DAVID EVANS
AND ASSOCIATES INC.

PROJECT MEMORANDUM

DATE:	June 3, 2013
TO:	South Cooper Mountain Technical Advisory Committee
CC:	South Cooper Mountain Project Management Team
FROM:	Ethan Rosenthal and Phil Rickus
SUBJECT:	**DRAFT Natural Resources Memorandum**
PROJECT:	**South Cooper Mountain Concept and Community Plans**
	City of Beaverton #2752-13B
DEA PROJECT NO.	APGI0000-0002

Executive Summary

This report is intended to provide a planning level review of natural resources within the South Cooper Mountain Concept Plan project study area. Specifically, this report covers wetlands and waterways, riparian areas, and upland wildlife habitats. The goal of this report is to provide project planners with the ecological context to support concept and community plan development for the study area. A Local Wetland Inventory has also been conducted for the portion of the study area that was recently annexed to the City of Beaverton (described below as the South Cooper Mountain Annexation Area). The detailed Local Wetland Inventory documentation has been prepared as a separate report; however, the mapping results and general findings are included in this report.

The South Cooper Mountain Concept Plan study area is divided into three adjacent subareas (see Executive Summary Figure 1) based on jurisdiction and planning context: North Cooper Mountain, which is in Washington County jurisdiction, and has been within the urban growth boundary since 2002; the Urban Reserve Area, which is in County jurisdiction and outside the Urban Growth Boundary; and South Cooper Mountain Annexation Area, which was brought into the Urban Growth Boundary in 2011 and is in City of Beaverton jurisdiction. Each area has features in common as well as its own distinct character.

North Cooper Mountain lies along the ridge top of Cooper Mountain. Current land use consists primarily of suburban large lot single family residences. Vegetation consists of lawns and suburban landscaping, and remnant tree groves.

Cooper Mountain Nature Park is a key natural resource feature within the study area. The entrance and northern extent of Cooper Mountain Nature Park is located in the North Cooper Mountain area, but the park and associated habitats extend south into the Urban Reserve Area. The park contains a host of native plant communities, including Douglas fir forest, Oregon oak and madrone woodlands and prairie. Restoring and enhancing oak and prairie habitat is one of the primary management goals for the park. Additional management goals include: improving riparian corridors, enhancing park access through land acquisition and securing trail connections between major publicly-owned properties, and keeping important wildlife corridors and buffers intact.

Slopes steepen within the Urban Reserve Area, with several drainages flowing generally from northeast to southwest. These drainages typically occur in steep, forested, V-shaped ravines. McKernon Creek is the principle drainage, but the headwater of Summer Creek is also located in the Urban Reserve Area and drains the eastern most portion of the Urban Reserve Area to the east. The majority of the Urban Reserve Area consists of rural land uses, primarily pasture and more intensive agricultural production including annual crops, vineyards, and orchards. Some wood lots and native forest are also present.

Slopes in the South Cooper Mountain Annexation Area tend to be gentler than in the Urban Reserve Area. The majority of the land drains to the south, with a portion of the area draining to the southeast. Land use is predominantly agricultural, with a mix of annual crop production, pasture, orchards, and viticulture. A few small remnant patches of native forest habitat occur within the area. The following provides a brief summary of existing habitats within the study area, and Executive Summary Figures 1 and 2 show the resources.

Summary of Results

Streams, Wetlands, and Riparian Areas

Roughly 9.6 miles of streams occur within the project area. Streams are fairly small, of relatively high gradient, and upper reaches likely only flow seasonally. Portions of streams have also been rerouted, piped, and/or ditched. All mapped drainages, including in-line ponds[1], are assumed to be subject to state and federal regulations.

The overall project area contains relatively few wetlands, with most wetland acreage located in the South Cooper Mountain Annexation Area where roughly 19 acres of wetlands and probable wetlands were identified. Three study area wetlands were found to meet locally significant wetland criteria[2]. The others did not meet these criteria due to their small size and/or highly degraded conditions. The majority of wetland acreage would be classified as a slope wetland under the HGM classification system, which means the principle source of hydrology to these wetlands comes from hill side seepage or shallow subsurface flow. Several depressional wetlands are also present, resulting from excavation activities.

Wetland plant communities typically consist of the forested or emergent classes according to the USFWS wetland classification system (Cowardin 1979). Emergent wet prairie wetland is found within the Cooper Mountain Nature Park, but some portions of this wetland class have recently been planted to a scrub-shrub community. Agricultural wetlands are also present in areas of annual crop production. Some agricultural fields use tile drains to reduce saturated soil conditions, which results in either a reduction of wetland acreage or complete removal of wetland conditions relative to historic conditions.

[1] An in-line pond is created by blocking flows within the stream channel
[2] Those wetland sites that provide functions or exhibit characteristics that are pertinent to community planning decisions made at a local scale, for example within a UGB. These wetlands typically contain a locally unique native plant community and perform at least one of the following functions: wildlife habitat, fish habitat, water quality functions, or hydrological control functions.

The steeper, forested riparian areas within the study area generally appear to have good vegetative cover, whereas riparian areas in flatter areas – which are more common in the agricultural areas in the South Cooper Mountain Annexation Area – tend to have had greater disturbance to natural vegetation. Development activities in riparian areas up to a certain distance from the water body are typically regulated and protected for water quality and/or habitat protection purposes by local codes. The Urban Reserve Area contains the greatest acreage of high quality riparian habitat where steep ravines remain forested.

Upland Habitats

The Urban Reserve Area contains the greatest acreage of high quality upland habitat. Much of it occurs within the Cooper Mountain Nature Park; however, there is considerable acreage of high quality habitat in private ownership, too. North Cooper Mountain contains high quality habitats within portions of the nature park and adjacent to the park. In addition, the numerous small groves of large conifer trees scattered among the residential units provide valuable habitat, particularly for bird species. High quality habitat is fairly limited in the South Cooper Mountain Annexation Area, with the exception of several remnant patches of upland forest. These remnant patches connect with riparian and wetland forest areas and are therefore of particularly high value for the area. No upland habitat on private land in the study area is currently protected by local regulations; however, Beaverton's tree and vegetation protections will apply to the SCMAA, and the City can designate high quality areas as Significant Natural Resource Areas as a part of this project.

Key Focal Habitat Conservation Areas

Two key focal habitat conservations areas were identified within the overall study area (see Figure 4). The first focal area includes Cooper Mountain Nature Park and adjacent high value habitats located in the NCM and URA. This includes areas that Metro has identified, in general terms, as areas for potential future park expansion. Portions of this focal area that are likely to remain in private ownership could potentially be included in County Habitat Benefit Areas or SNRA programs.

The second focal area is located in the SCMAA and consists of a chain of linked upland, riparian forest and wetland areas. This area contains a relatively large intact upland forest patch that provides native structure, proximity to a large wetland complex, and a wildlife migration corridor within an otherwise agricultural context. Human disturbance in the parcel appears to be relatively minimal. The upland forest connects with adjacent riparian and wetland forest communities. The overall forested area displayed good migratory bird diversity and diverse vegetation with limited invasive species.

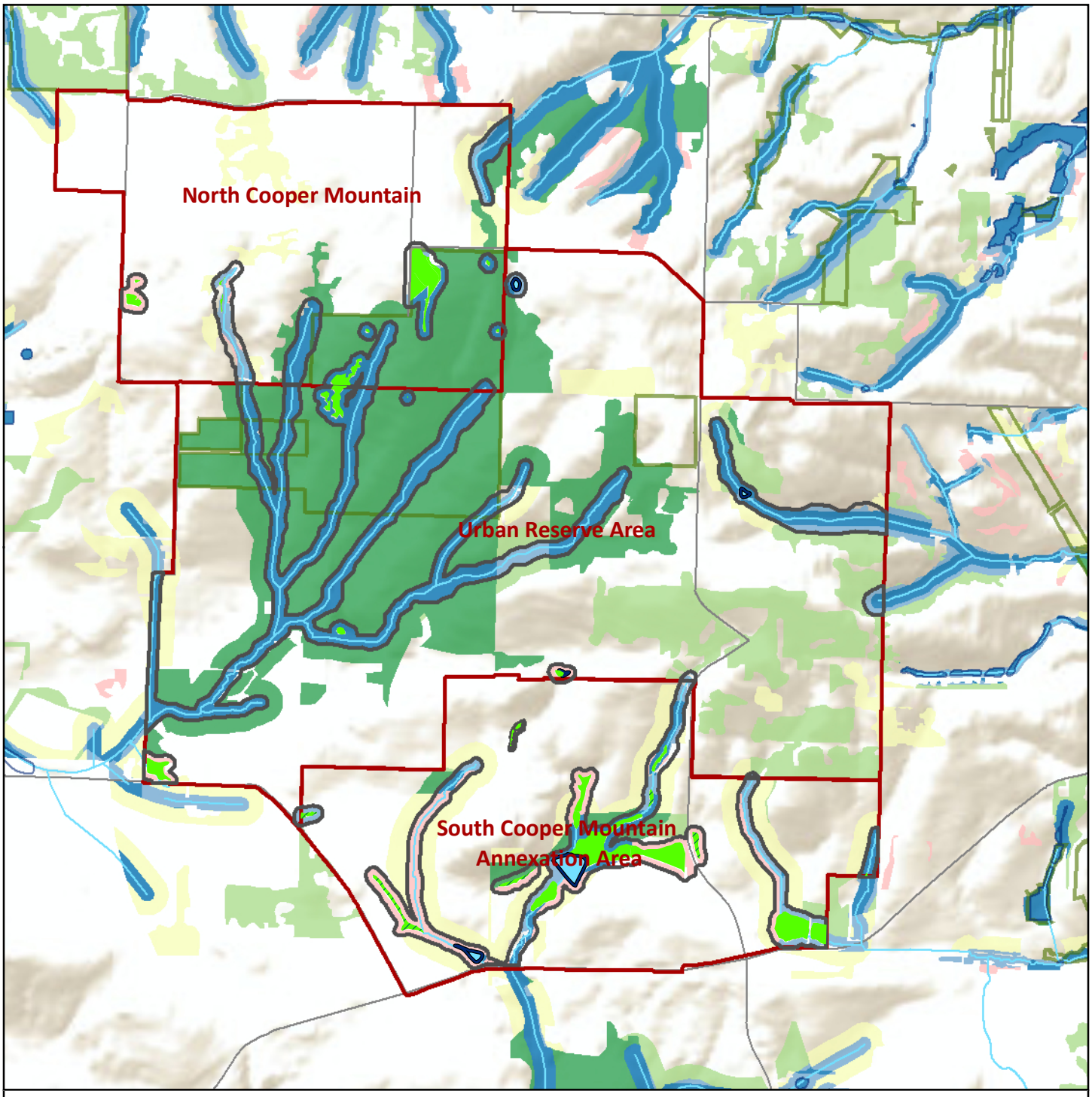
Opportunities

Review of project area natural resources and local and regional conservation goals resulted in a list of potential opportunities to protect and improve ecological conditions within the project study area. This list is provided below and is also displayed, in part, in Figure 2.

