.

4. Identify the kind of ecosystem to be restored and the type of restoration project. The ecosystem to be restored is designated along with any particular habitats and plant or animal communities of that ecosystem that are targeted for restoration. The type of restoration is selected from the following list of five options. It is important to make this initial distinction to avoid misunderstandings later. Restoration projects at diverse project sites may include more than one of these options:

1) *Repair of a damaged ecosystem.* This option attempts to return a site to its historic or preexisting condition. Commonly a few minor aspects of the preexisting ecosystem cannot be fully restored. These should be identified and accepted as exceptions. Restoration work takes place at the same site where damage occurred. Such restoration has been termed *in-kind* (the historic type of ecosystem is restored) and *onsite* (restoration occurs at the same location where the historic ecosystem was damaged). Restoration with respect to the following four options is not necessarily *on-site,* and some are not *in-kind.*

2) *Creation of a new ecosystem of the same kind to replace one that was entirely removed.* The term *creation* signifies that the restored ecosystem must be entirely reconstructed on a site denuded of its vegetation (terrestrial systems) or its benthos (aquatic systems). Creations are commonly conducted on surface mined lands and in brownfields (severely damaged urban and industrial lands).

3) *Creation of another kind of regional ecosystem to replace one which was removed from a landscape that became irreversibly altered.* This option is important for restoring natural areas in an urban context where, for example, original hydrologic conditions cannot be restored.

4) *Creation of a replacement ecosystem where an altered environment can no longer support any previously occurring type of regional ecosystem.* The replacement ecosystem may consist of novel combinations of indigenous species that are assembled to suit novel site conditions as, for example, at a retired solid waste disposal site.

5) *Creation of a replacement ecosystem, because no reference system exists to serve as a model for restoration.* This option is relevant in densely populated regions of Eurasia, where many centuries of land use have obliterated all remnants of original ecosystems.

5. Identify restoration goals, if any, that pertain to social and cultural values. Goals are the ideals that a restoration project attempts to achieve. Goals relating to social and cultural values may be prescribed as long as they are congruent with the primary goal of reestablishing a functional ecosystem that contains sufficient biodiversity to continue its maturation by natural processes and to evolve over longer time spans in response to changing environmental conditions. Social values are largely economic. They may consist of the production of goods such as timber, forage, and fisheries at restored sites. Or they may comprise natural services including the protection of recharge areas and potable water supplies, detention of floodwaters, attenuation of erosion and sedimentation, noise reduction, immobilization of contaminants, transformation of excess nutrients, generation of pollinators for crops, generation of predators of crop pests, and provision of recreational opportunities and consequent tourism. They can also conserve germ plasm of economic species and serve as refugia for wildlife and for rare species. Cultural values

include aesthetic amenities and the revival of historical environments as aspects of preserving cultural heritage. If the goal is to restore a fixed cultural landscape, then the project may have to be re-designated as rehabilitation.

6. Identify physical site conditions in need of repair. Some examples of conditions that are amenable to restoration are improvements in water quality, removal of structures to reestablish a more natural hydrologic regime, and improvements to the soil in terms of compaction, organic matter content, and nutrient content.

7. Identify stressors in need of regulation or re-initiation. Stressors are re-occurring external conditions that maintain the integrity of an ecosystem by discouraging the establishment of competitive species that cannot tolerate particular stress events. Examples are fires, anoxia caused by flooding or prolonged hydroperiods, periodic drought, salinity shocks associated with tides and coastal aerosols, freezing temperatures, and unstable substrates caused by water, wind or gravity as on beaches, dunes, and flood plains.

8. Identify biotic interventions that are needed. Some characteristic species of plants and animals may require reintroduction or their existing populations need to be augmented. Nuisance species and exotic species may require removal or control. Mycorrhizal fungi, N-fixing bacteria, and other microbial species may need to be introduced.

9. Identify landscape restrictions, present and future. The biota at a project site is affected by off-site conditions, particularly land usage. Restoration should not be attempted in landscapes that can no longer support the kind of ecosystem designated for restoration or which will likely be compromised later by the effects of land usage offsite. To the extent possible, future threats to the integrity of the restored ecosystem should be minimized by mechanisms such as zoning or binding commitments from neighboring landowners.

Some aquatic ecosystem restoration depends entirely on improving the watershed, and all restoration work is accomplished offsite. Examples of impacts from offsite include water pollution, turbidity, and agricultural runoff. The hydrologic regime in any project site can be altered offsite by dams, drainage projects, diversions of runoff caused by highways and other public works, and by the impervious surfaces characteristic of developed land. Water tables are lowered by transpiration from trees and are raised, sometimes dramatically, by timber harvest. Fire frequency is reduced by intentional suppression and by landscape fragmentation that interrupts the cover of flammable vegetation. Exotic species colonization onsite is commonly traced to infestations offsite. The presence or abundance of birds and other mobile animals depends on the health of other ecosystems in the landscape upon which they partially depend.

10. Identify project-funding sources. Potential external funding sources should be listed if internal funding is inadequate.

11. Identify labor sources and equipment needs. New personnel may have to be hired, volunteers invited, and other labor contracted. The availability of special equipment must be determined.

12. Identify biotic resource needs. Biotic resources include seeds, other plant propagules, nursery-grown planting stocks, and animals for establishment at the project site.

13. Identify the need for securing permits required by government agencies. Dredge and fill permits may be required for tasks involving rivers and wetlands. Other permits may be applicable for the protection of endangered species, historic sites, etc.

14. Identify permit specifications, deed restrictions, and other legal constraints. If restoration is being conducted as mitigation, compliance with permit specifications must be incorporated into the restoration plan or re-negotiated. Restrictive covenants and zoning regulations may preclude certain restoration activities. Legal restrictions on ingress and egress could prevent some restoration tasks from being accomplished. If the restoration is being placed under conservation easement, the timing of the easement must be satisfied.

15. Identify project duration. Short-term restoration projects are generally more costly than longer-term projects. The longer the project, the more the practitioner can rely on natural processes and volunteer labor to

accomplish specific restoration objectives that are identified below in Guideline #27. In accelerated restoration programs such as mitigation projects, costly interventions must substitute for these natural processes.

16. Identify strategies for long-term protection and management. Restoration is futile without reasonable assurance that the project site will be protected and properly managed into the indefinite future. Protection could be secured with conservation easements or the legal transfer of the property to a public resource agency or non-governmental organization.

PRELIMINARY TASKS

Preliminary tasks are those upon which project planning depends. These tasks form the foundation for well-conceived restoration designs and programs. Preliminary tasks are fulfilled after conceptual planning results in the decision to proceed with the restoration project.

17. Appoint a restoration ecologist who is responsible for technical aspects of restoration. Restoration projects are complex, require the coordination of diverse activities, and demand numerous decisions owing in part to the stochastic nature of ecological processes. For these reasons, leadership should be vested in an individual who maintains overview of the entire project and who has the authority to act quickly and decisively. The restoration ecologist may delegate specific tasks but retains the ultimate responsibility for the attainment of objectives. Nonetheless, restoration responsibilities are sometimes divided according to the organizational charts of larger corporations and government bureaus. Pluralistic leadership augments the potential for errors in project design and implementation. In mitigation projects, agency personnel become silent co-partners with the restoration ecologist when they mandate particular restoration activities as permit specifications. This practice reduces the restoration ecologist's capacity for flexibility and innovation, including the prompt implementation of adaptive management actions. The preparation of a written guidance document, based upon responses to these guidelines, will help promote the judicious execution of the restoration project in cases of pluralistic leadership and in negotiating permit specifications with government agencies.

18. Appoint the restoration team. The team includes the restoration ecologist, the project manager, other technical personnel who may contribute to the project, and anyone else whose input will critically affect the project. It is essential that the responsibilities of each individual are clearly assigned and that each person be given concomitant authority. The restoration ecologist and the project manager should maintain open lines of communication. If restoration is one component of a larger project, the restoration ecologist should enjoy equal status with other project planners to prevent actions that could compromise restoration quality or inflate costs.

19. Prepare a budget to accommodate the completion of preliminary tasks. Time and resources as well as funding need to be allocated for these tasks.

20. Document existing project site conditions and describe the biota. Project evaluation depends in part upon being able to contrast the project site before and after restoration. Properly labeled and archived photographs are fundamental. Camera locations should be recorded, so that before and after photos can be compared. Videotapes, aerial photographs, and oblique aerial photos from a low-flying aircraft are helpful. Soils and other physical site conditions should be described. To the extent possible, species composition should be listed and species abundance estimated. The structure of all component communities should be described in sufficient detail to permit objective means of evaluating the performance of projects subsequent to their implementation.

21. Document the project site history that led to the need for restoration. The years in which impacts occurred should be recorded. Historical aerial photos are helpful. Disturbance features should be photographed.

22. Conduct pre-project monitoring as needed. Sometimes it is useful or requisite to obtain baseline measurements on such parameters as water quality and groundwater levels for a year or more prior to initial project installation. If so, these measurements will continue after the project begins as part of the monitoring program.

23. Gather baseline ecological information and conceptualize a reference ecosystem from it upon which the restoration will be modeled and evaluated. The kind of ecosystem that has been selected for restoration must be described in sufficient detail to develop restoration objectives and to serve as a comparison for

evaluating the completed restoration project. Documentation of the pre-project site conditions (Guideline #20) may contribute substantially to the reference. Generally, no one site contains the range of variability that is representative of the ecosystem designated for restoration. Therefore, the reference system should be conceptualized from the collective attributes of several sites. These attributes should include both the biotic and abiotic (physical) components. They should include seral (developmental) descriptions, because a comparison between an ecologically young restoration site and a mature reference system requires assumptions that are difficult to substantiate. The description of the reference system can be the citation of existing documents, a report of baseline ecological studies conducted by the restoration team, or a combination thereof.

24. Gather pertinent autecological information for key species. The restoration ecologist should have access to whatever knowledge is available regarding the recruitment, maintenance, and reproduction of key species. If necessary, trials and tests can be conducted by the restoration team prior to project installation.

25. Conduct investigations as needed to assess the effectiveness of restoration methods. Novel and unusual restoration methods may require testing prior to their implementation at the project site.

26. Decide if ecosystem goals are realistic or if they need modification. On the basis of information gained from carrying out the aforementioned guidelines, the project team should conduct a feasibility study to determine if the type of restoration (Guideline #4) and the original project goals (Guideline #5) were realistic. If not, modifications should be proposed.

27. Prepare a list of objectives designed to achieve restoration goals. Objectives are the specific activities to be undertaken for the satisfaction of project goals. The restoration ecologist should list all objectives needed to achieve each project goal. Objectives may be executed directly through the establishment of project features or passively through suitable project design. In either case, objectives are explicit, measurable, and have a designated time element. Objectives can cover a wide array of specific actions. They may be hydrological, e.g., the filling of a drainage ditch to improve sheet flow; pedological, e.g., the amendment of organic matter to improve soil texture; or biological, e.g., the prompt removal of a particular exotic species that threatens ecosystem integrity. Other objectives may pertain to re-introducing fire according to a specific prescription, removing an abandoned road, or establishing a windbreak. Certain objectives may require actions that take place offsite to improve conditions onsite. Some restoration projects can be accomplished with one or few objectives. For example, perhaps all that is needed is to install culverts beneath a road to improve drainage, assuming the vegetation can recover passively.

28. Secure permits required by regulatory and zoning authorities. These are the permits identified in guidelines #13 and #14.

29. Establish liaison with other interested governmental agencies. Potential interested agencies should be notified of the project. Later, site tours can be conducted for agency personnel and progress reports dispatched to them. This networking could expedite assistance, should it become needed.

30. Establish liaison with the public and publicize the project. Local residents automatically become stakeholders in the restoration. They need to know how the restored ecosystem can benefit them personally. For example, the restoration may attract ecotourism that will benefit local businesses, or it may serve as an environmental education venue for local schools. If residents favor the restoration, they will protect it and vest it with their political support. If they dislike the restoration, they may vandalize or otherwise disrespect it.

31. Arrange for public participation in project planning and implementation. The restoration team should make every effort to involve local residents or other interested members of the public to participate in project planning and installation. By doing so, the participants develop a feeling of ownership, and they will be more likely to assume a stewardship role for the completed project. Volunteer labor by local residents or by ecotourists may reduce overall project costs. However, such labor requires coordination, special supervision, and additional liability insurance.

32. Install roads and other infrastructure needed to facilitate project implementation. The degree to which infrastructure is provided should be weighed against the costs of down time caused by its absence and against considerations of safety and opportunities for public relations tours.

33. Engage and train personnel who will supervise and conduct project installation tasks. Project personnel who lack restoration experience or knowledge of particular methods will benefit from attending workshops and conferences that provide background information. Otherwise, the restoration ecologist should provide training.

INSTALLATION PLANNING

Installation plans describe how the project will be implemented, i.e., project design. The care and thoroughness with which installation planning is conducted will be reflected by how aptly project objectives are realized.

34. Describe the interventions that will be implemented to attain each objective. The restoration ecologist should identify all actions and treatments needed to accomplish each objective listed in Guideline #27. Detailed instructions are prepared for implementing each of these interventions. Concomitantly, the needs for labor, equipment, supplies, and biotic stocks are identified.

Restoration projects should be designed to reduce the need for mid-course corrections that inflate costs and cause delays. Special care should be given to describing site preparation activities, i.e., those interventions that precede the introduction of biotic resources. Once biotic resources are introduced, it may become exceedingly difficult to repair dysfunctional aspects of the physical environment.

Some interventions can be accomplished concurrently and others must be done in sequence. The need for sequencing should be clearly identified. Some restoration activities require follow-up activities or continuing periodic maintenance following installation. These tasks are predictable and can be written into the implementation plans under their respective objectives. Examples of maintenance tasks include the repair of erosion on freshly graded land and the removal of competitive weeds and vines from around young plantings.

35 State how much of the restoration can be accomplished passively. Restoration tasks initiate or accelerate natural processes. Nearly all manifestations of restoration are accomplished by these processes and not by the direct artifice of the restorationist. For example, a small quantity of plants may be introduced as nursery stock with the expectation that these plants will propagate and increase substantially in density. Many restoration projects make no provision for introducing species of animals. The assumption is that, 'if we build it, they will come.' The restoration plan should acknowledge those aspects that are expected to develop passively, i.e., without intervention. If passive restoration is not realized, then additional interventions must be prescribed (see Guideline #47).

36. Prepare performance standards and monitoring protocols to measure the attainment of each objective. A performance standard (also called a design_criterion) provides evidence on whether or not an objective has been attained. This evidence is gathered by monitoring in accord with a prescribed protocol or methodology. Performance standards require careful selection for their power to measure the completion of an objective. Monitoring tells the restoration ecologist to what degree a given objective has been attained. It is essential that performance standards and monitoring protocols be selected prior to any project installation activity. Otherwise, the objectivity of the performance standard will be compromised by the initial results of installation. Monitoring protocols must be geared specifically to performance standards. Other information is extraneous and inflates project costs. Monitoring protocols should be designed so that data are readily gathered, thereby reducing monitoring costs. They should be empirical to facilitate their objective interpretation.

37. Schedule the tasks needed to fulfill each objective. Scheduling can be complex. Planted nursery stock may have to be contract-grown months or longer in advance of planting and must be delivered in prime condition. Older, root-bound stocks are generally worthless. If direct seeding is prescribed, seed collecting sites will have to be identified. The seed must be collected when ripe, possibly stored, and perhaps pre-treated. Site preparation for terrestrial systems cannot be scheduled when conditions are unsuitable. For example, soil manipulations cannot be accomplished if flooding is likely, and prescribed burning must be planned and conducted in accordance with applicable fire codes. The availability of labor and equipment can further complicate scheduling. Workdays may have to be shortened for safety during especially hot weather and in lightening storms. Wet weather may cause equipment to bog down. Schedules should reflect these eventualities.

Most objectives are implemented within the first or second year of installation. Some objectives may have to be delayed. For example, the re-introduction of plants and animals with specialized habitat requirements may have to be postponed several years until habitat conditions become suitable.

38. Procure equipment, supplies, and biotic resources. Care should be taken to assure that regional ecotypes of biotic resources are obtained to increase the chances for genetic fitness and to prevent needless and harmful introductions of non-indigenous ecotypes and species.

39. Prepare a budget for installation tasks, maintenance events, and contingencies. Budgeting for planned objectives is obvious. However, budgeting for unknown contingencies is just as important. No restoration project has ever been accomplished exactly as it was planned. Restoration is a multivariate undertaking, and it is impossible to account for all eventualities. Examples of contingencies are severe weather events, depredations of deer and other herbivores on a freshly planted site, colonization by invasive species, vandalism, and unanticipated events elsewhere in the landscape that impact the project site. The need to conduct at least some remediation is a near certainty. Generally, the cost of remediation increases in relation to the time it takes to respond after its need is discovered. For these reasons, contingency funds should be available on short notice.

INSTALLATION TASKS

Project installation fulfills installation plans. If planning was thorough and supervision adequate, installation will generally proceed smoothly and within budget.

40. Mark boundaries and secure the project area. The project site should be staked or marked conspicuously in the field. Fencing and fire lanes should be installed as needed. This guideline is sometimes ignored until it results in a contingency, such as a neighbor's cattle escaping into a freshly planted project site.

41. Install monitoring features. Permanent transect lines, staff gauges, piezometer wells, etc., need to be installed and marked.

42. Implement restoration objectives. Restoration tasks were identified in Guideline #34. The restoration ecologist must supervise project installation or delegate supervision to project team members. Responsibility for proper implementation should not be entrusted to subcontractors, volunteers, and labors crews who are doing the work. The cost of retrofitting exceeds the cost of appropriate supervision.

POST-INSTALLATION TASKS

The attainment of objectives may depend as much on follow-up activities as it does to the care given to initial installation activities. The importance of post-installation work cannot be overemphasized.

43. Protect the project site against vandals and herbivory. Project sites attract dirt bike riders, feral swine, deer, geese, nutria, etc. Beaver can destroy a newly planted site by plugging streams and culverts. Appropriate preventive actions should be taken.

44. Perform post-implementation maintenance. Conduct maintenance activities that were described in Guideline #34.

45. Reconnoiter the project site regularly to identify needs for mid-course corrections. The restoration ecologist needs to inspect the project site frequently, particularly during the first year or two following an intervention, to schedule maintenance as needed and to react promptly to contingencies.

46. Perform monitoring as required to document the attainment of performance standards. Measurements of water levels and certain water quality parameters are generally conducted on a regular schedule. Otherwise, monitoring should not be required until monitoring data will be meaningful for decision-making. Monitoring and the reporting of monitoring data are expensive. Regular reconnaissance (Guideline #45) negates the need for frequent monitoring.

47. Implement adaptive management procedures as needed. Adaptive management as a restoration strategy is essential, because what happens at one stage in restoration dictates what needs to happen next. A restoration plan must contain built-in flexibility. If reconnaissance or monitoring reveal that objectives are not being met, then alternative interventions may have to be attempted. The project manager should realize that restoration objectives may never be realized for reasons that lie beyond the control of the restoration ecologist. If so, then new goals (Guideline #5) and objectives (Guideline #27) may have to be adopted if a functional ecosystem is to be returned to the project site.

EVALUATION

The installation of a project does not guarantee that its objectives will be attained or its goals achieved. Restoration differs from most civil engineering projects for which the results are more predictable. Restored ecosystems are dynamic and require evaluation within the context of an indefinite temporal dimension.

48. Assess monitoring data to determine if performance standards are being met. If performance standards are not being met within a reasonable period of time, refer to Guideline #47.

49. Describe aspects of the restored ecosystem that are not covered by monitoring data. This description should commence when project work has been essentially completed. The description should compliment the documentation that was conducted prior to the initiation of restoration activities (Guideline #20) to allow before and after comparisons.

50. Determine if project goals were met, including those for social and cultural values. Based on monitoring data and other documentation (Guidelines #46, #49), evaluate the restoration with respect to its project goals. These will include the primary goal to restore a functional ecosystem that emulates the reference ecosystem at a comparable ecological age (Guideline #4). They will also include any secondary goals with respect to social and cultural values (Guideline #5).

51. Publish an account of the restoration project and otherwise publicize it. Publicity and documentation should be incorporated into every restoration project for the following reasons: Published accountings are fundamental for instituting the long-term protection and stewardship of a completed project site. Policy makers and the public need to be appraised of the fiscal and resource costs, so that future restoration projects can be planned and budgeted appropriately. Restoration ecologists improve their craft by becoming familiar with how restoration objectives were accomplished.

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Appendix 6.

Selected restoration activities and potential indicators of the effects of management activities, based on ecosystem function. Please read the Restoration chapter and take note of cautionary advice regarding planning and implementing restoration activities in an urban setting, particularly instream modifications.

Function or Value	Selected Potential Restoration Activities	Some Potential Indicators of Management Activity Effects
Water quality (sediment filtering, nutrient/pollutant filtering, erosion control and stream bank stability)	• Increase riparian and upland vegetation (especially woody vegetation) in watershed • Vegetative filter strips (VFS) • Control sediment inputs through BMPs and regulatory measures • Promote development of healthy soils through native plant communities (increases soil retention and filtering capacity) • Limit development and impervious surfaces near stream • Remove or modify sewer outfalls • Artificial wetlands (bioswales and water detention structures) • Public education to keep toxins out of storm drains • Reduce or eliminate industrial discharges • Promote alternatives to pesticides and chemical fertilizers • Promote passage of more water through wetlands and undeveloped floodplains • Retain/increase springs, seeps and wetlands • Increase late summer flows	• Benthic index of biological integrity (B-IBI) (Booth 1991; Spence et al. 1996; Karr and Chu 2000; Booth et al. 2001) • Piezometers or small wells to test groundwater and hyporheic water quality (Fernald et al. 2000) • Water quality tests such as temperature, sediment/turbidity, pH, dissolved oxygen, conductivity, nitrogen and phosphorus, herbicides/pesticides, suspended/floating matter, trash loading, odor, and chemical contamination (National Marine Fisheries Service 1996; Spence et al. 1996; FIRSWG 1998; Hollenback and Ory 1999) • Percent catchment in various types of vegetation and wetland cover (Spence et al. 1996) • Total impervious area, effective impervious area, or road density and location (National Marine Fisheries Service 1996; Schueler 1994; May et al. 1997b) • Intergravel dissolved oxygen in sites where fine particulate organic matter is present (Spence et al. 1996)
Microclimate and shade	• Terrestrial: reduce microclimatic edge effects by addressing size, shape of habitat patches • Aquatic: provide vegetative shade over stream • Terrestrial and aquatic: increase forest width	• Terrestrial: measures of air temperature, relative humidity, soil moisture and temperature, solar radiation, and wind speed (Spence et al. 1996; Saunders et al. 1999; Gehlhausen et al. 2000; Laurance et al. 2000) • Aquatic: water temperature (Budd et al. 1987; Beschta et al. 1988)
Sources of stream flow and flood storage (hydrology)	• Reduce impervious surfaces in watershed • Remove or modify sewer outfalls • Add riparian and upland vegetation; increase riparian forest width • Reconnect streams to floodplain • Retain/increase springs, seeps and wetlands (sources of cold water) • Allow channel meanders • Limit development near stream • Control water inputs artificially to mimic natural conditions • Protect natural and create new detention ponds to detain increased peak runoff • Groundwater recharge (increases late summer flows) • Dam removal/modification to more closely mimic natural flow regime • Reintroduce/allow beaver (increases water storage) • Increase late summer flows	• B-IBI (urban land cover correlates equally well in Pacific Northwest with B-IBI at subbasin, riparian, and local scales) (Booth 1991; Spence et al. 1996; Karr and Chu 2000; Booth et al. 2001) • Hydrographs (historic vs present) and stream gauges (Brookes 1987; Hollenbach & Ory 1999) • Annual and interannual streamflow patterns such as T_{qmean}, $T_{0.5\ yr}$ and CV_{AMF}, quality and timing of peak and low flows (Spence et al. 1996; Booth et al. 2001) • Channel scour (Spence et al. 1996) • Discharge (Spence et al. 1996) • Width/depth ratio, streambank condition, floodplain connectivity, change in peak/base flows, increase in drainage network (National Marine Fisheries Service 1996)

Function or Value	Selected Potential Restoration Activities	Some Potential Indicators of Management Activity Effects
Organic materials	• Increase native vegetation, particularly in riparian areas (although note that small mammals and amphibians require woody debris, thus this should also be addressed in uplands) • In riparian areas, increase conifer:hardwood ratio (large wood from coniferous trees lasts longer instream) • Increase stream connectivity with and ecological integrity of floodplain (floodplain delivers organic materials to stream and riparian areas during flood events) • Addition of fish carcasses to stream	• Measure woody debris and leaf litter or retention time of same (relatively straightforward; Webster and Meyer 1997) • Measure instream nutrient retention time, nutrient spiraling, nutrient cycling (relatively complex; Allan 1995; Cederholm et al. 2000; Cederholm et al. 2001) • GIS: measure forest width and conifer:hardwood ratio or amount and types of vegetative cover (Schueler 1994; Xiang 1996)
Channel dynamics	• Reconnect isolated habitats (instream and terrestrial) • Use a variety of methods (TIA reduction, forest canopy increase, sediment control) to modify flow and sediment regimes to resemble undisturbed conditions • Reduce stream crossings • Control sediment inputs • Remove or modify fish passage barriers • Road removal or alteration • Structural additions (large wood, boulders) • Bank stabilization (vegetation plantings, gabion structures, etc.) • Fencing to avoid livestock grazing • Rest-rotation or grazing strategy • Conifer conversion • Dam removal/modification • Addition of large wood, boulders	• Benthic index of biological integrity (Spence et al. 1996; Karr and Chu 2000; Booth et al. 2001) • Fish-IBI (Regier et al. 1989) • Fraction of bed sediment below a threshold size (measures potentially lethal reductions in permeability allowing flow of oxygenated water to substrate) (Booth et al. 2001) • Cross section and bankfull channel boundary measurements, flood stage surveys, width-to-depth ratios, rates of bank or bed erosion (FIRSWG 1998; Prichard 1998) • Relative Bed Stability Index (Olsen et al. 1997, from Booth et al. 2001) • Riparian forest width measures (Spence et al. 1996) • Channel sinuosity measures (Spence et al. 1996) • Connectivity measures (aerial photography or fragmentation program such as FRAGSTATS) (FIRSWG 1998; FRAGSTATS available at http://www.umass.edu/landeco/research/fragstats/fragstats.html)
Habitat and connectivity	• Reconnect isolated habitats • Consider habitat patch size and shape • Increase native canopy and shrub cover • Control invasive and nonnative plants • Add water sources for wildlife • Plant food resources for wildlife • Manage to increase instream and terrestrial large woody debris • Introduce controlled fire regime to mimic natural disturbances • Improve fish passage	• Bird and wildlife use (FIRSWG 1998) • Large woody debris, instream and terrestrial (Beschta 1979; Dooley and Paulson 1988; FIRSWG 1988; Booth et al. 1997) • Riparian-dependent birds (Spence et al. 1996; Bureau of Land Management 2001) • Aerial photography (FIRSWG 1998) • B-IBI (Booth 1991; Spence et al. 1996; Karr and Chu 2000; Booth et al. 2001) • Sensitive fish (e.g., salmonids) (Spence et al. 1996) • Presence of area-sensitive species (needing large habitat patches) (Keller et al. 1993; Hodges and Krementz 1996; Wenger 1999) • Instream habitat elements: substrate, large woody debris, pool frequency and quality, off-channel habitat, and refugia; % road crossings with inadequate culverts, % unscreened diversions, % impassable dams, frequency of off-channel

Function or Value	Selected Potential Restoration Activities	Some Potential Indicators of Management Activity Effects
		habitats and LWD in riparian zone (National Marine Fisheries Service 1996; Spence et al. 1996) • Terrestrial habitat elements: percent vegetative cover, species density, size and age class distribution, planting survival and reproductive vigor (FIRSWG 1998) • Physical barriers such as culverts (National Marine Fisheries Service 1996) • Nonnative species (Spence et al. 1996) • % riparian zone within 100 m with natural riparian woody plants (Spence et al. 1996) • Beaver sign (Spence et al. 1996)
Reducing human disturbance	• Reduce edge effects • Reduce road effects • Limit trails (especially paved) in large habitat patches for Neotropical migratory birds, which are disturbance-sensitive • Reduce nonnative species through direct removal and/or habitat manipulations • Preserve endangered habitats and habitats critical to endangered species	• Presence, abundance, diversity of sensitive species, or sensitive species index such as B-IBI or Neotropical migratory breeding bird surveys (Spence et al. 1996; Karr and Chu 2000; Booth et al. 2001; Moore et al. 1993; Friesen et al. 1995; Nilon et al. 1995; Theobald et al. 1997; Mancke and Gavin 2000; Hennings 2001) • Bird nesting success studies and studies on associated predators (Small and Hunter 1988; Marzluff et al. 1998; Heske et al. 2001) • Vegetation surveys (Hennings 2001; Roni et al. 2001) • Recreational use surveys (FIRSWG 1998)

Appendix 7. Metro's activities relevant to the Willamette Restoration Initiative's Critical Action Items.

