# Riparian and Aquatic Habitat Inventory & Management Plan
# Rouge Green Corridor
# Urban Habitat Conservation & Stewardship Project

City of Birmingham
Village of Beverly Hills
City of Southfield
Friends of the Rouge
Six Rivers Regional Land Conservancy
Southeast Oakland County Water Authority
Oakland County Planning & Economic Development Services
Oakland County Water Resources Commissioner

November 28, 2008

ASTI Environmental

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## TABLE OF CONTENTS

## LIST OF TABLES, FIGURES, AND APPENDICES

## EXECUTIVE SUMMARY

> "The 19th Century was the century of exploration of our rivers, and the 20th Century of their exploitation and destruction. Now it's up to us to make the new century one of restoration."
>
> *Robert Haas, U.S. Poet Laureate from 1995 - 1997*

This report and analysis focuses upon a section of the upper Main River Rouge, referred to as the "Rouge Green Corridor (RGC)," within the Cities of Birmingham and Southfield, the Village of Beverly Hills, Oakland County, Michigan. Although surrounded by urban land uses, much of this portion of the Main Rouge River corridor exhibits an intact riparian forest and is home to a surprising variety of plant and animal species. The three communities within the RGC collectively own and operate 11 parks and nature preserves along the river. Some of the RGC's natural areas (both privately and publicly owned) are of exceptional quality, while many are impacted by a variety of stressors and would benefit from restoration.

This report is one product of the Rouge Green Corridor Urban Habitat Conservation and Stewardship Project. The purpose of that project is to provide a coordinated management approach for the RGC by (1) developing a detailed inventory of aquatic and terrestrial habitat conditions on all public land and selected private land within the RGC; (2) developing a habitat stewardship plan with specific recommendations for public lands, corridor-wide policies/programs, and recommendations for private landowners; and (3) by providing educational opportunities for private riparian landowners. It expands upon five years of work by the Oakland County Planning & Economic Development Services Division and the project steering committee, composed of representatives from the City of Southfield, Village of Beverly Hills, City of Birmingham, the Southeast Oakland County Water Authority (SOCWA), the office of the Oakland County Water Resources Commissioner, Friends of the Rouge, the Six Rivers Regional Land Conservancy, and concerned citizens (collectively, the RGC Steering Committee). The project is partially funded by a grant from the National Fish and Wildlife Foundation.

ASTI Environmental was contracted by the RGC Steering Committee to develop the RGC inventory and habitat management plans. This report combines the results of the inventory and management recommendations. It documents the baseline condition of aquatic and terrestrial habitat on all public land and on selected private lands within the RGC. The management plan includes one hundred and thirty-two (132) recommendations, including twenty-seven (27) to be implemented across the whole corridor; eight (8) recommendations common to all parks and preserves within the RGC; and ninety-seven (97) recommendations for specific parks, preserves, or river stretches. The recommendations are grouped according to twelve (12) goals, each of which is further associated with one or more benchmarks (metrics) for measuring success.

Target metrics for each park, preserve, and river segment were based upon many of the same measures used to assess the health and quality of habitat within the RGC. Targets were established based upon preferred, but reasonable, thresholds indicative of a healthy ecosystem and/or regulatory standards. If a site already exceeds the desired minimum, then maintaining that level or better was established as the target. If the minimum desired threshold is not currently met, then that minimum was set as the target.

Specifically, the following rationales were used to determine targets at each location:

- Amphibian count (AC) targets were generally set at the occurrence of 4 common species, based upon both a review of historic and current records at sites throughout the RGC. IF higher counts had been recorded in early years of the frog and toad surveys, then re-establishing those levels determined the target.
- Aquatic Habitat Ratings (AHR) targets were set to attain "Good" or "Acceptable" Procedure 51 habitat scores, the minimum required to meet state designated uses.
- Stable or better Bank Stability Index (BSI) ratings were established as a threshold for all sites.
- Good" or "Acceptable" Procedure 51 fish community (FC) scores, the minimum required to meet state designated uses, were established as the minimum for all sites.
- Target Floristic Quality Scores (FQI) equal to, or exceeding, the average score of most undeveloped land in Michigan (20). It is further hoped that protection and management efforts will maintain a native plant species composition of over 75% at all sites.
- Good" or "Acceptable" Procedure 51 macroinvertebrate community (MC) scores, the minimum required to meet state designated uses, were established as the minimum for all sites.
- Reversing the trend of increasing flashiness, as measured by the Richards-Baker Flashiness Index (RBFI), was established as the target at sites with stream gages and representing conditions throughout the RGC.
- Wetland Functional Value (WFV) targets were based upon the conditions observed within the riparian zone and additional values that may provided if management recommendations for restoration are implemented.
- Water Quality (WQ) targets for all sites were set to equal or exceed state water quality standards for dissolved oxygen (DO), *Escherichia coli* bacteria (*E. coli*), and total suspended solids (TSS), those parameters identified as in existing Total Maximum Daily Load (TMDL) allocations (targets) for this portion of the Rouge Main 1-2 subwatershed. For individual river reaches exhibiting nuisance algal growth, an additional target for total phosphorus concentrations was added.

The metrics used to both conduct the river corridor assessment and to measure whether goals are achieved, along with protection and restoration goals for the RGC, are listed below. The 132 individual recommendations are summarized in Table 1:

Metrics:

1. AC – Amphibian Counts
2. AHR – Aquatic Habitat Ranking
3. BSI – Bank Stability Index

4. FC – Fish Community
5. FQI – Floristic Quality
6. MC – Macroinvertebrate Community
7. RBFI – Richards-Baker Flashiness Index
8. WFV – Wetland Functional Value
9. WQ – Water Quality (DO, *E. coli*, and TSS)

Goals:

1. Connect river and floodplain (AHR, BSI, FC, RBFI, WQ, WFV)
2. Educate and involve residents in riparian corridor stewardship (no targets established)
3. Expand survey and monitoring efforts (AC, AHR, MC, WFV, WQ)
4. Improve in-stream aquatic habitat (AHR, FC, MC)
5. Improve water quality to meet TMDL and water quality criteria (FC, MC, WQ)
6. Maintain/expand vegetated riparian buffer (AHR, FQI, WFV, WQ)
7. Manage invasive species (FQI, WFV)
8. Manage woody debris (AHR, BSI)
9. Promote the river and the RGC as a recreational asset (no targets established)
10. Reduce erosion and sedimentation (AHR, BSI, FC, MC, WQ)
11. Reduce flashiness (AHR, BSI, RBFI)
12. Restore wetlands (FQI, WFV)

The majority of the recommendations in this report emphasize and/or require that the volume and timing of storm water runoff to the river be reduced and controlled. Reducing peak-flows, and maintaining or increasing baseflows to the river, are central to reducing erosion, improving in-channel habitat, improving water quality, and managing large woody debris. Additionally, storm water volume controls have implications for efforts to combat invasive species, for riparian resident education, for park acquisition, for efforts to improve recreational use of the RGC, and for municipal policies and investments in infrastructure.

# Table 1. Corridor-Wide and Reach or Park Specific Management Recommendations

| Location | | # | Recommended Strategy | Goal | Target Metrics | Level of Effort (units) | Estimated Capitol Cost | Annual O&M Cost | Cost Rating | Impact Rating | Measure of Success | Notes, Comments, Resources |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Corridor-wide Recommendations | Entire Rouge Green Corridor - Public & Private Lands | 1 | Review policies and procedures to capture, detain, and treat storm water. Revise to further reduce peak flow runoff. | Reduce Flashiness | AHR, BSI, RBFI | 3 communities | $1,000 - $2,000 each $3,000 to $6,000 total | on-going enforcement, permit fee passed to applicants | Low | Medium | Revised stormwater detention standards or stormwater ordinance in each community | Model ordinances and a new guidebook entitled, *Managing Stormwater in Your Community: A Guidebook for Building an Effective Post-Construction Program,* are available from the Center for Watershed Protection: http://www.cwp.org/Resource_Library/Controlling_Runoff_and_Discharges/sm.htm http://www.cwp.org/Resource_Library/Center_Docs/SW/pcguidance/Tool3.doc The model ordinance at the following web link provides a particularly useful discussion of alternative storage requirements to minimize the erosive work of runoff on channels: http://www.stormwatercenter.net/Manual_Builder/stormwater_ordinance.htm |
| | | 2 | Build upon the existing RGC storm water infrastructure inventory and the retrofit evaluations in the Franklin Subwatershed Study to include assessments of capacity and treatment efficacy. Identify possible retrofits to increase storage, sediment retention, infiltration and/or evapotranspiration. Prioritize, design and build retrofits. | Reduce Flashiness | AHR, BSI, RBFI | Approximately 125 stormwater retention/detention facilities within the extended RGC drainage area as shown in Figure 15 | $45,000 - $100,000 for initial inventory, prioritization, designs Retrofit consrtuction costs vary depending upon sites and BMP. Median costs for some practices per cubic foot of stormwater treated: pond retrofit $3; rain garden $4; infiltration retrofit $15; imperviousness conversion $20; small bioretention retrofit $30; porous pavers $120; green roof $225-$360 | 3-5% construction costs | Medium to High | High | High priority storm water infrastructure retrofitted to dissipate stormwater erosion and sedimentation | Center for Watershed Protection has produced useful guidance for conducting storm water retrofit analyses, including additional cost information than presented here. *Manual 3: Urban Stormwater Retrofit Practices* is available for download at http://www.cwp.org/formmaker/Download-Form_RedirectFormPage.html Potential Funding Source: Section 319 CWA Implementation Grants |
| | | 3 | Develop downspout disconnection programs where needed to maximize runoff to porous areas. Encourage rain barrel use. | Reduce Flashiness | AHR, BSI, RBFI | unknown, parts or all of 3 communities | $50 per house - disconnection rain barrels $20-$45 each | Not Applicable | Medium | Medium | Reduced peak flows and slowed channel erosion | Downspout disconnections can be accomplished thrugh either incentives such as utility credits or through regulatory means. Useful references can be found at: http://www.cwp.org/Resource_Library/Center_Docs/Residential/rainbarrelgarden.pdf http://www.cwp.org/Resource_Library/Center_Docs/USRM/ELC_USRM8v2sls.pdf |
| | | 4 | Identify where other direct connections and outfalls can be daylighted to treatment or infiltration systems. | Reduce Flashiness | AHR, BSI, RBFI | RGC river corridor | $5,000 - $10,000 for inventory and retrofit concept plans implementation variable, bioretention ~$6.80/ft$^3$ | 2% of O&M | Medium | Medium | Established, viable, native wetland plant communities and restored hydrology | Inventory could be done concurrent with inventory of stormwater infrastructure |
| | | 5 | Develop programs and policies to minimize the amount of new, and to reduce existing, impervious surface where possible. | Reduce Flashiness | AHR, BSI, RBFI | 3 communities | $2,000 - $5,000 each $6,000 to $15,000 total | on-going enforcement, permit fee passed to applicants | Low | Medium | Revised design/zoning standards in each community | Recommendations and models available from the Center for Watershed Protection, the City of Olympia Washington, and in SEMCOG's LID Manual: http://library.semcog.org/InmagicGenie/DocumentFolder/LIDManual.pdf. |
| | | 6 | Develop standards/incentives to reduce road/sidewalk widths, parking requirements, and building footprints, and/or encourage porous material use. | Reduce Flashiness | AHR, BSI, RBFI | 3 communities | $2,000 - $5,000 each $6,000 to $15,000 total | on-going enforcement, permit fee passed to applicants | Low | Medium | Revised design/zoning standards in each community | Recommendations and models available from the Center for Watershed Protection, the City of Olympia Washington, and in SEMCOG's LID Manual: http://library.semcog.org/InmagicGenie/DocumentFolder/LIDManual.pdf. |
| | | 7 | Explore overlay zoning in Darcy Map priority areas to facilitate infiltration and reduce imperviousness. | Reduce Flashiness | AHR, BSI, RBFI | Southfield | $500 - $1,500 each $500 to $1,500 total | on-going enforcement, permit fee passed to applicants | Low | Medium | Groundwater Recharge Proection Overlay District enacted in each community | |
| | | 8 | Develop and implement wetland and watercourse ordinances in Birmingham and Beverly Hills. | Maintain/Expand Riparian Buffer | AHR, FQI, WFV, WQ | 2 communities | $500 - $1,500 each $1000 to $3000 total | on-going enforcement, permit fee passed to applicants | Low | High | Wetland and Watercourse Protection Ordinance enacted in each community | Southfield's Wetland & Watercourse Protection Ordinance could serve as a model, other model wetland ordinances available from the Huron River Watershed Council and the Center for Watershed Protection. |
| | | 9 | Conduct a detailed Urban Ecosystem Analysis (UEA) for the RGC to quantify trends in forest loss/gain, impervious surface changes, and to quantify the monetary value of green infrastructure benefits provided by the RGC riparian corridor. | Maintain/Expand Riparian Buffer | AHR, FQI, WFV, WQ | 2 communities | $500 - $1,500 each $1000 to $3000 total | on-going enforcement, permit fee passed to applicants | Low | High | Wetland and Watercourse Protection Ordinance enacted in each community | http://www.americanforests.org/resources/urbanforests/analysis.php |
| | | 10 | Use the results of the UEA to educate city and village councils regarding the economic and societal value of retaining RGC open space. | Maintain/Expand Riparian Buffer | AHR, FQI, WFV, WQ | 2 communities | $500 - $1,500 each $1000 to $3000 total | on-going enforcement, permit fee passed to applicants | Low | High | Wetland and Watercourse Protection Ordinance enacted in each community | http://www.americanforests.org/downloads/rea/AF_Detroit.pdf |
| | | 11 | Use the results of the UEA to develop regional and land use specific tree canopy goals. | Maintain/Expand Riparian Buffer | AHR, FQI, WFV, WQ | 2 communities | $500 - $1,500 each $1000 to $2000 total | on-going enforcement, permit fee passed to applicants | Low | High | Woodland Protection Ordinance enacted in each community | http://www.americanforests.org/downloads/rea/AF_Detroit.pdf |
| | | 12 | Develop and implement woodland protection ordinances in Birmingham and Beverly Hills. | Maintain/Expand Riparian Buffer | AHR, FQI, WFV, WQ | 2 communities | $500 - $1,500 each $1000 to $2000 total | on-going enforcement, permit fee passed to applicants | Low | High | Woodland Protection Ordinance enacted in each community | Southfield's Woodland Protection Ordinance could serve as a model, other model ordinances are available from the Center for Watershed Protection and other southeast Michigan communities. Additional information fro evaluating and developing a municipal tree ordiance is available from the International Society of Arboriculture: http://www.isa-arbor.com/publications/ordinance.aspx |
| | | 13 | Develop and implement Environmental Features Setback ordinances in each of the 3 RGC communities. | Maintain/Expand Riparian Buffer | AHR, FQI, WFV, WQ | 3 communities | $500 - $1,500 each $1,500 to $4,500 total | on-going enforcement, permit fee passed to applicants | Low | High | Natural Features Setback Ordinance enacted in each community | Examples and recommendatoins for Natural Features or Environmental Setback Ordinances available from West Bloomfield Township, in SEMCOG's LID Manual: http://library.semcog.org/InmagicGenie/DocumentFolder/LIDManual.pdf, and in *Filling the Gaps: Environmental Protection Options for Local Governements* : http://www.michigan.gov/deq/0,1607,7-135-3313_3677_3696-73358--,00.html |
| | | 14 | Develop and implement design standards to protect steep slopes in each of the 3 RGC communities. | Maintain/Expand Riparian Buffer | AHR, FQI, WFV, WQ | 3 communities | $500 - $1,500 each $1,500 to $4,500 total | on-going enforcement, permit fee passed to applicants | Low | High | Natural Features Setback Ordinance enacted in each community | http://www.partnershipsforchange.cc/planningeduc0135.asp http://www.cityoflakeforest.com/pdf/cd/steepslp.pdf |
| | | 15 | Review historic topographic survey information (road crossings, etc.) and/or establish monitoring stations to determine extent of channel downcutting. Determine if grade control structures are needed to prevent the river's disconnection from its floodplain. | Connect River and Floodplain | AHR, BSI, FC, RBFI, WQ, WFV | 3 communities | Dependent upon need for in-field topographic survey Estimated cost = $7,500 - $10,000 | Costs approximately the same for field time to re-survey and determine rends/ rates of change. | Medium | Medium | Methods to maintain connections to floodplain and water table. | MDOT or the Road Commission for Oakland County should posess records that would allow this analysis. The Oakland County Drain Commissioner's Office may have additional records regarding bottom elevations for channelized sections. |
| | | 16 | Utilize MDEQ maps to identify areas of former wetland or hydric soils. Develop priorities/strategies for restoring 85 acres of wetland in the RGC south of I-696 (1/2 the estim. acreage lost since European settlement). | Restore Wetlands | FQI, WFV | 85 acres | $30,000 to $40,000/acre $2,550,000 to $3,400,000 | Monitor for 3-5 years after establishment to confirm establishment $1,000-$5,000 per year | High | Medium | Established, viable, native wetland plant communities and restored hydrology | Potential wetland restoration maps of Oakland County are available from the Michigan Center for Geographic Information at: http://www.mcgi.state.mi.us/mgdl/?rel=cext&action=Oakland Potential Funding Sources: Section 319 CWA Implementation Grants, EPA 5-Star Restoration Grant, NFWF |