List of Potential Ecological Protection and Enhancement Opportunities:

- Cooper Mountain Nature Park expansion
- Protect and improve wildlife corridors
  - Upgrade road crossings when conducting road improvements and as appropriate based on site specific evaluation (i.e., fish friendly and wildlife passable culverts/bridges, etc.)
  - Limit number of new road crossings and design to minimize impacts.
  - Protect and improve connections between high quality habitats (locations shown on Figure 2 are approximate only and not defined by regulatory code. They are provided for planning discussion purposes).
- Prioritize protection of Oak woodland and remnant large oak trees.
- Remove in-line irrigation/stock water ponds, restoring to natural stream condition. This will reduce water quality problems to downstream waters, particularly elevated water temperatures.
- Realign stream sections back to natural state, away from roadways.
- Restore agricultural wetlands to natural conditions either as voluntary restoration opportunity or as wetland mitigation opportunity.
- Expand opportunities for community to connect with nature (i.e., bike/ped trails)
- Unavoidable impacts to streams and riparian corridors should be placed in low quality riparian corridors before looking to place them in higher quality corridors.
- Promote voluntary conservation measures and integration of built and natural systems
  - Utilize native habitats of Cooper Mountain Nature Park as a template to guide planting schemes in developed areas.
  - Blend storm water management with natural systems
  - Develop conservation easement or lease programs to protect upland habitats prior to and post-development.

The primary opportunities in the Urban Reserve Area are preservation and protection of existing high value habitats; however, enhancement opportunities also exist. The South Cooper Mountain Annexation Area provides the greatest opportunity for restoration because it contains the highest density of wetlands and larger waterways, and is currently dominated by agriculture rather than residential or protected natural areas. Primary opportunities include protecting and enhancing native vegetation (in wetlands, riparian areas, and wildlife corridors) and enhancing stream function for fish. The lower reaches of McKernon Creek within the project study area are likely to provide the greatest opportunity for native fish as a result of channel size and perennial flow. There are very limited opportunities for restoration in North Cooper Mountain but efforts should focus on retaining and restoring habitat connectivity.



Riparian and Upland Habitats

Legend

Riparian Wildlife Habitat Quality

- Class I
- Class II
- Class III

Upland Wildlife Habitat Quality

- Class A
- Class B
- Class C

- Project Study Area
- CWS Vegetated Corridor
- Open Water
- Probable Wetland
- Wetland
- Streams
- Parks
- Arterials

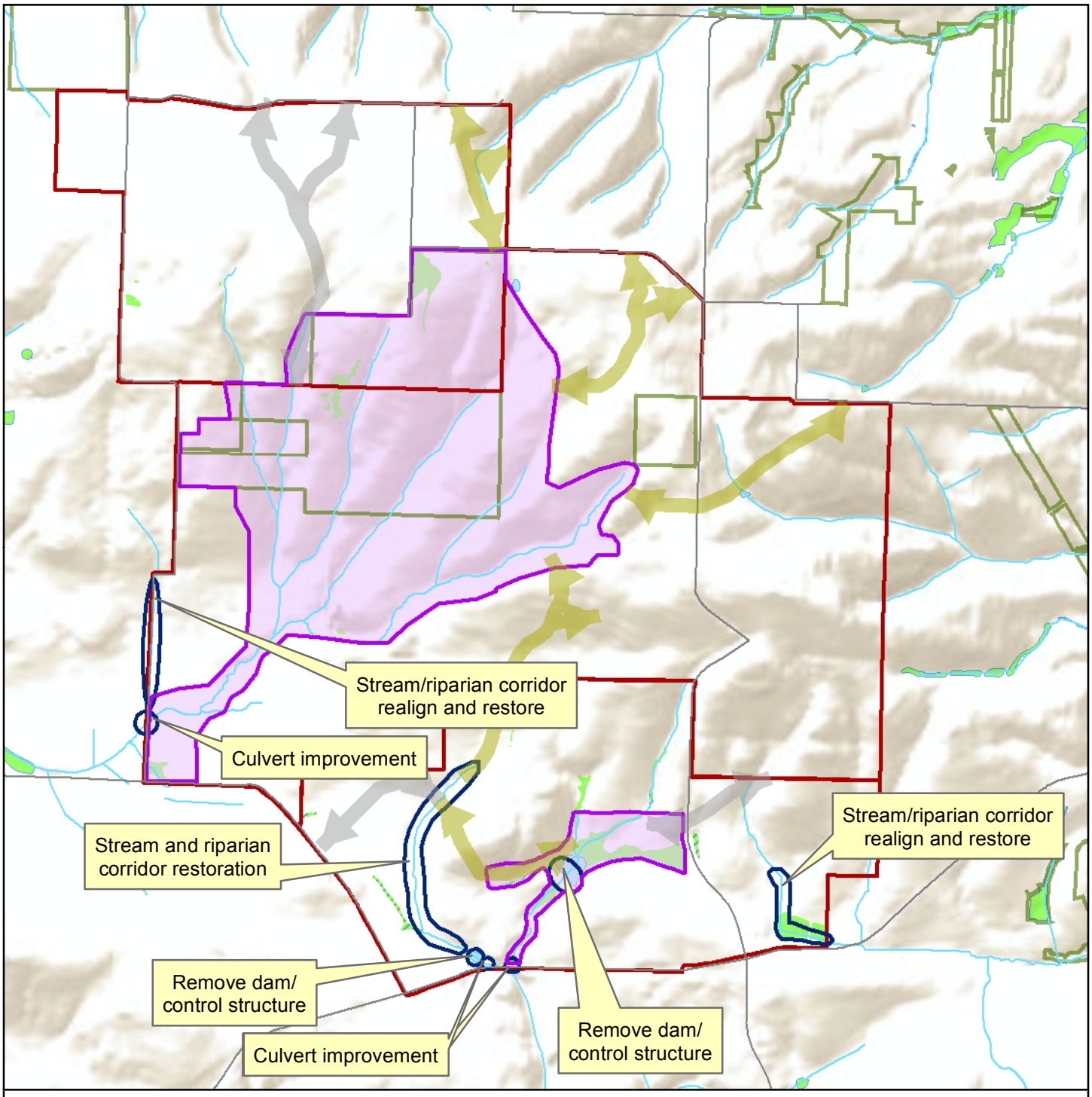
Prepared By: David Evans and Associates, Inc.

Date: 5/28/2013

Coordinate System: NAD 1983 HARN StatePlane Oregon North FIPS 3601 Feet Intl

NORTH

0 1,000 2,000 4,000 Feet



Potential Protection and Enhancement Opportunities*

Natural Resource Opportunities

- Opportunities as labeled
- Focal Habitat Conservation Area
- South Cooper Mountain Subareas
- Type 1 Wildlife Corridor
- Type 2 Wildlife Corridor
- Wetland
- Probable Wetland
- Open Water
- Streams
- Park
- Arterials

* Natural resource opportunities and potential wildlife corridors illustrated are conceptual only. Protection and enhancement activities specifically required by current regulatory programs have not been highlighted, but typically include avoidance and minimization of impacts to wetlands, streams, and vegetated buffer areas. Impacts to these features would require mitigation. Additionally, Clean Water Services requires all "degraded" vegetated buffer areas on a parcel to be improved as a condition of issuing development permits, regardless of whether the buffer areas are impacted.

Prepared By: David Evans and Associates, Inc.

Date: 5/28/2013

Coordinate System: NAD 1983 HARN StatePlane Oregon North FIPS 3601 Feet Intl

NORTH

0 1,000 2,000 4,000

Feet

Table of Contents

Table of Tables

Project Overview

The South Cooper Mountain Concept Plan will establish a vision that serves as a long-term guide for future growth and development of the South Cooper Mountain area. The Concept Planning process provides an opportunity to identify long-term needs of the area and proactively address future challenges. This process will recognize the unique needs of the three distinct subareas (North Cooper Mountain (NCM), the Urban Reserve Area (URA), and the South Cooper Mountain Annexation Area (SCMAA)) while developing a holistic understanding of how the three areas could integrate and grow sustainably. The concept plan area totals 2,290 acres.

Community plans identifying appropriate comprehensive plan and zoning designations that implement the overall vision in the concept plan will be developed for the areas that are currently within the urban growth boundary (UGB). The South Cooper Mountain Annexation Area Community Plan will designate specific areas for a range of housing types and densities, commercial and civic uses, and parks; preserve natural resources; provide for green infrastructure; and plan for new utilities, streets, trails and paths. The North Cooper Mountain Community Plan will reflect the needs of current residents in this already developed area, and result in an appropriate plan for the area's future. Planning for the URA will guide how best to protect natural areas and Cooper Mountain Nature Park, where future urban development may occur, and where connecting streets, water lines, and other utilities should be located.
A Finance Plan will identify realistic strategies for paying for infrastructure to serve the area.