	WRI Critical Action Item	Metro's Activities relating to Action Item
Clean Water	1. Support the Willamette Basin total maximum daily load (TMDL) process, including coordination and communication.	• Green Streets Program – Environmental designs for transportation systems (2002)
	2. Support effective implementation of the agricultural water quality management plan process (Senate Bill 1010) and encourage its use to address species needs.	• Develop agricultural water quality management plans on all leased farm land in the Tualatin River Basin owned by Metro.
	3. Reduce the levels of toxic pollutants in the Willamette Basin.	• Regional Environmental Management (REM) accepts household hazardous waste from throughout the region. This program has been in place since 1986 to reduce risks to water quality from improper disposal of items such as pool chlorine, paint, and motor oil. In the 1988-89 fiscal year, this program collected 2.4 million pounds of hazardous waste, of which 79% was reused, recycled or burned for energy. In 1999-2000 this program collected 2.7 million pounds of hazardous waste, of which 81% was reused, recycled, or burned for energy. • REM operates two permanent facilities where household hazardous waste can be properly disposed of each year. • REM cleans up illegal dumps in the region, many of them in streamside areas. This has resulted in approximately 1,000 sites cleaned up annually. • REM promotes integrated pest management and natural gardening to reduce pesticide use in the region. • Metro Recycling Information fields 100,000 calls annually. It helps the public find acceptable ways to recycle waste oil, household hazardous wastes, and other wastes which otherwise might be buried in area landfills or be improperly disposed of. • Application and potential release of herbicide compounds in the Willamette River Basin is minimized following our integrated pest management (IPM) approach to vegetation management on approximately 6,500 acres. • Green Streets Program – Environmental designs for transportation systems
	4. Provide economic incentives to decrease water pollution.	• REM has sold 60,000 composting bins at below market price to promote composing which minimize erosion, increases water conservation, and reduces the use of lawn fertilizer. • REM accepts household hazardous waste at far below processing cost to provide an economic incentive for proper disposal and recycling. • Metro Transportation Improvement Program (2003) • Green Streets Program (2002)
	5. Promote a developer education/certification program tied to incentives.	
	6. Initiate an effluent and "water quality impact" trading pilot project in the Willamette Basin.	

Appendix 7. Metro's activities relevant to the Willamette Restoration Initiative's Critical Action Items.

	WRI Critical Action Item	Metro's Activities relating to Action Item
Water Quantity	7. Support improvements to water quantity management efforts to meet water supply needs for ecological and economic purposes	• REM has continuously promoted composting and "grasscycling" to increase the particle and water holding capacity of the soil. This increases storm water conservation, reduces storm water flow surges, reduces erosion as well as reducing the use of lawn fertilizer. • Working with Water Trust to convert all non-essential water rights to in-stream rights. • Restoration activities on Metro park and open space lands have improved riparian areas and associated wetlands which enhance both water quality and quantity. • Green Streets Program (2002)
	8. Support the Corps of Engineers' ongoing assessment of flood control reservoir operation by helping identify and communicate changes needed to address streamflow issues.	
Habitat & Hydrology	9. Establish science-based riparian area protection guidelines.	• Title 3 and Goal 5 efforts
	10. Support basinwide scientific investigations of how to restore floodplain function.	• Goal 5 efforts
	11. Inventory, map, and conserve priority fish and wildlife habitats in the basin.	• Title 3; Goal 5 inventory, ESEE analysis, and related policies and procedures • Forest canopy inventory; Natural areas inventory; Disappearing natural areas assessment; working with local partners to identify interconnected, region-wide system of parks, natural areas, trails and greenways for benefit of fish, wildlife and people. • Metro Transportation Improvement Program: Regional Culverts program (2003)
	12. Improve both upstream and downstream fish passage at dams, culverts, and water diversions.	• REM installed a screen, approved by the Oregon Department of Fish and Wildlife, to prevent fish from being sucked into the pump intake at St. John's Landfill. • Dam removal project-Johnson Creek (Ambleside properties); dam removal - Smith/Bybee Lakes (replace with fish friendly water control structure). Note: both dam projects are in planning stages. • Metro Transportation Improvement Program: Regional Culverts Inventory program (2003)
	13. Support improvements to hatchery and harvest management systems.	• Participate in ODFW Basin Planning efforts in the Sandy River watershed
	14. Prevent the introduction and control the spread of the most harmful invasive species.	• Volunteer efforts; example = Cooper Mountain habitat restoration, including removal of Himalayan blackberries. • Currently working with other agencies in the region to form a regional weed board. Working with other governmental and NGOs on developing new weed control techniques. In partnership with Nature Conservancy, Metro published and distributed brochures to landowners offering information and guidance for the suppression of Japanese knotweed. • Aggressive efforts to control invasive species on Metro properties involving variety of strategies including volunteers, herbicides, revegetation with native species, water control, mechanical etc.; education integrated into Environmental Education Programs and Volunteer training • In partnership with USFWS—grants to variety of partners to support invasives control/removal on publicly owned lands. Primary target species include Reed canary grass, Japanese Knotweed, Him. Blackberry, English Ivy, Scots broom, purple loosestrife, etc.

Appendix 7. Metro's activities relevant to the Willamette Restoration Initiative's Critical Action Items.

	WRI Critical Action Item	Metro's Activities relating to Action Item
	15. Improve delivery mechanisms for incentive programs, especially the Conservation Reserve Enhancement Program (CREP).	• Published "Protecting Open Space: A Review of Successful Programs and Landowner Perspectives"; with funding assistance from local partners, have awarded contract to Eco NW to develop and propose new incentive programs for natural resource conservation on private lands in PDX metropolitan region (in process).
	16. Support funding for on-the-ground protection and restoration projects.	• USFWS, other volunteer efforts through Metro. See Volunteer Program Year-end Report 2000. • Metro, through RPAG dept. is aggressively supporting proposed Conservation and Reinvestment Act of 2001; In partnership with USFWS, Metro administers successful small grants program supporting restoration and environmental education • Metro developed and forwarded to voters1995 $135.6 million Open Space, Parks and Streams Bond Measure. Approved by voters by a 62% margin, administered by RPAG, these funds have allowed for the acquisition of 7,000 acres including more than 42 mi. of stream and river frontage and funded nearly 100 local greenspace projects in three-county metro region. • Regional Culverts program
Institutions & Policies	17. Increase public and consumer awareness of the Willamette Basin health issues.	
	18. Help grow the market for, and encourage development of, environmentally friendly products.	• Recycling program, including sale of recycled paints • Collected native grasses and forbs seeds and contracted growers to develop plant material sources for native plant materials.
	19. Create new stewardship pathways through agreements and incentives.	• RPAG volunteer program provides numerous opportunities for wide variety of citizens to get involved in stewardship of region's natural resources; RPAG environmental education and special events enhance awareness, understanding and appreciation of natural environment and human relationship/impacts on natural resources. • Green Streets Program (2002)
	20. Reduce tax barriers to conservation on private lands.	
	21. Create an effective and cooperative strategy at the local level to fund and implement watershed action plans.	• Green Streets Program (2002)
	22. Create watershed technical assistance teams.	
	23. Establish a basinwide salmonid recovery coordinating council.	
	24. Coordinate and integrate major regulatory programs and responses to them.	• Title 3, Goal 5 efforts
	25. Improve Willamette Basin information management.	• Goal 5 science paper
	26. Increase usefulness of land use planning and management programs for watershed issues.	• Green Streets Program (2002)
	27. Strengthen agency capacity to implement and administer existing programs, including enforcement.	• Green Streets Program (2002)

Appendix 8

Mike Reed
Overview of the City of Portland's
Endangered Species Act Program
June 6, 2001

THE ENDANGERED SPECIES ACT

The Endangered Species Act first became an issue for the City of Portland when steelhead were listed in March of 1998. Subsequent listings of chinook in March of 1999 and pending listings of coastal cutthroat have created a legal and environmental responsibility for the City. The 4(d) rule was released on June 20, 1999 that makes it illegal to "take" a listed species. The definition of take is broadly defined to mean that a species that is listed under the ESA cannot be killed or harmed in any way. The definition of take has been interpreted to also include habitat conditions. Habitat that the species depends on cannot be destroyed or altered that jeopardizes the species existence.

The following is a brief description of the city-wide response to the ESA.

THE PORTLAND CITY COUNCIL RESPONSE

After the Steelhead was listed as threatened in March of 1998 under the Endangered Species Act, the City Council gave direction to the City's Endangered Species Act Program during an informal work session in May 1998 (City Council Work Session Briefing Packet, 5 May 1998) and again in the Steelhead Resolution in July of 1998 (#35715, Appendices to the Briefing Packet for City Council, 12 January 1999). The City Council included the following recommendations for complying with the Endangered Species Act:

- **The ESA program should be an integrated, comprehensive City-wide approach with representation from all affected City agencies.**
- **Conduct an assessment of City activities that have the potential to impact steelhead and other salmonids.**
- **Work proactively with NMFS to develop a programmatic response to the ESA listing.**
- **Work to support the recovery of steelhead populations.**
- **Work with other regional and state partners.**
- **Engage the community stakeholders in the development of the ESA response.**

THE BEAK REPORT – AN ASSESSMENT OF CITY ACTIVITIES

One of the first actions of the ESA Program was to conduct an assessment of the potential for City activities to impact steelhead and other salmonids. The Beak Report assessment, as it is commonly referred to, consisted of interviews with over 100 City staff.

The assessment found that the following City activities could affect steelhead (and other salmonids as well):

- **Alteration of watershed conditions through permitted development (e.g. reduced vegetation cover and increased impervious surfaces)**
- **Introduction of toxic materials, nutrients, fine sediment, or organic material to the watercourse (e.g., storm water discharge)**
- **Modification of the flow regime (e.g., water diversions)**
- **Influencing water temperature (e.g., modification of the riparian shade canopy)**
- **Influencing riparian vegetation (e.g., riparian removal or alteration)**
- **Influencing fish passage (e.g., installation of culvert stream crossings)**
- **Influencing factors that increases the likelihood of inter- and intra-species predation rates (e.g., installation and/or alteration of bank and instream structures**
- **Influencing the level of direct disturbance to fish (e.g., installation of streambank structures that encourage human activity)**

It was recognized that for any given activity to influence salmonids, it was dependent upon the watershed in which the activity occurred. Sediment delivered into the Willamette River for example, will have much different short and long term affects than sediment delivered into a smaller stream such as Johnson Creek.

The Beak report recognized that a number of watersheds within City of Portland's jurisdiction support steelhead spawning and rearing – Johnson and Tryon creeks. Fish surveys by ODFW and the City of Portland have found that the Johnson Creek watershed also supports chinook rearing in the lower portion of the creek as well as cutthroat rearing and spawning throughout the watershed. Although coho have been found in limited numbers, they are believed to prefer the tributaries and headwaters of Johnson Creek.

Because of their size in relation to the Willamette River, many of the watersheds in the City of Portland are vulnerable to the effects of many City activities, especially those activities that affect sediment delivery and riparian canopy shade. Flow – both low and high flows – and fish passage (culverts) are also impacts that the City can influence.

Because a large portion of the watersheds such as Johnson and Tryon creeks fall within the jurisdiction of the City's comprehensive planning and zoning processes, the City has a greater potential to influence development and the activities conducted in these portions of the watershed. This greater vulnerability and higher level of regulatory influence, combined with the possible year-round presence of steelhead as well as different spatial and temporal distributions of chinook, coho and cutthroat due to various life history strategies, makes these streams more vulnerable to the potential influences of City activities and processes.

On the other hand, with the potential influence of the City, the Endangered Species Act Program believe that Johnson and Tryon creeks likely represent *one of the City's greatest opportunities to protect and benefit salmonids.*

As a result of the Beak Report assessment several city-wide, intra-bureau committees were established to investigate city programs and activities that might need to be updated to meet Endangered Species Act compliance standards. Through the work of these committees, the following City programs have been updated and will have direct influence in the City's watersheds:

- **Erosion Control – The City's Erosion Control Program was expanded and improved to reduce erosion and its impacts on fish and their habitat. The Erosion Control Manual was created to describe proactive practices that should be taken to prevent erosion, releases of sediment and other pollutants generated at a site of ground disturbance. The emphasis is on measures that prevent erosion and control stormwater runoff, over practices designed to strictly control sediment.**

  The measurable and enforceable standard for the Erosion Control code is that "no visible and measurable sediment or pollutant shall exit the site, enter the public right of way or be deposited into any water body or storm drainage system."

- **Stormwater Management – The City's Stormwater Management Program is being updated to obtain ESA compliance for City point source, stormwater, and maintenance discharges. Building upon existing programs, particularly the National Pollution Discharge Elimination System (NPDES) permit renewal with the Department of Environmental Quality, the updates include the creation of effective "Best Management Practices" that will address stormwater impacts on fish. The updates to the program are still in progress.**

- **Environmental Overlay Zone (E-Zone) Review – In response to the ESA as well as regional riparian (streamside) protection standards (Goal5/Title 3), the City has been updating its environmental zoning program for improving riparian protection for the small urban streams and waterways, such as Johnson Creek, Tryon Creek, Fanno Creek, Balch Creek, and the Columbia Slough.**

The goal of these city-wide program updates is to obtain federal recognition under the Endangered Species Act. All of the watersheds in the City of Portland should benefit from these changes. At the same time, there are fundamental watershed specific issues that cannot be effectively addressed at the city-wide level, and yet must be dealt with in order to meet pressing local needs and meet the intent of the ESA. The City's ESA Program is developing a comprehensive strategy that builds

on watersheds where more focused strategies are needed for controlling impacts to listed fish.

WATERSHED PLANNING – THE CITY OF PORTLAND FRAMEWORK FOR WATERSHED AND HABITAT CONSERVATION PLANNING

The City's comprehensive response to the Endangered Species Act consists of several different elements. The City is developing a coordinated city-wide plan based on science including the development of incentives and other means necessary to ensure habitat protection and restoration. The plan will not apply identical approaches to each watershed, but will focus on how the fish use, or need to use, a particular stretch of the river or stream and provide for customized approaches based on that information.

It is fully acknowledged that streams in urban areas, such as Johnson and Tryon Creeks, are nearly always located at the lowest point in a watershed, magnifying the effects of landuse changes in headwater and upland areas. There is near universal acceptance that urban watersheds are degraded. While a return to historic conditions is not possible, the City of Portland believes that urban watersheds still perform important ecosystem functions. The City also believes that those functions can be enhanced and restored to the benefit of salmon and humans.

Using sound scientific principles as a foundation for a comprehensive plan, the city will merge traditional practices with strategies for ecosystem restoration. The result will be an important new role for urban communities – assisting recovery of watersheds, streams and species instead of exacerbating their decline.

FUNDAMENTAL ELEMENTS OF THE WATERSHED APPROACH – VISION, GOALS AND OBJECTIVES

- Vision – A Vision will be created with the cooperation of all interested stakeholders to describe what the City of Portland is trying to accomplish with regard to ESA compliance, fish and wildlife and other desired benefits from the watersheds within the City of Portland. It is important that each watershed contribute a vision. These visions will be integrated and coordinated with visions related to other City objectives (e.g., sustainability, livable neighborhoods, economic vitality, recreation and wildlife).
- Watershed Goals – Watershed Goals are an important ingredient to achieving the stated ideals of the vision. The goals will describe more specifically what the City is trying to achieve with its fish recovery efforts. In the case of Johnson Creek, watershed goals must clearly define the desired characteristics of fish populations that the program is striving to restore within Portland's watersheds. The goals will also acknowledge and refer to other objectives the City needs to meet as an urban center (e.g., jobs, growth

management, affordable housing, and recreation). These goals have the potential to support or conflict with fish recovery goals and it is only through explicit acknowledgement, analysis, and planning that opportunities can be found and potential conflicts can be resolved.

- Watershed Conditions – Watershed Conditions will define ecological characteristics of the watersheds needed to achieve fish recovery. These are based on scientific analysis of the habitat conditions required to support healthy salmon populations and the description of "properly functioning conditions" (PFCs) from the National Marine Fisheries Service. PFCs are those conditions that describe important ecological and watershed conditions that species need to carry out their full life histories. Examples of PFCs include appropriate temperatures, flows, instream conditions that allow salmon to thrive in their freshwater environments.
- Planning and Analysis – The City will take steps to develop and analyze alternative strategies and actions to meet goals and objectives developed in the previous steps. The objective of this step is to develop a broadly supported set of detailed actions – projects, programs, regulations, etc. – that will be adopted by the City Council and ultimately implemented by the City of Portland and its partners.
- Developing watershed and habitat strategies and actions – Analyzing the biological effectiveness of alternative strategies and actions will be accomplished using the Ecological Diagnostic and Treatment (EDT) model. An important advantage of the EDT model is that it provides a structured way to estimate the effects of a particular set of actions. These estimates can be compared for alternative actions to develop priorities for the best strategies to pursue first. EDT's structured approach also will help Portland organize its analysis so assumptions and data are transparent to regulators, stakeholders and policy makers.
- Monitoring and Evaluation – The monitoring and evaluation program will have the following characteristics: structured testable actions, monitoring key watershed attributes, data management and analysis, assess economic effects, fiscal reporting and financial accountability, and evaluation schedule and reporting.
- Adaptive Management – A decision process that institutionalizes integration, strategic reviews and mid-course corrections.

Potential Wildlife Habitat

Wildlife value scores and habitats of concern are based on the criteria matrix attached to proposed Council Resolution 02-3177.

4/17/2002 - Decision Draft

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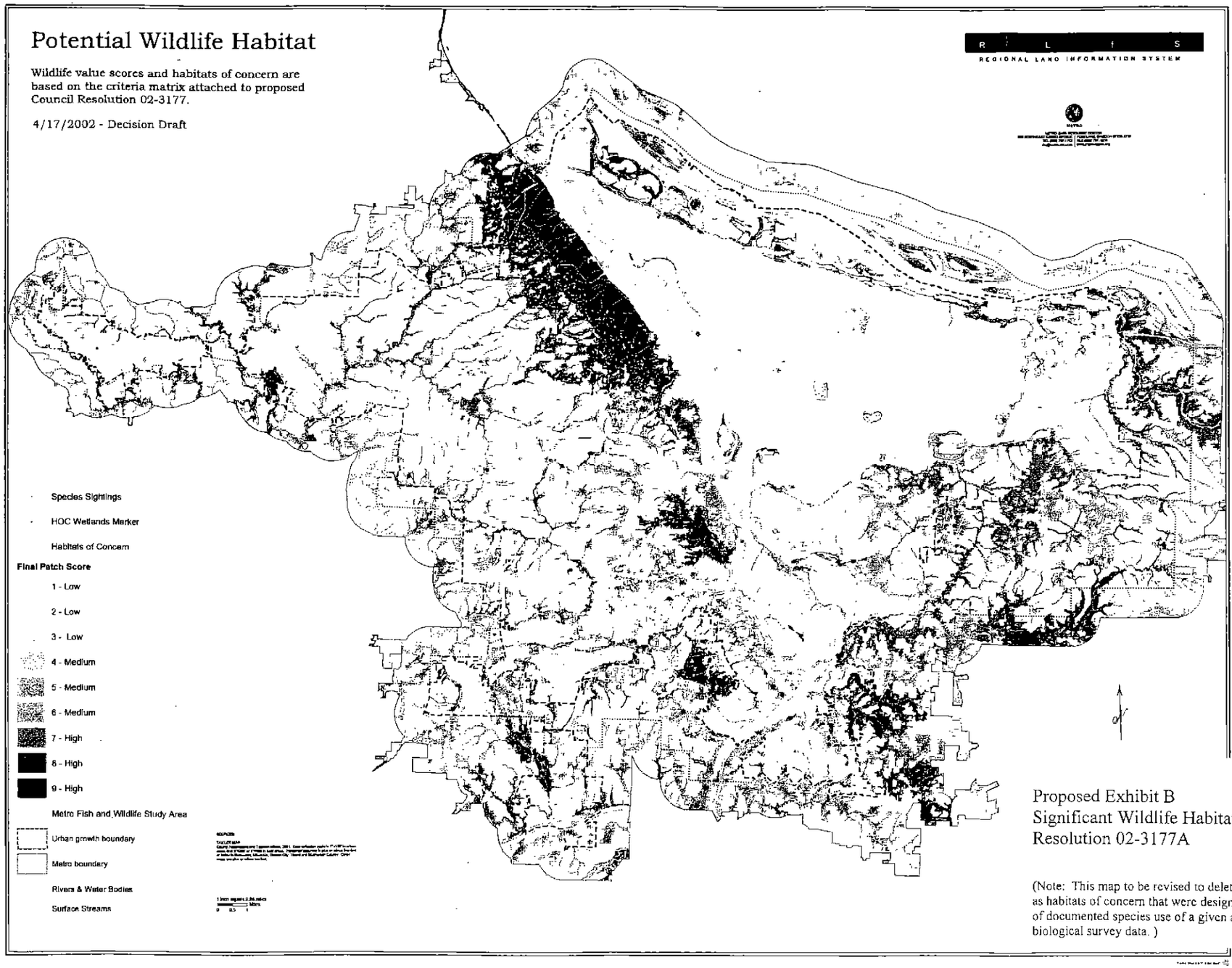

Proposed Exhibit B
Significant Wildlife Habitat
Resolution 02-3177A

(Note: This map to be revised to delete two areas designated as habitats of concern that were designated solely on the basis of documented species use of a given area, but which lack biological survey data.)

Resolution No. 02-3177A
Exhibit C
Criteria for Identifying Regionally Significant Wildlife Habitat

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 9) 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 Goal 5** 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.

Potential Wildlife Habitat

Wildlife value scores and habitats of concern are based on the criteria matrix attached to proposed Council Resolution 02-3177A.

8/1/2002 - Decision Draft

R L I S
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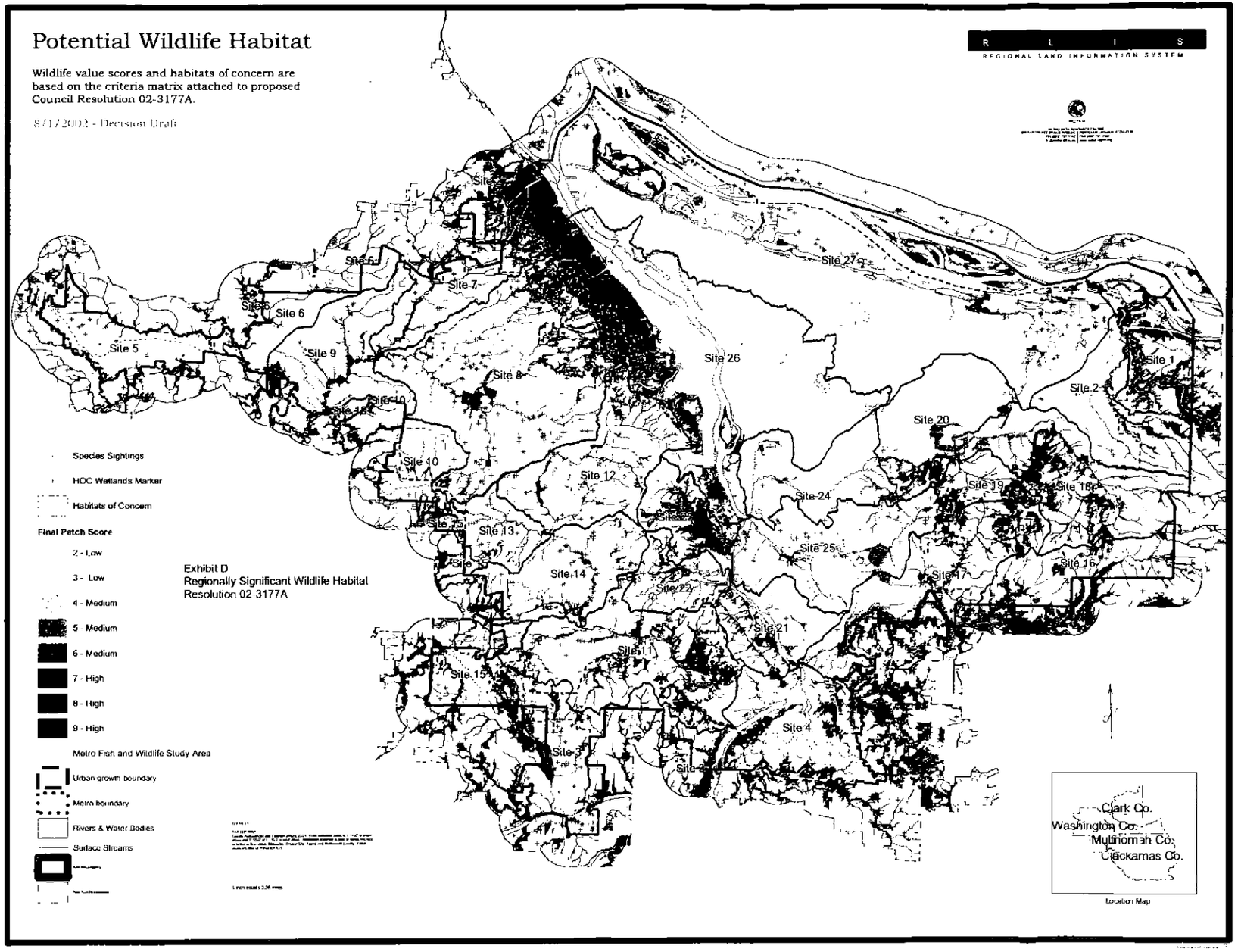


NATURAL RESOURCES COMMITTEE REPORT

CONSIDERATION OF RESOLUTION NO. 02-3177A, FOR THE PURPOSE OF ESTABLISHING CRITERIA TO DEFINE AND IDENTIFY REGIONALLY SIGNIFICANT WILDLIFE HABITAT AND ADOPTING A DRAFT MAP OF REGIONALLY SIGNIFICANT WILDLIFE HABITAT AREAS

Date: August 1, 2002 Presented by: Councilor McLain

Committee Action: At its July 31 meeting, the Natural Resources Committee voted 5-0 to recommend Council adoption of Resolution 02-3177A. Voting in favor: Councilors Atherton, Bragdon, Hosticka, Park and McLain.