# Table 1. Corridor-Wide and Reach or Park Specific Management Recommendations

| Location | | # | Recommended Strategy | Goal | Target Metrics | Level of Effort (units) | Estimated Capitol Cost | Annual O&M Cost | Cost Rating | Impact Rating | Measure of Success | Notes, Comments, Resources |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Corridor-wide Recommendations (cont'd) | Entire Rouge Green Corridor - Public & Private Lands | 17 | Revise ordinance landscaping requirements to identify and prohibit use of invasive plant species. | Manage Invasive Species | FQI, WFV | 2 communities | $500 - $1,500 each $1,000 to $3,000 total | on-going enforcement, permit fee passed to applicants | Low | Medium | Wetland and Watercourse Protection Ordinance enacted in each community | The City of Ann Arbor has a thorough list of prohited and invasive species. This list and other educational materials regarding invasive plant species are available at: http://www.a2gov.org/government/publicservices/fieldoperations/NAP/Pages/InvasivePlants.aspx The Nature Conservancy and the Michigan Invasive Plants Council are also valuable resources for information regarding invasive species. TNC's *Weed Control Methods Handbook: Tools and Techniques for Use in Natural Areas* is available at: http://tncweeds.ucdavis.edu/handbook.html Additional information regarding invasive plant species control is available at: http://tncweeds.ucdavis.edu/ and http://invasiveplantsmi.org/ |
| | | 18 | Develop land owner education strategy and materials and disseminate. | Educate/Involve Residents in Riparian Stewardship | --- | Up to 43,444 households in 3 communities | Overall residential outreach costs per annum: $0.14 - $1.11 $43,000 - $87,000 | Annual costs could equal original production and dissemination if repeated annually | Medium | High | Improved behavior difficult to measure | Existing educational materials available from SEMCOG, Huron River and Clinton River Watershed Councils, Friends of the Rouge Direct mail materials can be disseminated in tax or water bills Additional tips for effective education programs can be found at the following links: http://www.cwp.org/Resource_Library/Center_Docs/USRM/ELC_USRM8v2sls.pdf http://www.epa.gov/owow/nps/toolbox/print/getnstepguide.pdf Potential Funding Source: Section 319 CWA Implementation Grants |
| | | 19 | Expand upon LTI inventory to develop a corridor-wide large woody debris management plan. Establish priorities, identify permitting requirements, and develop budgets, schedules, and on-going maintenance programs for clearing recreational access through logjams and stabilizing the worst erosion hotspots. Encourage use of deformable, vegetative stabilization where possible. | Manage Woody Debris | AHR, BSI | RGC corridor or 13 to 8 Mile Roads | $12,000 -$16,000 to complete inventory and prioritization Implementation costs will depend upon plan and priorities | Not Applicable | Medium | High | River corridor passable by paddle craft | http://www.nps.gov/ncrc/programs/rtca/ Potential Funding Source: Section 319 CWA Implementation Grants. The National Park Service River & Trails Program may offer technical support. |
| | | 20 | Identify which LWD accumulations result from sewer/water infrastructure crossing the river. Develop plans, schedules, and budgets to replace or bury these pipes. | Manage Woody Debris | AHR, BSI | RGC corridor or 13 to 8 Mile Roads | Permitting and contractor/removal costs varaibale dependent upon which nifrastructure may be alterred. | 2-4% construction cost | HIgh | Medium | Eliminate existing infrastructure caused logjams | Identification of these situations can be done as part of the inventory above. |
| | | 21 | Continue and expand volunteer water quality (macroinvertebrates) monitoring to provide coverage of main drainage network inputs. | Expand Survey and Monitoring Efforts | --- | Continue sampling existing sites and add 3-4 new sites within RGC | Maintain current program at current cost Add 3-4 sites at $500 to $1,200 per site $1,500-$4,800 total | $500-$1,200 per site $1,500-$4,800 total | Low | Medium | Database to track water quality attainment | http://www.micorps.net/ Potential Funding Source: Section 319 CWA Implementation Grants, MiCorps Volunteer Stream Monitoring Grants |
| | | 22 | Conduct follow-up mussel surveys every 5 to 10 years, expand sampling stations to identify other high quality areas and monitor over time. | Expand Survey and Monitoring Efforts | --- | 10 new and previously sampled sites within RGC | $7,500 | Recurring costs on 5 -10 year cycle | Low | Low | Regular, recurring monitoring to monitor population trends | Information on survey techniques is available at: http://el.erdc.usace.army.mil/mussels/sampling.html and http://www.michigandnr.com/slideshows/musselsurvey/publish_to_web/index.html Potential Funding Source: NFWF |
| | | 23 | Continue to address high priority erosion identified in 2004 Limno-Tech (LTI) and Franklin Branch Erosion Inventories. | Reduce Erosion and Sedimentation | AHR, BSI, FC, MC, WQ | $1,500 feet | $90-$150/linear foot $135,000 to $225,000 | Not Applicable | Medium | Medium | Stable banks and reduced erosion | Those sites that are estimated to generate the greatest annual sediment load to the RGC are shown in Figures 24 and 25, pages 104 and 107. A list of high priority sites within the Rouge Main 1-2 and on the Franklin Branch are provided in Appendix H. Examples and information regarding streambank stabilization conducted elsewhere in the Rouge River basin is available at: http://www.rougeriver.com/pdfs/WC_Streambank_Stabilization.pdf Other useful references include: http://www.cwp.org/Resource_Library/Center_Docs/USRM/ELC_USRM4cwp.pdf |
| | | 24 | Incorporate pollutant removal standards (particularly for TSS or TS) into municipal stormwater ordinances of municipalities and or w/in OCDC rules. | Improve Water Quality | WQ | 3 communities | $500 - $1,500 each $1,500 to $4,500 total | on-going enforcement, permit fee passed to applicants | Low | High | Revise stormwater ordinance or standards enacted in each community | Model ordinances and a new guidebook entitled, Managing Stormwater in Your Community: A Guidebook for Building an Effective Post-Construction Program, are available from the Center for Watershed Protection: http://www.cwp.org/Resource_Library/Controlling_Runoff_and_Discharges/sm.htm http://www.cwp.org/Resource_Library/Center_Docs/SW/pcguidance/Tool3.doc http://www.stormwatercenter.net/Manual_Builder/stormwater_ordinance.htm |
| | | 25 | Continue municipal street sweeping programs. Review practices to determine if areas within the directly connected drainage area of the RGC can be swept on a more frequent basis. | Improve Water Quality | WQ | 3 communities | TBD | TBD | Low-Medium | Medium | Public streets swept annually or at current levels if more frequent, at a minimum. Desired outcome is to increase frequency and coverage of street sweeping programs to reduce total suspended solids concentrations in river. | Deriving Reliable Pollutant Removal Rates for Municipal Street Sweeping and Storm Drain Cleanout Programs in the Chesapeake Bay Basin: http://www.cwp.org/Resource_Library/Center_Docs/municipal/CBStreetSweeping.pdf http://www.cwp.org/Resource_Library/Center_Docs/municipal/TechMemo1LiteratureSummary.pdf http://www.cwp.org/Resource_Library/Center_Docs/municipal/TechMemo2SummaryMunicipalPractices.pdf |
| | | 26 | Establish capitol budgets to replace existing street sweeping equipment with high efficiency, regenerative air or vacuum assisted sweepers. | Improve Water Quality | WQ | 4 communities | TBD | TBD | Medium | Medium | Existing equipment replaced with high efficiency trucks/sweepers. | Potential Funding Source: municipal stormwater utility |
| | | 27 | Develop and enact a Fertilizer Ordinance to require, or maximize, the use of no-phosphorus fertilizers by commercial applicators. | Improve Water Quality | WQ | 3 communities | $500 - $1,500 each $1,500 to $4,500 total | on-going enforcement, permit fee passed to applicants | Low | High | Fertilizer ordinance enacted in each community | Public education materials supporting Commerce Township's fertilizer ordinance are available at: http://www.commercetwp.com/Building/fertilizer_Commerce%5B1%5D.pdf Information regarding Ann Arbor' sfertilizer ordinance program: http://www.a2gov.org/GOVERNMENT/PUBLICSERVICES/SYSTEMS_PLANNING/ENVIRONMENT/Pages/PhosphorusFertilizer.aspx Potential Funding Source: Section 319 CWA Implementation Grants. |