The South Cooper Mountain Concept Planning study area consists of three adjacent subareas (Appendix A-Figure 1). These subareas have been divided based on jurisdiction and planning context as noted in Table 1.

Table 1: Project Study Area

Study Area	Acres	Planning Jurisdiction	UGB Designation
North Cooper Mountain	510	Washington County	Annexed into UGB in 2002
Urban Reserve Area	1,232	Washington County	Urban Reserve, not in UGB
South Cooper Mountain Annexation Area	544	City of Beaverton	Annexed into UGB in 2011

Report Purpose

This report is intended to provide a planning level review of natural resources within the project study area. Specifically, this report covers wetlands and waterways, riparian areas, and upland wildlife habitats. The goal of this report is to provide project planners with the ecological context to support concept and community plan development for the study area. A Local Wetland Inventory (LWI) has also been conducted for the SCMAA. The detailed LWI documentation has been prepared as a separate report; however, the mapping results and general findings are included in this report.

Documentation of natural resources is intended to support Oregon State Goal 5 compliance and associated Metro Titles 3 and 13. Washington County (County) and City of Beaverton (City) planning codes have also been taken into consideration. A discussion of regulatory considerations for the various habitat types reviewed for the project is provided in the Regulatory Context section of this report.

Landscape Setting and Land Use

The project study area primarily consists of rural lands that are bordered to the east and north by suburban development. An exception to this is the NCM area, in which current land use primarily consists of suburban large lot single family residences. Areas to the south and west of the overall study area consist of rural landscape.

The NCM area is situated along the top of Cooper Mountain. Topography in this area is typically gently rolling, with slopes gradually steepening to the north and south to each side of the ridge top. The headwaters of several project area streams are located in the NCM area. Vegetation consists of lawns and suburban landscaping, and remnant tree groves. The entrance and northern extent of Cooper Mountain Nature Park is located in the NCM area. The park contains a host of native plant communities, including Douglas fir forest, Oregon oak and madrone woodlands and prairie. The park and associated habitats extend south into the URA.

Slopes steepen within the URA, with several drainages flowing generally from northeast to southwest. These drainages typically occur in steep forested V-shaped ravines, including McKernon Creek, which is the principle drainage. The headwater of Summer Creek is located east of 175th Avenue and drains the eastern most portion of the URA to the east. Moderately sloping terraces occur between the ravines. These land surfaces typically consist of pasture and more intensive agricultural production including annual crops, vineyards, and orchards. Some wood lots and native forest also occurs on the terrace surfaces. The majority of Cooper Mountain Nature Park is located within the URA.

Cooper Mountain Nature Park is a key natural resource feature within the overall project study area. As previously noted the park contains a diverse mix of native habitats and considerable restoration work has been – and continues to be – carried out. The park contains the regionally rare upland prairie and oak and madrone woodland habitat, which supports what may be the largest remaining population of the state endangered pale larkspur (*Delphinium leucophaeum*). Park habitats also support populations of sensitive species including meadow checkermallow (*Sidalcea campestris*), breeding populations of Northern red-legged frog (*Rana aurora aurora*), and Western gray squirrel (*Sciurus griseus*). Restoring and enhancing oak and prairie habitat is one of the primary management goals for the park. Additional management goals include:

improving riparian corridors, enhancing park access through land acquisition and securing trail connections between major publicly-owned properties, and keeping important wildlife corridors and buffers intact.

Slopes in the SCMAA tend to be gentler than in the URA. The majority of the land drains to the south, with a portion of the area draining to the southeast. Land use is predominantly agricultural, with a mix of annual crop production, pasture, orchards, and viticulture. Several small remnant patches of native forest habitat occur within the area, including mixed upland fir-deciduous forest, Oregon ash dominated wetland forest, and patches of Oregon oak forest. Several fir dominated lots were being logged or had recently been logged as observed during the March 2013 site visits.

Methods

Resource review included a review of project area background materials, and drive by and on-site field reconnaissance visits. Field work was conducted during the week of March 18, 2013.

Preliminary Resource Review

Reference materials were reviewed prior to the field investigation to provide information regarding the possible presence of wetlands, water features, hydric soils, wetland hydrology, site topography, and habitat conditions. The materials reviewed included:

- Clean Water Services (CWS) GIS streams layer shapefile (2013).
- Environmental Systems Research Institute (ESRI) National Geographic World Map for ArcGIS (2013)
- ESRI ArcGIS OnlineWorld Imagery aerial photo imagery for ArcGIS (2009)
- Metro Regional Land Information System (RLIS) GIS wetlands layer, hydric soils layer, and GIS streams layer (2013).
- Metro Technical Report for Fish and Wildlife Habitat (April 2005)
- Metro Cooper Mountain Natural Resource Management Plan (November 2005)
- Natural Resources Conservation Service (NRCS) Soil Survey Geographic Database for Washington County, Oregon (2010).
- Oregon Biodiversity Information Center (ORBIC) Oregon Wetlands Cover, version 20091030 (2009)
- Oregon Department of Fish and Wildlife (ODFW) Fish distribution GIS layers (2013)
- Shapiro & Associates, Inc. City of Beaverton Local Wetland Inventory and GIS data (2000)
- U.S. Fish and Wildlife Service. National Wetland Inventory Wetland Mapper (2013)
- U.S. Geological Survey (USGS) National Hydrographic Database National Hydrographic Database (NHD) GIS streams layer (2013)
- City of Beaverton January 2013 LIDAR[3] derived contours (January 2013)
- City of Beaverton January 2013 high resolution aerial photography (January 2013)

[3] LIDAR stands for Light Detection and Ranging, a laser-based contour mapping technology.

Resource-Specific Methods

The intensity of review and mapping effort of project natural resources was greatest for the SCMAA, where property access was available for roughly one third of the area. A Local Wetland Inventory (LWI) was also conducted for the SCMAA as part of this project. Site conditions in the NCM and URA areas were evaluated based on a combination of review from publicly accessible vantage points, aerial photography, and LIDAR.

Water Bodies

The Metro-RLIS GIS streams layer was used as a starting point for mapping of project area streams. All RLIS mapped streams were adjusted to fit the more detailed contours derived from the January 2013 LIDAR data. The 2013 aerial photography was also used to assess stream location and possible stream end points (i.e., upper extent of stream and/or culverted or piped stream sections). For SCMAA properties with site access, points along stream center lines within forested areas were identified by use of a Trimble GeoXH Global Positioning System (GPS). This helped improve accuracy in locations of dense tree canopy but shallow grades where the LIDAR data was not as helpful in determining stream location.

Wetlands

The Metro-RLIS wetlands layer and LWI-DSL layer provided by the City were merged and used as a starting point for mapping wetland resources within the project study area. Obvious wetland boundary adjustments were made based on review of the 2013 aerial photography and roadside reconnaissance. For example, wetland polygons[4] that clearly overlapped with developed areas were reduced in size so that only the undeveloped portion of the polygon remained. All wetlands were assigned a Cowardin class (i.e., vegetation type such as forested, emergent, etc.) and a hydrogeomorphic (HGM) class (i.e., slope, depression, etc.). Assigning of Cowardin and HGM classes was typically based on review of aerial photo and LIDAR contours, or field verification where possible.

Local Wetland Inventory

In addition to the above general methods that were used for wetlands throughout the project study area, a LWI was conducted for the SCMAA. The LWI followed the Oregon Department of State Lands (DSL) rules, specifically Oregon Administrative Rule (OAR) 141-086. All wetlands one half acre or larger were mapped as wetlands, while smaller wetlands were mapped as “probable wetlands.” Although DSL only requires that probable wetlands be mapped as point features (meaning that a single point would represent the wetland), for this project, these wetlands were mapped as polygons. This was done to aid planning efforts, as these features will likely need to be avoided or encroachment minimized. Mapping these features as polygons also enables creation of buffers (i.e., Clean Water Services (CWS) Vegetated Corridors), which will also need to be avoided.

[4] In GIS terms, “polygon” refers to a two-dimensional shape used to represent a certain feature such as a wetland.

Where site access was available within the SCMAA LWI area, sample plots documenting typical conditions for the respective wetlands were completed and boundaries mapped using GPS. Data collection and wetland boundary delineation followed the Level 2 Routine Delineation Method described in the U.S. Army Corps of Engineers (Corps) Wetlands Delineation Manual (Environmental Laboratory 1987) and further supported by the Western Mountains, Valleys, and Coast Region (Corps 2010) regional supplement (Supplement). This method requires the simultaneous presence of hydrophytic vegetation, hydric soils, and positive wetland hydrology in wetland delineations.

Wetland functions were evaluated for wetlands greater than one half acre using the Oregon Freshwater Wetland Assessment Method (OFWAM). OFWAM results were used to determine if any of the SCMAA wetlands qualify as "locally significant wetlands" in accordance with criteria set forth in OAR 141-086-0350. Following DSL guidance, probable wetlands were not included in the evaluation of locally significant wetlands.

Riparian Habitats

In the context of this project, the term "riparian area" refers to the land surrounding wetlands, streams, and other water bodies. Typically, a buffer area of a certain distance from the water body is regulated and protected for water quality and/or habitat protection purposes. These buffer areas are typically determined through various land use codes, with buffer widths determined by mathematical formula taking into account things such as wetland size, stream type, drainage basin area, and slopes. Beaverton, the CWS, and Metro all have regulations defining these areas. Generally speaking, the typical buffer width defined by these codes is 50 feet, with buffer width extending to a maximum of 200 feet in areas of steep slopes (i.e., 25 percent or greater).