Background: Resolution 02-3177A and a companion resolution, 02-3176, help complete the inventory phase of Metro's Fish and Wildlife Habitat Protection program. 02-3176 identifies and maps regionally significant riparian corridor inventory, and 02-3177A identifies and maps the regionally significant wildlife habitat inventory. The inventory phase will be complete, for the purposes of beginning the ESEE phase, when these inventories are combined into a single map, and when Metro addresses local Goal 5 plan analyses in Resolution 02-3218, as required by Metro Title 3.

Criteria used to create the regional wildlife habitat map, identify features such as trees, vegetation, wetlands, streams and floodplains. These features in turn are related to habitat functions for fish and other wildlife. The criteria are:

1. Patch size.
2. Interior habitat size.
3. Connectivity and proximity to water.
4. Connectivity and proximity to other patches.

These criteria were independently mapped for the entire region, then combined in a single map that ranks the quality of the habitat on a scale from 1 (lowest) to 9 (highest). In addition, Habitats of Concern identify a limited number of sites deemed to be important habitat types by the state (ODF&W), but were not rated on the 1-9 scale.

The Metro Executive has recommended adoption of inventoried sites receiving scores of from 2-9, and including Habitats of Concern. That recommended has been paralleled by the Goal 5 TAC, MTAC and MPAC, with additional comments. WRPAC recommended adoption of all sites 1-9.

The Natural Resources Committee provided significant opportunity for public input by holding hearings on June 26, July 3, July 17 and July 31.

Committee Issues/Discussion: Paul Ketcham opened the July 31st meeting with a background of activities that led to criteria and mapping of wildlife habitat. A public

hearing was opened with about 50 people testifying. Most speakers encouraged the passage of resolution 02-3177.

The Committee accepted the chair's "A" version of the resolution as its starting point for discussion. The "A" version identifies regionally significant wildlife habitat as the areas receiving a score of 2-9, including Habitats of Concern. The "A" version also corrects language in order to be parallel with previously adopted resolutions 01-3141C and 02-3176. A modified Resolved # 11 clarifies that the map amendment process has been an ongoing one, and directs that a post-adoption correction process be developed by staff for Council consideration.

Councilor Atherton suggested that the committee add sites with a 1 rating to the regionally significant list. He agreed with prior testimony that it would be better to be more inclusive at the inventory stage, and let ESEE sort things out. Staff clarified that the sites rated 1 amount to about 2,100 acres, and tend to be disconnected from larger resource sites. Several committee members were not comfortable with this proposal, but were interested in tracking #1 related sites, or asking local jurisdictions to review them. Councilor Bragdon accepted as a friendly amendment language that paralleled a companion resolution on riparian corridors, 02-3176. This language, placed in resolved # 7, asks local jurisdiction to consider these (#1) sites during their local Goal 5 processes.

Known Opposition: In the past several months a group of homeowners in the Portland area has expressed concerns, mostly by mail, about the effects of the program in possibly limiting the use and value of their property. Their concerns are carried over from criticism of the City of Portland's proposed program, which included a completed ESEE analysis and proposed regulatory program.

The Homebuilders Association of Metropolitan Portland has critiqued Metro's work as not being consistent with state Goal 5 relative to the actual presence of species in mapped resource sites.

Some individuals and local jurisdictions have called attention to disagreements to the presence or absence of resource sites. Many of these disagreements have been resolved through a map correction process, though some disagreements remain. Metro has made clear that the map correction process will be an ongoing one.

See staff report for a more detailed discussion of criticism of the material contained in this resolution.

Legal Antecedents: Metro has undertaken the Fish and Wildlife Habitat Protection Plan, as recommended by MPAC in the adoption of Title 3 of the Urban Growth Management Functional Plan and the Goal 5 Vision Statement. It follows requirements in Metro's Regional Framework Plan. It also completes Title 3 of the Urban Growth Management Functional Plan, and is consistent with statewide planning Goal 5. Resolution 02-3177A

and the entire Fish and Wildlife Habitat Protection Plan also must comply with federal law in the form of the Clean Water and Endangered Species Acts.

Budget Impact: There is no impact to the budget.

STAFF REPORT

IN CONSIDERATION OF RESOLUTION NO. 02-3177, FOR THE PURPOSE OF ESTABLISHING CRITERIA TO DEFINE AND IDENTIFY REGIONALLY SIGNIFICANT WILDLIFE HABITAT AND ADOPTING A DRAFT MAP OF REGIONALLY SIGNIFICANT WILDLIFE HABITAT AREAS

Date: March 12, 2002 Presented by: Andy Cotugno

BACKGROUND

In June 1998, Metro Council adopted Title 3 of the Urban Growth Management Functional Plan. Section 5 of this Title called for identifying, considering and protecting regionally significant fish and wildlife habitat conservation areas. Since that time, work has been initiated to carry out this Metro Council policy direction, consistent with State law, especially State land use Goal 5. With the adoption of Resolution 01-3141C, the Metro Council established criteria for defining and identifying riparian corridors, one section of State regulations.

Resolution 02-3177 concerns defining, identifying and mapping regionally significant wildlife habitat, the other section of State law relevant to fish and wildlife habitat. The adoption of this resolution will complete a first step, creating an inventory, and will establish which wildlife habitat areas are regionally significant and therefore, suitable for analysis in the second of three steps. The second step, if this resolution is adopted, will analyze the regionally significant wildlife habitat areas for the economic, social, environmental and energy consequences of allowing, limiting or prohibiting conflicting uses (known as the ESEE analysis). After the second step, a third step, a draft protection program, can begin. The program stage will likely include an array of possible program options for Metro Council consideration including incentives, education, acquisition and regulation or some combinations of these options.

The documents attached to this resolution include:

1) a technical review of the scientific literature; (Exhibit A)

2) a summary of how the scientific literature was converted to operational criteria for identification and mapping purposes; (Exhibit A)

3) an inventory of all areas within the region providing one or more wildlife habitat functions, including maps of the region for four wildlife habitat functions, (Exhibit A)

4) a composite map that takes each wildlife function and ranks areas by their relative wildlife habitat function and (Exhibit A)

5) alternatives for determining which of the areas identified as having wildlife habitat functions could be considered regionally significant and for ESEE analysis. (Exhibit C)

6) a map of regionally significant wildlife habitat (Exhibit B)

(a separate resolution, 02-3176 addresses riparian corridor inventory. If both resolutions are adopted an ESEE analysis of both could commence.)

ANALYSIS/INFORMATION

1. **Known Opposition**

Concerns about wildlife habitat inventory have been raised by the Home Builders Association of Metropolitan Portland. Their letter and a Metro response are being made part of the public record of this resolution. In summary, the Home Builders have voiced a concern that State Goal 5 is not being followed because they assert that "...presence of wildlife species is the primary factor in developing an inventory and determining significance." Home Builders also state that State resource agencies should be consulted and they further recommend that Metro should use the State resource agency mapping inventory as the universe from which to select regionally significant wildlife habitat.

The standard process under Goal 5 is based on habitat information, not exclusively on the presence of wildlife species. The inventory must include habitat information on sensitive and threatened and endangered species, but may include habitat information on other wildlife species as well. In addition, State and Federal agencies have been consulted by Metro staff. Either State and Federal agency information has been incorporated into Metro's data and inventory or, State agencies do not have this information for the metropolitan area and Metro staff assert that they have used a sound scientific approach and applicable data in a manner consistent with State Goal 5 to identify wildlife habitat. Finally, the Home Builder comment pertains to a State safe harbor approach and Metro has pursued the other State approved option which is the standard inventory approach.

Other opposition includes some landowners who may be concerned about the impact of this work on the value and use of their land. Until Metro completes the second step (which includes consideration of the economic, social, environmental and energy consequences of allowing, limiting or prohibiting conflicting uses) and creates the program step (which could include acquisition, education, incentives and regulations), it is not possible to determine what change, if any, the final Metro decision may have on an area or site. If regulations alone are the only approach, then it is likely that some property owners will oppose the final program decision. If acquisition, incentive or education approaches are used, it is likely that very little, if any opposition will be heard from property owners, but those most concerned with protecting these resources may oppose a voluntary only approach. What combination of these approaches, regulatory and voluntary would be optimal, would be best considered after the ESEE analysis and after program options are designed.

During earlier discussions, a wide range of interests and perspectives, from the development community to local governments to the environmental community have urged that wildlife habitat be made a part of Metro's fish and wildlife habitat protection plan. The reasons for this range from an interest in an integrated approach to the legal, administrative, and outreach costs of doing wildlife habitat separate from riparian corridors.

2. Legal Antecedents

There is a myriad of legislation that relates to this resolution. It includes Federal, State, regional and local laws. At the Federal level there is the Clean Water Act and the Endangered Species Act. At the State level there are State planning laws, goals and administrative rules (especially OAR chapter 660 and sections 660-023-090 and 660-023-110). At the regional level there is the Regional Framework Plan, the Urban Growth Management Functional Plan and resolution 01-3141C. Local governments within the region have also enacted a range of local policies and regulations and these are documented in the draft Local Plan Analysis, Metro, 2002.

3. Anticipated Effects

The anticipated effect of the adoption of this ordinance is to begin the analysis of the economic, social, environmental, and energy consequences of allowing, limiting or prohibiting uses that conflict with the protection of those areas determined to be regionally significant wildlife habitat.

4. Budget Impacts

As noted above, the approach that the Metro Council may direct can be considered after the Council considers the economic, social, environmental and energy consequences and after program alternatives are created. The cost to implement this legislation is not possible to estimate until these steps have been taken.

RECOMMENDED ACTION

Adopt Resolution 02-3177 and direct staff which option to follow for determining regionally significant wildlife habitat for a forthcoming analysis of the economic, social, environmental and energy consequences of allowing, limiting or prohibiting conflicting uses.

Exhibit A
Resolution 02-3177A

Contents:

- Metro's Riparian Corridor and Wildlife Habitat Inventories (Preliminary draft, July 2002)
- Memo dated July 29, 2002 entitled "Revisions to Metro's January 2002 Technical Report for Goal 5"
- Memo dated July 23, 2002 entitled "City of Hillsboro's Technical Review (Fishman report): Wildlife portion"
- Metro's Technical Report for Goal 5 (Revised draft, January 2002 version)

PRELIMINARY DRAFT

Metro's Riparian Corridor and Wildlife Habitat Inventories

JULY 2002

PLEASE NOTE: This document (Exhibit A) was too large to scan in its entirety. To view the document, please contact the Council Archivist.

M E M O R A N D U M

METRO

Date: July 29, 2002
To: Andy Cotugno
From: Lori Hennings
Re: Revisions to Metro's January 2002 Technical Report for Goal 5

I am currently revising Metro's January 2002 Technical Report for Goal 5. These are primarily "housekeeping" issues, and none result in any suggested alterations to Metro's Wildlife Habitat Inventory process. Two of the changes include additional information to document the importance of river islands, deltas and hilltops to wildlife in general, and migrants in particular. A few of the items are in response to the City of Hillsboro's critique of Metro's Goal 5 Technical Report (as prepared by Paul Fishman on behalf of the City of Hillsboro; response attached). The last two bullet items deal with uncompleted items from the previous version. These are described below.

- **Page 59.** Incorporated the following additional information on river islands and deltas (at the end of the section entitled "Wildlife Use of Urban Riparian Corridors"):

> "River islands provide important habitat for many wildlife species, including an additional riparian area available to wildlife in the middle of a river (Thorp 1992). Large wood commonly accumulates on upstream ends of islands, where it influences meander cutoffs, provides cover for juvenile salmonids, and serves as habitat for invertebrate production (Naiman et al. 1992). Doppelt et al. (1993) comment that, "Debris and other physical blockages – such as islands – contribute to the physical structure of large river systems by slowing water velocity and deflecting its course. As water is slowed and deflected, it pushes against the banks and into the soils underlying the adjacent floodplain, thereby contributing to the local water table."
>
> Thorp (1992) studied three islands on the Ohio River and found that that these islands had a significant positive effect on invertebrate density and diversity, related to changes in physical habitat structure within the river channel. Thorp commented:
>
> > 'Anthropogenic reductions in braiding, meandering, and snag abundance have diminished habitat heterogeneity of regulated rivers, factors directly influencing island formation, retentive capacity of the ecosystem, and community diversity. Habitat heterogeneity associated with riverine islands should, therefore, be of paramount importance to the ecosystem and may require special management protection...Islands have significant positive effects on invertebrate density and diversity that appear related to changes in physical habitat characteristics. Current velocity and substrate particle size are diminished in narrow channels between islands and shore, and areal extent of the littoral zone is enhanced within an otherwise deepwater region...Because of a relatively low exploitation by humans, islands probably enhance snag formation and input of organic matter, both factors having positive effects on macrofauna. Creation of selected riverine preserves near islands as a management tactic is recommended.'
>
> River deltas and islands create unique bottomland hardwood forest, including important cottonwood/willow communities, tree types that must be in close contact with the water table. Willow Flycatchers in the

southwestern US intensively use river deltas as stopover habitat during migration (Garcia-Hernandez et al. 2001). During migration, the majority of willow flycatchers preferred native broadleaf dominated areas near standing water, such as that found in deltas and many river islands; these areas produce an abundance of flying insects hatched from the enriched aquatic macroinvertebrate community. River deltas are known to provide important winter waterfowl habitat in the west (Fleskes et al. 2002). Bald Eagles commonly use Pacific Northwest river deltas and islands for breeding and foraging (Iverson et al. 1996).

The sand bars and mudflats in river deltas and islands are also vital to certain types of wildlife. Shorebirds rely on the barren and sandy areas in these areas, seeking invertebrates in the mud and silt; other research suggests that shorebirds may be particularly susceptible to human disturbance, thus making islands even more important (Andres 1994).

- **Page 75.** Revised Table 7 per Metro's July 23, 2002 staff response to the City of Hillsboro's critique (response attached). Note that this resulted in a few corrections but did not result in any recommended modifications to Metro's current Wildlife Habitat inventory process.

- **Page 83.** Added the following verbiage documenting the local importance of hilltops to migratory birds:

  "However, certain upland habitats without connectivity to riparian areas may also be highly important to wildlife due to unique features such as topography. In the Portland metro region, vegetated hilltops provide key wildlife habitat, including migratory stopover habitats for many Neotropical migratory bird species (Houck 2002; see also Nehls 2002)."

- **Page 90.** Inserted Figure 11: historical vegetation map.

- **Appendices.** Revise Appendix 1 to reflect addition of Sharp-tailed Snake and other modifications (including corrections on scientific names, per Dr. Richard Forbes). Completed Appendix 6: Selected restoration activities and potential indicators of the effects of management activities.

M E M O R A N D U M

METRO

Date: July 23, 2002
To: Andy Cotugno, Paul Ketcham
From: Lori Hennings
Re: City of Hillsboro's Technical Review (Fishman report): Wildlife portion

You may recall that we received a critique of Metro's riparian corridor inventory prepared by Paul Fishman on behalf of the City of Hillsboro (report date November 2001, available online at http://www.fishenserv.com/metrog5/). Fishman and his staff reviewed Metro's Scientific Literature Review, now entitled "Metro's Technical Report for Goal 5," with special focus on Table 5 (now Table 7 in the January, 2002 science paper draft). At that time we opted to address only non-wildlife components of the critique, and did so in a document dated December 12, 2001 ("Staff Response to City of Hillsboro's Technical Review of Metro Goal 5 Riparian Corridor Program"). We focused on non-wildlife issues because the riparian corridor inventory significance decision was up before Council just a week after we received the critique, and the wildlife habitat component had been decoupled from the riparian inventory.

We are now approaching a final wildlife habitat model and have addressed the remaining criticisms. The attached table details staff response to these criticisms. Because Fishman's critique was riparian-focused, all of the criticisms relate to the Connectivity to Water criterion in our current Wildlife Habitat model. Although after careful review Fishman identified four errors (a relatively minor error rate, considering the volume of material staff covered), there is absolutely no evidence that we should alter any aspect of our existing Wildlife Habitat model. In fact, our 2001 field research validated all four of the criteria currently in the model, including the proximity to water criterion.

Thus I am recommending a few relatively minor changes to Table 7 and related textual information within the next draft of the science paper. As before, Fishman's critique and Metro's analysis of that critique will help strengthen our scientific approach, and our legal standing, in the future.

Please let me know if you have any questions.

cc: Mark Turpel

Staff response to wildlife-related riparian corridor width recommendation criticisms made by Paul Fishman on behalf of City of Hillsboro

Reference	Table 7 (formerly Table 5) criterion	GIS model criterion	Fishman's criticism(s)	Metro Staff Response	Comments and relevance to GIS model
Environment Canada 1998	Recommended riparian widths for fish and wildlife; Terrestrial habitat; Movement Corridors function.	Connectivity to water	Metro cited this reference as a buffer width recommendation for wildlife movement on one side of the stream, when in fact the reference meant the recommendation as *total* corridor width.	Agree. Quoted from Environment Canada's report: "Corridors designed to facilitate species movement should be a minimum of 100 metres wide, and corridors designed for specialist species should be a minimum of 500 metres wide. Studies have demonstrated that wider corridors are more effective at facilitating species movement." Note that this is not riparian-specific, thus if a stream is sufficiently wide or deep to be impassable to certain species, it is functionally a one-sided corridor.	**Correct Technical Report, including Table 7 (formerly Table 5).**
May 2000	General wildlife habitat; terrestrial habitat	Connectivity to water	Fishman states: "The basis for May's choice of a 328 ft wildlife buffer is unsubstantiated in his paper. Metro has cited the original text correctly, but the source document is unsound." And also: "The main focus of this article is on in-stream habitat rather than the adjacent riparian habitat. The article only devotes one paragraph and one table to the discussion of wildlife use of the stream-riparian ecosystem and riparian buffer widths for wildlife habitat."	Disagree. First, note that taking the average (using the midpoint if a range of widths is provided) for all terrestrial vertebrates listed in Dr. May's literature review yields a width of 325.8 ft (99.3 m), a difference of less than 2-1/2 feet - less than one percent of Metro's recommendation of 328 feet. Second, consider Dr. May's professional credentials. Christopher May, Ph.D., is an environmental science/engineering researcher at the Applied Physics Laboratory, College of Oceanography and Fisheries at the University of Washington. He is also an adjunct professor at Western Washington University, UW-Tacoma, The Evergreen State College and Seattle University. He has taught courses in stream ecology, conservation biology, salmonid ecology, water pollution and stormwater best management practices (BMPs). He is currently researching the effectiveness of stormwater BMPs in mitigating the ecological effects of urbanization on stream ecosystems. Dr. May's conclusions are based on peer review of his Pacific Northwest based research and thorough literature reviews Third, though the May paper does not include a major discussion of the literature for terrestrial wildlife, it does not negate the importance of the buffer widths obtained from those references.	**No action recommended.**
Knutson and Naef 1997	Terrestrial habitat	Connectivity to water	Fishman: "The reference does not make any new recommendations as to what buffer widths may be appropriate for Pacific Northwest riparian habitats...In order to determine if the reference was cited correctly, it would be necessary to go back to the references used by Knutson and Naef to determine the context in which the buffer recommendations were made..." And also: "No mention of willow flycatcher or western pond turtle or recommended buffer widths for these species was found in the reference..."	Disagree with first part, agree in part with second part. This was a literature review, designed to consolidate information rather than necessarily making new recommendations. The references used in the Knutsen and Naef paper, which was prepared for the Washington Department of Fish and Wildlife and was extensively peer-reviewed. The necessity of revisiting each cited paper to check for citation accuracy seems excessive, as it could be applied to every research paper that cites any other paper. We agree in part with Fishman's second comment – we found numerous mention of Neotropical migrants (the Willow flycatcher is one), but no specific reference to the Willow Flycatcher. Taking the average recommended widths from the Knutson and Naef paper (using the midpoint if a range of widths is provided) for Neotropical migrant species yields a width of 358 ft (109 m), as compared to Willow flycatcher's 123 ft. This approach would increase the width recommendation. With regard to Western pond turtle requirements, these are outlined in the paper's Appendix D, under "Amphibians and Reptiles." This table recommends avoiding disturbance within 400-500 meters (1,312-1,640 feet) around all bodies of water inhabited by Western pond turtles. Thus, the actual recommendation was 1,312-1,640 ft, not the 330 feet cited by Metro.	**No action recommended.**
Prose 1985	Terrestrial habitat	Connectivity to water	Fishman: "...belted kingfishers do not utilize all streams equally, and the reference also states that 'Vegetation along the margins of feeding waters has both positive and negative implications. Belted kingfishers are seldom seen on ponds or streams that are overgrown with thick vegetation that obscures vision...' " And: "...it seems obvious that it is not necessary to provide a 100 to 200 foot riparian buffer on all streams to allow for kingfisher roosting, since	Disagree. The statement that kingfishers do not utilize all streams equally is probably correct, but there is no scientific evidence cited in support. Metro is using the known scientific literature, most of it peer reviewed (e.g., Knutsen and Naef 1997; May 2000) as its foundation. In the Portland metropolitan region, Metro staff have routinely observed Belted kingfishers perched in very dense vegetation overhanging small streams, such as tributaries flowing into Fernhill Wetlands in Forest Grove, and look in such areas first to locate this species. With regard to the statement that "it seems obvious that it is not necessary to provide a 100 to 200 foot riparian buffer on all streams," Metro has not completed the program step which could include buffer regulations, but also will consider other options such as incentives, acquisition, education and stewardship programs. When Metro does address program choices it is likely that not all streams will receive that level of protection in our	**No action recommended.**

Staff response to wildlife-related riparian corridor width recommendation criticisms made by Paul Fishman on behalf of City of Hillsboro.