# Table 1. Corridor-Wide and Reach or Park Specific Management Recommendations

| Location | | # | Recommended Strategy | Goal | Target Metrics | Level of Effort (units) | Estimated Capitol Cost | Annual O&M Cost | Cost Rating | Impact Rating | Measure of Success | Notes, Comments, Resources |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| All Parks/Preserves | RGC Public Lands | 28 | Develop a detailed invasive species inventory, database, and map for Quarton Lake Park. Map locations and densities of rare plant species. Map aerial distribution of individual invasive species infestations, measure abundance, and track eradication efforts. Prioritize areas of highest floristic quality at risk of infestation. | Manage Invasive Species | FQI, WFV | Park-wide in each RGC Park and preserve | $4,000 - $5,000 per park/preserve | $800 per park/preserve | Low | High | Detailed maps, data on species, densities, age, etc. for each RGC park/preserve. Detailed information regarding plants targeted for protection and the threat of invasives. Priorities and estimated costs for control, to allow comparison between parks and allocation of resources. | The Nature Conservancy's Weed Information Management System version 3.0 (WIMS 3) is compatible with ArcPad and is available for free to assist in mapping of invasive species: http://tncweeds.ucdavis.edu/wims.html Additional invasive plant control information is available at: http://tncweeds.ucdavis.edu/handbook.html Other valuable resources are the Michigan Invasive Plants Council: http://invasiveplantsmi.org/ and the Stewardship Network: http://www.stewardshipnetwork.org/site/c.hrLOKWPILuF/b.1361967/ |
| | | 29 | Weigh the merits of using available resources for invasive species management at Quarton Lake Park against protection of higher quality resources elsewhere. If that analysis indicates that Quarto Lanke is a high priority within Birmingham, then cut, remove and/or treat tree-of-heaven, purple loosestrife, common reed, honeysuckle, and buckthorn while numbers, densities, and coverage are fairly low. | Manage Invasive Species | FQI, WFV | TBD | TBD | TBD | unknown | High | Coordinated strategy to allocate resources for invasive species removal, Improving FQIs | |
| | | 30 | Review past and existing invasive species management actions to identify the approaches that have worked the best. Share these successes with other RGC communities, natural resource agencies, and incorporate these techniques into detailed invasive species management plans for each park and preserve. | Manage Invasive Species | FQI, WFV | 11 RGC Parks/Preserves | $500 - $1,500 each $1000 to $3000 total | Not applicable | Low | Medium | Identify what works and what does not | Information reagrding what's been tried to date is available from the Six Rivers Regional Land Conservancy : http://www.oaklandlandconservancy.org/ |
| | | 31 | Inventory density and distribution of deer within the RGC. Hold public meetings regarding deer management options, and develop deer management strategy and budgets. | Manage Invasive Species | FQI, WFV | Conduct sampling within all or standardized subset of RGC parks/preserves, implement plans in all 11 RGC Parks/Preserves or as survey results dictate | Other sources put costs at $4,500 - $30,000 depending upon methods employed and area sampled, OCPR believes it can be done for as litte as a few hndred dollars | Not applicable except for periodic re-sampling of population | Low-Mdeium | Medium | Known deer population, strategy implemented to reduce herd as needed. | Sampling may be done by pellet group counts, spot lighting, automated camera surveys, or other means. OCPR could conduct a survey of the RGC parks/preserves deer populations if desired. OCPR, HCMA, and MDNR can provide detailed information reagrding deer management optionsand public relations concerns associated with each. Troy and Oakland Township are also considering deer management options. Sharp-shooting may be the most cost-effective, low profile approach to reducing the deer herd size. The Nature Conservancy has developed a special permit process for distributing licenses to open hunting on their preserves. This may not be appropriate in a highly urban area, but information is available at: http://www.nature.org/wherewework/northamerica/states/michigan/science/art25456.html |
| | | 32 | Continue frog and toad volunteer surveys in all parks and preserves where monitoring is currently conducted. Expand frog and toad survey efforts to include wetlands in each of the 11 RGC parks and preserves as noted in the recommendations for individual sites. | Expand Survey and Monitoring Efforts | AC | Continue monitoring at all existing locations (20) and add monitoring locations where noted ( ) | $500 to $1,200 per site | $500-$1,200 per site | Low | Low | Database to track habitat improvements or loss | http://www.therouge.org/Programs/PI/frog_and_toad_survey.htm Potential Funding Source: Section 319 CWA Implementation Grants. |
| | | 33 | Conduct spring ephemeral plant surveys in all RGC parks and preserves. Recalculate FQI scores. | Expand Survey and Monitoring Efforts | --- | All parks and preserves (349 acres) | $1,000 to $1,200 | Not Applicable | Low | Medium - High | Database to track better evaluate FQI, track habitat changes, and plan protection | Section-specific data to prioritize efforts may be purchesed from the Michigan Natural Features Inventory (MNFI): http://web4.msue.msu.edu/mnfi/ |
| | | 34 | Expand bird surveys to include all parks and preserves and to incorporate annual counts, where possible, to detect population changes. | Expand Survey and Monitoring Efforts | --- | All parks and preserves (349 acres) | Not Applicable | Largely volunter effort, $4,000 to $8,000 for coordination for all parks/preserves | Low | Medium | Database to track population trends | Information on the Audubon Society Christamas Bird Count at: http://www.audubon.org/Bird/cbc/ |
| | | 35 | Expand volunteer, agency staff, and/or consultant surveys to include insects and herptiles, as resources allow, in each of the RGC parks and preserves. | Expand Survey and Monitoring Efforts | --- | All parks and preserves (349 acres) | $800 to $2,400 per park/preserve | Not Applicable | Low | Low | Database to track population trends | Section-specific data to prioritize efforts may be purchesed from the Michigan Natural Features Inventory (MNFI): http://web4.msue.msu.edu/mnfi/ |
| Quarton Rd d/s to Quarton Lk | River Reach Ciy of Birmingham | 36 | Develop and disseminate targeted land owner education materials regarding use of low/no phosphorus fertilizers and other ways to reduce nutrient runoff: | Educate/Involve Residents in Riparian Stewardship | --- | Up to 50 homes adjacent to river | $100 | $100 if repeated annually | Low | Medium | Reduced nutrient concetrations and algae in this reach and Quarton Lake downstream | See notes on fertilizer ordinance above and public education materials listed. Potential Funding Source: Section 319 CWA Implementation Grants. |

# Table 1. Corridor-Wide and Reach or Park Specific Management Recommendations

| Location | | | # | Recommended Strategy | Goal | Target Metrics | Level of Effort (units) | Estimated Capitol Cost | Annual O&M Cost | Cost Rating | Impact Rating | Measure of Success | Notes, Comments, Resources |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quarton Lake Park | Park/Preserve | City of Birmingham | 37 | Identify opportunities to redirect storm water outfalls in the park to bioswales, rain gardens, or other treatment systems prior to discharge. | Improve Water Quality<br>Improve In-Stream Aquatic Habitat | WQ, AHR, FC, MC | Inspect and explore options for 6-12 outfalls | Bioretention ~$6.80/ft$^3$ | 2% of O&M | Low | High | Established, viable, native wetland plant communities and restored hydrology | Inventory could be done concurrent with inventory of stormwater infrastructure |
| | | | 38 | Re-establish shallow water and shoreline planting, particularly at upstream end and near and storm water inlets. Netting or other means to limit waterfowl herbivory should be used until plants are well established. | Improve Water Quality<br>Improve In-Stream Aquatic Habitat | WQ, AHR, FC, MC | 5,0000 sq. ft. nearshore area | $3,000 for design, plants, labor, and netting. | Not Applicable | Low | Medium | Established, viable, native wetland plant communities, additional frog/toad species with additional habitat | https://sslserver.com/wetland.org/shop/mainpub.shtml?id=pub5 |
| | | | 39 | Provide pet-waste bags, trash cans, and educational signage regarding proper disposal. | Educate/Involve Residents in Riparian Stewardship | --- | 3-4 pet waste stations in park | $300 - $500 per station | $62.75 for 10- 200 count rolls of bags | Low | Medium | Reduced nutrients and bacteria in Quarton Lake | http://projects.geosyntec.com/NPSManual/Fact%20Sheets/Pet%20Waste%20Management.pdf |
| | | | 40 | Use only low/no phosphorus fertilizers on park lawns and avoid fertilizer use within riparian buffers. | Educate/Involve Residents in Riparian Stewardship | --- | Same as current effort | Same as current cost | Not Applicable | Low | Medium | Reduced nutrients and algae in Quarton Lake | http://www.a2gov.org/GOVERNMENT/PUBLICSERVICES/SYSTEMS_PLANNING/ENVIRONMENT/Pages/PhosphorusFertilizer.aspx |
| | | | 41 | Provide additional signage, or other local resident education, to reduce feeding of ducks and geese. | Educate/Involve Residents in Riparian Stewardship | --- | 1-2 signs within park | $50 - $650 depending upon design | Not Applicable | Low | Medium | Reduced nutrients, algae, and bacteria in Quarton Lake | |
| | | | 42 | Widen existing riparian buffer with additional native species plantings. | Maintain/Expand Riparian Buffer | AHR, FQI, WFV, WQ | 100,000 sq feet of new planted area | $8,000 | 2% construction | Low | Medium | Naturalized buffer surrounding entire lake | |
| | | | 43 | Establish a frog and toad volunteer monitoring location at Quarton Lake Park. | Expand Survey and Monitoring Efforts | AC | 1 new site at this location | $500 to $1,200 per site | $500-$1,200 per site | Low | Low | Database to track habitat improvements or loss | http://www.therouge.org/Programs/PI/frog_and_toad_survey.htm<br>Potential Funding Source: Section 319 CWA Implementation Grants. |
| Booth Park Trail | Park/Preserve | City of Birmingham | 44 | Conduct a bird survey for this park, incorporating annual counts of individuals of each species to monitor trends, if possible. | Expand Survey and Monitoring Efforts | --- | 1-2 day survey in park | Not Applicable | Largely volunter effort, $4,000 to $8,000 for coordination | Low | Low | Database to track population trends | |
| | | | 45 | Conduct mussel survey within this park. Continue to monitor with other RGC sites if it contains special concern species similar to those found in location sampled nearby. | Expand Survey and Monitoring Efforts | --- | Survey representative or likely habitat in park | $500 | Recurring costs on 5 -10 year cycle | Low | Low | Regular, recurring monitoring to monitor population trends | Potential Funding Source: NFWF |
| | | | 46 | Evaluate existing streambank stabilization, work with landowners under a local watercourse protection ordinance to re-stabilize areas where previous stabilization techniques are failing or do not reduce erosion. | Reduce Erosion and Sedimentation | AHR, BSI, FC, MC, WQ | 19.6 acres in Booth Park surveyed | $500 to evaluate and meet with landowners | Not Applicable | Low | Low | Improved soil erosion control and aesthetics | |
| | | | 47 | Expand upon LTI inventory to develop a corridor-wide large woody debris management plan. Establish priorities, budgets, schedules, and on-going maintenance programs for clearing recreational access and stabilizing the worst erosion hotspots. Encourage use of deformable, vegetative stabilization where possible. | Manage Woody Debris | AHR, BSI | RGC corridor or 13 to 8 Mile Roads | $8,000 -$12,000 to complete inventory and prioritization Implementation costs will depend upon plan and priorities | Not Applicable | Medium | High | River corridor passable by paddle craft | |
| | | | 48 | Review 2007 Booth Park Trail Woody Debris Management program. Incorporate successful techniques into corridor-wide LWD management plan. | Manage Woody Debris | AHR, BSI | Booth Park | Not Applicable | Not Aplicable | Low | High | Improved, coordinated invasice species control efforts | |
| Linden Park Trail | Park/Preserve | City of Birmingham | 49 | Explore possibility and mechanisms for purchasing additional parcels or placing them under conservation easements. | Maintain/Expand Riparian Buffer | AHR, FQI, WFV, WQ | TBD | TBD | TBD | unknown | Medium | Easement or purchase completed | |
| | | | 50 | Conduct mussel survey within this park. Continue to monitor with other RGC sites if it contains special concern species similar to those found in location sampled nearby. | Expand Survey and Monitoring Efforts | --- | Survey representative or likely habitat in park | $500 | Recurring costs on 5 -10 year cycle | Low | Low | Regular, recurring monitoring to monitor population trends | Potential Funding Source: NFWF |
| | | | 51 | Add a volunteer macroinvertebrate monitoring station within Linden Park Trail. | Expand Survey and Monitoring Efforts | --- | Spring and fall macroinvertebrate monitoring | $500 to $1,200 per site | $500-$1,200 per site | Low | Low | Database to track water quality attainment | Friends of the Rouge and MICorps<br>Potential Funding Source: Section 319 CWA Implementation Grants. |