Riparian resources throughout the project study area were mapped following CWS standards for determining "vegetated corridor" buffer widths as described in *Design and Construction Standards for Sanitary Sewer and Surface Water Management* (CWS 2007). However, CWS guidance requires that a determination of perennial or intermittent streams occur during the summer dry season and that two site visits, one month apart, are required to confirm that a stream flows intermittently. Because site visits were conducted in March a determination of perennial or intermittent could not be accurately performed. As a result, all study area streams were assumed to be perennial for the purposes of determining the vegetated corridor. CWS currently does not have jurisdiction in the NCM and URA; however, they will have jurisdiction in the future if the UGB is extended to include these areas. Currently-adopted Washington County Significant Natural Resource Areas (SNRAs) apply to these areas CWS vegetated corridors are presumed to cover an equal or greater area than the County SNRAs.

An assessment of riparian corridor quality was based on Metro-Title 13 habitat mapping, which was revised based on a combination of site reconnaissance and aerial photo review. Metro's 2005 inventory of regionally significant riparian corridors and wildlife habitat provided the technical basis and starting point for this project. By starting with Metro's inventory, we were able to incorporate and build on the extensive research, technical analysis, and public review that shaped the regional inventory. David Evans and Associates (DEA) updated riparian habitat mapping when the updated stream locations created gaps and when habitat appeared to have changed since previous mapping efforts were conducted.

Metro classifies riparian habitats into Classes I, II, or III. Class I habitats are the highest quality habitats, with progressively lower quality habitat provided by Classes II and III. According to the Metro method, these scores are based on the ability of the riparian habitat to provide the following important ecological functions:

- Microclimate and shade
- Bank function and control of sediments, nutrients and pollutants
- Streamflow moderation and flood storage
- Organic inputs and food web
- Large wood and channel dynamics
- Wildlife habitat/corridors

Upland Habitats

DEA mapped upland wildlife habitat using Metro-Title 13 habitat mapping. As with Metro's inventory, DEA focused on forest vegetation, which provides critical functions for native wildlife in the Willamette Valley, including breeding, foraging, dispersal, and wintering habitat. Grassland and pasture habitats were included only if they were found to contain remnant native grassland or prairie (no such habitats were found outside the Cooper Mountain Nature Park). Orchards, hedgerows and small patches of forested habitat were not included unless they were found to contain native oak habitat or be especially valuable for wildlife migration (primarily due to location). Similar to riparian habitats, upland habitat mapping was revised based on site reconnaissance and aerial photo review. Forested areas that had been cut since the 2005 mapping were generally removed from mapping, as were recent residential development areas.

The wildlife habitat mapping was based on the following assumptions:

- Large habitat patches are more valuable than small patches
- Interior habitat is more important to at-risk wildlife species than edge habitat
- Connectivity and proximity to other habitat patches is important
- Connectivity and proximity to water is important
- Unique or at-risk habitats deserve special consideration

Based on these assumptions, Metro classifies upland habitats into Classes A, B, or C. Class A habitats are the highest quality habitats (those that best meet the above assumptions), with progressively lower quality habitat provided by Classes B and C. Following Metro mapping methods, all areas within 300 feet of streams or wetlands were mapped as well, whether they currently contain native habitat (Class A or B), or are occupied by agricultural lands or non-native grasslands (Class C).

Wildlife Habitat Corridors

Potential wildlife habitat corridors were developed based on site reconnaissance and aerial photo review. The goal of the corridors is to connect high value habitats within the project study area with those outside of the study area. Corridors were divided into two types as follows:

- Type 1 Corridor: Connects two high value habitat types together. High value habitats include: Upland Habitat Class A, Riparian Habitat Classes I and II, proposed key focal habitat conservation areas, and currently protected areas.
- Type 2 Corridor: Connects one high value habitat type (as defined above) to a lower value habitat type (i.e., Upland Habitat Classes B and C, Riparian Habitat Class III)

Generally speaking, the mapped corridors provide general locations for potential wildlife corridors and are intended to support concept planning discussions. The corridors were not developed based on regulatory code as there is currently no regulatory program that specifically defines and regulates wildlife corridors within the project area.

Regulatory Context

Streams, Water Bodies, and Wetlands

All mapped drainages, including in-line ponds[5], are assumed to be regulated by the U.S. Army Corps of Engineers (USACE) and U.S. Environmental Protection Agency (EPA) under Section 404 of the Clean Water Act and by the DSL under state Removal-Fill law. Mapped wetlands would also be regulated by these agencies; however, the USACE does not take jurisdiction over isolated wetlands, such as some of the small depressional wetlands not connected to streams. Small irrigation or stock water ponds clearly dug from uplands and not connected to jurisdictional waters may be exempt from both DSL and USACE jurisdiction. Local agencies, including CWS, the City, and County also have land use codes protecting streams, water bodies, and wetland resources. Avoidance of impacts is first priority. Unavoidable impacts to these resources typically require mitigation.

Riparian Habitats

For this project, riparian area boundaries have been defined in accordance with CWS vegetated corridor width determination methods. CWS currently has or will soon have jurisdiction within the SCMAA and therefore mapped vegetated corridors in this study area are assumed to be jurisdictional resources that have development restrictions. CWS requires all degraded vegetated corridors on a parcel to be improved as a condition of issuing development permits regardless if the vegetated corridor is impacted. Additionally, mitigation is typically required for unavoidable impacts.

[5] An in-line pond is created by blocking flows within the stream channel.

CWS currently does not have jurisdiction within the NCM and URA and likely will not have jurisdiction in these areas for some time. Therefore, CWS vegetated corridors mapped in these study areas are for general planning purposes but currently do not carry CWS development restrictions. However, currently adopted County SNRA mapping does apply. County mapping does not specifically show mapping of riparian communities in these areas; however, it does show “Water areas, wetlands, and fish and wildlife habitat” SNRA mapped along the various stream corridors. This mapping appears to be limited to the ravine bottoms and does not extend up the slopes like the CWS vegetated corridors.

The County and City were both partner to the Tualatin Basin Natural Resource Coordinating Committee. Utilizing Metro habitat mapping, this group developed a program to protect, conserve and restore Class I and II riparian habitats and Class A upland habitats, referred to as Habitat Benefit Areas (HBAs), as a voluntary program. The City has also chosen to include Class III riparian habitat as HBA. HBA areas are intended to be the area beyond the areas that are managed or protected through other programs such as City and County Goal five SNRAs and CWS Vegetated Corridors.

Upland Habitats

The City protects upland habitats through designation of high quality areas, typically native forest, as a SNRA. The City’s tree and vegetation protections also support protection of forested upland habitats. These protections would apply to the SCMAA. City SNRA’s will be developed as a part of the South Cooper Concept Planning project.

The County also protects upland habitats through designation of SNRAs. However, no SNRAs covering upland resources are mapped for the NCM and URA in the County’s adopted SNRA mapping.

As noted in the riparian area discussion, Class A upland HBAs are protected through voluntary means. These include habitat friendly development practices, but not necessarily complete avoidance of impacts to these resources.

Wildlife Corridors and Key Focal Habitat Conservation Areas

These areas were identified to support integrating local and regional conservation planning efforts with the South Cooper Mountain Concept Planning project. Although these areas may include habitats containing existing protections as noted above, the designation of “wildlife corridor” or “key focal habitat conservation areas” does not itself provide any regulatory protection. Protections, through regulatory or voluntary programs, could be identified as part of the concept and community plan development process, which will include stakeholder involvement.

Existing Conditions

Drainage Basins and Streams

Roughly 9.6 miles of streams occur within the project area. The breakdown between stream type (perennial vs. intermittent) is currently unknown and due to time of field work (late winter/early spring) and limited site access a determination of stream type was not conducted. However, many of the project streams, particularly the upper reaches, are likely to be intermittent, with lower reaches flowing perennially. Table 2 provides a summary of project area drainage basins and associated streams. These are also displayed in Figure 2 of Appendix A.

Based on a review of ODFW fish distribution maps, project area streams do not support populations of anadromous fish, such as salmon and steelhead trout. Likewise, there is limited habitat opportunity for native fish. Streams are fairly small (two to three feet wide by four to 12 inches deep), of relatively high gradient, and upper reaches likely only flow seasonally. Portions of streams have also been rerouted, piped, and/or ditched. The lower reaches of McKernon Creek, within the project study area, are likely to provide the greatest opportunity for native fish as a result of channel size and consistency of flows.

Although project area streams may not provide a lot of on-site habitat opportunity for native fish populations, for the reasons described above, they do likely provide other important functions. These include habitat for native amphibians, export of course organic matter to downstream fish bearing waters, water source for native wildlife, and macro invertebrate habitat.

Those streams with the most intact riparian corridors are likely to be in the best condition. For example, habitat conditions within McKernon Creek, which primarily flows through a deep forested ravine, should have greater bank and sediment stability, recruitment of woody debris and coarse organic materials, and greater overall habitat complexity compared to Stream TR-1a, which is a ditched stream channel running through a plowed field.