Reference	Table 7 (formerly Table 5) criterion	GIS model criterion	Fishman's criticism(s)	Metro Staff Response	Comments and relevance to GIS model
			smaller, densely vegetated streams may not provide the correct habitat for kingfisher."	region because the resource has been inventoried based on what currently exists. In some areas, development has already encroached well into that buffer distance and these structures are unlikely to be removed in the near future.	
Castelle et al. 1992	Terrestrial habitat	Connectivity to water	Fishman begins with the same argument given when criticizing use of the Knutsen and Naef (1997) reference, in that he would need to look up every reference used to validate its appropriate use. Minor arguments/dissuasions regarding many of the species' requirements in the reference.	Disagree. See comments under Knutsen and Naef reference, above, regarding revisiting source literature. Regarding Bald Eagles, the statement is made that: "Although bald eagles are found in the Metro region, most riparian areas do not provide habitat for this species." However, no documentation is provided. This documentation is critical because it controverts basic facts about Bald Eagles as being a riparian-dependent species. In fact, this species does utilize many riparian areas in the region for nesting, roosting and perching, as Metro's Species of Concern data layer indicates (primary data source from ongoing OSU Bald Eagle study data). Bald Eagles rely primarily on fish and waterfowl for food (Johnson and O'Neil 2001), and riparian areas provide vital habitat for such species.	**No action recommended.**
FEMAT 1993	Terrestrial habitat	Connectivity to water	Fishman states that Metro incorrectly inferred a riparian area width range of 100-600 ft when the correct inference would be 100-300. Further, Fishman states that "The riparian reserve buffer widths determined in the reference are based upon preserving habitat for species associated with late successional forests...Therefore, the riparian reserve buffer widths recommended in the reference are not directly applicable to the majority of streams in the Metro region."	Agree in part. Metro inadvertently picked up the upper limit of the buffer range to be 600 ft rather than 300 ft. There is a reference in the document for 600 ft (page V-35), but it refers to both sides of the stream. We will correct that error. However, buffers are intended to protect ecological functions in urban areas, where human impacts are much more severe than in old-growth forest, and therefore logically should be substantially wider than those in old growth forests if the same level of ecological function is to be provided. In any case, altering the recommended width from this reference in no way impacts Metro's current Wildlife Habitat GIS model, which considers connectivity to water within 300 ft of the water source.	**Correct the recommended range in Table 7 to read 100-300 ft rather than 100-600 ft.**
NRCS 1999	Terrestrial habitat	Connectivity to water	Fishman used a different reference than that used by Metro because he could not locate the reference "despite an extensive online search, phone calls to the NRCS and the Government bookstore." Fishman states that Metro used the recommended widths as one-sided when they should have been two-sided.	Agree in part. The 1995 reference used by Metro was a draft document and is not the same document as that reviewed by Fishman. To illustrate the differences in the document, the 1995 reference consisted of 14 pages, while the 1999 document has over 100 pages. The 1995 reference provides general buffer width guidance for selected wildlife species: "Widths below include the sum of buffer widths on one or both sides of water courses and may extend beyond riparian boundaries..." This statement is unclear , but Fishman is probably correct in his interpretation that it means *total* buffer width rather than one-sided width. In Knutsen and Naef's (1997) extensive literature review, the average one-sided buffer width recommendation for reptiles and amphibians is 153 ft (46.7 m); for deer it is 138 ft (42 m, including a much narrower recommendation for eastside deer); and for beaver it is 271 ft (82.6 m). These numbers apply to perpendicular distance from the stream, thus total width excludes the width of the stream. However, given that this document was a draft and not regionally-specific, staff recommends removing it from Table 7. Whether it is retained or not, this information does not change staff recommendations for the 300-ft proximity to water criterion, which is based on numerous other references with wider recommendations for a broad range of species and our own field data as cited.	**Remove this outdated reference from Table 7.**

REVISED DRAFT

Metro's Technical Report for Goal 5

January 2002

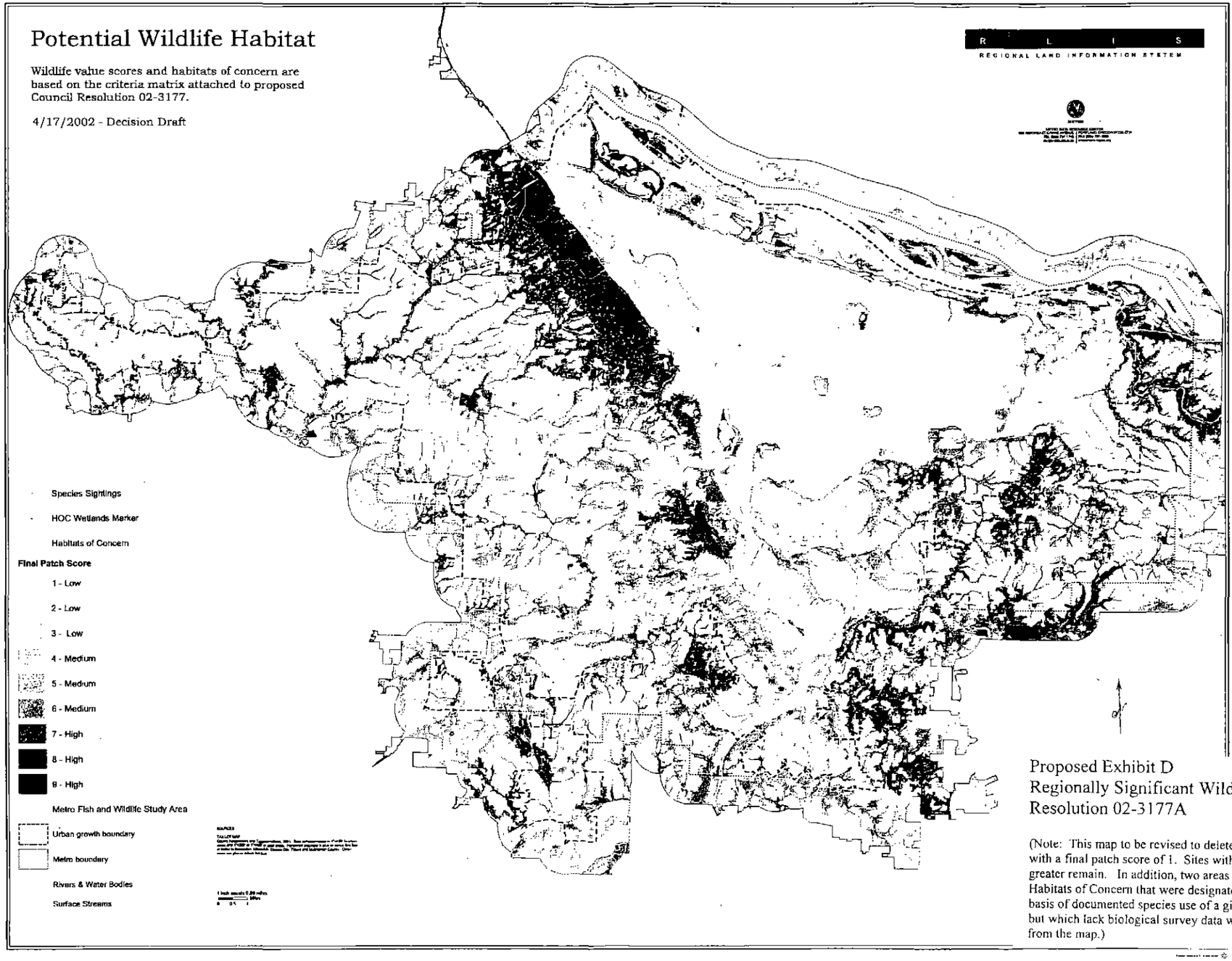
PLEASE NOTE: This document was too large to scan in its entirety. To view the document, please contact the Council Archivist.

Potential Wildlife Habitat

Wildlife value scores and habitats of concern are based on the criteria matrix attached to proposed Council Resolution 02-3177.

4/17/2002 - Decision Draft

R L I S
REGIONAL LAND INFORMATION SYSTEM



Proposed Exhibit D
Regionally Significant Wildlife Habitat
Resolution 02-3177A

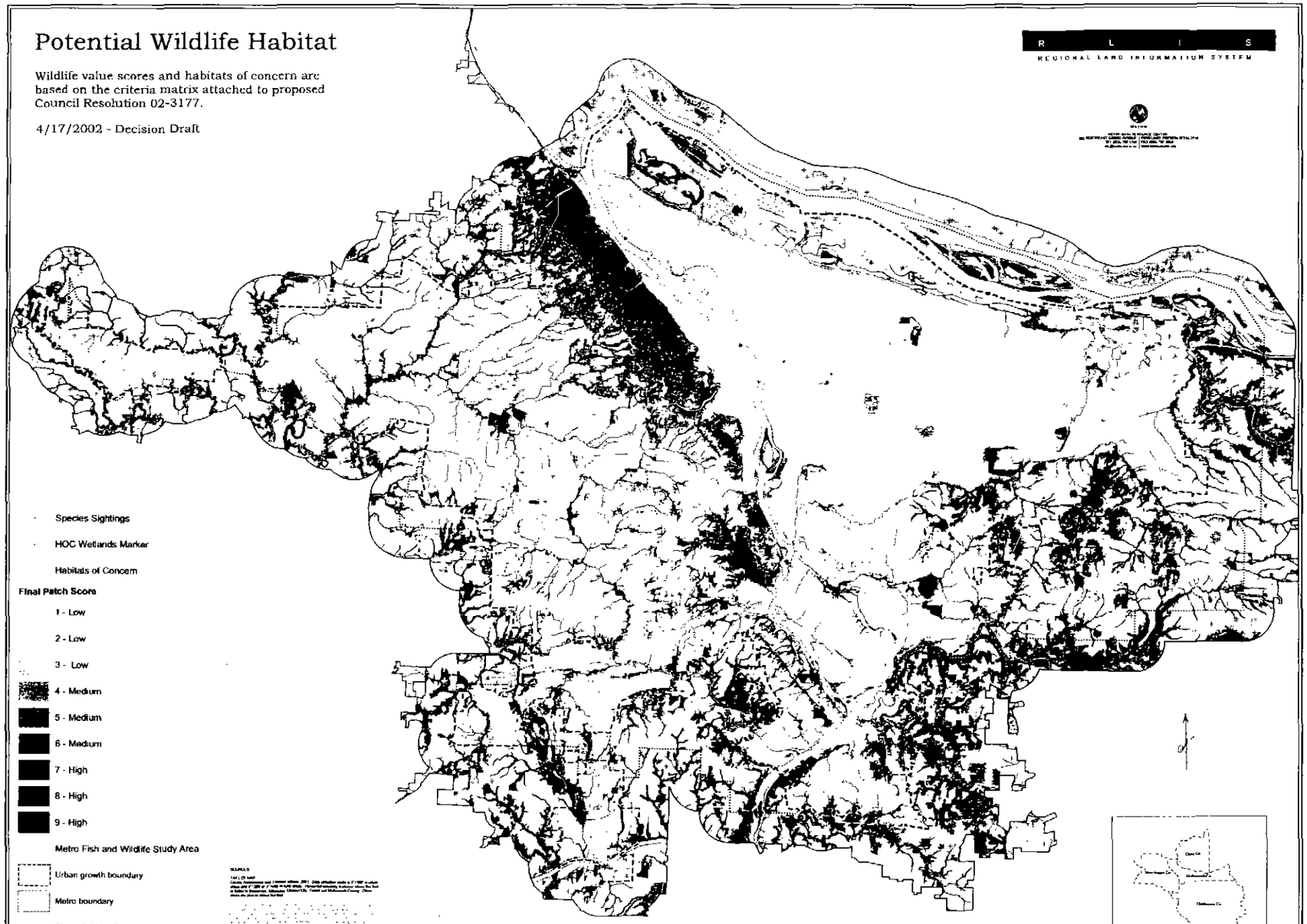
(Note: This map to be revised to delete all resource areas with a final patch score of 1. Sites with ratings of 2 or greater remain. In addition, two areas designated as Habitats of Concern that were designated solely on the basis of documented species use of a given area, but which lack biological survey data will be deleted from the map.)

Potential Wildlife Habitat

Wildlife value scores and habitats of concern are based on the criteria matrix attached to proposed Council Resolution 02-3177.

4/17/2002 - Decision Draft

R L I S
REGIONAL LAND INFORMATION SYSTEM



- Species Sightings
- HOC Wetlands Marker
- Habitats of Concern

Final Patch Score

- 1 - Low
- 2 - Low
- 3 - Low
- 4 - Medium
- 5 - Medium
- 6 - Medium
- 7 - High
- 8 - High
- 9 - High

- Metro Fish and Wildlife Study Area
- Urban growth boundary
- Metro boundary
- Rivers & Water Bodies
- Surface Streams

Location Map

This map may be viewed on the internet at the following location:
ftp://ftp.metro-region.org/dist/gm/goal5/maps/4434Finalhab041702.pdf

BEFORE THE METRO COUNCIL

FOR THE PURPOSE OF ESTABLISHING CRITERIA TO DEFINE AND IDENTIFY REGIONALLY SIGNIFICANT WILDLIFE HABITAT AND ADOPTING A DRAFT MAP OF REGIONALLY SIGNIFICANT WILDLIFE HABITAT AREAS	))))))	RESOLUTION NO. 02-3177 Introduced by Metro Council Natural Resources Committee

WHEREAS, the Regional Framework Plan and Urban Growth Management Functional Plan (Functional Plan) state that Metro will undertake a program for protection of fish and wildlife habitat; and

WHEREAS, the Title 3, Section 5 of the Functional Plan sets forth actions anticipated by Metro Council that Metro would take in identifying, considering, and protecting regionally significant fish and wildlife habitat conservation areas; and

WHEREAS, Metro is applying the State Goal 5 administrative rule as the framework for identifying regionally significant fish and wildlife habitat areas; and

WHEREAS, Metro Council has determined that OAR 660-023-0090 (riparian corridors) and OAR 660-023-0110 (wildlife habitat) are the relevant State Goal 5 resources for Metro Council consideration of regional fish and wildlife habitat to be consistent with State Goal 5; and

WHEREAS, on December 13, 2001, Metro Council adopted Resolution No. 01-3141C for the purpose of establishing criteria to define and identify regionally significant fish habitat; and

WHEREAS, in public hearings before Metro Council Natural Resources Committee and in recommendations from the Metro Policy Advisory Committee (MPAC), Metro Technical Advisory Committee (MTAC), Metro Goal 5 Technical Advisory Committee (Goal 5 TAC) and the Water Resources Policy Advisory Committee (WRPAC) Metro Council was urged to complete the analysis of potential regionally significant wildlife habitat and combine that information with the mapping of regionally significant riparian corridors; and

WHEREAS, in Resolution No. 01-3141C, Metro Council directed staff to complete additional work necessary to inventory and map regional wildlife habitat and present that information to Metro Council in early 2002; and

WHEREAS, in response to Metro Council's direction, staff compiled a decision package similar to the package provided for Metro Council's consideration of regionally significant riparian corridors. That package included the following products:

- An analysis of existing Goal 5 data, reports and regulations from cities and counties. This information is contained in a November 20, 2001 memo from the Office of General Counsel on local Goal 5 data, reports and regulations and additional information concerning fish and wildlife habitat areas gathered and exchanged with local governments and agencies.
- A methodology and criteria for identifying wildlife habitat and maps applying those criteria to the region.
- A map(s), based on the regionwide wildlife habitat maps, identifying Goal 5 resource sites and Goal 5 "wildlife habitat" within those resource sites to serve as the basis for identifying regionally significant wildlife habitat.

- An inventory narrative including information on the location, quantity and quality of the potential resource sites identified on the map.
- A map(s) of potential significant resource sites containing wildlife habitat.
- A summary of recommended criteria for identifying and defining regionally significant wildlife habitat.
- A map(s) of potential resource sites containing wildlife habitat, which could be adopted as "regional resources" under the Goal 5 administrative rule. The map of resource sites is the map identified as Exhibit B of Resolution No. 01-3141C; and
-

WHEREAS, staff presented draft criteria to Metro Council Natural Resources Committee in February 2002 for identifying Goal 5 wildlife habitat based on information contained in "Metro's Scientific Literature Review for Goal 5;" and

WHEREAS, MPAC recommended on March 27, 2002 ....

WHEREAS, MTAC recommended on March 20, 2002 ....

WHEREAS, WRPAC recommended on March 25, 2002 ....

WHEREAS, the Goal 5 TAC recommended on March 22, 2002 ....; now therefore,

BE IT RESOLVED:

1. That Metro Council finds that the information in Exhibit A, including *Metro's Wildlife Habitat Inventory*, dated March 2002, and *Metro's Scientific Literature Review for Goal 5*, dated January 2002, contain adequate information to determine the location, quantity and quality of wildlife habitat resources in the Metro region.

2. That Metro Council finds that sufficient data has been gathered and examined concerning local Goal 5 data, reports and regulations to comply with Title 3, Section 5(C)(2) of the Functional Plan.

3. That Metro Council identifies the resource sites in Exhibit B as Goal 5 resource sites containing wildlife habitat.

4. Metro Council accepts Metro Council Natural Resources Committee, WRPAC, Goal 5 TAC, MTAC and MPAC recommendations that the resources shown on Exhibit B are significant "riparian corridor" resources.

5. That Metro Council interprets the term "regionally significant" wildlife habitat as that term is used in Title 3 of the Functional Plan to be those Goal 5 wildlife habitat resources that qualify as "regional resources" under the Goal 5 administrative rule.

6. That the list of criteria in Exhibit C are criteria that define regionally significant wildlife habitat. A resource need not meet every criteria to be considered regionally significant.

7. That Metro Council has applied the criteria identified in Exhibit C to the information in Exhibit A to define regionally significant wildlife habitat as all areas identified in Exhibit B.

8. That staff is directed to produce a combined map reflecting Metro Council's regionally significant riparian corridor decision in Resolution No. 01-3141C and its decision on regionally significant wildlife habitat.

9. That the map of regionally significant riparian corridors and wildlife habitat that staff has been directed to produce will be a draft map which will be the basis for conducting subsequent steps in the Goal 5 process including the economic, social, environmental and energy consequences analysis and the Program to Achieve Goal 5.

10. Metro Council reserves the opportunity to minimally or substantially alter the draft map prior to adoption of a final map of regionally significant fish and wildlife habitat areas and Program to Achieve Goal 5, after public comment and review.

ADOPTED by the Metro Council this ____ day of _____ 2002.

_____
Carl Hosticka, Presiding Officer

Approved as to Form:

_____
Daniel B. Cooper, General Counsel

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Resolution No. 02-3177
Exhibit A

For a complete copy see:

http://www.metro-region.org/metro/habitat/aug_lit_review.pdf

REVISED DRAFT

Metro's Technical Report for Goal 5

January 2002

Table of Contents

List of figures

List of tables

List of appendices (available upon request)

DRAFT

Metro's Wildlife Habitat Inventory

March, 2002

Concept and Discussion Paper
Goal 5 Wildlife Habitat Model

Model Version 2
February 7, 2002

1. Introduction and Statement of Problem

The purpose of this paper is to propose refinements to Metro's methodology for identifying important wildlife habitats in the region. Below we outline the drawbacks to the first Wildlife model and suggest revisions to the model based on (a) the original model, (b) subsequent field studies to test the model, and (c) GIS data based on forest canopy that more accurately delineates habitat patches. We need input from the Goal 5 Technical Advisory Committee regarding three questions: first, is the new version likely to produce a valid assessment of the region's wildlife habitats? Second, should we include non-forest vegetation within 300 feet of the stream as important wildlife habitat, and if so, how should it be rated? And finally, should we consider including a species richness score similar to that included in the original model (produced by Oregon Natural Heritage Program)?

The Goal 5 rule involves an inventory of riparian corridors and wildlife habitat. The inventory forms the basis for determining Regionally Significant Resources, followed by an ESEE analysis (Environmental, Social, Economic and Energy) and development of a program to conserve, protect, and restore significant resources. To date Metro has inventoried regional riparian corridors and Metro Council determined all resources in that inventory as regionally significant (Resolution 01-3141C). The wildlife habitat inventory is yet to be completed; the preferred option is to fold the wildlife habitat component into the riparian corridor work such that an ESEE analysis and subsequent program development can be watershed-based rather than artificially separating the riparian and upland components.

Metro's Goal 5 Science Technical Report identified the following characteristics to be important to the value of habitat to wildlife:

- Larger habitat patches are better than small patches
- Interior habitat is likely to protect more at-risk species than edge habitat
- Connectivity and/or proximity to water is valuable
- Connectivity to other patches is important
- Small patches of unique habitat are worth saving (the idea is to use best available professional knowledge to identify and add select patches back in after the modeling process is completed)

Based on these findings, Metro formulated a GIS model to rank the value of natural areas to wildlife in the region. In the original model (Figure 1, left side), a habitat patch was defined as forest, shrub or grassy areas, or any combination thereof, larger than two acres. Each patch was assigned a set of scores based on patch size, interior habitat, proximity to other natural areas, proximity to water, and a species richness score derived from a model developed by the Oregon Natural Heritage Program. The patch's cumulative score determined its relative habitat value within the continuum of natural areas. In this way, one patch's value can be compared to another in the ESEE analysis.

Field studies designed to assess the model identified a significant problem with the model's ability to correctly delineate habitat patches based on coarse-scale satellite imagery (25-m rasters; we had to discard

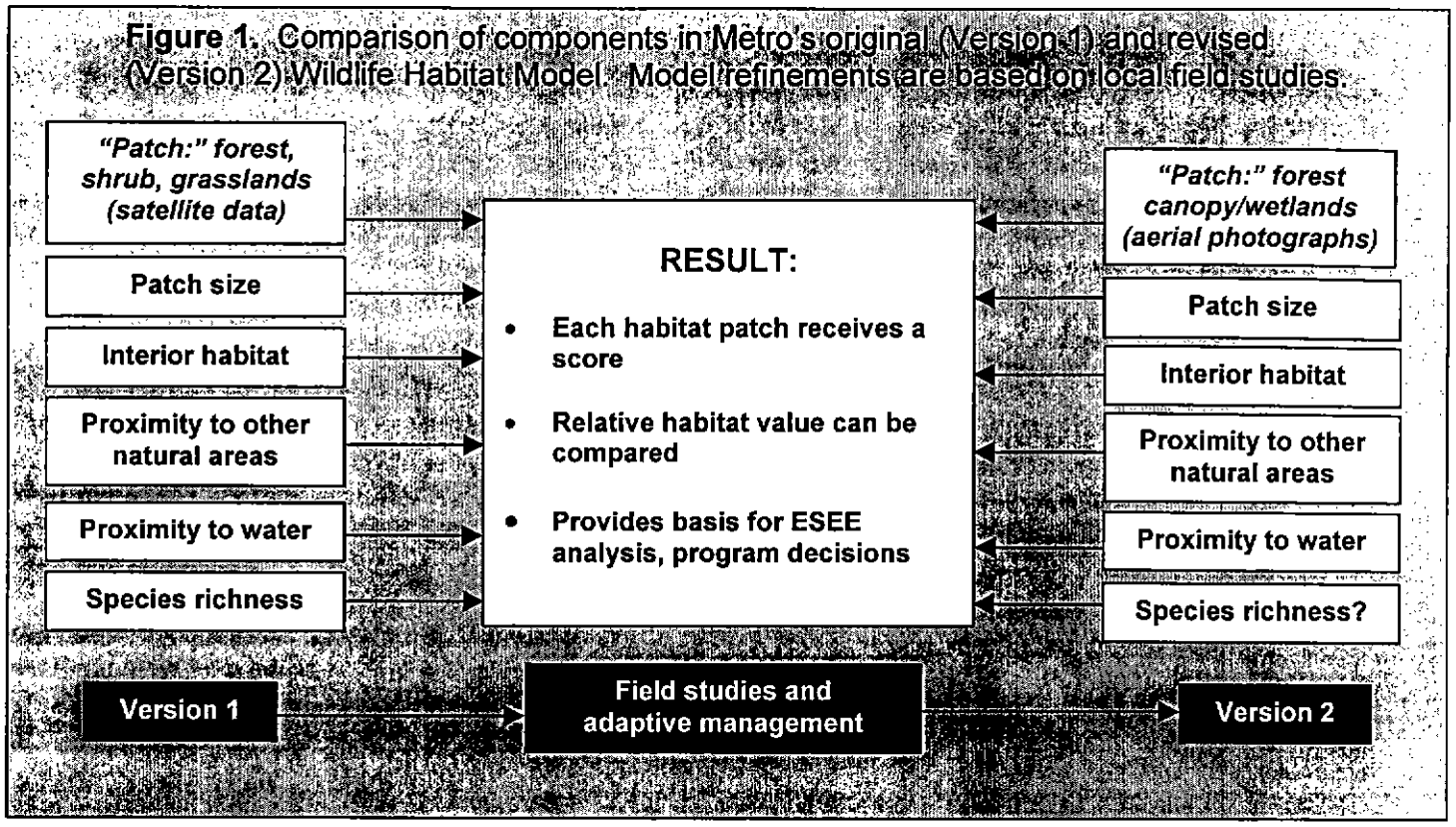


Figure 1. Comparison of components in Metro's original (Version 1) and revised (Version 2) Wildlife Habitat Model. Model refinements are based on local field studies.

approximately 1/3 of all randomly selected patches). Although coarse-scale data provide valuable tools for planning at a regional scale, more detailed information is clearly necessary when delineating patches for potential programmatic purposes. The obvious solution of hand-digitizing all patches in the region is not currently an option, because it would mean deferring the wildlife habitat inventory until after the riparian corridor process is complete. Thus, revising the model based on currently available GIS data, and simultaneously incorporating information from field data, is the preferred alternative.

Field studies identified the hand-digitized 2000 Forest Canopy Layer as the most accurate source of patch delineation currently available in Metro's toolbox. Using this layer, a habitat patch would consist of any digitized forest patch larger than 2 acres (adjacent wetlands included). Although the use of this data layer greatly improves the accuracy of patch delineation, it excludes other types of vegetation, including some open and scattered canopy forests and grasslands, that were included in model Version 1 habitat patches. One result is a reduction in the total acreage being considered as wildlife habitat in the model.

Strengths and weaknesses. There are strengths and weaknesses to this approach. The strengths include enhanced model precision by focusing the wildlife habitat inventory on relatively dense forest canopy. Lightly forested areas and grasslands are difficult to interpret from aerial photographs in an urban setting because there are several possible land cover types that could fall within these categories. For example, scattered canopy woodlands could be oak habitat or it may be backyard landscaping. Grasslands could be a ball field, agricultural such as ryegrass seed, or a naturalized field (but not native grasslands - those have already virtually disappeared from the Metro region). Shrubs are also problematic, because they could be willow communities or invasive Himalayan blackberries. Other strengths include vastly improved patch delineation, incorporation of field studies into the model's design (adaptive management), and the potential to finish the wildlife habitat inventory in time to fold in with the riparian corridor work. The weakness of this approach is that shrub, scattered forest and grasslands serving as potentially important wildlife habitat will be omitted from the regional inventory using only the Forest Canopy Layer. We offer a partial solution to this weakness in Section 3B, below.

2. Field Studies and Statistical Analyses (see Attachment 1)

In 2001 Metro received a grant from the U.S. Fish and Wildlife Service to conduct field studies to test the GIS wildlife habitat model. To do this we conducted qualitative Wildlife Habitat Assessments (WHAs) designed to rate the quality of food, water, and cover resources in woody structure habitats. The specific methodologies will be addressed in a separate document, but the WHA methodology was modified with the assistance of ODFW, USFWS, and the City of Portland and was subsequently statistically validated through field data collected in 1999 (Hennings 2001). We conducted WHAs on 102 randomly selected habitat patches that were reasonably accurately identified by Model Version 1; patches that were not delineated correctly were not evaluated (approximately 30 patches). Thus, our field studies essentially tested an *adjusted* model in which patches were well defined and composed primarily of woody vegetation.

Figures 2a-2f (Attachment 1) provide more detailed information of the statistical analysis. In short, we assessed the nature of the relationships between field survey scores and (1) overall model score, (2) individual model criteria scores, and (3) appropriate combinations of model criteria. Figure 2a shows the relationship between WHA score and Model Version 1 scores (without species richness; see below). Based on graphical and correlation analysis and a variety of model selection techniques (forward, backward, stepwise, and Mallow's Cp selection), the following trends emerged:

- ***Model performance.*** Field data suggests that the model is performing well in terms of predicting good wildlife habitat. The statistically "preferred" model is that shown in Figure 2a, which includes all variables except species richness; the graph including species richness looks similar, but the fit of the model is slightly reduced.
- ***ONHP's species richness criterion.*** Unlike any of the other model variables, the ONHP-generated species richness score was unrelated to field-based WHA scores. However, it was weakly but significantly correlated with a wildlife diversity score that was recorded in the field, but not used in final analyses. We omitted the wildlife diversity field score from the analyses because we surveyed both during and after the bird migratory season; birds comprise a large proportion of detectable wildlife, so sites surveyed earlier in the season tended to rate higher, rendering the data's integrity questionable. (We knew this from the start, but wanted to collect what wildlife information we could.) The statistical findings are suggestive enough to justify including ONHP's richness score in the model if we so choose, particularly since the model appears to perform nearly equally well with or without it. However, discussions with Metro's GIS staff suggest some potential problems with re-modeling the ONHP species richness criterion based on the new patches. Inclusion of the species richness criterion is not likely to strongly influence modeling outcomes. This issue remains open pending further staff discussions.
- It is worth noting that with or without species richness, total model score was significantly, positively related to the WHA wildlife diversity score (both r's > 0.50, $p < 0.0001$). Thus, the only field-based measure we have for wildlife, although excluded from final WHA scores, also appears to affirm the model's reliability in predicting good wildlife habitat.
- Of all the model variables, patch size has the strongest on-the-ground relationship with habitat quality. (The best fit includes an x^2 term because the graph's line is curved, similar to Figure 2a but with a slightly weaker statistical relationship.) However, the relationship between habitat quality and the remaining model variables, with the exception of species richness, were nearly as strong.