# Table 1. Corridor-Wide and Reach or Park Specific Management Recommendations

| Location | | # | Recommended Strategy | Goal | Target Metrics | Level of Effort (units) | Estimated Capitol Cost | Annual O&M Cost | Cost Rating | Impact Rating | Measure of Success | Notes, Comments, Resources |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fairway Park | Park/Preserve | City of Birmingham | 52 | Conduct a bird survey for this park, incorporating annual counts of individuals of each species to monitor trends, if possible. | Expand Survey and Monitoring Efforts | --- | 1-2 day survey in park | Not Applicable | Largely volunter effort, $4,000 to $8,000 for coordination for all parks/preserves | Low | Medium | Database to track population trends | Information on the Audubon Society Christamas Bird Count at: http://www.audubon.org/Bird/cbc/ |
| | | | 53 | Investigate mussel fauna within Fairway Park. Conduct follow-up mussel surveys every 5 to 10 years. | Expand Survey and Monitoring Efforts | --- | Survey representative or likely habitat in park | $500 | Recurring costs on 5 -10 year cycle | Low | Low | Regular, recurring monitoring to monitor population trends | Potential Funding Source: NFWF |
| Birmingham Golf Course | River Reach | City of Birmingham | 54 | Identify areas out of play that could be used/restored as created wetlands for flood storage and water quality protection. Work with Golf Course managers to design in context of course layout. | Connect River & Floodplain Restore Wetlands | AHR, BSI, FC, RBFI, WQ, WFV | 5 acres | $30,000 to $40,000/acre $150,000 to $200,000 | Not Applicable | Medium | High | Established, viable, native wetland plant communities and restored hydrology | Potential Funding Source: NFWF, EPA 5-Star Restoration Grants |
| | | | 55 | Design and plant deep rooted, native species to create no-mow buffer along stream and to replace the stabilizing effects of the trees that have been cut there. | Maintain/Expand Riparian Buffer Reduce Erosion and Sedimentation | AHR, FQI, WFV, WQ, BSI, FC, MC | 5 acres of 25'-wide riparian buffer | $17,000 to $34,000 for design, plants, and labor | 2% construction | Medium | High | Well established native riparian vegetation designed to work in concert with golf course operations | Potential Funding Source: NFWF, EPA 5-Star Restoration Grants |
| | | | 56 | Work with golf course personnel to change management practices, particularly to allow or create a natural vegetation buffer along the river and to reduce fertilizer use in proximity to the river. | Educate/Involve Residents in Riparian Stewardship | --- | 5 acres of 25'-wide riparian buffer, no/low P fertilizer throughout golf course | Not Applicable, same as existing price ater buffer establishment | Not Applicable | Low | Medium | | |
| | | | 57 | Evaluate whether portions of this reach could be narrowed and deepened to add habitat diversity. | Improve In-stream Aquatic Habitat | AHR, FC, MC | TBD | TBD | TBD | unknown | High | Improved in-stream habiatat, deeper flows in stable channel, could be combined with buffer so GC doesn't lose as much land in process | |
| Hidden Rivers Preserve and Riverside Park | Park/Preserve | Village of Beverly Hills | 58 | Develop and disseminate targeted land owner education materials regarding use of low/no phosphorus fertilizers and other ways to reduce nutrient runoff: | Educate/Involve Residents in Riparian Stewardship | --- | Up to 50 homes adjacent to river | $100 | $100 if repeated annually | Low | Medium | Reduced nutrient concetrations and algae in this reach | Potential Funding Source: Section 319 CWA Implementation Grants. |
| | | | 59 | Consider conducting invasive species removal on the island in Riverside Park and involve riparian residents as a form of outreach and education. | Manage Invasive Species | FQI, WFV | TBD | TBD | TBD | unknown | Medium | Reduced invasive species coverage and protetion of high quality native plant species | |
| | | | 60 | Analyze how changes in dam operation might impact area wetlands and floodplain forest. Develop cost-benefit analysis of no action, dredging, or dam removal. | Reduce Erosion and Sedimentation Improve In-stream Aquatic Habitat | AHR, BSI, FC, MC, WQ | Park-wide | $4,000 - $5,000 | Not Applicable | Low | High | Decision to pursue dam removal or manage sediment | |
| | | | 61 | Hold public meetings regarding dam removal or impoundment management options. | Reduce Erosion and Sedimentation Improve In-stream Aquatic Habitat | AHR, BSI, FC, MC, WQ | 1 to 2 meetings | $500 to $1,000 in staff costs, publicity, etc. | Not Applicable | Low | Medium | Strong showing of interested public and comments to incorporate into plan | |
| | | | 62 | Expand bird surveys to incorporate annual counts of individuals within each species, where possible, to monitor population changes. | Expand Survey and Monitoring Efforts | --- | 1-2 day survey in park | Not Applicable | Largely volunter effort, $4,000 to $8,000 for coordination for all parks/preserves | Low | Medium | Database to track population trends | Information on the Audubon Society Christmas Bird Count at: http://www.audubon.org/Bird/cbc/ |
| | | | 63 | Expand volunteer, agency staff, and/or consultant surveys to include insects and herptiles. | Expand Survey and Monitoring Efforts | --- | 20 acres | $800 to $2,400 | Not Applicable | Low | Low | Database to track population trends | Section-specific data to prioritize efforts may be purchesed from the Michigan Natural Features Inventory (MNFI): http://web4.msue.msu.edu/mnfi/ |

# Table 1. Corridor-Wide and Reach or Park Specific Management Recommendations

| Location | | # | Recommended Strategy | Goal | Target Metrics | Level of Effort (units) | Estimated Capitol Cost | Annual O&M Cost | Cost Rating | Impact Rating | Measure of Success | Notes, Comments, Resources |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Douglas Evans Nature Preserve | Park/Preserve Village of Beverly Hills | 64 | Actively manage invasive and woody species to maintain the planted prairie and wet meadow areas at the Douglas Evans Preserve. Maintain with periodic prescribed burns in late winter - early spring (every 2-3 years) or mowing and overseeding. | Manage Invasive Species | FQI, WFV | TBD | TBD | TBD | unknown | High | Stable prairie plant community; high, sustained FQI | |
| | | 65 | Expand volunteer, consultant and/or agency staff surveys to include insects and herptiles. | Expand Survey and Monitoring Efforts | --- | 19.0 acres in Douglas Evans Nature Preserve surveyed | $800 to $2,400 | Not Applicable | Low | Low | Database to track population trends | |
| | | 66 | Conduct follow-up mussel surveys every 5 to 10 years, expand sampling stations to identify other high quality areas and monitor over time. | Expand Survey and Monitoring Efforts | --- | Survey representative or likely habitat in park | $500 | Recurring costs on 5 -10 year cycle | Low | Low | Regular, recurring monitoring to monitor population trends | Potential Funding Source: NFWF |
| Douglas Evans to 13 Mile | River Reach Village of Beverly Hills | 67 | Conduct targeted outreach to landowners to maintain the wooded buffer within this reach. | Maintain/Expand Riparian Buffer | AHR, FQI, WFV, WQ | Reach | TBD | Not Applicable | Low | Low | Important forest preserved, reduction in invasive species and erosion | |
| 13 Mile to Lahser Rd | River Reach Village of Beverly Hills | 68 | Work with riparian landowner(s) immediately south of 13 Mile Road to establish deep rooted native plantings along river banks. | Educate/Involve Residents in Riparian Stewardship Maintain/Expand Riparian Buffer | AHR, FQI, WFV, WQ | 1 acre of 25'-wide riparian buffer | $5,000 for design, plants, and labor | Minimal | Medium | High | Well established native riparian vegetation designed to work in concert with golf course operations | Potential Funding Source: NFWF, EPA 5-Star Restoration Grants |
| | | 69 | Investigate funding/incentive programs to plant and establish riparian buffer plantings. | Educate/Involve Residents in Riparian Stewardship Maintain/Expand Riparian Buffer | AHR, FQI, WFV, WQ | | | | | | | |
| | | 70 | Stabilize high load streambank erosion within this reach. | Reduce Erosion and Sedimentation | AHR, BSI, FC, MC, WQ | 500 feet | $90-$150/linear foot<br>$45,000 to $75,000 | Not Applicable | Medium | Medium | Stable banks and reduced erosion | |
| | | 71 | Explore alternative designs and orientation for the Riverview Road bridge. | Reduce Erosion and Sedimentation | AHR, BSI, FC, MC, WQ | Rivervies Road Bridge hydraulic and hydrologic analysis | TBD | TBD | High | Medium | Recreational access<br>Reduced downstream erosion<br>Deepened channel | |
| | | 72 | Remove accumulated sediments and re-establish narrower river cross-section when a new bridge is constructed. | Reduce Erosion and Sedimentation | AHR, BSI, FC, MC, WQ | Rivervies Road Bridge hydraulic and hydrologic analysis | TBD | TBD | High | Medium | Recreational access<br>Reduced downstream erosion<br>Deepened channel | |
| | | 73 | Focus initial LWD Management on section of RGC between 13 and 10 Mile Roads as this affords the most enjoyable paddling experience. | Manage Woody Debris | AHR, BSI | Initial planning inventory $5,000<br>Implementation dependent upon permitting and labor needs | TBD | TBD | Low - Medium | High | Continuous recreational access 13 Mile to 10 Mile Road | |
| | | 74 | Explore options and possible locations for a stable and accessible canoe/kayak launch site. | Promote the River and RGC as Recreational Assets | --- | Douglas Evans Preserve shoreline | $2,000 - $5,000 | 2% of intsllation | Low | High | Launch site installed and stable through runoff events | A useful reference on canoe/kayak launch facilities, materials, and design considerations is available from the U.S. National Park Service:<br>http://www.nps.gov/ncrc/programs/rtca/helpfultools/launchguide.pdf |

# Table 1. Corridor-Wide and Reach or Park Specific Management Recommendations

| Location | | # | Recommended Strategy | Goal | Target Metrics | Level of Effort (units) | Estimated Capitol Cost | Annual O&M Cost | Cost Rating | Impact Rating | Measure of Success | Notes, Comments, Resources |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lahser Rd to 12 Mile Rd | River Reach | 75 | Work with riparian landowner(s), encouraging reestablishment of cleared streamside vegetation. | Maintain/Expand Riparian Buffer | AHR, FQI, WFV, WQ | 1 acre of 25'-wide riparian buffer | $5,000 for design, plants, and labor | Minimal | Medium | High | Well established native riparian vegetation designed to work in concert with golf course operations | Potential Funding Source: NFWF, EPA 5-Star Restoration Grants |
| | | 76 | Work with riparian landowner(s) to replace existing riprap with vegetative or more aesthetically pleasing erosion control methods (see photo insets 2 and 3, Figure 26). | Reduce Erosion and Sedimentation | AHR, BSI, FC, MC, WQ | 500 feet | $90-$150/linear foot $45,000 to $75,000 | Not Applicable | Medium | Medium | Stable banks and reduced erosion | |
| | | 77 | Expand existing streambank stabilization area further downstream (likely in different ownership) to capture the section of bank seemingly eroded, in part, due to riprap immediately upstream (see photo insets 2 and 3, Figure 26). | Reduce Erosion and Sedimentation | AHR, BSI, FC, MC, WQ | 500 feet | $90-$150/linear foot $45,000 to $75,000 | Not Applicable | Medium | Medium | Stable banks and reduced erosion | |
| | | 78 | Investigate options to replace/bury elevated pipes crossing the river and causing log jams. | Manage Woody Debris | AHR, BSI | One known utility crossing in this reach | TBD | TBD | Medium - High | Medium | Continuous recreational access 13 Mile to 10 Mile Road | |
| | | 79 | Consider sampling for mussels in this reach. Conduct follow-up mussel surveys every 5 to 10 years if found to contain diverse mussel assemblage. | Expand Survey and Monitoring Efforts | --- | Survey representative or likely habitat in park | $500 | Recurring costs on 5 -10 year cycle | Low | Low | Regular, recurring monitoring to monitor population trends | Potential Funding Source: NFWF |
| Valley Woods Nature Preserve at Streamwood | Park/Preserve | 80 | Identify opportunities to eradicate or reduce early infestations on or near the Berberian Property before they can threaten rare plant species. | Manage Invasive Species | FQI, WFV | TBD | TBD | TBD | unknown | High | Coordinated strategy to allocate resources for invasive species removal, Improving FQIs | |
| | | 81 | Evaluate need for/install a deer exclosure(s) within the Berberian tract to protect rare plant concentrations. | Manage Invasive Species | FQI, WFV | | | | | | | |
| | | 82 | Consider invasive species response when planning for/designing new trails, roads, and other openings in the canopy within the central portion of Valley Woods at Streamwood. Maintain the minimum widths possible for trails and minimize tree clearing to avoid disturbance that may facilitate invasive species introductions. | Manage Invasive Species | FQI, WFV | | | | | | | |
| | | 83 | Explore opportunities for removing invasives species and restoring native species at the north end of the park, while allowing for planned parking and trails. | Manage Invasive Species | FQI, WFV | | | | | | | |
| | | 84 | Provide trail signage encouraging local native landscaping and discouraging invasive non-native plant species and tying that effort to protection of the park. | Manage Invasive Species | FQI, WFV | 1-2 signs within park | $50 - $650 depending upon design | Not Applicable | Low | Medium | Heightened awareness of invasive plant concerns | |
| | | 85 | Explore opportunities to purchase additional parcel across the river from the Berberian property. | Maintain/Expand Riparian Buffer | AHR, FQI, WFV, WQ | TBD | TBD | TBD | unknown | High | | |
| | | 86 | Design trail network to maximize contiguous habitat acreage unimpacted by edge effects. | Maintain/Expand Riparian Buffer | AHR, FQI, WFV, WQ | Preserve-wide | TBD | Not Applicable | Low | High | Large contiguous block of woodland habitat >100 meters fro m any edge | |
| | | 87 | Establish a volunteer macroinvertebrate monitoring station at Valley Woods at Streamwood. | Expand Survey and Monitoring Efforts | --- | Spring and fall macroinvertebrate monitoring | $500 to $1,200 per site | $500-$1,200 per site | Low | Low | Database to track water quality attainment | Friends of the Rouge and MICorps<br>Potential Funding Source: Section 319 CWA Implementation Grants. |
| | | 88 | Conduct bird surveys including annual counts of individuals in each species, where possible, to detect population changes. | Expand Survey and Monitoring Efforts | --- | 1-2 day survey in park | Not Applicable | Largely volunter effort, $4,000 to $8,000 for coordination for all | Low | Medium | Database to track population trends | Information on the Audubon Society Christamas Bird Count at: http://www.audubon.org/Bird/cbc/ |
| | | 89 | Continue frog and toad volunteer surveys and consider adding a site within the southern half of the park. | Expand Survey and Monitoring Efforts | --- | Continue existing monitoring at this location, consider adding a 2nd | $500 to $1,200 per site | $500-$1,200 per site | Low | Low | Database to track habitat improvements or loss | http://www.therouge.org/Programs/PI/frog_and_toad_survey.htm<br>Potential Funding Source: Section 319 CWA Implementation Grants. |
| | | 90 | Expand volunteer, contractor, and/or agency staff surveys to include insects and herptiles. | Expand Survey and Monitoring Efforts | --- | Valley Woods at Streamwood surveyed | $800 to $2,400 | Not Applicable | Low | Low | Database to track population trends | |