Table 2: Drainage Basins and Streams

Clean Water Services Stream Shed[1]	Clean Water Services Basin ID[2]	Water Bodies[3]	Water Body ID[4]
	LW	McKernon Creek	MK
	LW	Unnamed trib to McKernon Creek-1	MK-1
	LW	Unnamed trib to McKernon Creek-2	MK-2
	LW	Unnamed trib to McKernon Creek-3	MK-3
Jackson/Lindow	LW	Unnamed trib to McKernon Creek-4	MK-4
	LW	Unnamed trib to MK-4	MK-4a
	LW	Unnamed trib to MK-4a	MK-4b
	LW	Unnamed trib to McKernon Creek-5	MK-5
	LW	Unnamed trib to McKernon Creek-6	MK-6

Clean Water Services Stream Shed[1]	Clean Water Services Basin ID[2]	Water Bodies[3]	Water Body ID[4]
Summer Creek	SM7W4	Summer Creek	SM
	SM7W4	Unnamed trib to Summer Creek	SM-1
	SM7W3S	No streams mapped in study area	--
	SMC	*Unnamed tributary	SMC
	SMC	*Unnamed tributary to SMC	SMC-1
Unnamed Tributary to Tualatin River	TR06.5	*Unnamed trib to Tualatin River	TR-1
	TR06.5	*Unnamed trib to TR-1	TR-1a
	TR06.5	*Unnamed trib to TR-1	TR-1b
Johnson Creek South	JSF	Unnamed tributary	JSF-1
	JSE	No streams mapped in study area	--
	JSCS	No streams mapped in study area	--
Cross Creek	CR4E3	No streams mapped in study area	--
	CR9S	No streams mapped in study area	--
	CRB	No streams mapped in study area	--
Butternut Creek	BN9S3E	No streams mapped in study area	--

[1] Data from "CWS_SmallSubBasins" GIS shapefile, "STREAMSHED" data field
[2] Data from "CWS_SmallSubBasins" GIS shapefile, "IDALL" data field
[4] Water body IDs assigned by SCM project
*Occurs within SCM Annexation Area LWI study area

Wetlands

The overall project area contains relatively few wetlands, with most wetland acreage located in the SCMAA. Table 3 provides a summary of wetland acreage across the three study areas. Project area wetlands are displayed in Figure 2 of Appendix A. The majority of wetland acreage would be classified as a slope wetland under the HGM classification system, which means the principle source of hydrology to these wetlands comes from hill side seepage or shallow subsurface flow. Several depressional wetlands are also present, resulting from excavation activities.

Wetland plant communities typically consist of the forested or emergent classes according to the USFWS classification system (Cowardin 1979). Emergent wet prairie wetland is found within the Cooper Mountain Nature Park, with portions having recently been planted to a scrub-shrub community. Agricultural wetlands are also present and occur in areas of annual crop production. Some agricultural fields use tile drains to reduce saturated soil conditions, which results in either a reduction of wetland acreage or complete removal of wetland conditions relative to historic conditions. Additional wetland plant community details are provided below.

Table 3: Summary of Wetlands by Study Area

Study Area	Wetlands acres[1]
North Cooper Mountain	6.69
Urban Reserve Area	3.22
South Cooper Mountain Annexation Area	19.37
Total	**29.28**

[1] Includes areas mapped as potential wetlands in South Cooper Area

Forested Wetland Habitat

This habitat was typically dominated by Oregon ash (*Fraxinus latifolia*), red alder (*Alnus rubra*), Indian plum (*Oemleria cerasiformis*), red-osier dogwood (Cornus stolonifera), Pacific willow (Salix lucida), slough sedge (*Carex obnupta*), and small-fruited bulrush (*Scirpus microcarpus*). Cluster rose (*Rosa pisocarpa*) and snowberry (*Symphoricarpos albus*) were observed as subdominants, particularly in areas transitioning to riparian and upland habitats.

Emergent Wetland Habitat

Emergent wetland habitats tended to be dominated by non-native pasture grasses. Dominant species typically included meadow foxtail (*Alopecurus pratensis*), tall fescue (*Schedonorus phoenix*), Kentucky bluegrass (*Poa pratensis*), and reed canarygrass (*Phalaris arundinacea*).

South Cooper Mountain Annexation Area LWI Results

Table 4 provides a summary of wetlands identified during LWI mapping for the SCMAA. Roughly 19 acres of wetlands and probable wetlands were identified. Wetland A was the largest wetland and contained a large portion of intact forested wetland as well as emergent wetland dominated by pasture grasses. Probable wetland PW-G is situated in an agricultural field growing annual crops. This feature was mapped based on aerial photo reconnaissance and soil survey mapping that shows hydric soils in the field. This wetland was considered probable because it was very difficult to determine if wetland conditions actually exist and if they do, how wide an area do they cover. All wetlands were considered to be slope wetlands as the dominant source of hydrology is likely to be hillside seepage.

Table 4: LWI Wetland Summary Results

Wetland ID[1]	Acres	Cowardin Class	HGM Class	Associated Drainage
W-A	8.92	PFO, PEM	Slope	TR-1
W-B	1.44	PFO, PEM	Slope	TR-1
W-C	1.42	PFO	Slope	TR-1
W-D	0.39	PFO, PEM	Slope	TR-1

Wetland ID[1]	Acres	Cowardin Class	HGM Class	Associated Drainage
PW-E	0.22	PEM	Slope	TR-1
PW-F	0.47	ag	Slope	TR-1
PW-G	1.16	ag	Slope	TR-1a
W-H	4.51	PSS, PEM	Slope	SMC
PW-I	0.40	PFO, ag	Slope	none
PW-J	0.26	PEM	Slope	none
PW-K	0.09	PEM	Slope	none
PW-L	0.09	PEM	Slope	none
Total	**19.37**			

[1] "W" = wetland, "PW" = probable wetland
[2] PFO = palustrine forested, PSS = palustrine scrub-shrub, PEM = palustrine emergent, ag = agricultural wetland situated in a plowed field

Table 5 provides a summary of wetland functional assessment results for wetlands that are one half acre or greater in size. Of the six wetlands evaluated, three met locally significant wetland criteria –Wetlands W-A, W-B, and W-H. This means at least one of the four functions evaluated rated highly. The remaining three wetlands did not meet locally significant wetland criteria due to their highly degraded conditions.

Table 5: Wetland Functional Assessment Results

Wetland ID	Wildlife Habitat	Fish Habitat	Water Quality	Hydrologic Control	Meets Locally Significant Criteria
W-A	**Diverse**	**Intact**	Degraded	**Intact**	**Yes**
W-B	Some Habitat	Degraded	Degraded	Degraded	No
W-C	**Diverse**	**Intact**	Degraded	Degraded	**Yes**
W-D	Some Habitat	Degraded	Degraded	Degraded	No
PW-G	Some Habitat	Degraded	Degraded	Degraded	No
W-H	**Diverse**	**Intact**	Degraded	Degraded	**Yes**
PW-K	Some Habitat	Degraded	Degraded	Degraded	No
PW-L	Some Habitat	Degraded	Degraded	Degraded	No

Riparian Habitats

Aerial photo review reveals that project riparian area characteristics correspond to their topographic setting. The steeper, forested riparian areas within the study area generally appear to have good vegetative cover, whereas riparian areas in flatter areas – which are more common in the agricultural areas in the SCMAA – tend to have had greater disturbance to natural vegetation. This pattern is visible in Figure 3 of Appendix A.

The Urban Reserve Area contains the greatest linear footage of streams, and therefore the most riparian area. As shown in Table 6, the URA also contains the greatest acreage of high quality (i.e., Class I) riparian habitat. The steep ravine side slopes appear to have protected the forest within the riparian zones in this area. Cooper Mountain Nature Park also provides important protection of riparian corridors in the URA. Due to its location at the Cooper Mountain ridge top, the NCM area contains few streams and therefore limited riparian area. Where streams do occur in NCM, the riparian area condition is mixed, with higher quality corridors occurring in the deeper ravines and within the nature park and lower quality corridors occurring in developed areas. Riparian conditions in the SCMAA range from relatively intact to highly degraded. Where remnant forest exists conditions tend to be good. However, most streams and riparian corridors have been highly altered as a part of agricultural land management activities.

Table 6: Title 13 Riparian Habitats and Clean Water Services Vegetated Corridor by Study Area

	Title 13 Riparian Habitats[1]			
Study Area	**Class I (acres)**	**Class II (acres)**	**Class III (acres)**	**Clean Water Services Vegetated Corridor (acres)**
North Cooper Mountain	25.94	7.99	3.41	49.13
Urban Reserve Area	126.46	12.88	2.50	150.63
South Cooper Mountain Annexation Area	15.90	15.45	40.37	99.86
Total	168.30	36.32	46.28	299.62

[1] The difference between the riparian habitat acreage and the CWS vegetated corridor acreage is due to the amount of developed property within the corridor that was not included in the habitat designations.

Plant communities found within designated project riparian areas include both true riparian plant communities (i.e., those typical of moist soil conditions) as well as those typically considered to be upland communities (i.e., relatively dry conditions). A description of the typical moist soil adapted riparian community is provided below. Dryer adapted plant communities that may occur in project riparian or upland locations are described in the Upland Habitat section of this report.

Riparian Forest (Class I)

This habitat is dominated by a fairly open canopy of red alder (*Alnus rubra*), big leaf maple (*Acer macrophyllum*), black cottonwood (*Populus trichocarpa*), Douglas fir (*Pseudotsuga menziesii*), and western red cedar (*Thuja plicata*). The understory includes sword fern (*Polystichum munitum*), snowberry (*symphoricarpos albus*), Indian plum (*Oemleria cerasiformis*), and tall Oregon grape (*Mahonia nervosa*), among others. This community was observed in forested areas adjacent to wetlands within the SCMAA and is likely to occur along the forested drainage bottoms in the URA and NCM areas.

Upland Habitats

As shown in Table 7, the URA contains the greatest acreage of high quality (i.e., Class A) upland habitat. Much of this occurs within Cooper Mountain Nature Park; however, there is considerable coverage of high quality habitat in private ownership too. NCM contains high quality habitats within portions of the nature park and adjacent to the park. Additionally, although not classified as Class A habitat, the numerous small groves of large conifer trees scattered among the residential units do provide valuable habitat particularly for bird species. High quality habitat is fairly limited in the SCMAA, with the exception of several remnant patches of upland forest. These remnant patches connect with riparian and wetland forest areas and are therefore of particularly high value for the area.

Table 7: Title 13 Upland Habitats by Study Area

Title 13 Upland Habitats			
Study Area	**Class A (acres)**	**Class B (acres)**	**Class C (acres)**
North Cooper Mountain	83.37	0.76	36.41
Urban Reserve Area	328.42	141.55	38.17
South Cooper Mountain Annexation Area	12.38	4.48	86.54
Total	424.17	146.79	161.12

Typical wildlife that may occur within upland areas includes numerous mammal species such as raccoon, black-tailed deer, bobcat, coyote, Mazama pocket gopher, and little brown bat, among others. Birds heard during the site visits include numerous songbirds such as red-breasted nuthatch, black-capped chickadee, Bewick's wren, orange-crowned warbler, and many others, and may include great horned owl, sharp-shinned or Cooper’s hawk, and hairy and downy woodpeckers, among others.