- Patch size and interior scores are highly related ($r = 0.98$); patch size and proximity to natural areas are also related to a lesser degree ($r = 0.77$). This reflects the spatial and ecological relationships between the model variables.

3. Proposed Solution – Model Version 2 (see Attachment 2)

As stated above, Version 1 of the model appears to be ecologically valid if it is applied to well defined, woody vegetation patches. Our task is to find a way to incorporate ecologically important elements, using the data in hand and what we have learned through field studies about the model. The overall success of model scores in predicting "better" habitats (e.g., good structural complexity, higher percentage of native plants, good food and water resources) implies that the most logical course is to retain as much of the original model's character as possible. The fundamental change proposed here is to redefine patches based on digitized forest canopy and the option to include non-forest vegetation within 300 feet of streams.

3A. Version 2 model components.

1. ***Patch definition.*** Unlike Version 1, patches will be identified using the digitized forest canopy layer, with a minimum patch size of 2 acres and including adjacent wetlands. Wetlands may also form their own patch when no forest is adjacent. Patch definition is the major difference between Versions 1 and 2.
2. ***Patch size.*** As in Version 1, rank and score identified patches based on total patch size.
3. ***Interior habitat.*** As in Version 1, each patch is buffered internally (i.e., measure 200 feet towards the interior of the patch). Local field studies suggest that non-native birds and plants are significantly reduced at about this distance from forest edges. The area of the "internal" patch is calculated to approximate the amount of interior habitat available.
4. ***Proximity to other natural areas.*** This is conducted similarly to Version 1, but the result is different because patch definition differs between the two model versions. As in Version 1, each patch in Version 2 is considered one raster (25-m) at a time in a "nearest neighbor" analysis. This considers other natural areas within a quarter-mile around the raster, assigns a score, and ranks the patches. However, in Version 1, patches and proximity to other patches were measured using patches that included forest canopy and other vegetation types. In Version 2, only forest canopy will be considered.
5. ***Proximity to water.*** As in Version 1, patches are scored and ranked based on the presence and abundance of water within 300 feet of the patch boundary. We should add in isolated wetlands (not associated with the riparian corridor), and include them in the proximity to water criterion, to address their importance as water sources for upland wildlife. If the isolated wetland has no adjacent forest and is 2 acres or larger, we could consider it a habitat patch.
6. ***Optional: ONHP's species richness criterion (see discussion in Section 2).*** Species richness would have to be re-modeled using only forested patches. This would reduce habitat heterogeneity, presumably resulting in generally reduced richness scores for the new patches.

3B. Version 2 scoring system.

Staff recommends retaining the two separate model systems rather than attempting a combined riparian/wildlife model system. However, a scoring system can still be created to rate each site using both Riparian and Wildlife scores to compare the relative ecological value of two sites. For example:

- ***Run the revised model.*** After deciding whether to include the species richness and 300-foot non-forest criteria, run the Version 2 model on all forest patches. The resulting output will provide a gradient of wildlife habitat scores for all sites.
- ***Assign patches to habitat quality classes.*** Decide on logical divisions within the gradient of scores to create 3 classes, to be comparable with the 3-tiered riparian system currently being developed - for example, Tiers 1, 2, and 3, with Tier 1 representing the best wildlife patches.
- ***Address special habitats.*** Add back in the special habitats such as grassy hilltops, oak woodlands and patches with known sensitive wildlife species sightings (ODFW information) into one of the three tiers (to be determined).
- ***Result: comparability.*** We now have two rating systems, one for wildlife and one for riparian, that can be used to compare the relative ecological value of different sites in the ESEE process.

ADDITIONAL STAFF-RECOMMENDED OPTION(S):

- ***Near stream non-forest riparian vegetation.*** After patches have been assigned to classes, assign low-structure vegetation within 300 feet of the stream to one of the (to be determined; Tier 2?) Wildlife classes. **This would recognize and incorporate the importance of riparian vegetation as a regional backbone of wildlife connectivity.**
- ***Another version of this option.*** Use low structure vegetation within 300 feet of the stream as a connectivity criterion, either as a new criterion (e.g., Critical travel corridors) or as part of the existing Proximity to other natural areas criterion. In this scenario, low structure vegetation within 300 feet of the stream would comprise patches, but a different type of patch from forest/wetland patches. These patches could be used in two ways: (a) include the new patches when calculating the forest/wetland patch Proximity to other natural areas, retaining the new patches as a (probably a low-tier) part of the resource; or (b) use the new patches only as a modification of the Proximity to other natural areas criterion such that low structure patches would positively influence forest/wetland patch scores, but would not be considered part of the resource.

4. Summary

To date Metro has reviewed the scientific literature pertaining to wildlife and habitats in urban ecosystems, created a corresponding model rating existing habitats in the region, and field-tested the model to assess its validity. We found that the model performs reasonably well, but that there were precision problems with the patch delineation. Above we outlined a revised model based largely on the original model, adjusted via input through field studies. The GIS work is relatively straightforward and can be accomplished within the time frame needed to fold into Metro's Goal 5 riparian corridor work. The scoring system can be adjusted based on input from the Technical Advisory Committee and others. We believe the revised model is biologically relevant and appropriate for the Metro region. However, we seek advice from the Goal 5 Technical Advisory Committee regarding:

1. Should we proceed with wildlife habitat modeling based on the current scenario?
2. Should we include non-forest vegetation within 300 feet of the stream as important wildlife habitat, and if so, how should it be rated?
3. Should we consider including a species richness score similar to that included in the original model?

Attachment 1

How well did the original version of the Wildlife Habitat Model perform?

Metro conducted habitat assessments on 102 randomly selected habitat patches. Our first assessment was to test the model's overall performance, then we looked at individual model criteria to assess their relative importance to the model and provide input into model refinement.

Figure 2a shows the relationship between data from field studies (Wildlife Habitat Assessment, or WHA, score) and the original GIS Wildlife Habitat Model ("Model") total scores (without the species richness score; see Discussion paper and below). The relationship was between modeled and field-assessed scores was relatively strong (adjusted $r^2 = 0.60$, $p < 0.0001$). WHA scores reflect forest structural diversity, large wood and snag resources, water and food resources, and nativeness of the vegetation layers. Total model scores reflect the sum of scores for habitat patch size, proximity to water resources, habitat interior, and proximity to other natural areas; the graphical relationship is similar with or without the species richness criterion.

We examined scatterplots and conducted correlation and linear regression analyses to determine the relative importance of each variable in the model, based on WHA scores. Except for **Figure 2b**, all model variables showed a relatively strong, statistically significant relationship (all $|r| > 0.5$, $p < 0.0001$) with field-based scores. Mallow's cP statistic suggested that **Figure 2a** provides the best model. The ONHP species richness criterion (Figure 2b) was statistically unrelated to field-based scores ($p > 0.1$). Patch size appears to be the most important criterion in the model. Relationships between WHA score and the remaining four model criteria are shown on the next page (**Figures 2c-2f**).

Figure 2a.

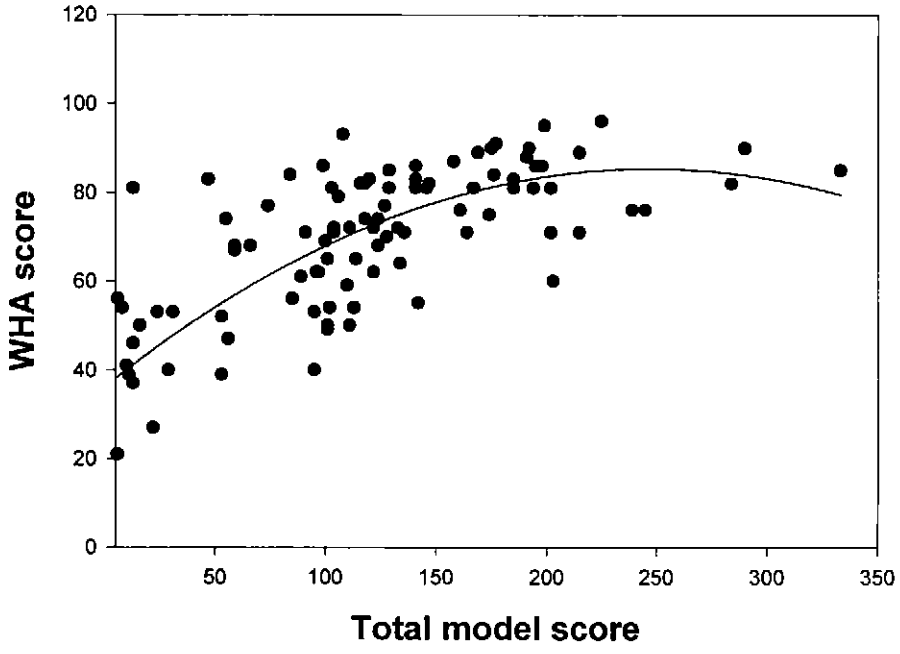


Figure 2b.

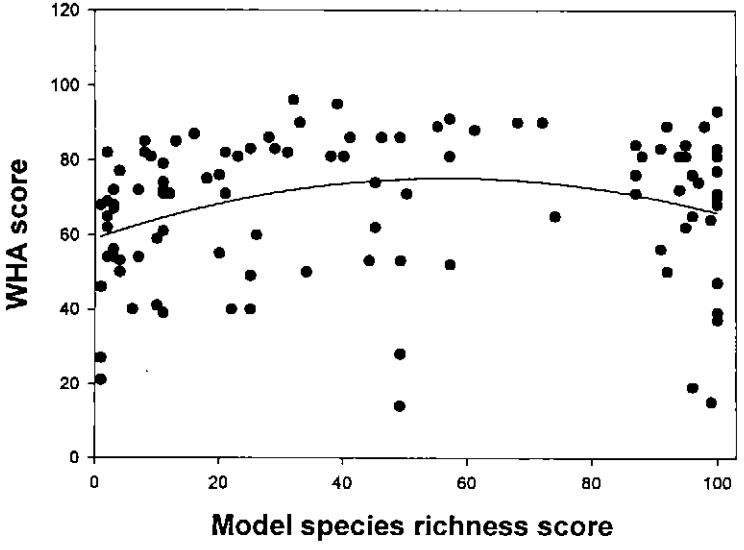


Figure 2c

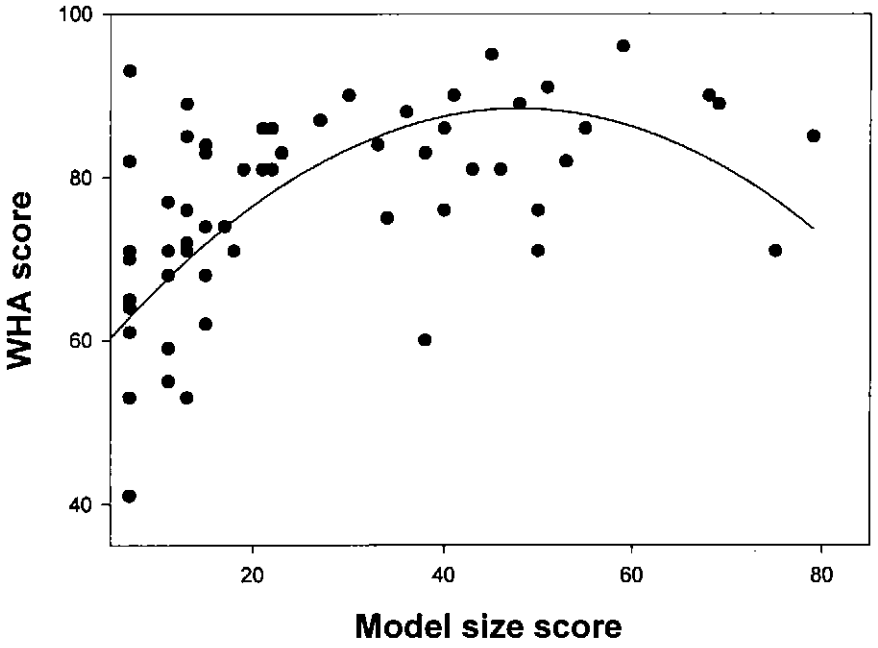


Figure 2d

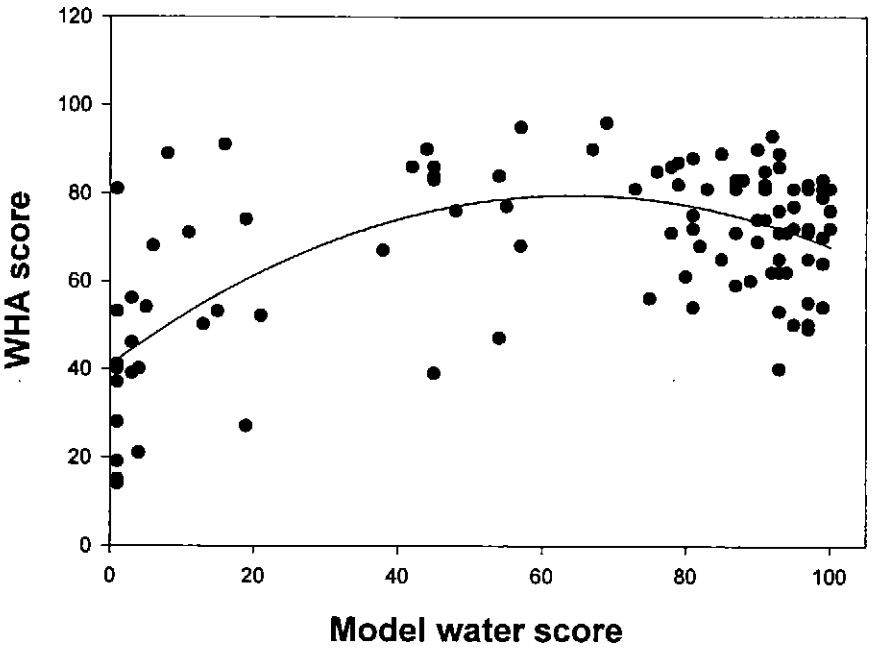


Figure 2e

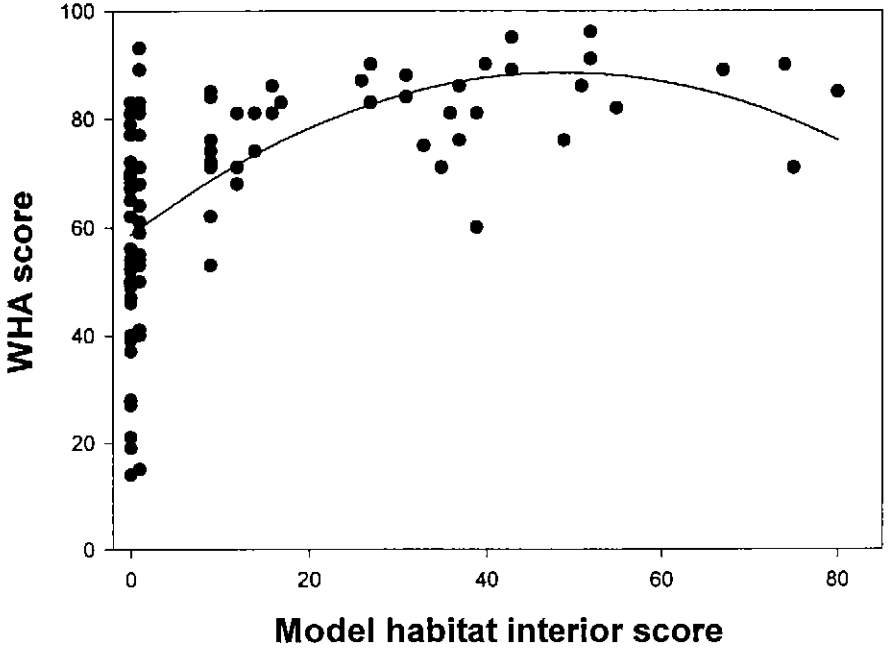
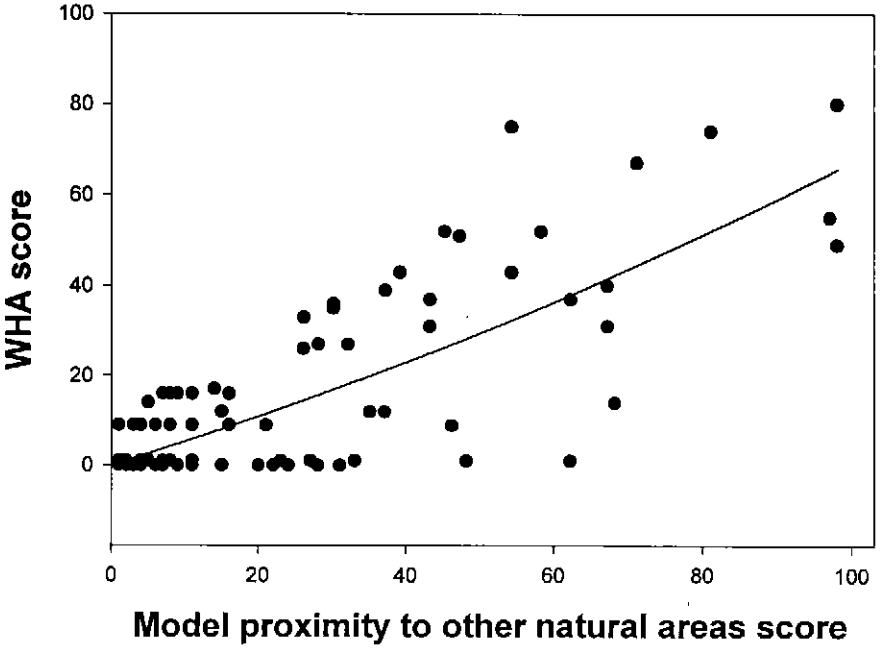


Figure 2f



ATTACHMENT 2

DRAFT: February 8, 2002

Wildlife Habitat Criteria Matrix

LARGE PATCHES ARE BETTER THAN SMALL PATCHES		
How does the function benefit fish and wildlife?	**Mapping assumption**	**Criteria and Ranking**
Several studies have been conducted that indicate a larger habitat patch is better for the survival of many native species. • A study on the predation on Neotropical migratory songbirds in the northeastern U.S. found an increased amount of predation in smaller forest patches. • A study of native small mammal populations found that species diversity increased with patch size. The habitat patches that did not contain native small mammals were in general smaller fragments. • Local studies show that large habitat patches have higher proportions of native plants and birds than small patches. Larger patches frequently retain more of the functions and values provided by native habitat. For example, many forest interior bird species are dependent on insects for food and a study in Ontario found that invertebrate biomass was 10 to 36 times higher in large forest patches than small forest patches. Long-term trends in wildlife populations are directly related to the area of habitat available – the larger the patch, the longer a population can sustain itself. Some species require a certain amount of territory for foraging and breeding purposes. Other species are limited in population by the amount of resources available within a patch, thus the larger the patch the larger the population. Larger animals typically require a larger amount of land just to support their body mass. For example, a deer forages on a much larger range than a mouse.	*Overall Patch Size* Assumption: the larger the patch the greater the value for wildlife habitat.	The rank value for a patch is calculated by: 1. A "patch" is defined as any forest patch, forested wetland, or nonforested wetland with a total size greater than 2 acres. Wetlands adjacent to forests are considered part of the patch, whereas non-forested wetlands form their own patch. 2. Place patches into an ascending array based on their calculated size in acres. After all patches in the model have been assigned scores for each criterion, calibrate individual criterion scores such that all criteria have the same point scale. Now each patch will have a cumulative score, and patches can be divided into three habitat quality tiers based on cumulative model scores, with guidance from field data.

MAXIMIZE INTERIOR HABITAT (MINIMIZE EDGE HABITAT)		
How does the function benefit fish and wildlife?	**Mapping assumption**	**Criteria and Ranking**
Edge habitat occurs where one habitat type, such as a forest, meets a meadow, stream, road, or other natural or artificial habitat type. While edge habitats frequently contain a high number of species, many sensitive species that need interior habitat are unable to survive in edge areas. • The size of a patch, as well as the relationship with surrounding habitats, relate directly to the edge effects on wildlife populations. • Species richness and diversity is typically higher in edge habitats, but the number of habitat specialists, or species that require a particular type of habitat for survival, tends to decrease. These are the species most vulnerable to negative effects of urbanization. • Patch size and shape both impact the amount of edge habitat – a large square has less edge habitat and more interior habitat than a long, thinly shaped habitat. • Urbanization typically increases habitat fragmentation, providing more edge habitat and reducing the amount of original habitat. The edge effect can penetrate far into the interior habitat necessary for certain species. • Some studies have shown that certain impacts such as invasion by exotic plants and predation can penetrate up to 1,640 feet (500 meters) into the forest. • Studies have found that the abundance of interior habitat bird species was reduced within 656-1,640 feet (200 to 500 meters) of an edge. • Local studies have found that non-native plants and birds are substantially reduced beyond 200 feet (61 meters) of an edge. • A study in southern Ontario found that ovenbirds, an interior habitat species, select nest sites more than 820 feet (250 meters) from the forest edge, a distance that is not possible in a small habitat fragment. *(See the Upland Habitat section of Metro's Scientific Literature Review for Goal 5).*	*Edge to Interior* Assumption: a patch with more interior habitat has a higher value for wildlife habitat because it reduces competition from nonnative and generalist species, provides better food and cover, and increases avian nest success for native species.	The rank value for a patch is calculated by: 1. Place patches into an ascending array based on their calculated interior size in acres. "Interior" is calculated by drawing internal 200-foot buffers within each patch and calculating the acreage of the new interior patch. 2. After all patches in the model have been assigned scores for each criterion, calibrate individual criterion scores such that all criteria have the same point scale. Now each patch will have a cumulative score, and patches can be divided into three habitat quality tiers based on cumulative model scores, with guidance from field data.

CONNECTIVITY AND PROXIMITY TO WATER RESOURCES IS IMPORTANT		
How does the function benefit fish and wildlife?	**Mapping assumption**	**Criteria and Ranking**
Corridors play an important role in urban areas to provide opportunity for migration and movement, including between upland and riparian habitats. • Habitat patches near water resources have increased diversity of wildlife • Most wildlife species use riparian areas for some aspect of their life history • In the Metro region, nearly half of all native vertebrate species depend on riparian habitats, with 93 percent using riparian areas for breeding or feeding • Riparian corridors frequently serve as travel routes, especially in urban areas, and have the greatest potential for an interconnected wildlife system providing food, water and travel routes	*Proximity to water* Assumption: patches that are closer to sources of water have higher wildlife performance than areas further from water sources. Upland patches with connectivity to the riparian area are more valuable than disconnected upland patches.	The rank value for a patch is calculated by: 1. Determining the average distance of a patch from water sources such as streams, lakes and wetlands within 320 feet of the patch. Patches receive a proximity score based on how close the patch is to the water resource. 2. Placing patches into a descending array based on the average distance to water sources. 3. After all patches in the model have been assigned scores for each criterion, calibrate individual criterion scores such that all criteria have the same point scale. Now each patch will have a cumulative score, and patches can be divided into three habitat quality tiers based on cumulative model scores, with guidance from field data.
CONNECTIVITY AND PROXIMITY TO OTHER PATCHES IS IMPORTANT		
How does the function benefit fish and wildlife?	**Mapping assumption**	**Criteria and Ranking**
Connectivity is important for wildlife for several reasons. Wildlife populations that are connected to each other are more likely to survive over the long term than an isolated. Many species must migrate seasonally to meet basic needs for food, shelter and breeding, and connections between habitat patches allow this migration to occur. Animal movement frequency decreases in direct relation to the distance between habitat patches, and is called the *distance effect*. • Increased habitat fragmentation impacts the ability of wildlife to disperse between habitat patches. • Dispersal of animals between patches helps to preserve populations by protecting against catastrophes and preventing genetic decline due to inbreeding. • However, the distance between habitat fragments need not be great before it begins to have an impact if a species is unable to move through the matrix of modified habitat. • Some species may be able to use small habitat patches that are individually too small by composing a home range made up of multiple habitat fragments. • Other species may survive within the urban matrix if they have a series of relatively small patches that are connected by movement corridors.	*Proximity to other Patches* Assumption: the closer a patch is to other disaggregated patches the greater the value for wildlife habitat.	The score for a patch is calculated as follows: 1. Perform a nearest neighbor operation that measures the average distance from each patch to other patches within ¼ mile of their perimeters.* 2. Place patches into a descending array based on the average distance to other patches. 3. After all patches in the model have been assigned scores for each criterion, calibrate individual criterion scores such that all criteria have the same point scale. Now each patch will have a cumulative score, and patches can be divided into three habitat quality tiers based on cumulative model scores, with guidance from field data. *General fragmentation also affects the overall score to a lesser degree.

HABITATS OF CONCERN AND HABITATS FOR UNIQUE AND SENSITIVE SPECIES		
How does the function benefit fish and wildlife?	**Mapping assumption**	**Criteria and Ranking**
The Goal 5 Rule for Wildlife Habitat 660-23-110 (2) states that: ...local governments shall obtain current habitat inventory information from ODFW and other state and federal agencies. These inventories shall include at least the following: (a) Threatened, endangered, and sensitive wildlife species habitat information; (b) Sensitive bird site inventories; and (c) Wildlife species of concern and/or habitats of concern identified and mapped by ODFW... Metro has obtained data from ODFW and USFWS that documents information on sensitive, endangered and threatened species, including species of concern. This information will help to identify some of the highest priority habitats for protection. Riparian areas, which would fall into the habitat of concern category, have already been considered.	*Habitat for sensitive wildlife species* Assumption: Habitats of concern and areas that contain sensitive, threatened, or endangered animal or plant communities are critical.	The score for a patch is calculated as follows: 1. Any patch (whether previously defined as a patch or not) that contains critical habitat or at-risk species identified by ODFW, USFWS, or other agencies is automatically elevated in importance to one of the three Tiers. • ***Sensitive species.*** Metro has ODFW information pertaining to sightings of state- or federally-listed at-risk species. The score for a site with a known Bald Eagle nest could be elevated (we will have to figure out by how much, and also additional rules when this occurs in very large patches such as Forest Park). • ***Special or sensitive habitats.*** The score for a known Oregon white-oak habitat patch (special or sensitive habitat) could be elevated. Grassy hilltops, riverine islands, and important grasslands could also be considered for elevation in importance, depending on the quality of the information and judgment of appropriate wildlife professionals. • ***Small but important patches.*** Other exceptions could include elevating the importance of small patches in specific situations, such as those that function as important connectors, as important or unique habitats (rocky crags, etc.), or are the only patches in a large area. In some cases patches smaller than 2 acres may be considered.