City of Southfield

# Table 1. Corridor-Wide and Reach or Park Specific Management Recommendations

| Location | | # | Recommended Strategy | Goal | Target Metrics | Level of Effort (units) | Estimated Capitol Cost | Annual O&M Cost | Cost Rating | Impact Rating | Measure of Success | Notes, Comments, Resources |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Valley Wds at Streamwood (cont'd) | Park/Preserve | City of Southfield | 91 | Conduct mussel survey within the park and resample every 5 to 10 years if mussel assemblage is found to be diverse or sensitive. | Expand Survey and Monitoring Efforts | --- | Survey representative or likely habitat in park | $500 | Recurring costs on 5 -10 year cycle | Low | Low | Regular, recurring monitoring to monitor population trends | Potential Funding Source: NFWF |
| | | | 92 | Monitor known rare plant communities to determine if deer browsing is negatively impacting plants. | Expand Survey and Monitoring Efforts | --- | Valley Woods at Streamwood | $500 | | Low | Medium - High | | |
| | | | 93 | Record frequency and extent of flooding within the central area of the park. Assess whether changing stream morphology is altering the historic flood frequency and negatively impacting plant communities. | Expand Survey and Monitoring Efforts | --- | Valley Woods at Streamwood | Cost of depth gage and recording observations | | Low | Medium - High | | |
| | | | 94 | Evaluate older streambank stabilization within this reach, determine need for replacing to improve aesthetics or function. | Reduce Erosion and Sedimentation | AHR, BSI, FC, MC, WQ | Priavte properties with failing stabilization | TBD | | Medium | Medium | Improved aesthetics and sediment capture | |
| | | | 95 | Continue stream bank stabilization for high priority sites identified in the Franklin Branch Erosion Inventory. | Reduce Erosion and Sedimentation | AHR, BSI, FC, MC, WQ | 500 feet | $90-$150/linear foot $45,000 to $75,000 | Not Applicable | Medium | Medium | Stable banks and reduced erosion | |
| Valley Woods at Civic Center Drive | Park/Preserve | City of Southfield | 96 | Restore capacity of wetlands to store and detain storm water by removing or blocking existing culverts and shallow ditches and placing rock-armored inlets within spoil banks and upstream and downstream ends of park. | Restore Wetlands | FQI, WFV | 5 acres | up to $40,000/acre depending upon design, excavation if any, etc. $50,000 to $200,000 total | Monitor for 3-5 years after establishment to confirm establishment $1,000-$5,000 per year | High | Medium | Established, viable, native wetland plant communities and restored hydrology | Potential Funding Source: NFWF, EPA 5-Star Restoration Grants, Section 319 Clean Water Act Watershed Management Implementation Grants |
| | | | 97 | Expand volunteer, contractor, and/or agency staff surveys to include insects and herptiles. | Expand Survey and Monitoring Efforts | --- | Valley Woods Trail at Civic Center surveyed | $800 to $2,400 | Not Applicable | Low | Low | Database to track population trends | |
| | | | 98 | Consider conducting a fish survey within this reach to determine if previous efforts to provide fish cover were successful or if more should be done to enhance fishing opportunities. | Expand Survey and Monitoring Efforts | --- | River within park | $2,500 | Not Applicable | Low | Medium | Determination if other habitats improvements are necessary | |
| | | | 99 | Provide pet-waste bags and educational signage in park regarding proper disposal. | Educate/Involve Residents in Riparian Stewardship | --- | 3-4 pet waste stations in park | $300 - $500 per station | $62.75 for 10- 200 count rolls of bags | Low | Medium | Reduced nutrient and filamentous algae in river | |
| | | | 100 | Create signage/kiosks in park to provide education on other relevant topics as well. | Educate/Involve Residents in Riparian Stewardship | --- | 1-2 signs within park | $50 - $650 depending upon design | Not Applicable | Low | Medium | | |
| | | | 101 | Design and post signage connecting hiking trail to a water trail for canoes and kayaks. | Educate/Involve Residents in Riparian Stewardship | --- | 1-2 signs within park | $50 - $650 depending upon design | Not Applicable | Low | Medium | | |
| | | | 102 | Work with MDOT to manage invasive species within their ownership as a continuous unit with other portions of this park to minimize potential for neighboring seed sources. | Manage Invasive Species | FQI, WFV | TBD | TBD | TBD | unknown | Medium - High | | |
| | | | 103 | Replace geo-grid erosion control and riprap with vegetative stabilization to improve shoreline aesthetics, as resources allow. | Reduce Erosion and Sedimentation | AHR, BSI, FC, MC, WQ | 1,000 feet | $90-$150/linear foot $90,000 to $150,000 | Not Applicable | Medium | Medium | Stable banks and reduced erosion | |
| | | | 104 | Develop a formal walking trail through this park with designated access to river's edge to limit erosion. | Promote the River and RGC as Recreational Assets | --- | TBD | TBD | TBD | unknown | Medium - High | | |
| | | | 105 | Design and post signage connecting hiking trail to a water trail for canoes and kayaks. | Promote the River and RGC as Recreational Assets | --- | 1-2 signs within park | $50 - $650 depending upon design | Not Applicable | Low | Medium | | |
| | | | 106 | Develop a map/brochure for paddling the RGC. | Promote the River and RGC as Recreational Assets | --- | RGC | $5,000 for development $5,000 to $10,00 tp print | periodic reprints | Low | Medium | | |
| | | | 107 | Develop a dedicated walking trail connecting Southfield RGC parks and preserves between 12 and 10 Mile Roads. | Promote the River and RGC as Recreational Assets | --- | TBD | TBD | TBD | unknown | Medium - High | | |

# Table 1. Corridor-Wide and Reach or Park Specific Management Recommendations

| Location | | | # | Recommended Strategy | Goal | Target Metrics | Level of Effort (units) | Estimated Capitol Cost | Annual O&M Cost | Cost Rating | Impact Rating | Measure of Success | Notes, Comments, Resources |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Valley Woods at 10 Mile | Park/Preserve | City of Southfield | 108 | Restore capacity of wetlands to store and detain storm water by removing or blocking existing culverts and shallow ditches and placing rock-armored inlets at upstream end of park. | Restore Wetlands | FQI, WFV | 5 acres | up to $40,000/acre depending upon design, excavation if any, etc. $50,000 to $200,000 total | Monitor for 3-5 years after establishment to confirm establishment $1,000-$5,000 per year | High | Medium | Established, viable, native wetland plant communities and restored hydrology | Potential Funding Source: NFWF, EPA 5-Star Restoration Grants, Section 319 Clean Water Act Watershed Management Implementation Grants |
| | | | 109 | Explore the potential for a conservation easement on the hillside owned by the DENSO Corporation to facilitate restoration and protection activities. | Maintain/Expand Riparian Buffer | AHR, FQI, WFV, WQ | TBD | TBD | TBD | Low | Medium - High | | |
| | | | 110 | Establish macroinvertebrate monitoring station at this park. | Expand Survey and Monitoring Efforts | --- | Spring and fall macroinvertebrate monitoring | $500 to $1,200 per site | $500-$1,200 per site | Low | Low | Database to track water quality attainment | Friends of the Rouge and MICorps Potential Funding Source: Section 319 CWA Implementation Grants. |
| | | | 111 | Expand volunteer, contractor, and/or agency staff surveys to include insects, herptiles, and/or mammals. | Expand Survey and Monitoring Efforts | --- | Valley Woods Trail at 10 Mile surveyed | $800 to $2,400 | Not Applicable | Low | Low | Database to track population trends | |
| | | | 112 | Continue and celebrate the existing active partnership with the management and employees of the DENSO Corporation. Encourage their participation in local monitoring and restoration activities, both within the park and on DENSO property. | Educate/Involve Residents in Riparian Stewardship | --- | TBD | TBD | TBD | Low | Medium - High | | |
| 10 Mile to Beech Rd betw. 8 and 9 Mile Rds | River Reach | Ciy of Southfield | 113 | Stabilize eroding gullies and crumbling infrastructure in all 3 of these reaches. | Reduce Erosion and Sedimentation | AHR, BSI, FC, MC, WQ | 500 feet | $90-$150/linear foot $45,000 to $75,000 | Not Applicable | Medium | Medium | Stable banks and reduced erosion | |
| | | | 114 | Enhance floodwater storage in former oxbows, meander channels and drained wetlands. | Connect River and Floodplain | AHR, BSI, FC, RBFI, WQ, WFV | 5 acres | up to $40,000/acre depending upon design, excavation if any, etc. $50,000 to $200,000 total | Monitor for 3-5 years after establishment to confirm establishment $1,000-$5,000 per year | High | Medium | Established, viable, native wetland plant communities and restored hydrology | Potential Funding Source: NFWF, EPA 5-Star Restoration Grants, Section 319 Clean Water Act Watershed Management Implementation Grants |
| | | | 115 | Explore overlay zoning in Darcy Map priority areas to facilitate infiltration and reduce imperviousness. | Reduce Flashiness | AHR, BSI, RBFI | Southfield | $500 - $1,500 each $500 to $1,500 total | on-going enforcement, permit fee passed to applicants | Low | Medium | Groundwater Recharge Protection Overlay District enacted in each community | |
| Beech Woods Park | Park/Preserve | City of Southfield | 116 | Design and plant deep rooted, native species to create no-mow buffer along stream. | Maintain/Expand Riparian Buffer | AHR, FQI, WFV, WQ | 5 acres | $30,000 to $40,000/acre $150,000 to $200,000 | Not Applicable | Medium | High | Established, viable, native riparian plant communities and restored hydrology | Potential Funding Source: NFWF, EPA 5-Star Restoration Grants |
| | | | 117 | Identify areas out of play that could be used/restored as created wetlands for flood storage and water quality protection. | Restore Wetlands | FQI, WFV | 5 acres | $30,000 to $40,000/acre $150,000 to $200,000 | Not Applicable | Medium | High | Established, viable, native wetland plant communities and restored hydrology | Potential Funding Source: NFWF, EPA 5-Star Restoration Grants |
| | | | 118 | Stabilize eroding gullies and crumbling infrastructure in all 3 of these reaches. | Reduce Erosion and Sedimentation | AHR, BSI, FC, MC, WQ | 500 feet | $90-$150/linear foot $45,000 to $75,000 | Not Applicable | Medium | Medium | Stable banks and reduced erosion | |
| | | | 119 | Repair infrastructure and stabilize stream bank erosion at 4th hole of golf course. | Reduce Erosion and Sedimentation | AHR, BSI, FC, MC, WQ | Done | | | | | | Done |
| | | | 120 | Work with golf course personnel to change management practices, particularly leaving a natural vegetation buffer along the river and reducing fertilizer use in proximity to river. | Educate/Involve Residents in Riparian Stewardship | --- | 5 acres of 25'-wide riparian buffer, no/low P fertilizer throughout golf course | Not Applicable, same as existing price ater buffer establishment | Not Applicable | Low | Medium | | |
| | | | 121 | Establish macroinvertebrate monitoring at this park. | Expand Survey and Monitoring Efforts | --- | Spring and fall macroinvertebrate monitoring | $500 to $1,200 per site | $500-$1,200 per site | Low | Low | Database to track water quality attainment | Friends of the Rouge and MICorps Potential Funding Source: Section 319 CWA Implementation Grants. |
| | | | 122 | Conduct follow-up mussel surveys every 5 to 10 years, expand sampling stations to identify other high quality areas and monitor over time. | Expand Survey and Monitoring Efforts | --- | Survey representative or likely habitat in park | $500 | Recurring costs on 5 -10 year cycle | Low | Low | Regular, recurring monitoring to monitor population trends | Potential Funding Source: NFWF |