The following describes habitats outside of the Nature Park. Habitats within the park are described in detail in the Washington County Master Plan & Management Recommendations (2005). Where these habitats fall within the calculated CWS Vegetated Corridor they are classified as riparian communities.

Mixed Forest (Upland Class A or Riparian Class I)

Within the SCMAA, mixed forest is limited primarily to the center of the area, where a patch of forest remains, surrounded by agriculture. Overstory vegetation consists primarily of Douglas fir and red alder, with smaller amounts of Oregon ash (*Fraxinus latifolia*) and Oregon white oak (*Quercus garryana*). Shrub cover ranges from sparse to dense and is dominated by snowberry, Indian plum, cluster rose (*Rosa pisocarpa*), Beaked hazelnut (*Corylus cornuta*), Pacific madrone (*Arbutus menziesii*), poison oak (*Toxicodendron diversilobum*), and oceanspray (*Holodiscus discolor*). Ground cover consists primarily of sword fern, native trailing blackberry (*Rubus ursinus*), salal (*Gaultheria shallon*), tall Oregon grape, and youth on age (*Tolmeia menziesii*). There is minimal invasion of exotic species because of the closed forest canopy, although Himalayan blackberry (*Rubus armeniacus*) is present in places.

In the URA, forested areas are generally mid to late seral[6] and contain species similar to those described above for the SCMAA although with greater cover by conifers. However, where this habitat mixes with rural and semi-suburban residences, understory diversity has been reduced. Several dense young conifer stands lie along the northeast edge. The most fragmented forest habitat occurs in the NCM area outside the Nature Park, where only small patches of forest remain.

Oak Forest (Upland Class A or Riparian Class I)

Very little oak forest was present in areas with access. Species are similar to those described for mixed forest, but with greater cover by Oregon white oak, Pacific madrone, and poison oak. A small remnant patch was noted in the SCMAA, at the base of hill slope due west of the earthen dam associated with Stream TR-1. This patch connects with a slightly larger patch of mixed forest to the north. Additional patches of oak forest may be present within the project study area, but were not distinguishable from other deciduous trees during aerial photo review and were not observed from public access ways.

Mixed Shrub Areas (Upland Class B or Riparian Class II)

This habitat occurs in relatively unmaintained areas that were clearcut and have not been replanted with trees. Non-native grasses such as tall fescue and Kentucky bluegrass are being succeeded by Himalayan blackberry, trailing blackberry, and young trees. This habitat occurs within the Urban Reserve and SCMAA but not in North Cooper Mountain.

Agricultural Areas (Upland Class C or Riparian III)

These include fields planted with non-native grasses such as tall fescue (*Schedonorous phoenix*) and Kentucky bluegrass (*Poa pratensis*) for pasture and grazing, as well as grape orchards with non-native grasses beneath. These areas occurred primarily in the URA and SCMAA, with only very minor occurrence in NCM.

[6] Mid-seral – medium sized trees generally 15 to 19 inches in diameter, late seral – larger sized trees generally larger than 20 inch diameter

Key Focal Habitat Conservation Areas

Two key focal habitat conservation areas were identified within the overall study area (see Figure 4). The first focal area includes Cooper Mountain Nature Park and adjacent high value habitats located in the NCM and URA. This includes areas that Metro has identified, in general terms, as areas for potential future park expansion. Portions of this focal area that are likely to remain in private ownership could potentially be included in County HBA or SNRA programs.

The second focal area is located in the SCMAA and consists of a chain of linked upland and riparian forest and wetland areas that are connected to Stream TR-1. This area contains a relatively large intact upland forest patch that was previously mapped as Class B by Metro, but was reclassified as Class A due to its native structure, proximity to a large wetland complex, and importance as a wildlife migration corridor within an otherwise agricultural context. Human disturbance in the parcel appears to be relatively minimal due to the relatively intact fencing of the parcel, especially on the north edge, where a deer fence was installed to keep deer out of the vineyards. The upland forest connects with adjacent riparian and wetland forest communities. The overall forested area displayed good migratory bird diversity, with some less common species such as Townsend's warbler and California quail, in addition to common species such as American robin, black-capped chickadee, red-breasted nuthatch and common flicker. Vegetation was quite diverse, likely due to a moderately high groundwater table from adjacent slopes, resulting in a mixture of coniferous and deciduous trees in the upper layer, with a mixture of less and more hydrophytic (i.e., wetland adapted) shrub and herb species. Invasive species were quite limited, with some Himalayan blackberry in places. A narrow band of Oak woodland was also included in this focal area.

Potential Opportunities

Review of project area natural resources and local and regional conservation goals resulted in a list of potential opportunities to protect and improve ecological conditions within the project study area. This list is provided below and is also displayed, in part, in Figure 4 of Appendix A.

List of Potential Ecological Protection and Enhancement Opportunities:

- Cooper Mountain Nature Park expansion
- Protect and improve wildlife corridors
  - Upgrade road crossings when conducting road improvements and as appropriate based on site specific evaluation (i.e., fish friendly and wildlife passable culverts/bridges, etc.).
  - Limit number of new road crossings and design to minimize impacts.
  - Protect and improve connections between high quality habitats (locations shown on Figure 4 are approximate only and not defined by regulatory code. They are provided for planning discussion purposes).
- Prioritize protection of Oak woodland and remnant large oak trees.
- Remove in-line irrigation/stock water ponds, restoring to natural stream condition. This will reduce water quality problems to downstream waters, particularly elevated water temperatures.
- Realign stream sections back to natural state, away from roadways.

- Restore agricultural wetlands to natural conditions either as voluntary restoration opportunity or as wetland mitigation opportunity.
- Expand opportunities for community to connect with nature (i.e., bike/ped trails)
- Unavoidable impacts to streams and riparian corridors should be minimized and placed in low quality riparian corridors (i.e., Metro Title 13 Riparian Corridor Type III) before looking to place them in higher quality corridors. This will protect both higher value riparian area as well as the stream itself.
- Promote voluntary conservation measures and integration of built and natural systems
    - Utilize native habitats of Cooper Mountain Nature Park as a template to guide planting schemes in developed areas.
    - Integrate storm water management with natural systems (i.e. place detention ponds adjacent to natural areas, acknowledge importance of tree canopy to storm water detention and delay, etc.)
    - Develop conservation easement or lease programs to protect upland habitats prior to and post-development (i.e., similar to NRCS wetland and habitat conservation programs).

Bibliography

Clean Water Services (2013) GIS streams layer shapefile exported from the CWS website. Downloaded in February 26, 2013. Located online at: http://www.cleanwaterservices.org/OurWatershed/MapsAndData/

Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual, Technical Report Y-87-1, US Army Engineer Waterways Experiment Station, Vicksburg, MS.

Environmental Science & Assessment, LLC (ES&A). 2013.Fox Hollow Wetland/Goal 5 Natural Resource Determination (18200 SW Horse Tale Drive Washington County, Oregon). Memorandum from Jack Dalton (ES&A) to Matt Wellner (Metropolitan Land Group, LLC). April 2, 2013.

ESRI. 2013. National Geographic World Map. Downloaded in February, 2013. Located online at: http://services.arcgisonline.com/ArcGIS/rest/services/NatGeo_World_Map/MapServer

ESRI 2009. ArcGIS Online,World Imagery. Aerials Express (AEX). Portland, Oregon. Downloaded in February, 2013. Located online at: http://goto.arcgisonline.com/maps/World_Imagery

Metro 2013. Metro Regional Land Information System (RLIS) GIS wetlands layer, hydric soils layer, and GIS streams layer. Downloaded in February, 2013. Located online at: http://www.oregonmetro.gov/index.cfm/go/by.web/id/593

Metro 2005a. Metro's Technical Report for Fish and Wildlife Habitat (Technical Report). April 2005.

Metro 2005b. Cooper Mountain Natural Resource Management Plan. November 2005. Located online at: ftp://tbg5.co.washington.or.us/CooperMt/CooperMtMasterPlan.pdf

Natural Resource Conservation Service (NRCS). 2010. Soil Survey Geographic Database for Washington County, Oregon. Located online at: http://SoilDataMart.nrcs.usda.gov/

Oregon Department of Fish and Wildlife (2013). Fish distribution GIS layers. Downloaded in February, 2013. Located online at: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistmaps

Oregon Biodiversity Information Center (ORBIC) and The Wetlands Conservancy. 2009. Oregon Wetland Cover, Dated 20091030. ESRI file geodatabase. Oregon Natural Heritage Information Center, Oregon State University.

Shapiro & Associates, Inc. 2000. City of Beaverton Local Wetland Inventory, December 1, 2000. Downloaded in February 26, 2013. Located online at: http://www.oregon.gov/DSL/WETLAND/Pages/lwi_disclaimer_agreed.aspx

U.S. Army Corps of Engineers (USACE). 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0). Final Technical Report ERDC/EL TR-10-3, May, 2010. US Army Engineer Research and Development Center, Environmental Laboratory, Vicksburg Mississippi.