Wildlife Habitat Map Information on the Web

Metro now has this information available on our FTP site. By using your computer, web browser and internet connection, you can view these maps and explanatory materials. The site address is:

ftp://ftp.metro-region.org/dist/gm/goal5/

When you go to this site it should say:

Welcome to Metro's FTP server.

The local time is .....

Metro is the regional government for the 3 counties and 24 cities of Metropolitan Portland Oregon.

Information about your login and any transfers are logged by this server. If this bothers you, please disconnect now.

By using this server, you agree to the terms and conditions of use outlined in the policy.txt document at the root level of the ftp directory.

Please contact ftp-admin@metro-region.org with any technical problems accessing this server.

Up to higher level directory

data/	Thu Feb 28 16:10:00 2002 Directory
documents/	Thu Feb 28 16:10:00 2002 Directory
maps/	Mon Mar 04 15:45:00 2002 Directory

Maps

If you click on the maps link a page will come up that has a whole set of files on it. These are maps of the region-wide layers and the quad maps as follows:

Region-wide maps

File name	Feature Mapped
4434con022802.pdf	(this is the region-wide Connectivity to Other Patches layer)
4434fin022802.pdf	(this is the region-wide Final Patch Score layer)
4434int022802.pdf	(this is the region-wide Interior Score layer)
4434siz022802.pdf	(this is the region-wide Size Score layer)
4434wat022802.pdf	(this is the region-wide Connectivity to Water layer)

Quad maps

These maps show detailed areas of the draft wildlife habitat inventory including consideration of all of the above data layers. Once you download the map, you can zoom into areas for detailed examination of the data.

File Name	(Location)
camawashhab022802.pdf	(Camas/Washougal area)
canboreghab022802.pdf	(Canby/Oregon City area)
damasandhab022802.pdf	(Damascus/Sandy area)
foregalehab022802.pdf	(Forest Grove/Gales Creek area)
hilllinnhab022802.pdf	(Hillsboro/Linnton area)
lakegladhab022802.pdf	(Lake Oswego/Gladstone area)
portmtabhab022802.pdf	(Portland/Mr. Tabor area)
sauvvanchab022802.pdf	(Sauvie Island/Vancouver area)
schobeavhab022802.pdf	(Scholls/Beaverton area)
shercanbhab022802.pdf	(Sherwood/Canby area)

Documents

If you click on the documents link, you will get text documents as follows:

flooddeveloped.doc	43 Kb	(word document of the developed floodplain approach)
wildlifemodel.doc	1450 Kb	(word document explaining the wildlife habitat model)

Data

If you click on the data link and have GIS capabilities, you can use the following data:

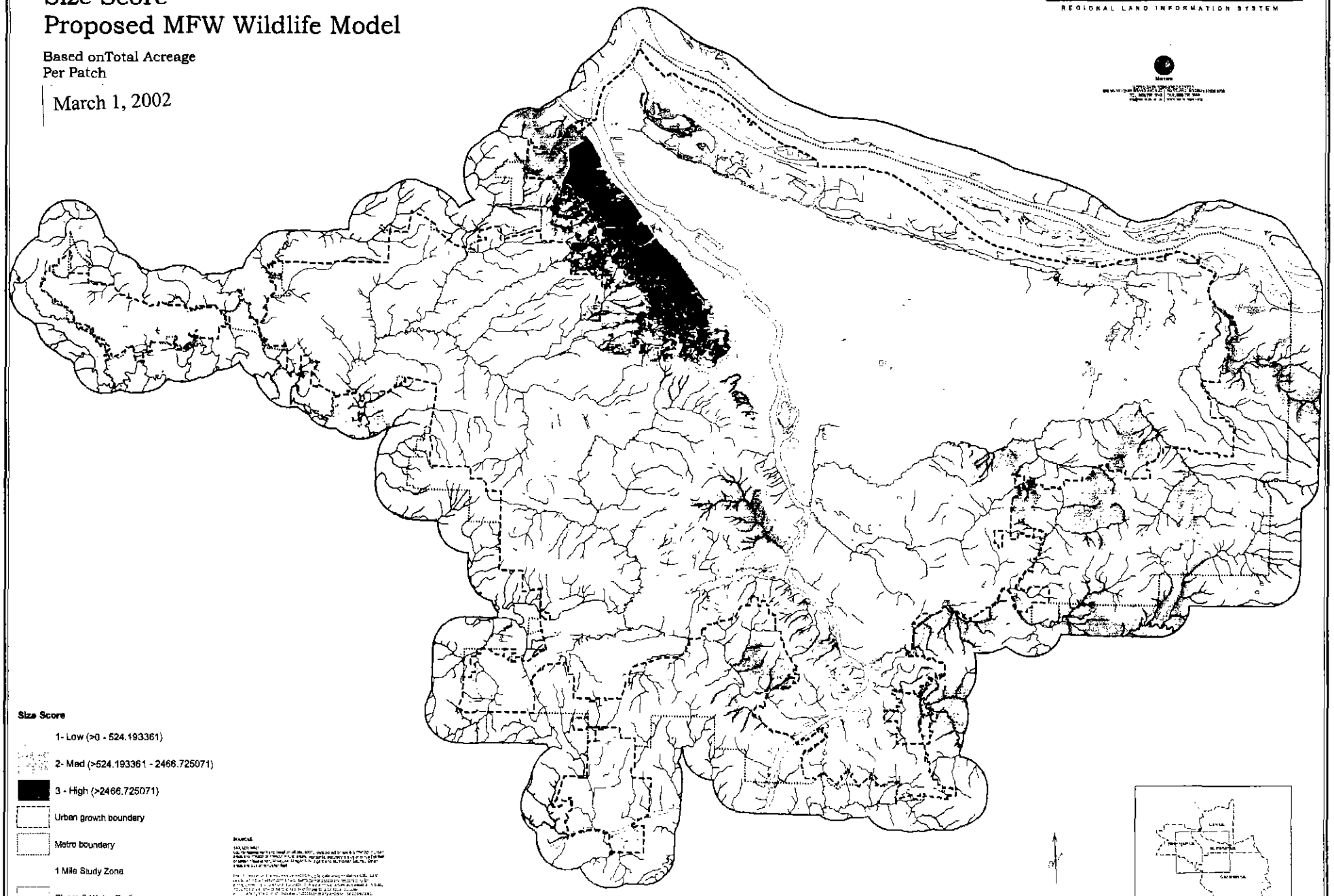
File Name	Description
devfld022602.zip	(region-wide developed floodplain layer)
patchmod022602.zip	(region-wide patch model layer)

Size Score
Proposed MFW Wildlife Model

Based onTotal Acreage
Per Patch

March 1, 2002

REGIONAL LAND INFORMATION SYSTEM



Size Score

- 1- Low (>0 - 524.193361)
- 2- Med (>524.193361 - 2466.725071)
- 3 - High (>2466.725071)
- Urban growth boundary
- Metro boundary
- 1 Mile Study Zone
- Rivers & Water Bodies
- Surface Streams

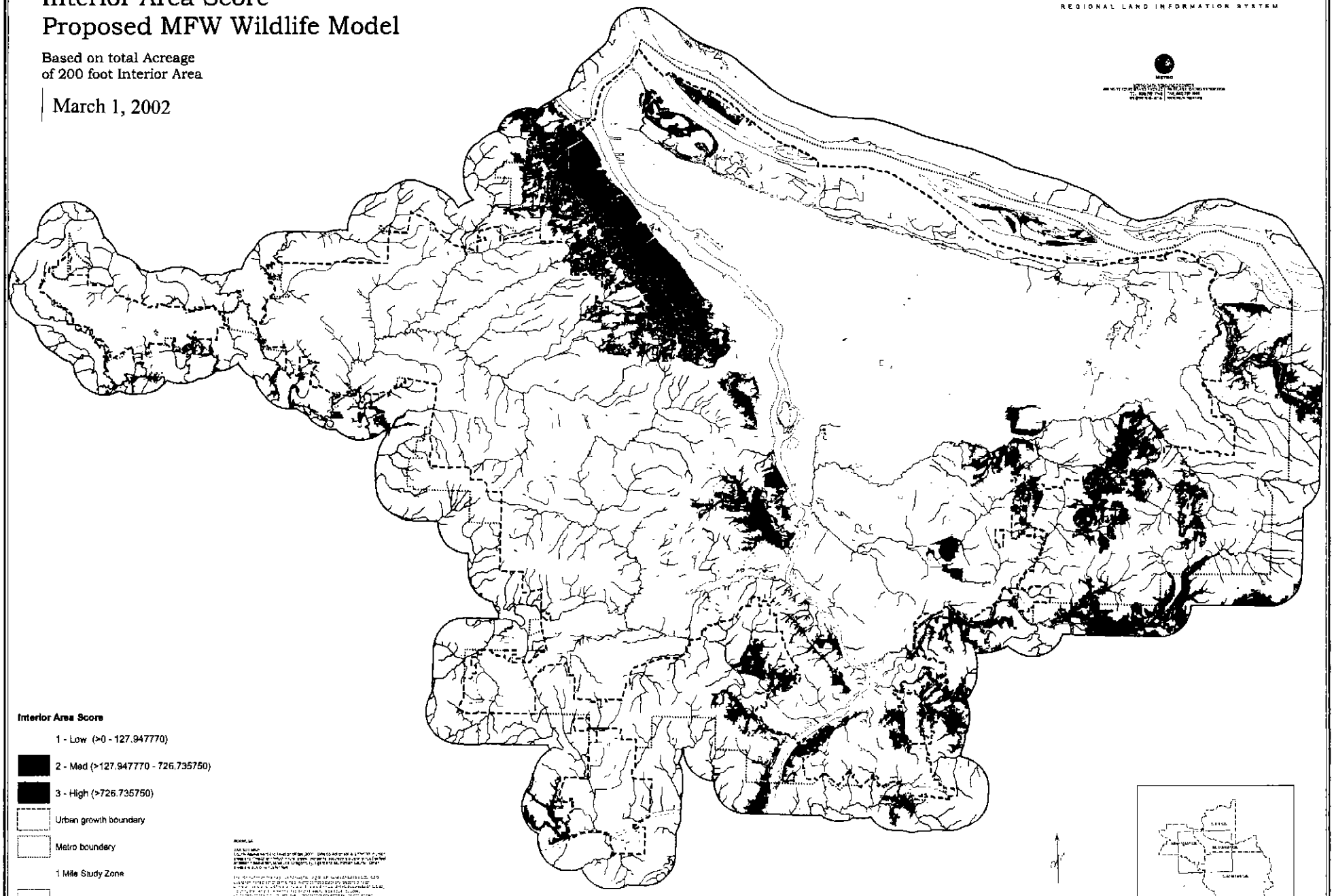
Location Map

Interior Area Score
Proposed MFW Wildlife Model

Based on total Acreage
of 200 foot Interior Area

March 1, 2002

REGIONAL LAND INFORMATION SYSTEM



Interior Area Score

- 1 - Low (>0 - 127.947770)
- 2 - Med (>127.947770 - 726.735750)
- 3 - High (>726.735750)
- Urban growth boundary
- Metro boundary
- 1 Mile Study Zone
- Rivers & Water Bodies
- Surface Streams

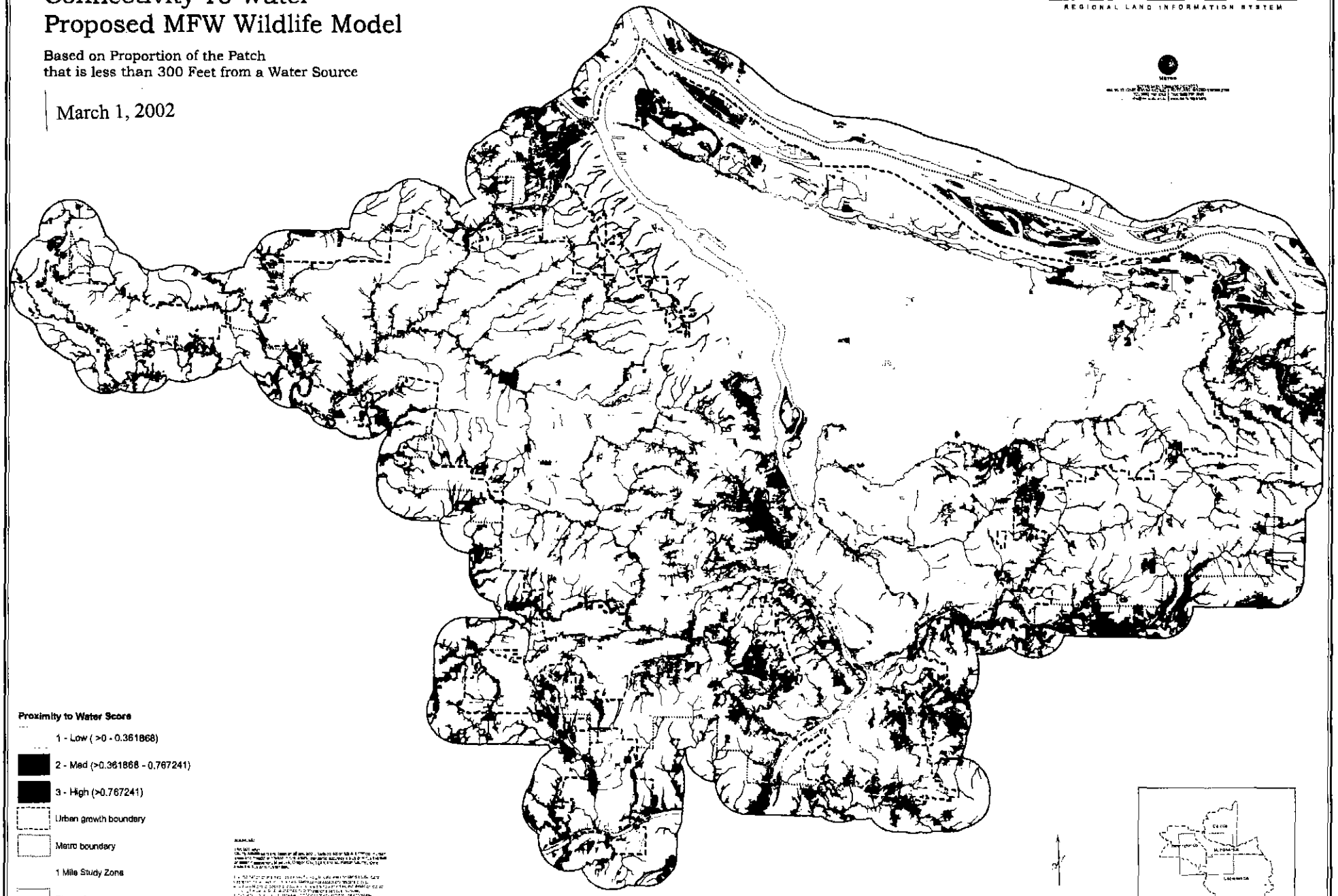
Location Map

Connectivity To Water
Proposed MFW Wildlife Model

Based on Proportion of the Patch
that is less than 300 Feet from a Water Source

March 1, 2002

REGIONAL LAND INFORMATION SYSTEM



Proximity to Water Score

- 1 - Low (>0 - 0.361868)
- 2 - Med (>0.361868 - 0.767241)
- 3 - High (>0.767241)
- Urban growth boundary
- Metro boundary
- 1 Mile Study Zone
- Rivers & Water Bodies
- Surface Streams

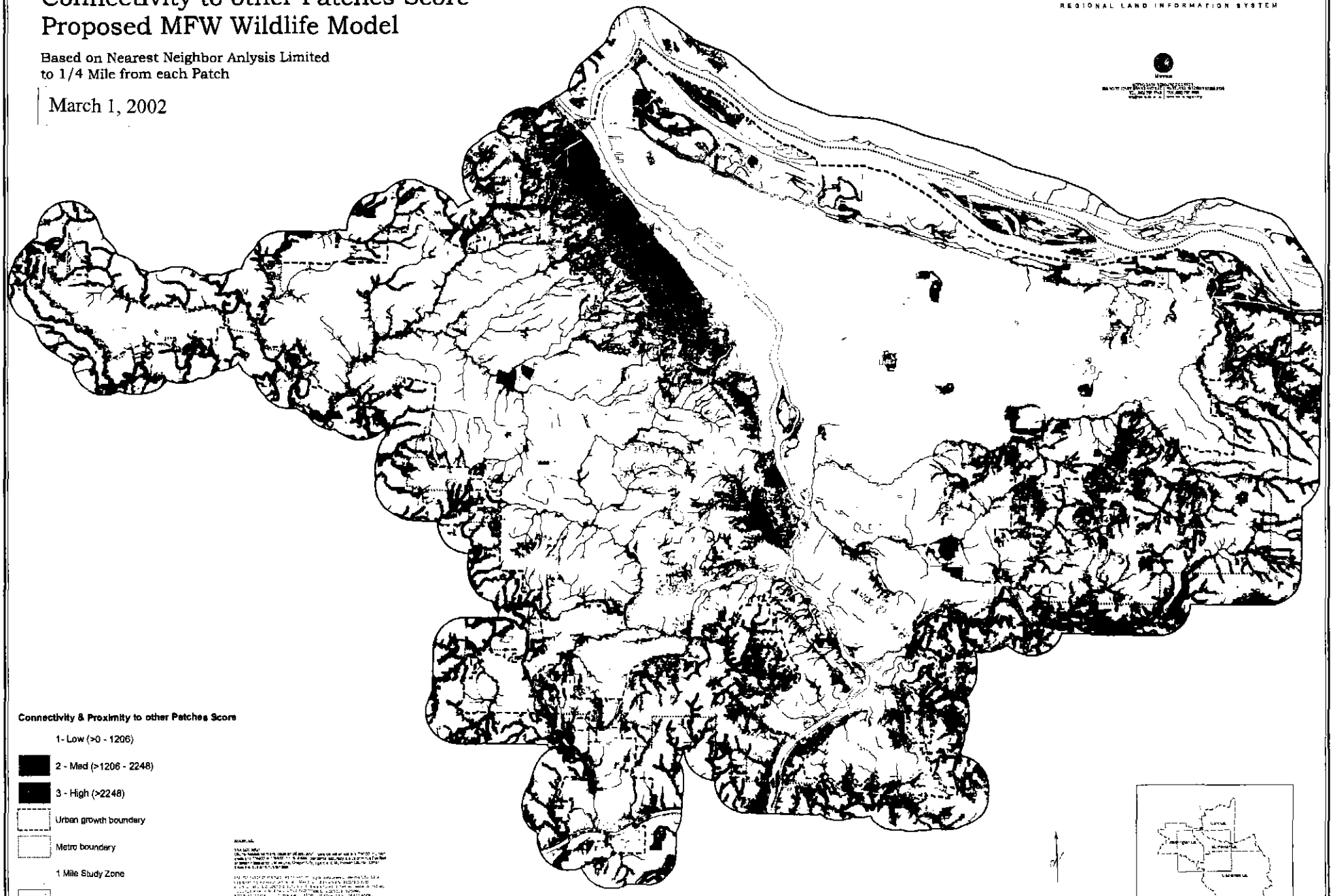
Location Map

Connectivity to other Patches Score
Proposed MFW Wildlife Model

Based on Nearest Neighbor Anlysis Limited
to 1/4 Mile from each Patch

March 1, 2002

REGIONAL LAND INFORMATION SYSTEM



Connectivity & Proximity to other Patches Score

- 1- Low (>0 - 1206)
- 2 - Med (>1206 - 2248)
- 3 - High (>2248)
- Urban growth boundary
- Metro boundary
- 1 Mile Study Zone
- Rivers & Water Bodies
- Surface Streams

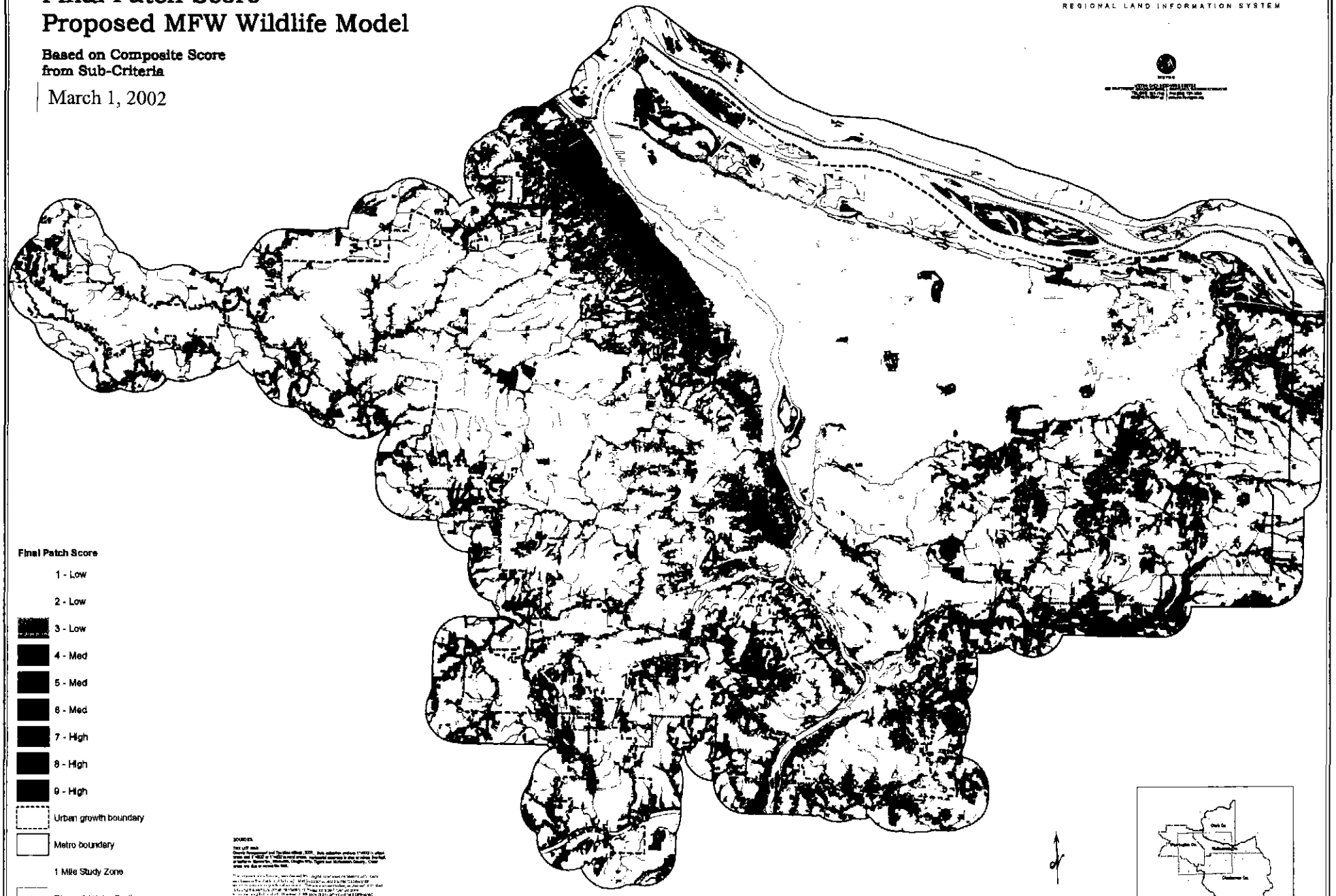
Location Map

Final Patch Score
Proposed MFW Wildlife Model

Based on Composite Score from Sub-Criteria

March 1, 2002

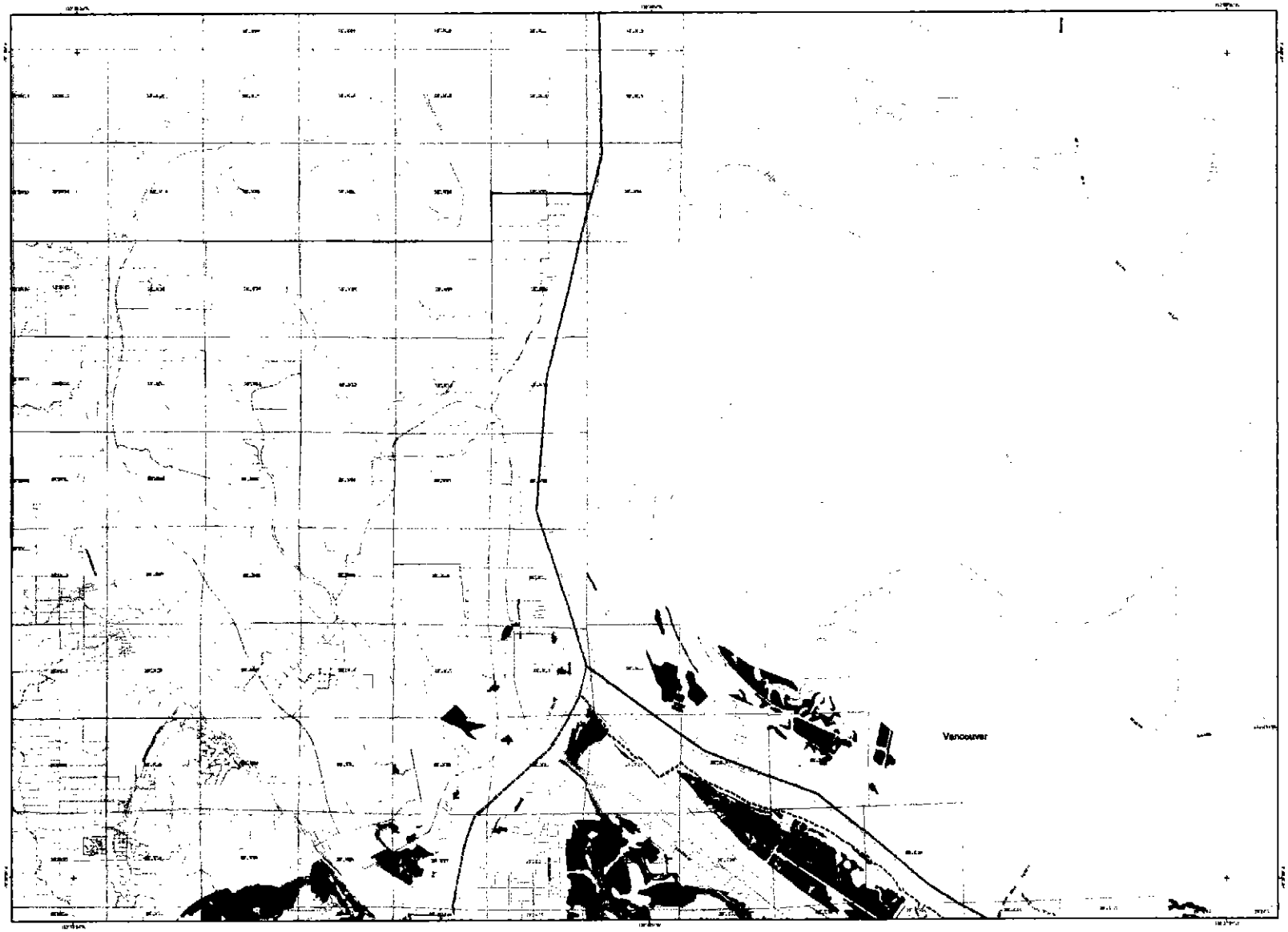
REGIONAL LAND INFORMATION SYSTEM



Final Patch Score

- 1 - Low
- 2 - Low
- 3 - Low
- 4 - Med
- 5 - Med
- 6 - Med
- 7 - High
- 8 - High
- 9 - High
- Urban growth boundary
- Metro boundary
- 1 Mile Study Zone
- Rivers & Water Bodies
- Surface Streams

Location Map



Sauvie Island & Vancouver Quads (1 of 10)

Metro Wildlife Habitat Inventory

Site scores based on relative measures of the following factors

1. Patch **Size**
2. Patch Interior Habitat Area
3. Patch Connectivity & Proximity to Other Patches
4. Patch Connectivity to Surface Water

This map doe not include known unique wildlife habitat areas that are also under consideration as important wildlife resources. The study area for the wildlife criteria is the metro jurisdiction plus one mile. The study area and thus the patch scores are subject to change.