# Table 1. Corridor-Wide and Reach or Park Specific Management Recommendations

| Location | | # | Recommended Strategy | Goal | Target Metrics | Level of Effort (units) | Estimated Capitol Cost | Annual O&M Cost | Cost Rating | Impact Rating | Measure of Success | Notes, Comments, Resources |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Beech Wds to Valley Wds South | Park/Preserve | City of Southfield | 123 Stabilize eroding gullies and crumbling infrastructure in this reach. | Reduce Erosion and Sedimentation | AHR, BSI, FC, MC, WQ | 500 feet | $90-$150/linear foot<br>$45,000 to $75,000 | Not Applicable | Medium | Medium | Stable banks and reduced erosion | |
| Valley Woods Nature Preserve South | Park/Preserve | City of Southfield | 124 Establish macroinvertebrate monitoring at this park. | Expand Survey and Monitoring Efforts | --- | Spring and fall macroinvertebrate monitoring | $500 to $1,200 per site | $500-$1,200 per site | Low | Low | Database to track water quality attainment | Friends of the Rouge and MICorps<br>Potential Funding Source: Section 319 CWA Implementation Grants. |
| | | | 125 Conduct bird surveys at Valley Woods park South, including annual counts, if possible, to detect population changes. | Expand Survey and Monitoring Efforts | --- | 1-2 day survey in park | Not Applicable | Largely volunter effort, $4,000 to $8,000 for coordination for all | Low | Medium | Database to track population trends | Information on the Audubon Society Christamas Bird Count at: http://www.audubon.org/Bird/cbc/ |
| | | | 126 Establish frog and toad volunteer survey station at this park. | Expand Survey and Monitoring Efforts | --- | 1 new site at this location | $500 to $1,200 per site | $500-$1,200 per site | Low | Low | Database to track habitat improvements or loss | http://www.therouge.org/Programs/PI/frog_and_toad_survey.htm |
| | | | 127 Expand volunteer, contractor, and/or agency staff surveys to include insects, mammals, and herptiles. | Expand Survey and Monitoring Efforts | --- | 24.2 acres in Valley Woods South surveyed | $800 to $2,400 | Not Applicable | Low | Low | Database to track population trends | |
| | | | 128 Establish mussel monitoring here. Conduct follow-up mussel surveys every 5 to 10 years. | Expand Survey and Monitoring Efforts | --- | Survey representative or likely habitat in park | $500 | Recurring costs on 5 -10 year cycle | Low | Low | Regular, recurring monitoring to monitor population trends | Potential Funding Source: NFWF |
| | | | 129 Remove invasive species near Bridge Street and restore areas as mesic to wet meadow. | Manage Invasive Species | FQI, WFV | | | | | | | |
| | | | 130 Breach levees to enhance floodwater storage in former oxbows, meander channels and drained wetlands. | Connect River and Floodplain | AHR, BSI, FC, RBFI, WQ, WFV | | | | | | | |
| | | | 131 Stabilize eroding gullies and crumbling infrastructure in all 3 of these reaches. | Reduce Erosion and Sedimentation | AHR, BSI, FC, MC, WQ | 500 feet | $90-$150/linear foot<br>$45,000 to $75,000 | Not Applicable | Medium | Medium | Stable banks and reduced erosion | |
| | | | 132 Remove logjams causing localized erosion and new channel formation. | Manage Woody Debris<br>Reduce Erosion and Sedimentation | AHR, BSI, FC, MC, WQ | TBD | TBD | TBD | unknown | Medium | | |

## 1.0 INTRODUCTION

The Rouge River Watershed, located in southeast Michigan, contains more than 126 miles of river channel in four separate branches, the Main, Upper, Middle, and Lower, and runs through the most densely populated and urbanized portion of the state. The watershed is approximately 438 square miles in size, includes all or part of 48 municipalities in three counties, and is home to a population of over 1.5 million people.

This report and analysis focuses upon a section of the upper Main River Rouge within the City of Birmingham, the Village of Beverly Hills, and the City of Southfield, in Oakland County. While surrounded by urban land uses, this portion of the Main Rouge has been dubbed the "Rouge Green Corridor" (RGC; Figure 1), and maintains elements of its natural character and ecological integrity. Throughout most of this reach the river still follows its natural course and is buffered by floodplain forest. This riparian buffer provides habitat for many species of plants and animals and links wildlife habitat along the entire RGC. Some of the natural areas within the RGC (both privately and publicly owned) are of exceptional quality, while many are impacted by a variety of stressors and would benefit from restoration.

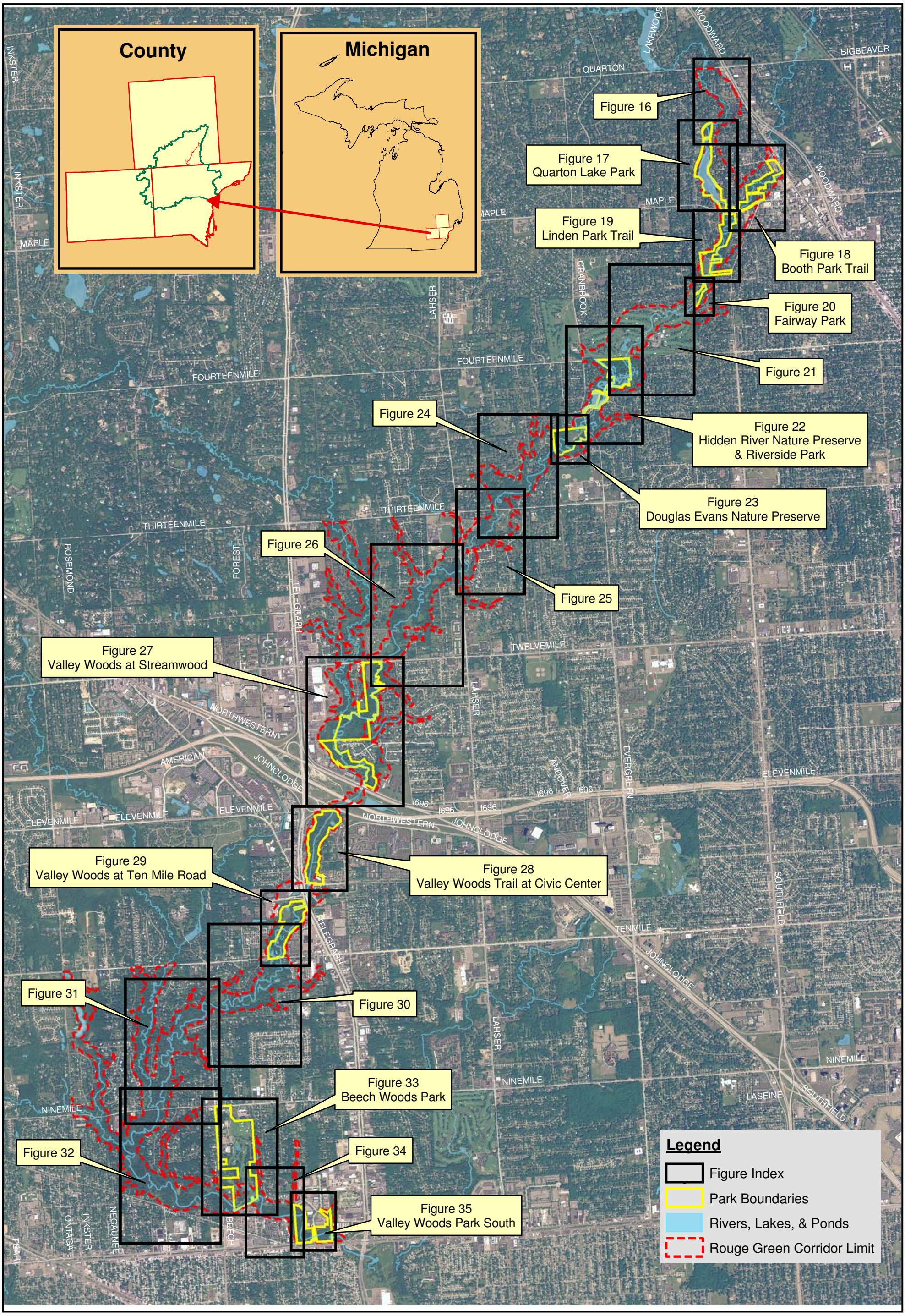
Despite these natural areas and forested buffer, human perturbation within the RGC is widespread. One cannot travel far down the river without finding culverts, dams, bridges, erosion control structures, and storm water outfalls, each of which impact habitat values in their own way. Riparian landowners have cleared vegetation to the river's edge in some areas and hardened streambanks in others in an attempt to stabilize the banks and stop erosion. In addition, there is ongoing development pressure within the corridor, and invasive species have gained a stronghold in many areas.

In order to protect the river, its water quality, and the forested riparian corridor from these threats, it is critical to first evaluate the baseline condition of the river and associated habitat. Secondly, it is important to develop management plans and recommendations for limiting further degradation and improving water quality and wildlife habitat wherever possible. A coordinated approach to riparian habitat management within the RGC is essential to preserving its future ecological integrity.

The purpose of the Rouge Green Corridor Urban Habitat Conservation and Stewardship Project is to provide that coordinated management approach. It expands upon five years of work by the Oakland County Planning & Economic Development Services Division and the project steering committee, composed of representatives from the City of Southfield, Village of Beverly Hills, City of Birmingham, the Southeast Oakland County Water Authority (SOCWA), the office of the Oakland County Water Resources Commissioner, Friends of the Rouge, the Six Rivers Land Conservancy, and concerned citizens (collectively, the RGC Steering Committee). The project is partially funded by a grant from the National Fish and Wildlife Foundation.

The main goals of this project are to develop a detailed inventory of aquatic and terrestrial habitat conditions on all public land and selected private land within the RGC; to develop a detailed habitat stewardship plan with specific recommendations for public lands, corridor-wide policies/programs, and private landowners; and to provide educational opportunities for private riparian landowners. ASTI Environmental (ASTI) was contracted by the RGC Steering Committee to develop this inventory and plan for the RGC.

This report documents the baseline condition of aquatic and terrestrial habitat on all public land and on selected private lands within the RGC. This report also provides park-specific and corridor-wide management recommendations.




# Rouge Green Corridor Habitat Assessment

Oakland County, Michigan

0 0.25 0.5 0.75 1 Miles

Created by: AGS, August 1, 2008, ASTI Project 6602
Aerial Photograph: USDA 2005

Figure 1 - Site Location & Index Map

## 2.0 METHODS

ASTI developed a multi-faceted approach to evaluate the terrestrial, aquatic, and corridor-wide conditions of the RGC. This approach involved (1) inventorying and assessing terrestrial plant communities within the RGC parks and preserves, (2) rating aquatic habitat both within and between parks and preserves, and (3) collecting and analyzing relevant published data on the RGC. The data and information collected were used to evaluate the existing character and condition of the RGC as a whole, and management recommendations were derived for each park and for the entire corridor based upon these data.

ASTI ecologists conducted meander surveys throughout 11 parks and preserves located within the Rouge Green Corridor. These meander surveys were designed to evaluate the character and quality of the terrestrial habitats located within these parks with the intent of eventually developing management recommendations for each. Detailed methods are outlined in Section 2.1.

ASTI also conducted field investigations of aquatic habitat by wading and/or kayaking the entire Rouge River within the RGC planning area. Detailed methods are outlined in Section 2.2.

Previously published reports, data summaries, plant and animal lists, maps, and digital geographic information were provided by members of the RGC Steering Committee, from the Michigan Natural Features Inventory, the Michigan Department of Natural Resources, the Michigan Department of Environmental Quality, the Rouge River National Wet Weather Demonstration Program Office, and other sources, and reviewed by ASTI. References cited in this report are provided in Appendix A.