U.S. Fish and Wildlife Service (USFWS). 2008 (estimated). National Wetland Inventory GIS shapefile exported from USFWS wetland mapper website. http://www.fws.gov/wetlands/Wetlands-Mapper.html

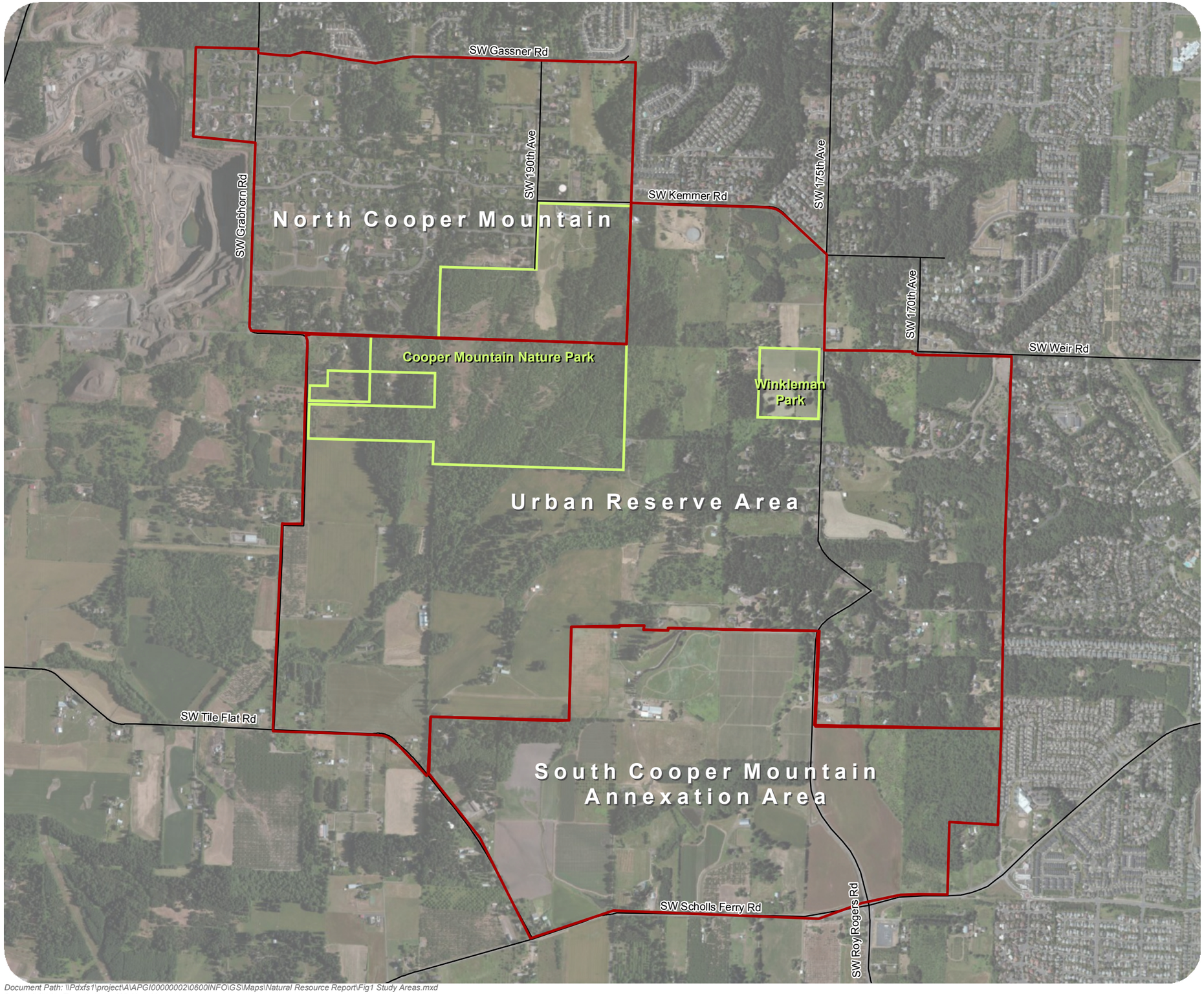
U.S. Geological Survey. 2013. National Hydrographic Database (NHD) GIS streams layer. Downloaded in February 26, 2013. Located online at: http://nhd.usgs.gov/

Washington County. 2005. Master Plan & Management Recommendations - November 2005 ftp://tbg5.co.washington.or.us/CooperMt/CooperMtMasterPlan.pdf

APPENDIX A – FIGURES

South Cooper Mountain Natural Resources Memorandum

Figure 1
Study Areas



Project Study Area
Park
Arterial

Data Sources:
Project Study Area: Metro RLIS, 2012. Modified by DEA.
Parks and Arterials: Metro RLIS, 2012
Service Layers: ESRI, USDA, USGS, DigitalGlobe, GeoEye

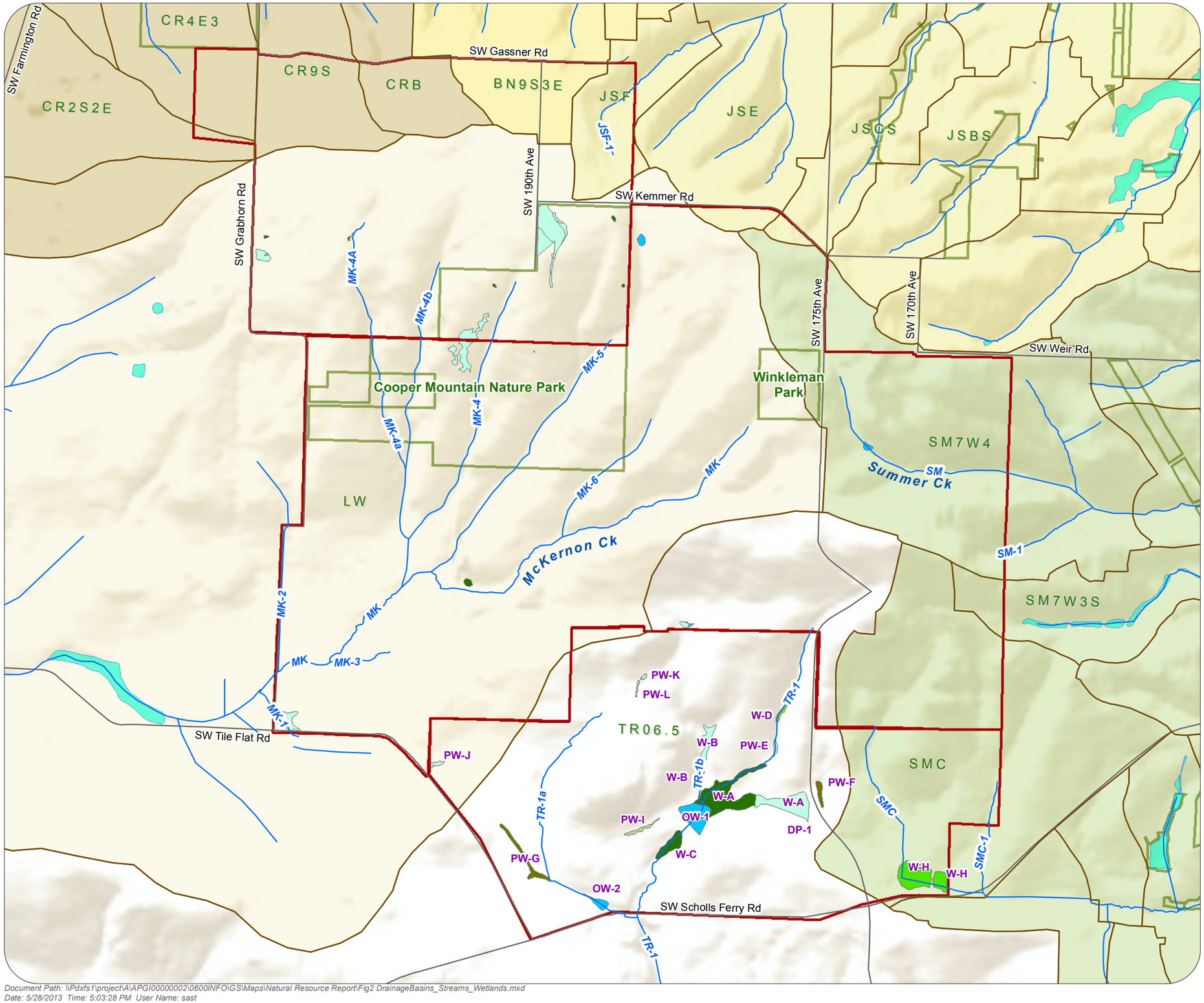
Beaverton OREGON

0 0.25 0.5 Miles

Document Path: \\Pdxfs1\project\A\APGI00000002\0600INFO\GS\Maps\Natural Resource Report\Fig1 Study Areas.mxd
Date: 4/3/2013 Time: 9:19:57 AM User Name: sast

South Cooper Mountain Natural Resources Memorandum

Figure 2
Drainage Basins, Streams, and Wetlands



Project Study Area
CWS Small Streamsheds Boundary

CWS Streamsheds in Study Area

- Butternut Creek
- Cross Creek
- Johnson Creek South (Wash. County)
- Lindow Creek / Jackson Creek
- Summer Creek
- Unnamed

Wetlands*

- Agricultural
- Forested (PFO)
- Emergent (PEM)
- Forested (PFO)/Agricultural
- Forested (PFO)/Emergent (PEM)
- Pond/Open Water (PUB)
- Scrub-Shrub (PSS)/Emergent (PEM)
- RLIS wetland outside Study Area
- Stream
- Park
- Arterial

* W = Wetlands
PW = Probable Wetland

Data Sources:
Project Study Area: Metro RLIS, 2012. Modified by DEA.
Parks and Arterials: Metro RLIS, 2012
Streamsheds: Metro RLIS, 2012
Wetlands: Metro RLIS, 2012. Modified by DEA.
Service Layers: USGS, ESRI