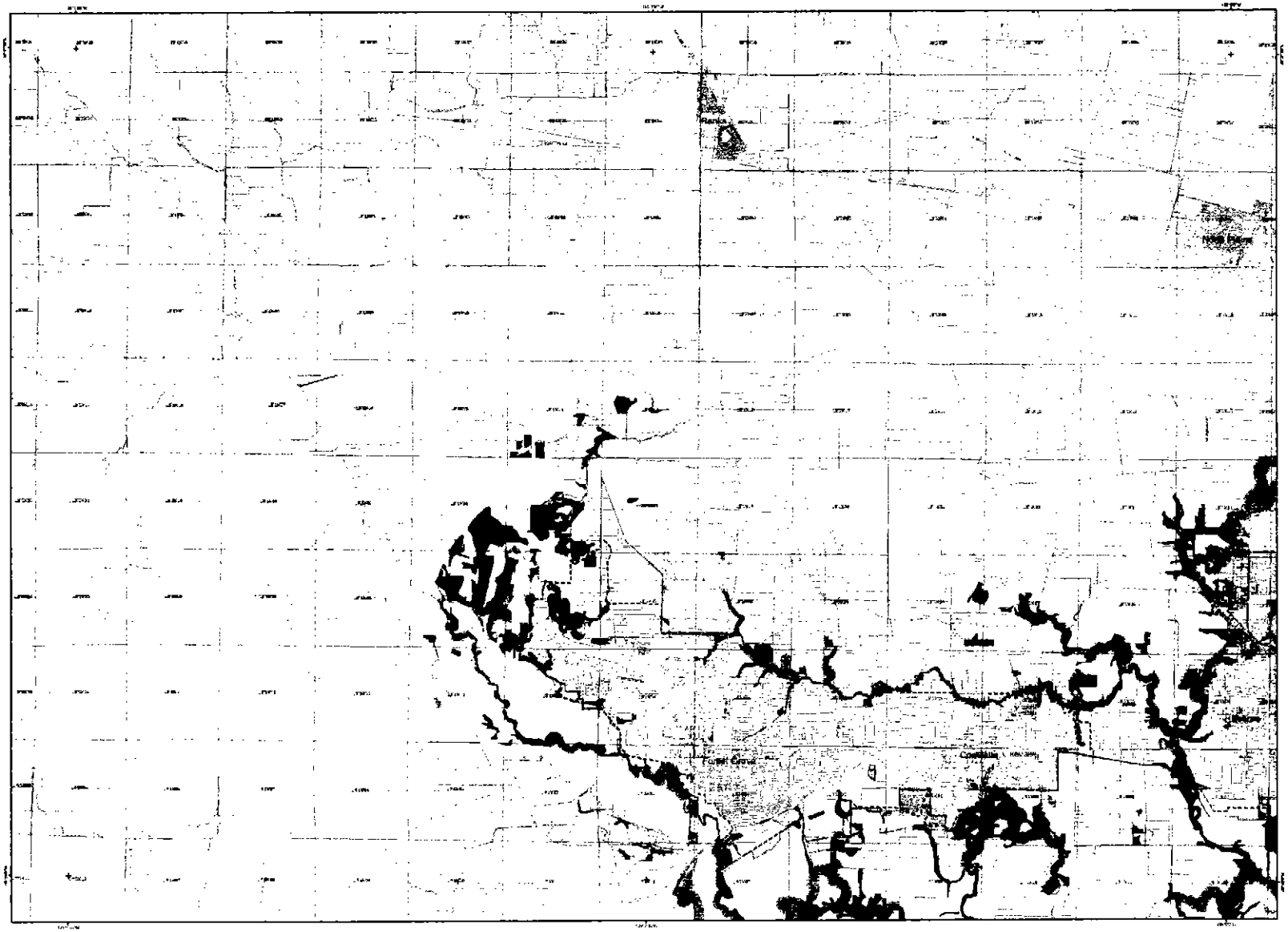
Final Patch Score

- Open Water
- Metro UGB
- Metro Boundary
- County Boundaries
- City Boundaries
- Section Lines
- Stream Centerlines
- Taxlots

METRO

Location Map

Review and Discussion Draft 2/28/2002



Forest Grove & Gales Creek Quads (2 of 10)

Metro Wildlife Habitat Inventory

Site scores based on relative measures of the following factors

1. Patch Size
2. Patch Interior Habitat Area
3. Patch Connectivity & Proximity to Other Patches
4. Patch Connectivity to Surface Water

This map doe not include known unique wildlife habitat areas that are also under consideration as important wildlife resources. The study area for the wildlife criteria is the metro jurisdiction plus one mile. The study area and this the patch scores are subject to change.

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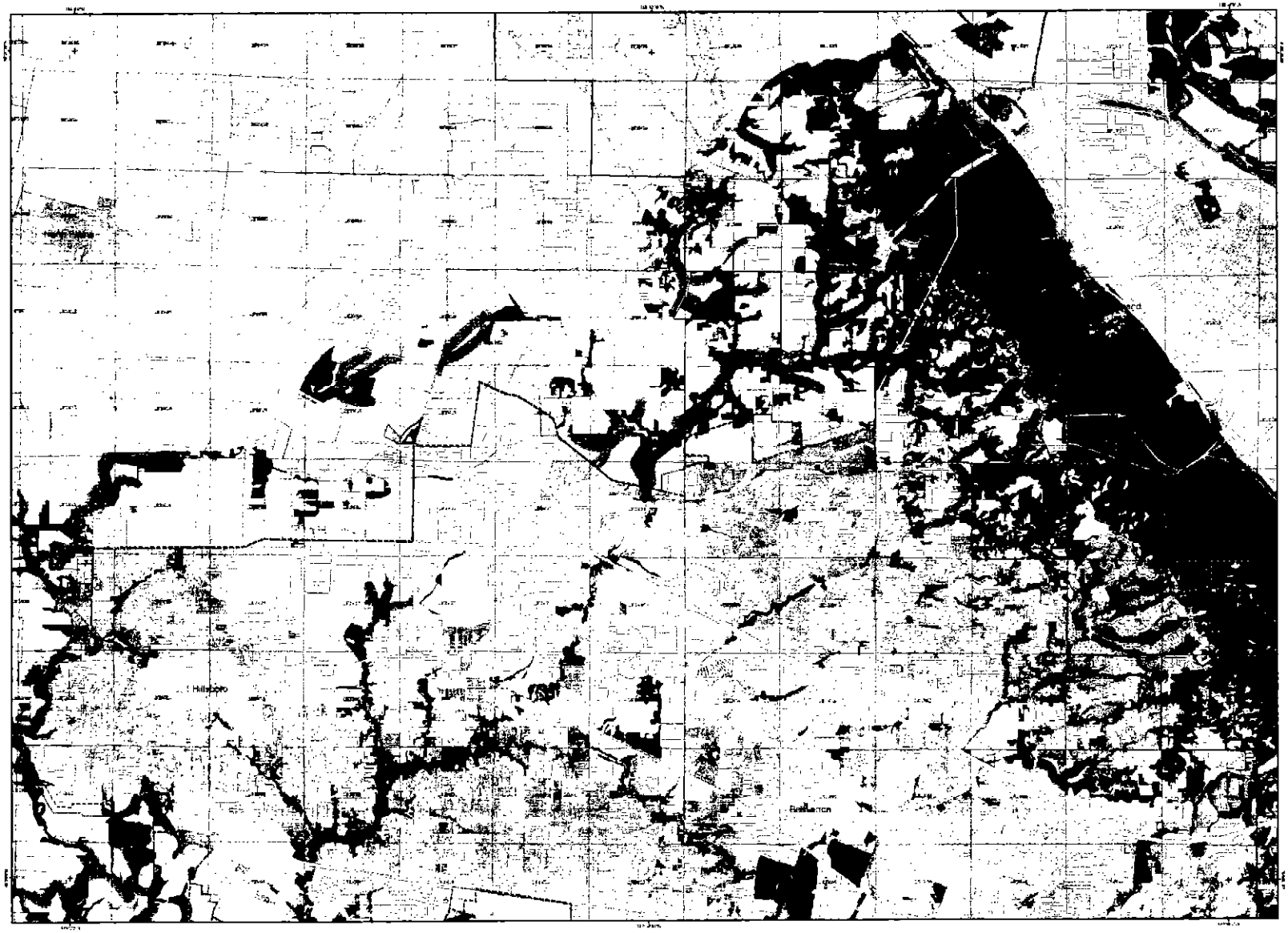
Final Patch Score

- Open Water
- Metro UGB
- Metro Boundary
- County Boundaries
- City Boundaries
- Section Lines
- Stream Centerlines
- Taxlots

METRO

Location Map



Hillsboro & Linnton Quads (3 of 10)

Metro Wildlife Habitat Inventory

Site scores based on relative measures of the following factors

1. Patch Size
2. Patch Interior Habitat Area
3. Patch Connectivity & Proximity to Other Patches
4. Patch Connectivity to Surface Water

This map doc not include known unique wildlife habitat areas that are also under consideration as important wildlife resources. The study area for the wildlife criteria is the metro jurisdiction plus one mile. The study area and thus the patch scores are subject to change.

Final Patch Score

- Open Water
- Metro UGB
- Metro Boundary
- County Boundaries
- City Boundaries
- Section Lines
- Stream Centerlines
- Taxlots

METRO

Location Map

Review and Discussion Draft 2/28/2002

Portland & Mt. Tabor Quads (4 of 10)

Metro Wildlife Habitat Inventory

Site scores based on relative measures of the following factors

1. Patch Size
2. Patch Interior Habitat Area
3. Patch Connectivity & Proximity to Other Patches
4. Patch Connectivity to Surface Water

This map doe not include known unique wildlife habitat areas that are also under consideration as important wildlife resources. The study area for the wildlife criteria is the metro jurisdiction plus one mile. The study area and thus the patch scores are subject to change.

Final Patch Score

- Open Water
- Metro UGB
- Metro Boundary
- County Boundaries
- City Boundaries
- Section Lines
- Stream Centerlines
- Taxlots

METRO

Review and Discussion Draft 2/28/2002

Location Map

Camas & Washougal Quads (5 of 10)

Metro Wildlife Habitat Inventory

Site scores based on relative measures of the following factors

1. Patch Size
2. Patch Interior Habitat Area
3. Patch Connectivity & Proximity to Other Patches
4. Patch Connectivity to Surface Water

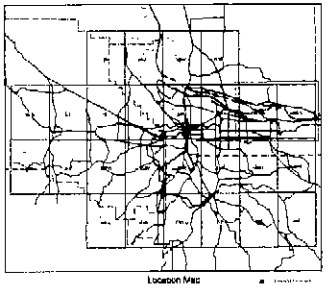
This map doe not include known unique wildlife habitat areas that are also under consideration as important wildlife resources. The study area for the wildlife criteria is the metro jurisdiction plus one mile. The study area and thus the patch scores are subject to change.

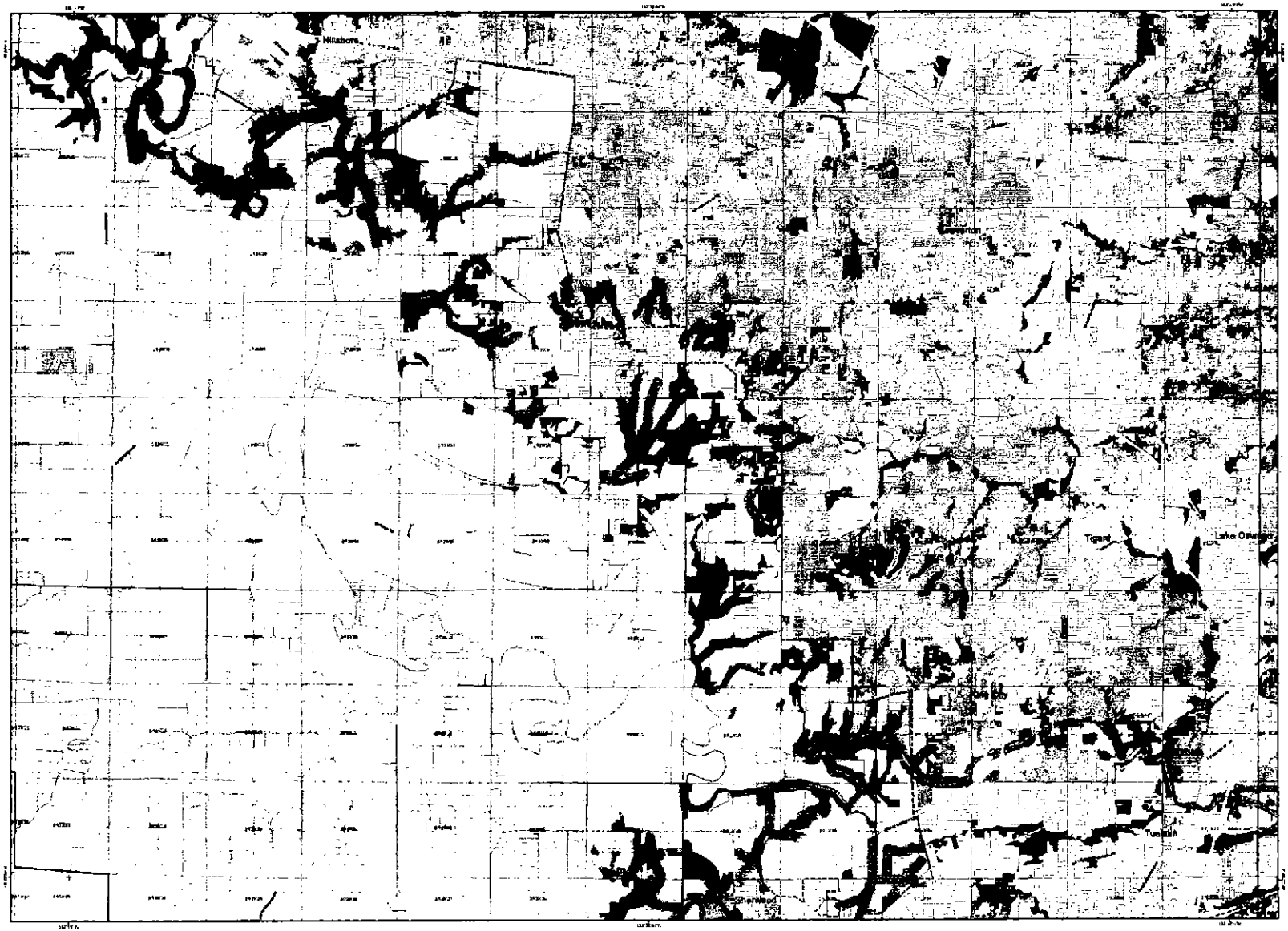
Review and Discussion Draft 2/28/2002

Final Patch Score

- Open Water
- Metro UGB
- Metro Boundary
- County Boundaries
- City Boundaries
- Section Lines
- Stream Centerlines
- Taxlots

METRO





Scholls & Beaverton Quads (6 of 10)

Metro Wildlife Habitat Inventory

Site scores based on relative measures of the following factors

1. Patch Size
2. Patch Interior Habitat Area
3. Patch Connectivity & Proximity to Other Patches
4. Patch Connectivity to Surface Water

This map doe not include known unique wildlife habitat areas that are also under consideration as important wildlife resources. The study area for the wildlife criteria is the metro jurisdiction plus one mile. The study area and this the patch scores are subject to change.

Final Patch Score

- Open Water
- Metro UGB
- Metro Boundary
- County Boundaries
- City Boundaries
- Section Lines
- Stream Centerlines
- Taxlots

Tualatin Valley Irrigation District Boundary

METRO

Location Map

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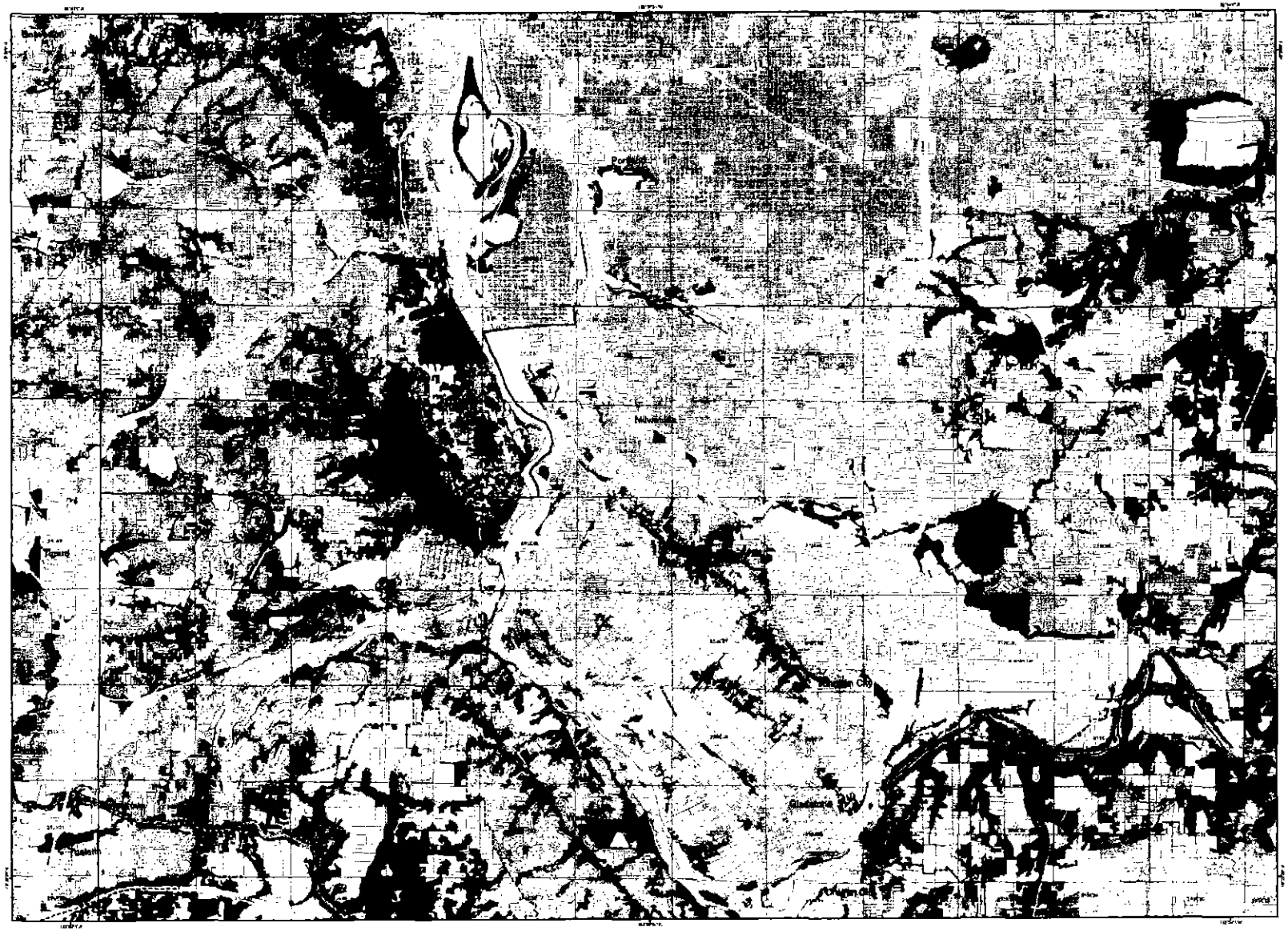


Lake Oswego & Gladstone Quads (7 of 10)

Metro Wildlife Habitat Inventory

Site scores based on relative measures of the following factors

1. Patch Size
2. Patch Interior Habitat Area
3. Patch Connectivity & Proximity to Other Patches
4. Patch Connectivity to Surface Water

This map doe not include known unique wildlife habitat areas that are also under consideration as important wildlife resources. The study area for the wildlife criteria is the metro jurisdiction plus one mile. The study area and thus the patch scores are subject to change.

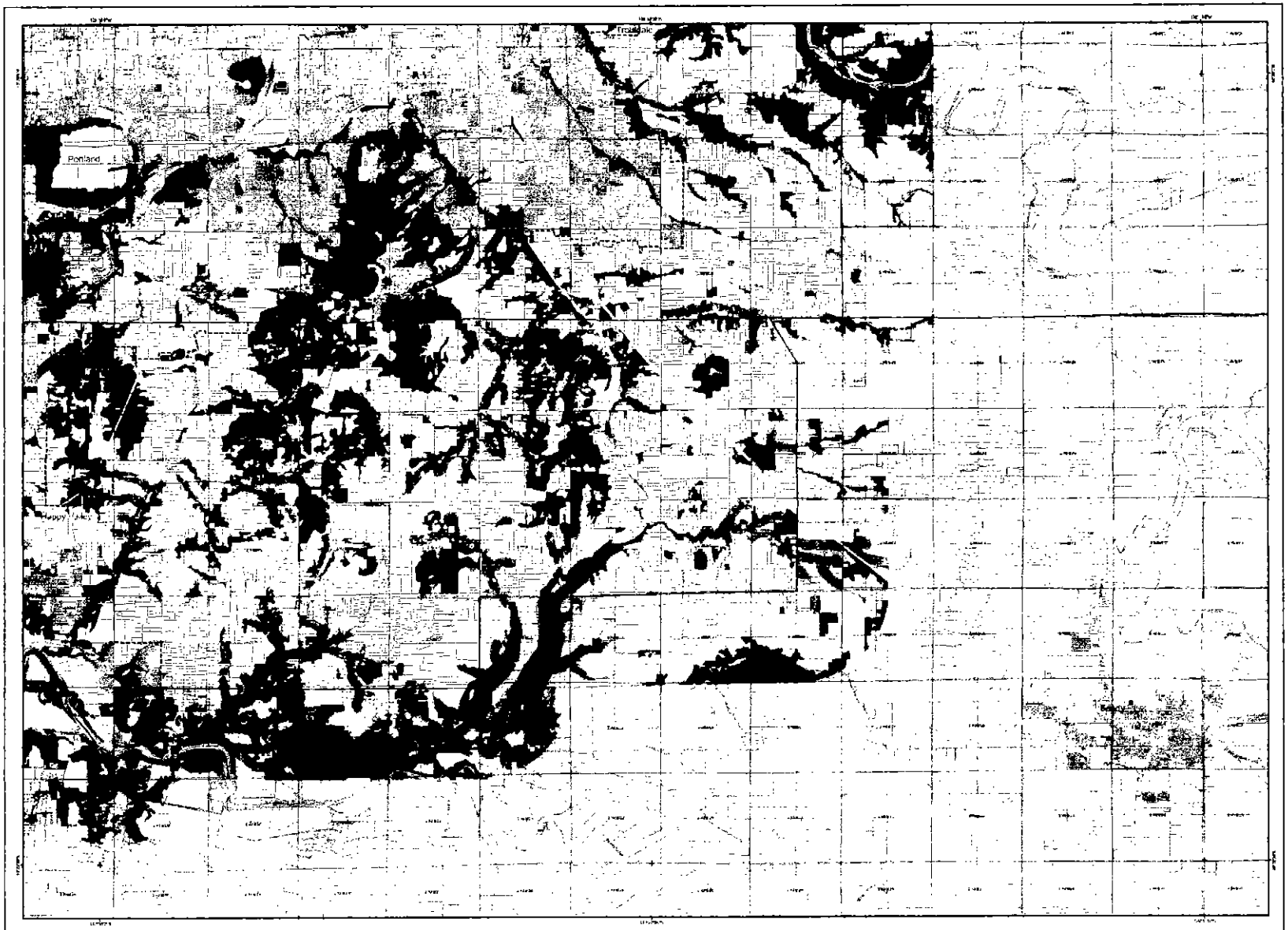
Final Patch Score

Open Water
Metro UGB
Metro Boundary
County Boundaries
City Boundaries
Section Lines
Stream Centerlines
Taxlots

METRO

Location Map

Review and Discussion Draft 2/28/2002



Damascus and Sandy Quads (8 of 10)

Metro Wildlife Habitat Inventory

Site scores based on relative measures of the following factors

1. Patch Size
2. Patch Interior Habitat Area
3. Patch Connectivity & Proximity to Other Patches
4. Patch Connectivity to Surface Water

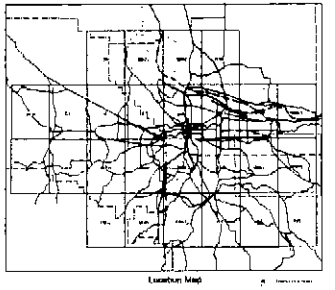
This map does not include known unique wildlife habitat areas that are also under consideration as important wildlife resources. The study area for the wildlife criteria is the metro jurisdiction plus one mile. The study area and this tile patch scores are subject to change.