## 2.1 Riparian (Terrestrial) Habitat Assessment

ASTI ecologists conducted meander surveys of terrestrial areas of the parks and nature preserves located within the RGC from September 18 through 27, 2007. The parks and nature preserves evaluated include (listed from north to south, upstream to downstream, Figure 1):

*City of Birmingham*
- Quarton Lake Park
- Booth Park Trail
- Linden Park Trail
- Fairway Park

*City of Beverly Hills*
- Hidden Rivers Nature Preserve and Riverside Park
- Douglas Evans Nature Preserve

*City of Southfield*
- Valley Woods at Streamwood (including the Berberian Parcel)
- Valley Woods Trail (at Civic Center Drive)
- Valley Woods at 10 Mile Road (including the adjacent DENSO property)
- Beech Woods Park
- Valley Woods South (at Bridge Street)

At each park, ASTI recorded all plant species observed. Plants not readily identifiable in the field were keyed and identified in the lab. Several parks/preserves within the RGC were previously surveyed by M. Penskar, and other researchers had previously compiled plant lists for Valley Woods Nature Preserve at Streamwood and Douglas Evans Preserve. Because these data were

collected by skilled botanists on the same sites during different seasons, the results of all plant surveys (ASTI's and others') were aggregated for analysis of each site. The resultant species lists for each park were tabulated and scored using computer software developed for the Michigan Department of Natural Resources (MDNR) Natural Heritage Program's *Floristic Quality Assessment* (FQA) methodology.[1]

*Floristic Quality Assessment*

The MDNR FQA methodology is based upon a judgment of conservatism of each plant species known to occur in Michigan. The coefficient of conservatism (C) assigned to each plant species represents the estimated probability that a particular species is likely to occur in a landscape unaltered from pre-settlement conditions. The greater the propensity that species has to being found in undisturbed settings, the greater the coefficient of conservatism (range = 0-10). Thus, plants assigned a low C value can be expected to grow in a wide variety of habitats, while plants assigned a high C value are likely to be found in only specific habitats that are undisturbed or possible remnants of pre-European settlement conditions. Average C values for all plants growing within discrete habitat units can be used as comparative tools when assessing the quality of several units.[2] A second measure of floristic quality, the floristic quality index (FQI) value, is calculated by multiplying the mean C values for all plants found in a particular area by the square root of the number of species encountered in that area. This allows comparison of sites that differ in size.

Most remaining undeveloped land in Michigan exhibits FQI scores of less than 20. Areas having an FQI greater than 35 are thought to exhibit sufficient conservatism and species richness to be floristically important and of statewide significance. FQI scores greater than or equal to 45 generally indicate that the remnant has natural area quality. Areas with FQI scores greater than 50 are extremely rare and represent a significant component of Michigan's native flora.[3]

The floristic quality index and mean C coefficient for a site are useful tools for natural area management and planning; however, these scores must be interpreted within the context of other site information to fully understand the landscape before implementing management actions. Additional information to consider at each site, for example, includes the distribution and nature of certain plant types (e.g., invasive species), the levels of historic and present anthropogenic disturbance, differences in survey effort and the seasons in which flora surveys were conducted, and the existing habitats found within each park or preserve.

Floodplain and riparian areas, although not always wetland, were characterized using the descriptive approach for assessing wetland functions and values developed by the New England District of the U.S. Army Corps of Engineers.[4] ASTI also mapped habitat types and recorded additional information regarding adjacent land uses, the condition of the riparian corridor, wildlife sign or sightings, the presence or absence of invasive species, and noted initial recommendations for management and restoration. Data sheets compiled during ASTI's field investigations are provided as Appendix B.

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[1] Herman, K.D., L.A. Masters, M.R. Penskar, A.A. Reznicek, G.S. Wilhelm, W.W. Brodovich, and K.P. Gardiner. 2001. Floristic Quality Assessment with Wetland Categories and Examples of Computer Applications for the State of Michigan – Revised, 2nd Edition. Michigan Department of Natural Resources, Wildlife Division, Natural Heritage Program. Lansing, Michigan. 19 pp. + Appendices.

[2] Ibid

[3] Ibid

[4] USACOE. 1999. The Highway Methodology Workbook Supplement: Wetland Functions and Values A Descriptive Approach. U.S. Army Corps of Engineers New England District, NAEEP, September 1999.

## 2.2 Aquatic Habitat Assessment

ASTI ecologists conducted field investigations, by wading and/or kayaking the entire Rouge River channel within the planning area between September 28 and November 2, 2007. The principal method employed for evaluating aquatic habitat within the RGC was the qualitative habitat survey protocols for wadeable streams and rivers developed by the Michigan Department of Environmental Quality's (MDEQ's).[5] Following this methodology, stream segments are first characterized as either riffle/run dominated systems or glide/pool dominated segments.

Riffles are shallow reaches with low sub-critical flows (generally 1-4% gradient) in alluvial channels with smaller, unstable substrate (e.g., gravel). They are characterized by small ripples, waves, and eddies, as water flows over rough bed materials. Riffles are smaller than rapids or cascades and exhibit finer bed materials. Stable riffles help maintain water levels in pools, commonly found immediately upstream of riffles, and provide spawning and feeding habitat.[6] A run is a reach of swiftly flowing water exhibiting little or no surface agitation, waves, or turbulence.

Glides, like runs, also exhibit a smooth water surface but, by contrast, they are shallower and slower than runs. Pools are aquatic habitats that are normally deeper and wider than other aquatic habitats. A variety of depths and velocities in pools is important for habitat diversity.[7] Pools may be formed by the damming effects of riffles immediately downstream, by scour caused as water flows over and under logs or around boulders, or by scour on the outside of bends of the channel. Pools provide refuge from high velocities, feeding habitat, and cover.

Using Procedure 51, each stream type was evaluated for 10 separate metrics rating in-stream habitat, channel morphology, bank structural features, and riparian vegetation. Scores for each of these metrics were summed for a possible total of 200 points and habitat scores were categorized as excellent (>154 points), good (105-154 points), marginal (56-104 points), or poor (<56 points), reflecting that segment's potential to support biological communities.

Procedure 51 metrics are applicable for evaluating wadeable portions of perennial or intermittent streams flowing within well-defined banks. These metrics do not lend themselves to evaluating impounded river sections, lentic (still) waters, or irrigation/drainage channels. The RGC does include two impounded sections: at Quarton Lake Park and at Hidden River Nature Preserve and Riverside Park. Aquatic habitat for these reaches was described in general terms.

In response to concerns regarding channel stability expressed by the RGC Steering Committee, additional observations regarding streambank angle and height, streamside vegetation coverage, soils, and substrate composition were also collected and used to calculate a Bank Stability Index, as proposed by Simon and Hupp[8] and modified by the U.S. Geological Survey.[9] Streambank stability, was rated as "stable," "at risk," "unstable," or "very unstable."

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[5] MDEQ. 2002. Qualitative Biological and Habitat Survey Protocols for Wadeable Streams and Rivers. Michigan Department of Environmental Quality, Surface Water Quality Division, Great Lakes and Environmental Assessment Section, Procedure #51, Lansing, Michigan. Revised May, 28, 2002.

[6] Armantrout, Neil B., compiler. 1998. Glossary of aquatic habitat inventory terminology. American Fisheries Society, Bethesda, Maryland.

[7] Ibid

[8] Simon, A. and C.R. Hupp. 1992. Geomorphic and vegetative recovery processes along modified stream channels of west Tennessee: U.S. Geological Survey Open-File Report 91-502, 142 p.

[9] Fitzpatrick, F.A., Waite, I.R., D'Arconte, P.J., Meador, M.R., Maupin, M.A., and M.E. Gurtz. 1998. Revised Methods for Characterizing Stream Habitat in the National Water-Quality Assessment Program. U.S. Geological Survey Water-Resources Investigations Report 98-4052.

# 3.0 HABITAT ASSESSMENT AND MANAGEMENT RECOMMENDATIONS

## 3.1 Corridor-Wide Assessment

*Historical/Geological Setting*

Topography, Geology & Soils

The RGC spans approximately 15.5 river miles, flowing southwest through the City of Birmingham and the Village of Beverly Hills, then turning southeast within the City of Southfield. The river occupies a relatively narrow valley as it falls from an elevation of approximately 727 feet to 610 feet above sea level, from the north (upstream) end of the RGC to the south (downstream) end (Figure 2). The valley longitudinal-section shown in the inset within Figure 2 shows a change in valley slope between the I-696 freeway and 10 Mile Road. Above this point, the average slope of the RGC is approximately 9.7 feet per mile. Below this point, the slope flattens out considerably, exhibiting a drop of only 4.2 feet per mile.

A transition in river channel morphology south of 10 Mile Road is also markedly noticeable in the field. Gravel, cobble, and, to a lesser degree, boulder substrates dominate north of 10 Mile Road, whereas south of 10 Mile Road, these larger substrates disappear and are replaced by mobile sand and silt substrates. South of 10 Mile Road the river exhibits very active meandering, erosion, and deposition. This change may in part be due to changes in geology, described below, but is more likely due to the change in gradient. Rivers tend to meander and erode in order to dissipate kinetic energy, generated in steeper upstream reaches, when they enter flatter valleys. The shallower slope causes larger bed materials to be deposited.

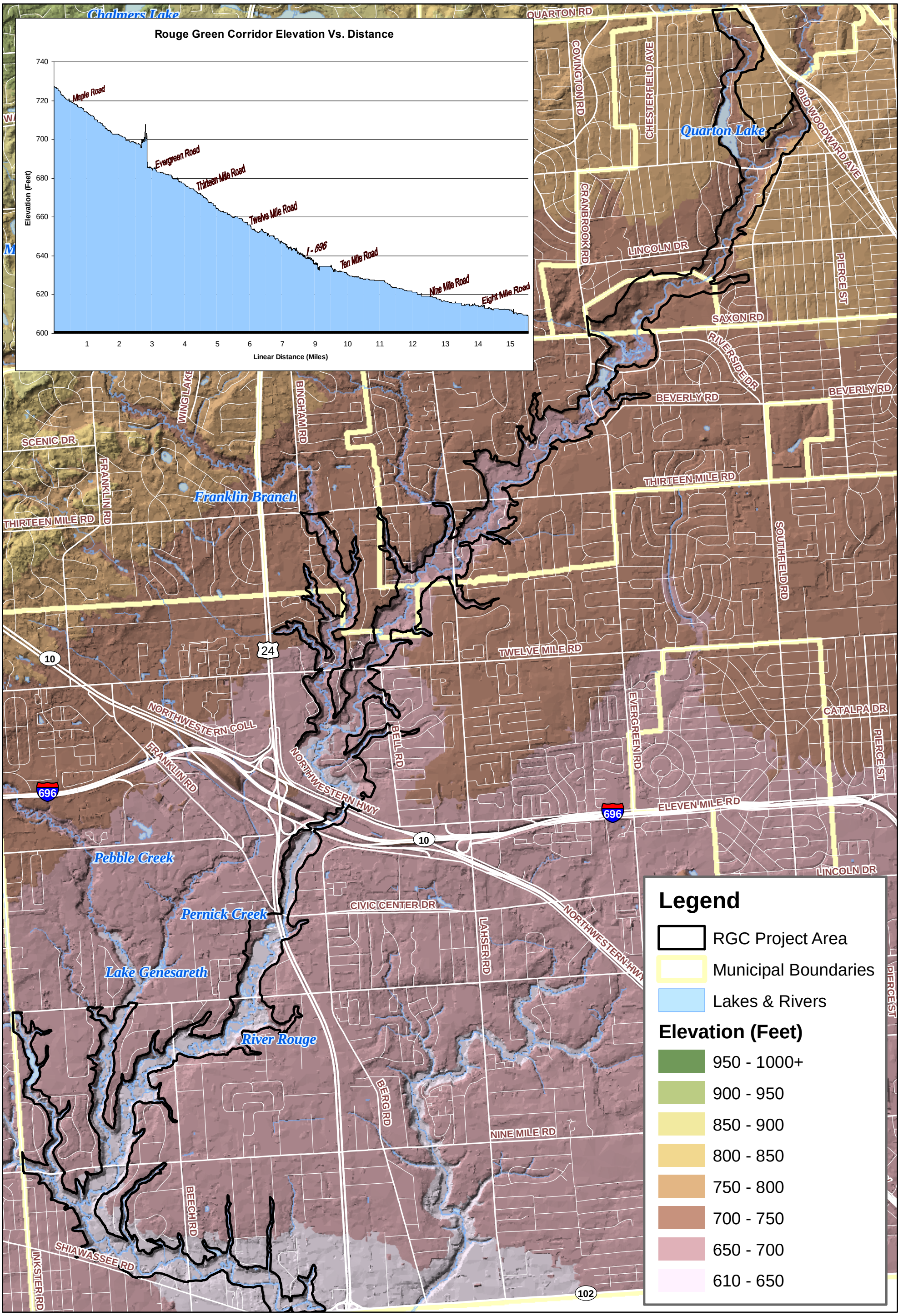
North America experienced four episodes of glaciation in the last 2 million years (the Quaternary Period). The last of these was the Wisconsin Glaciation that began approximately 120,000 years ago. The front of the Wisconsin glaciers began retreating approximately 14,500 years ago. As they did so, they left behind terminal and lateral moraines that dammed and diverted melting floodwaters. As the weight of a 2-mile thick layer of ice was removed, the land rebounded. The result was a series of glacial lake stages, ranging from 800 to 540 feet above sea level. Lake Erie, the receiving water for the Rouge and Detroit Rivers, reached its modern day elevation of approximately 573 feet above sea level around 11,000 years ago.[10]

The surficial geology of Southeast Michigan, and the Rouge River Basin, is dominated by the patterns of these glacial sediments and changing lakeshores. The headwaters of the RGC and its major tributaries, the Franklin Branch and Pebble Creek, begin in the unconsolidated materials of the Defiance Moraine. But most of the RGC valley cuts through finer materials deposited by ancient lake waters (lacustrine). North of Twelve Mile Road these materials are mostly sandy clays and south of Twelve Mile Road these materials are largely lacustrine sands (Figure 3).[11]

Other maps, developed at a state-wide scale by Farrand and Bell, place the change in geologic sediments somewhat farther south. They indicate the river flowing out of lacustrine clay and silt

[10] Rogers, Daniel T. 1996. Environmental Geology of Metropolitan Detroit. Clayton Environmental Consultants, Inc. Novi, Michigan.