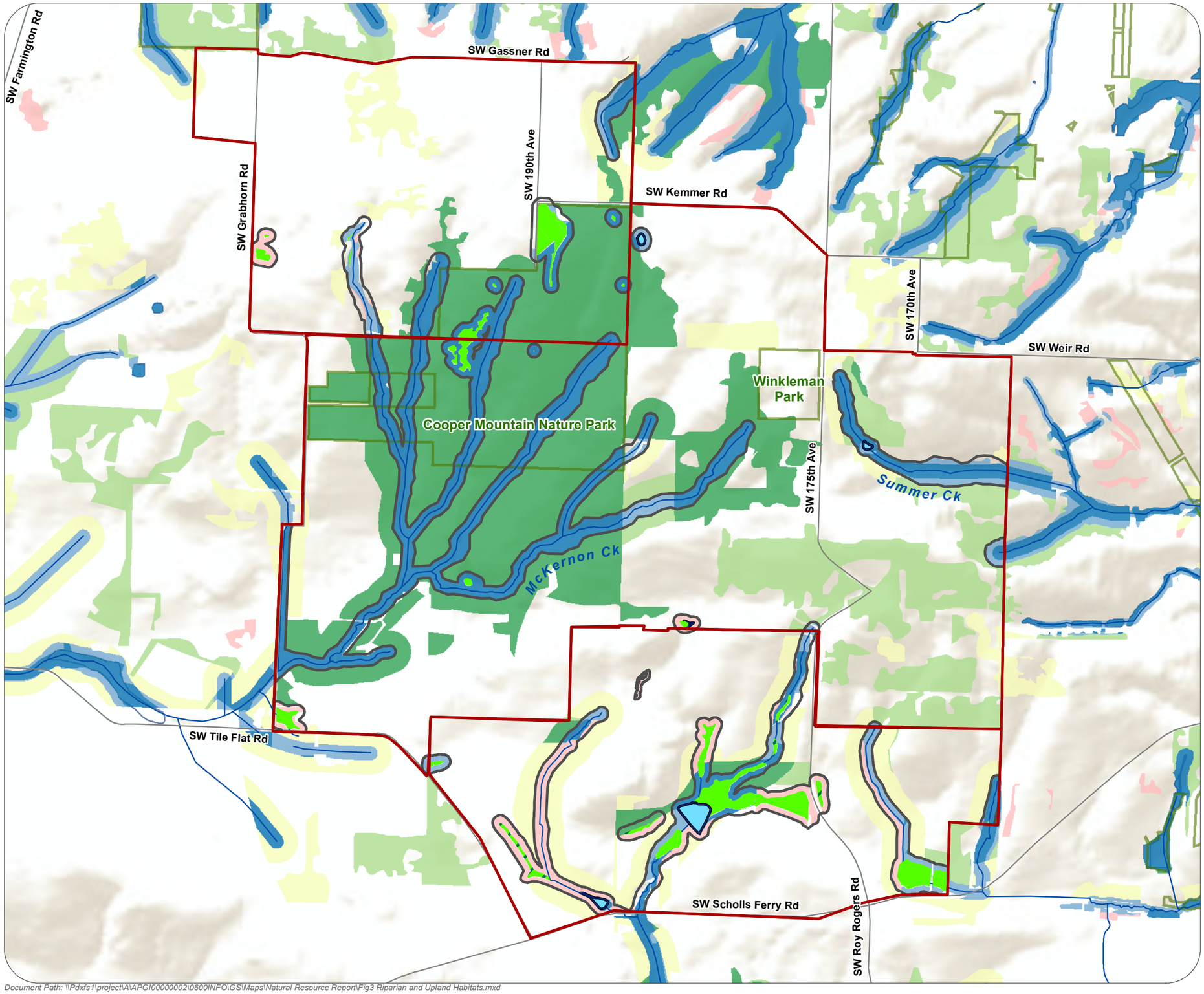
Beaverton OREGON

0 0.25 0.5 Miles

Document Path: \\Pdxfs1\project\A\APGI00000002\0600INFO\GS\Maps\Natural Resource Report\Fig2 DrainageBasins_Streams_Wetlands.mxd
Date: 5/28/2013 Time: 5:03:28 PM User Name: sast

South Cooper Mountain
Natural Resources Memorandum

Figure 3
Riparian and Upland Habitats



Riparian Wildlife Habitat Quality
- Class I
- Class II
- Class III

Upland Wildlife Habitat Quality
- Class A
- Class B
- Class C
- Project Study Area
- CWS Vegetated Corridor
- Wetland
- Probable Wetland
- Open Water
- Stream
- Park
- Arterial

Data Sources:
Project Study Area: Metro RLIS, 2012. Modified by DEA.
Parks and Arterials: Metro RLIS, 2012
Streamsheds: Metro RLIS, 2012
CWS Vegetated Corridor: DEA, 2013
Riparian/Upland Habitats: Metro RLIS, 2012. Modified by DEA.
Service Layers: USGS, ESRI

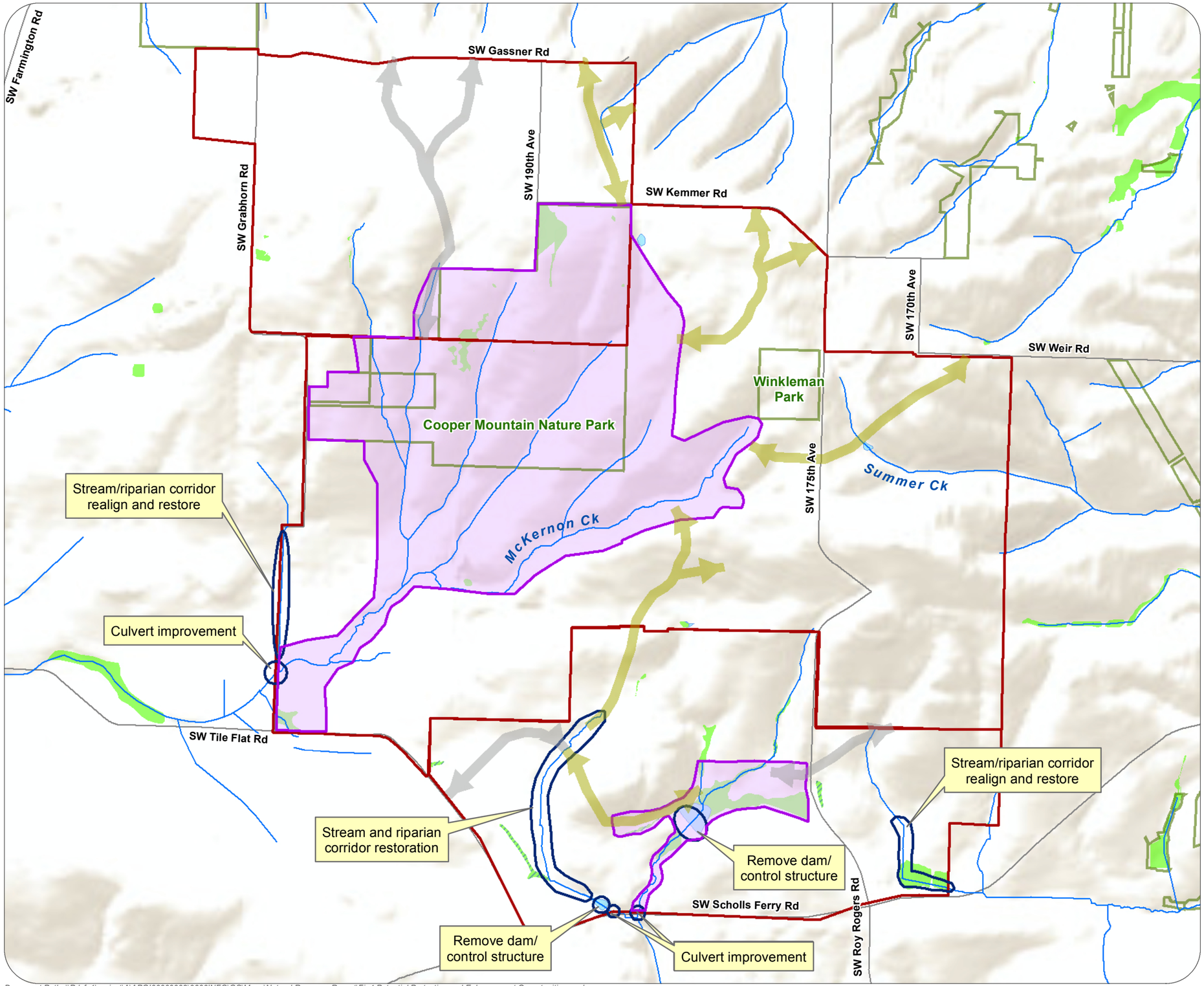
Beaverton OREGON

0 0.25 0.5 Miles

Document Path: \\Pdxfs1\project\A\APGI00000002\0600INFO\GS\Maps\Natural Resource Report\Fig3 Riparian and Upland Habitats.mxd
Date: 5/28/2013 Time: 4:03:56 PM User Name: sast

South Cooper Mountain Natural Resources Memorandum

Figure 4
Potential Protection and Enhancement Opportunities*



Project Study Area

Natural Resource Opportunities

- Opportunities as labeled
- Focal Habitat Conservation Area
- Type 1 Wildlife Corridor
- Type 2 Wildlife Corridor
- Wetland
- Probable Wetland
- Open Water
- Stream
- Park
- Arterial

* Natural resource opportunities and potential wildlife corridors illustrated are conceptual only. Protection and enhancement activities specifically required by current regulatory programs have not been highlighted, but typically include avoidance and minimization of impacts to wetlands, streams, and vegetated buffer areas. Impacts to these features would require mitigation. Additionally, Clean Water Services requires all "degraded" vegetated buffer areas on a parcel to be improved as a condition of issuing development permits, regardless of whether the buffer areas are impacted.

Data Sources:
Project Study Area: Metro RLIS, 2012. Modified by DEA.
Parks and Arterials: Metro RLIS, 2012
Streamsheds: CWS, 2012
Wetlands: Metro RLIS, 2012. Modified by DEA.
Natural Resource Opportunities: DEA, 2013
Wildlife Corridors: DEA, 2013
Service Layers: USGS, ESRI

Beaverton OREGON

0 0.25 0.5 Miles

Document Path: \\Pdxfs1\project\A\APGI00000002\0600INFO\GS\Maps\Natural Resource Report\Fig4 Potential Protection and Enhancement Opportunities.mxd
Date: 5/28/2013 Time: 4:08:05 PM User Name: sast