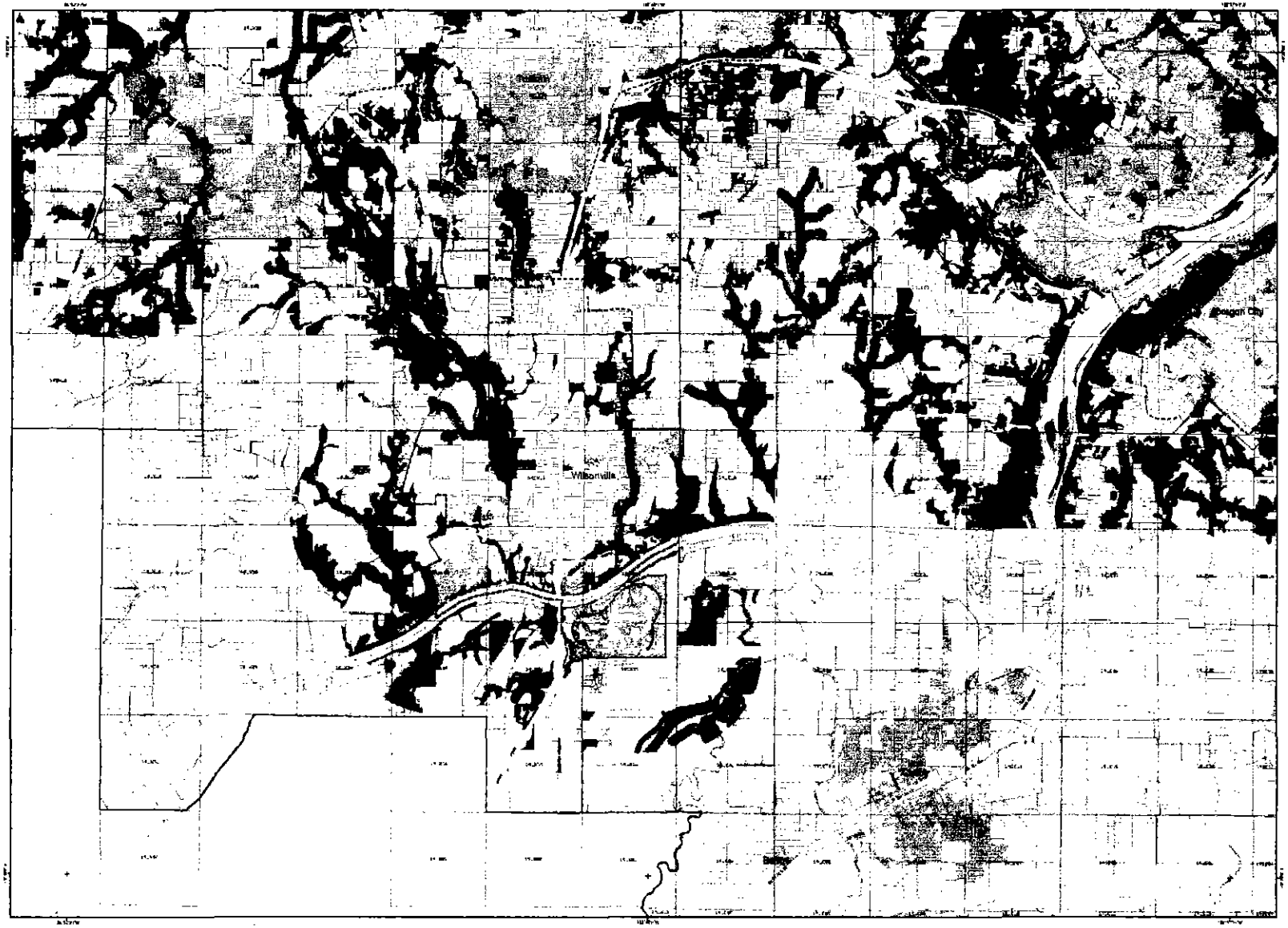
Review and Discussion Draft 2/28/2002

Final Patch Score

- Open Water
- Metro UGB
- Metro Boundary
- County Boundaries
- City Boundaries
- Section Lines
- Stream Centerlines
- Taxlots

METRO





Sherwod & Canby Quads (9 of 10)

Metro Wildlife Habitat Inventory

Site scores based on relative measures of the following factors

1. Patch Size
2. Patch Interior Habitat Area
3. Patch Connectivity & Proximity to Other Patches
4. Patch Connectivity to Surface Water

This map doe not include known unique wildlife habitat areas that are also under consideration as important wildlife resources. The study area for the wildlife criteria is the metro jurisdiction plus one mile. The study area and thus the patch scores are subject to change.

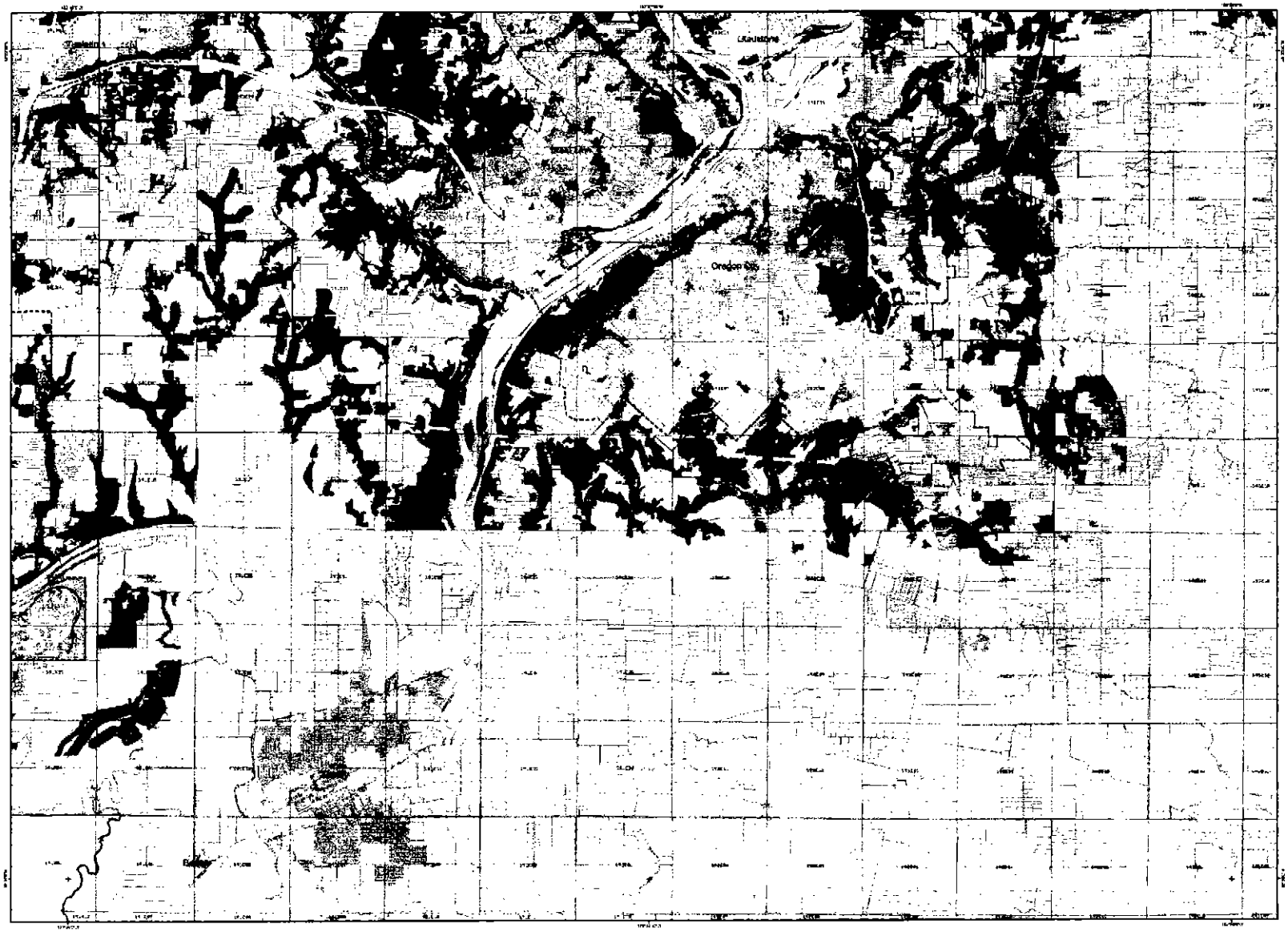
Review and Discussion Draft 2/28/2002

Final Patch Scores

- Open Water
- Metro UGB
- Metro Boundary
- County Boundaries
- City Boundaries
- Section Lines
- Stream Centerlines
- Taxlots

METRO

Location Map



Canby & Oregon City Quads (10 of 10)

Metro Wildlife Habitat Inventory

Site scores based on relative measures of the following factors

1. Patch Size
2. Patch Interior Habitat Area
3. Patch Connectivity & Proximity to Other Patches
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This map does not include known unique wildlife habitat areas that are also under consideration as important wildlife resources. The study area for the wildlife criteria is the metro jurisdiction plus one mile. The study area and thus the patch scores are subject to change.

Review and Discussion Draft 2/28/2002

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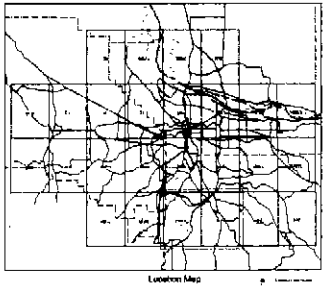

M E M O R A N D U M

METRO

TO: Councilor Susan McLain, Chair, Natural Resources Committee
FROM: Paul Ketcham, Principal Regional Planner
DATE: March 6, 2002 *Revised Version*
SUBJECT: Concept Maps for Regionally Significant Wildlife Habitat

During the special Natural Resources Committee meeting on February 27, staff presented maps and described proposed revisions to the wildlife habitat inventory. This memo gives a brief overview of the wildlife habitat inventory model, and presents several concept options for identifying regionally significant wildlife habitat.

Revised Wildlife Habitat Model

The revised wildlife habitat model, as in the previous version, uses the following criteria to evaluate value of wildlife habitat.

- larger patches are better than smaller patches
- interior habitat is more important to at-risk species than edge habitat
- connectivity to water is important
- connectivity to other wildlife habitat is important
- unique habitat deserves special consideration

Metro's field data confirms that these criteria are good predictors of valuable wildlife habitat. The species richness habitat layer was not included in the model due to its weak statistical relationship to the field data.

Data Sources used in the Wildlife Habitat Model: The previous version used coarse scale (25-meter raster) land cover data generated by satellite imagery. The revised approach defines wildlife habitat patches using the hand-digitized 2000 Forest Canopy Layer and Title 3 wetlands. This is the most accurate source of patch delineation currently available in Metro's land cover database. In addition, the wildlife inventory includes low structure vegetation (shrubs, grass, and undeveloped soils) within 300 feet of streams and wetlands as an important component to maintaining longitudinal and lateral connectivity between and among wildlife habitat patches and water resources.

Wildlife patch definition: Two types of wildlife patches are evaluated. The first type is composed of forest canopy with a minimum patch size of two acres and including adjacent wetlands. The second type is composed of low structure vegetation such as grass, shrubs, or meadow within 300 feet of streams and wetlands. The second type of habitat patch

incorporates the importance of the riparian corridor as the regional backbone of wildlife connectivity. Wetlands smaller than two acres not associated with forest canopy are not included in the model. We intend to address this shortcoming by adding such wetlands as unique habitats.

Scoring System: Forest canopy and associated wetland wildlife patches are rated for each of the four criteria used in the model. Patches are rated high, medium, and low for size, interior habitat, connectivity to water, and connectivity to other patches, making a total possible score of 12 for any given wildlife patch.[1] Low structure connector wildlife patches (located within 300 feet of water) are scored high, medium or low for only one of the criteria—connectivity to other patches. Thus, the maximum score for low structure connectors is 3.

Relationship of Wildlife Habitat Inventory to Regionally Significant Riparian Corridors Inventory

As described above, the wildlife habitat inventory is based on the same land cover database as the riparian corridor inventory. However, the riparian corridor and wildlife habitat methodologies apply this database in different ways based on the scientific literature. The land cover database includes the hand-digitized 2000 Forest Canopy Layer, Title 3 wetlands, and low structure vegetation and open space within 300 feet of streams. Utilizing the same land cover database allows a high degree of consistency between the two inventories.

Staff has produced a map that graphically depicts this relationship. The map entitled "Wildlife habitat remaining after regionally significant riparian corridors are removed" shows the wildlife patches that are "extra-territorial" from the riparian corridors. This maps shows wildlife patches that are not connected to water such as butte tops and park lands which are not included in regionally significant riparian corridors. Preliminary GIS calculations show that 94% of the land area inventoried as wildlife habitat falls within the area designated as regionally significant riparian corridors by Metro Council.

Concept alternatives for defining regionally significant wildlife habitat

Staff has developed three preliminary alternatives to help initiate the discussion of which wildlife habitat patches could be considered regionally significant. These alternatives are based on the scoring system described above.

Alternative A

All mapped wildlife habitat patches are regionally significant.

o This alternative would include all identified wildlife habitat including the smallest patches of forest and low structure (non-forest) vegetation within 300 feet of water as regionally significant wildlife habitat.

Alternative B

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[1] Although there is a theoretical possible score of 12, no wildlife habitat patch scored higher than 9 in the wildlife model.

o The lowest scoring wildlife habitat patches are not considered regionally significant.

o This alternative excludes low-structure connector patches that are small, isolated, or fragmented by roads and development. The relatively small size of the connector patches and their isolation from forest patches contribute to their low scores.

o However, recall that low-structure connector patches are rated for only one of the four criteria--connectivity to other patches. Therefore, they generally receive scores of 1, 2 or 3 of a possible score of 12 in the model and increasing amounts of connector patches will be excluded as lower scoring areas are dropped from consideration.

o Examples of these patches include meadow, grass and shrub habitat along major rivers and smaller connectors composed of agriculture land cover. Almost all forest patches are retained.

o No hydrologically connected wetlands are excluded.

Alternative C

The two lowest scoring wildlife habitat categories are not considered regionally significant.

o This alternative excludes longer portions of low structure connector patches compared to Alternative B. These areas are still fragmented by roads and development, but to a lesser degree than those connector patches excluded in Alternative B.

o Many small forest patches are excluded. These patches are generally isolated from other patches and are not connected to water.

o No hydrologically connected wetlands are excluded in this alternative.

o Examples of patches excluded from this alternative are low structure connector patches comprised of agricultural cover in urbanizing areas and isolated forest patches.

Alternative D

The three lowest scoring wildlife habitat patches are not considered regionally significant.

o Most low structure connector patches are excluded from this alternative, significantly reducing wildlife habitat connectivity to water.

o Larger upland forest patches are excluded.

o Some hydrologically connected wetlands within smaller forest patches are excluded.

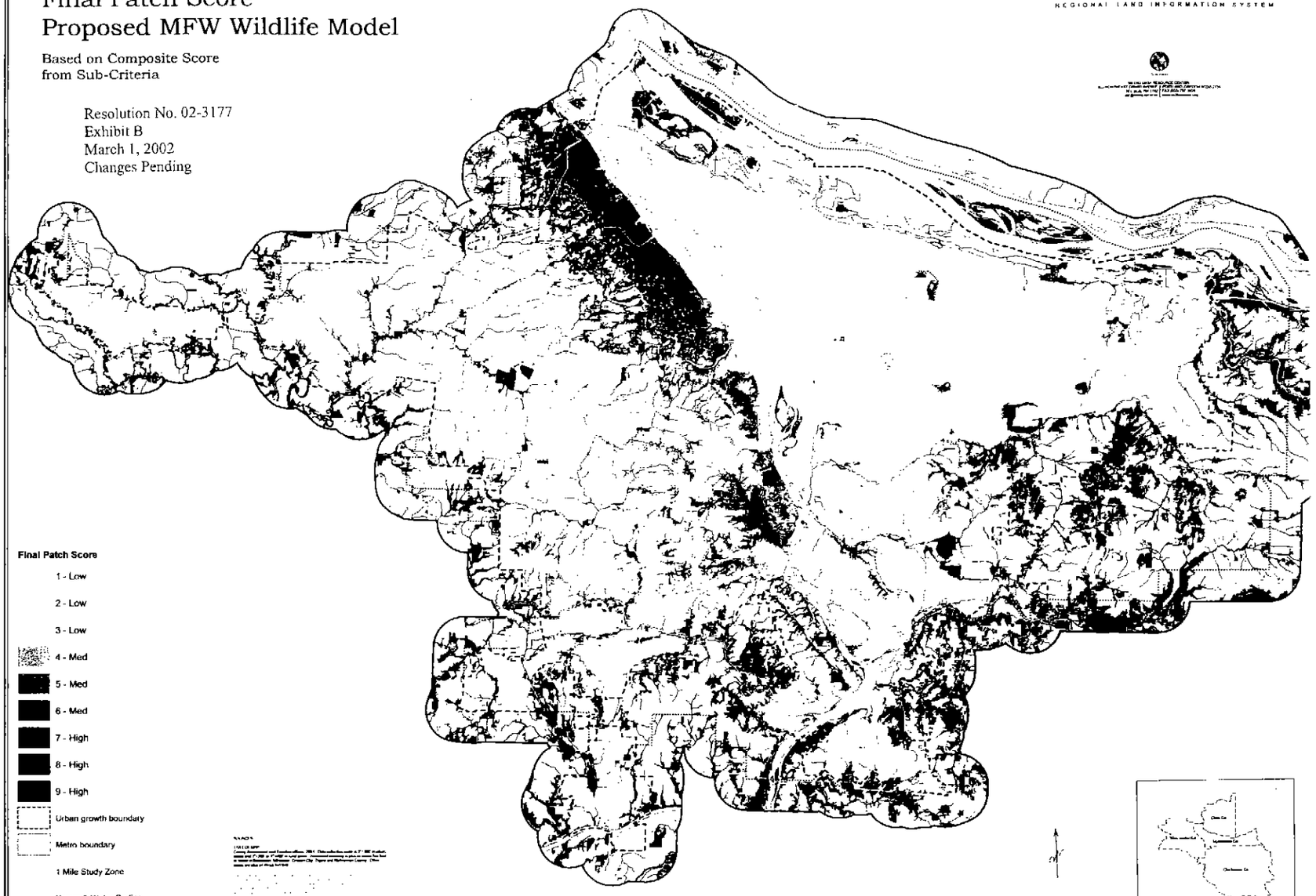
o Examples include larger upland forest patches and most low structure connector patches.

Final Patch Score
Proposed MFW Wildlife Model

Based on Composite Score
from Sub-Criteria

Resolution No. 02-3177
Exhibit B
March 1, 2002
Changes Pending

R L I S
REGIONAL LAND INFORMATION SYSTEM



Final Patch Score

- 1 - Low
- 2 - Low
- 3 - Low
- 4 - Med
- 5 - Med
- 6 - Med
- 7 - High
- 8 - High
- 9 - High
- Urban growth boundary
- Metro boundary
- 1 Mile Study Zone
- Rivers & Water Bodies
- Surface Streams

Location Map

Resolution 02-3177
Exhibit C

Alternatives for defining regionally significant Wildlife Habitat

Four alternatives have been developed to help initiate the discussion of which wildlife habitat patches could be considered regionally significant. These alternatives are based on the scoring system as follows:

Forest canopy and associated wetland wildlife patches are rated for each of the four criteria used in the model. Patches are rated high, medium, and low for size, interior habitat, connectivity to water, and connectivity to other patches, making a total possible score of 12 for any given wildlife patch.[1] Low structure connector wildlife patches (located within 300 feet of water) are scored high, medium or low for only one of the criteria—connectivity to other patches. Thus, the maximum score for low structure connectors is 3.

Alternative A

All mapped wildlife habitat patches with values including 1 and above are regionally significant.

o This alternative would include all identified wildlife habitat including the smallest patches of forest and low structure (non-forest) vegetation within 300 feet of water as regionally significant wildlife habitat.

Alternative B

Mapped wildlife habitat patches with values greater than 1.

o The lowest scoring wildlife habitat patches are not considered regionally significant.

o This alternative excludes low-structure connector patches that are small, isolated, or fragmented by roads and development. The relatively small size of the connector patches and their isolation from forest patches contribute to their low scores.

o However, recall that low-structure connector patches are rated for only one of the four criteria--connectivity to other patches. Therefore, they generally receive scores of 1, 2 or 3 of a possible score of 12 in the model and increasing amounts of connector patches will be excluded as lower scoring areas are dropped from consideration.

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[1] Although there is a theoretical possible score of 12, no wildlife habitat patch scored higher than 9 in the wildlife model.

o Examples of these patches include meadow, grass and shrub habitat along major rivers and smaller connectors composed of agriculture land cover. Almost all forest patches are retained.

o No hydrologically connected wetlands are excluded.

Alternative C

Mapped wildlife habitat patches with values greater than 2. (The two lowest scoring wildlife habitat categories are not considered regionally significant.)

o This alternative excludes longer portions of low structure connector patches compared to Alternative B. These areas are still fragmented by roads and development, but to a lesser degree than those connector patches excluded in Alternative B.

o Many small forest patches are excluded. These patches are generally isolated from other patches and are not connected to water.

o No hydrologically connected wetlands are excluded in this alternative.

o Examples of patches excluded from this alternative are low structure connector patches comprised of agricultural cover in urbanizing areas and isolated forest patches.

Alternative D

Mapped wildlife habitat patches with values greater than 3. (The three lowest scoring wildlife habitat patches are not considered regionally significant.)

o Most low structure connector patches are excluded from this alternative, significantly reducing wildlife habitat connectivity to water.

o Larger upland forest patches are excluded.

o Some hydrologically connected wetlands within smaller forest patches are excluded.

o Examples include larger upland forest patches and most low structure connector patches.

STAFF REPORT

IN CONSIDERATION OF RESOLUTION NO. 02-3177, FOR THE PURPOSE OF ESTABLISHING CRITERIA TO DEFINE AND IDENTIFY REGIONALLY SIGNIFICANT WILDLIFE HABITAT AND ADOPTING A DRAFT MAP OF REGIONALLY SIGNIFICANT WILDLIFE HABITAT AREAS

Date: March 12, 2002 Presented by: Andy Cotugno

BACKGROUND

In June 1998, Metro Council adopted Title 3 of the Urban Growth Management Functional Plan. Section 5 of this Title called for identifying, considering and protecting regionally significant fish and wildlife habitat conservation areas. Since that time, work has been initiated to carry out this Metro Council policy direction, consistent with State law, especially State land use Goal 5. With the adoption of Resolution 01-3141C, the Metro Council established criteria for defining and identifying riparian corridors, one section of State regulations.

Resolution 02-3177 concerns defining, identifying and mapping regionally significant wildlife habitat, the other section of State law relevant to fish and wildlife habitat. The adoption of this resolution will complete a first step, creating an inventory, and will establish which wildlife habitat areas are regionally significant and therefore, suitable for analysis in the second of three steps. The second step, if this resolution is adopted, will analyze the regionally significant wildlife habitat areas for the economic, social, environmental and energy consequences of allowing, limiting or prohibiting conflicting uses (known as the ESEE analysis). After the second step, a third step, a draft protection program, can begin. The program stage will likely include an array of possible program options for Metro Council consideration including incentives, education, acquisition and regulation or some combinations of these options.

The documents attached to this resolution include:

1) a technical review of the scientific literature; (Exhibit A)

2) a summary of how the scientific literature was converted to operational criteria for identification and mapping purposes; (Exhibit A)

3) an inventory of all areas within the region providing one or more wildlife habitat functions, including maps of the region for four wildlife habitat functions, (Exhibit A)

4) a composite map that takes each wildlife function and ranks areas by their relative wildlife habitat function and (Exhibit A)

5) alternatives for determining which of the areas identified as having wildlife habitat functions could be considered regionally significant and for ESEE analysis. (Exhibit C)

6) a map of regionally significant wildlife habitat (Exhibit B)

(a separate resolution, 02-3176 addresses riparian corridor inventory. If both resolutions are adopted an ESEE analysis of both could commence.)

ANALYSIS/INFORMATION

1. Known Opposition

Concerns about wildlife habitat inventory have been raised by the Home Builders Association of Metropolitan Portland. Their letter and a Metro response are being made part of the public record of this resolution. In summary, the Home Builders have voiced a concern that State Goal 5 is not being followed because they assert that "...presence of wildlife species is the primary factor in developing an inventory and determining significance." Home Builders also state that State resource agencies should be consulted and they further recommend that Metro should use the State resource agency mapping inventory as the universe from which to select regionally significant wildlife habitat.

The standard process under Goal 5 is based on habitat information, not exclusively on the presence of wildlife species. The inventory must include habitat information on sensitive and threatened and endangered species, but may include habitat information on other wildlife species as well. In addition, State and Federal agencies have been consulted by Metro staff. Either State and Federal agency information has been incorporated into Metro's data and inventory or, State agencies do not have this information for the metropolitan area and Metro staff assert that they have used a sound scientific approach and applicable data in a manner consistent with State Goal 5 to identify wildlife habitat. Finally, the Home Builder comment pertains to a State safe harbor approach and Metro has pursued the other State approved option which is the standard inventory approach.

Other opposition includes some landowners who may be concerned about the impact of this work on the value and use of their land. Until Metro completes the second step (which includes consideration of the economic, social, environmental and energy consequences of allowing, limiting or prohibiting conflicting uses) and creates the program step (which could include acquisition, education, incentives and regulations), it is not possible to determine what change, if any, the final Metro decision may have on an area or site. If regulations alone are the only approach, then it is likely that some property owners will oppose the final program decision. If acquisition, incentive or education approaches are used, it is likely that very little, if any opposition will be heard from property owners, but those most concerned with protecting these resources may oppose a voluntary only approach. What combination of these approaches, regulatory and voluntary would be optimal, would be best considered after the ESEE analysis and after program options are designed.

During earlier discussions, a wide range of interests and perspectives, from the development community to local governments to the environmental community have urged that wildlife habitat be made a part of Metro's fish and wildlife habitat protection plan. The reasons for this range from an interest in an integrated approach to the legal, administrative, and outreach costs of doing wildlife habitat separate from riparian corridors.

2. Legal Antecedents

There is a myriad of legislation that relates to this resolution. It includes Federal, State, regional and local laws. At the Federal level there is the Clean Water Act and the Endangered Species Act. At the State level there are State planning laws, goals and administrative rules (especially OAR chapter 660 and sections 660-023-090 and 660-023-110). At the regional level there is the Regional Framework Plan, the Urban Growth Management Functional Plan and resolution 01-3141C. Local governments within the region have also enacted a range of local policies and regulations and these are documented in the draft Local Plan Analysis, Metro, 2002.

3. Anticipated Effects
The anticipated effect of the adoption of this ordinance is to begin the analysis of the economic, social, environmental, and energy consequences of allowing, limiting or prohibiting uses that conflict with the protection of those areas determined to be regionally significant wildlife habitat.

4. **Budget Impacts**
As noted above, the approach that the Metro Council may direct can be considered after the Council considers the economic, social, environmental and energy consequences and after program alternatives are created. The cost to implement this legislation is not possible to estimate until these steps have been taken.

RECOMMENDED ACTION
Adopt Resolution 02-3177 and direct staff which option to follow for determining regionally significant wildlife habitat for a forthcoming analysis of the economic, social, environmental and energy consequences of allowing, limiting or prohibiting conflicting uses.