[11] Oakland County. 2003. Oakland County Surface Geology and Hydrology (map). Oakland County Planning & Economic Development Services, Environmental Stewardship Program and the Cranbrook Institute of Science.



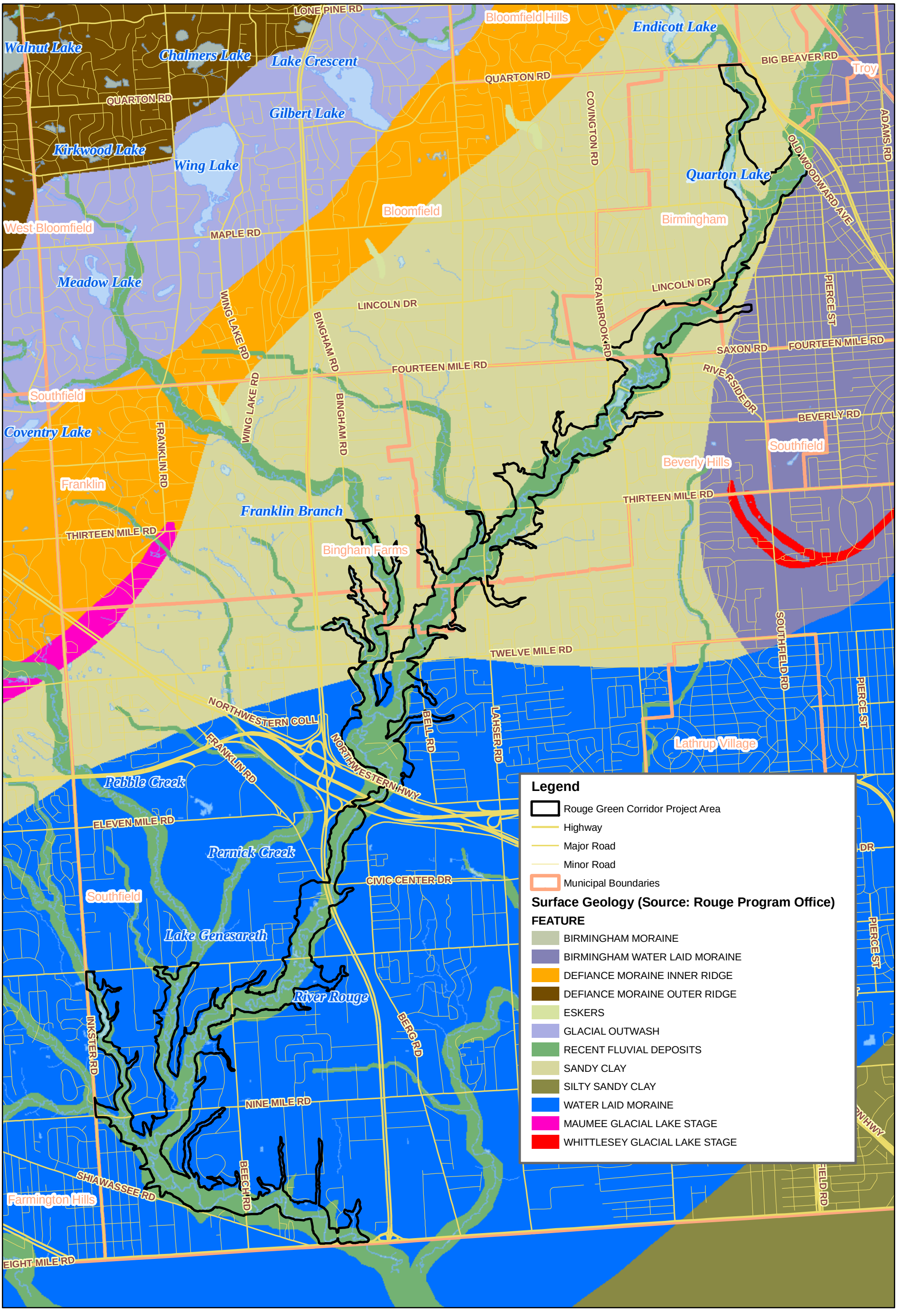

# Rouge Green Corridor Habitat Assessment
## Surface Topography

Oakland County, MI

1 inch equals 2,889 feet

Created for: Oakland Land Conservancy
Created by: Oakland County, 2/7/08, ASTI Project 6602

Figure 2 - Surface Topography




# Rouge Green Corridor Habitat Assessment
## Surface Geology

Oakland County, MI

1 inch equals 3,177 feet

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Created for: Oakland Land Conservancy
Created by: Oakland County, 2/7/08, ASTI Project 6602

Figure 3 - Surface Geology

deposits and onto lacustrine sand deposits at approximately 10 Mile Road (Southfield).[12] This corresponds to Oakland County's general soil map, which identifies soils within the RGC north of 10 Mile as poorly drained loams and silts, and the RGC south of 10 Mile as somewhat poorly drained sandy soils.[13]

Along its path, the River Rouge, within the RGC, cuts through the glacial beach ridges of former Lakes Maumee, Whittlesey, Arkona, Warren, and Wayne (trending northeast to southwest).[14] All these materials are moved and re-deposited by the river, so that the river channel itself consists of more recent fluvial deposits.

Figure 4 presents an overview of the soils within the RGC, grouped by hydrologic group. Hydrologic group "A" soils are highly permeable, whereas hydrologic group "D" soils, at the other end of the spectrum, exhibit very slow infiltration and water tends to pond on the surface or runoff readily. Although much of the RGC and surrounding area exhibit moderately permeable soils, highly permeable soils are only found at a few locations; near Quarton Lake at the upper end of the RGC, on the east side of the river between 13 and 14 Mile Roads, and in the lower RGC south of Northwestern Highway/Interstate 696 (I-696).

This soils information is combined with slope factors for the model data shown in Figures 5a and 5b. These maps identify the areas where groundwater discharge is expected, based upon calculations of Darcy's Law. Darcy's Law describes the flow of liquids through porous media such as soils. This model, developed by researchers at the University of Michigan School of Natural Resources & Environment,[15] indicates that the Rouge River receives very little groundwater input throughout the upper three-quarters of the RGC. The areas highlighted in red and blue indicate that near-stream areas along Pebble Creek and other tributary streams south of 10 Mile Road likely contribute greatly to groundwater recharge and that this groundwater and shallow through-flow is discharged to the adjacent streams.

Pre-European Settlement Vegetation

According to General Land Office (GLO) survey records from the 1800s, beech-sugar maple forest was the dominant vegetation type (72%) within the RGC, and the immediate area, prior to European settlement (Figure 6). Although maps developed from the GLO surveys show no wetlands upstream of I-696 and the Lodge Freeway, the lower portions of the RGC did contain significant wetland acreage. A narrow band of mixed hardwood swamp occupied most of the RGC's immediate river channel south of I-696. Oak-hickory forest was found in upland areas east of the river south of 10 Mile Road and the upper end of the RGC included small areas of mixed oak savanna.[16]

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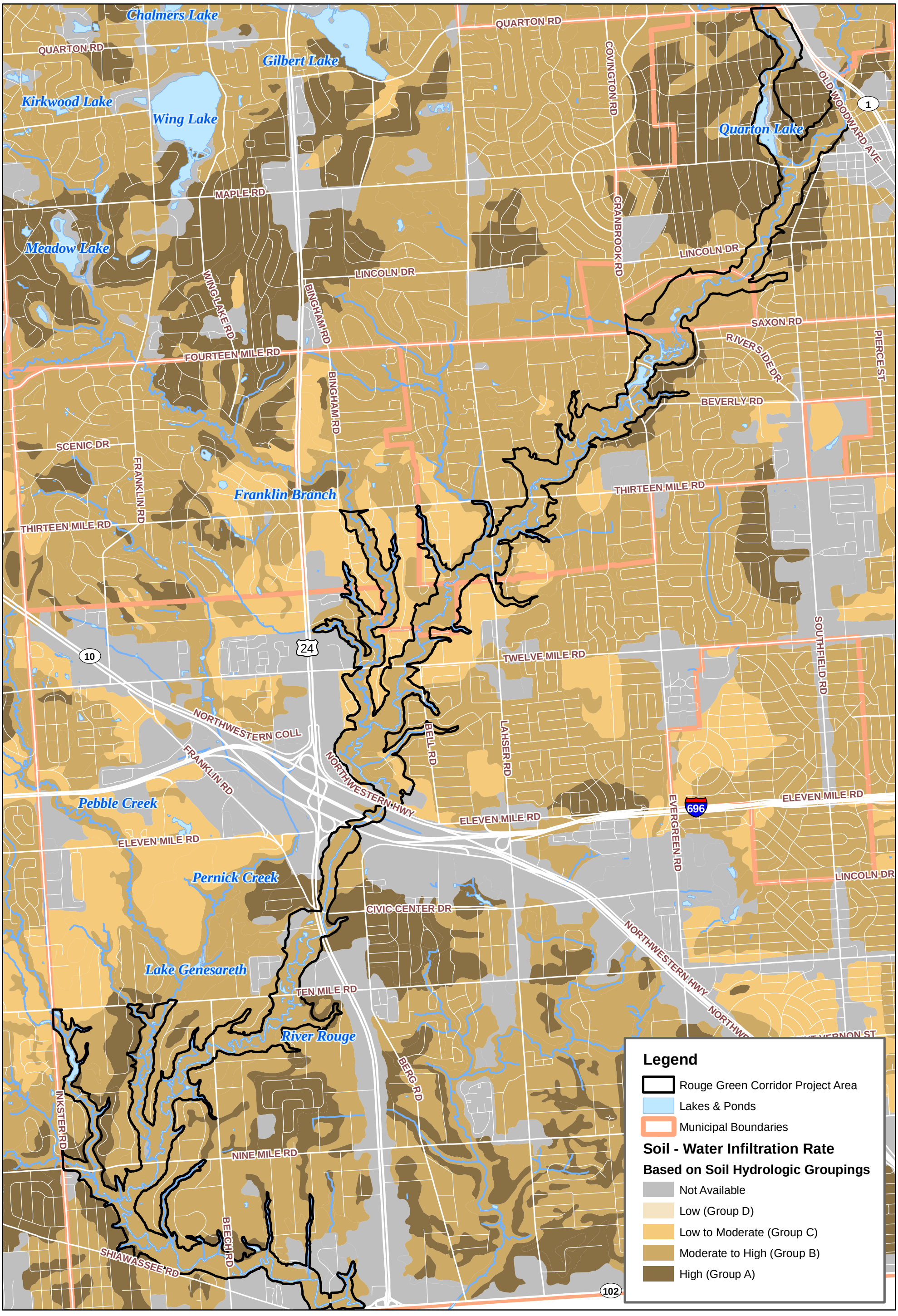
[12] Farrand, W.R. and D.L. Bell. 1982. Quaternary Geology of Michigan (maps). Lansing, Michigan: Michigan Department of Natural Resources, Geological Survey Division. 2 sheets. Scale 1:5000,000.

[13] Feenstra, James E. 1982. Soil Survey of Oakland County, Michigan. United States Department of Agriculture (USDA), Soil Conservation Service, Lansing, Michigan. March 1982.

[14] Oakland County. 2003. Oakland County Surface Geology and Hydrology (map). Oakland County Planning & Economic Development Services, Environmental Stewardship Program and the Cranbrook Institute of Science.

[15] Baker, M.E., Wiley, M.J., and P.W. Seelbach. 2003. GIS-based models of potential groundwater loading in glaciated landscapes: considerations and development in Lower Michigan. Michigan Department of Natural Resources, Fisheries Research Report 2064, Ann Arbor.

[16] MNFI. 2000. Circa 1800 Vegetation. Michigan Natural Features Inventory.




# Rouge Green Corridor Habitat Assessment

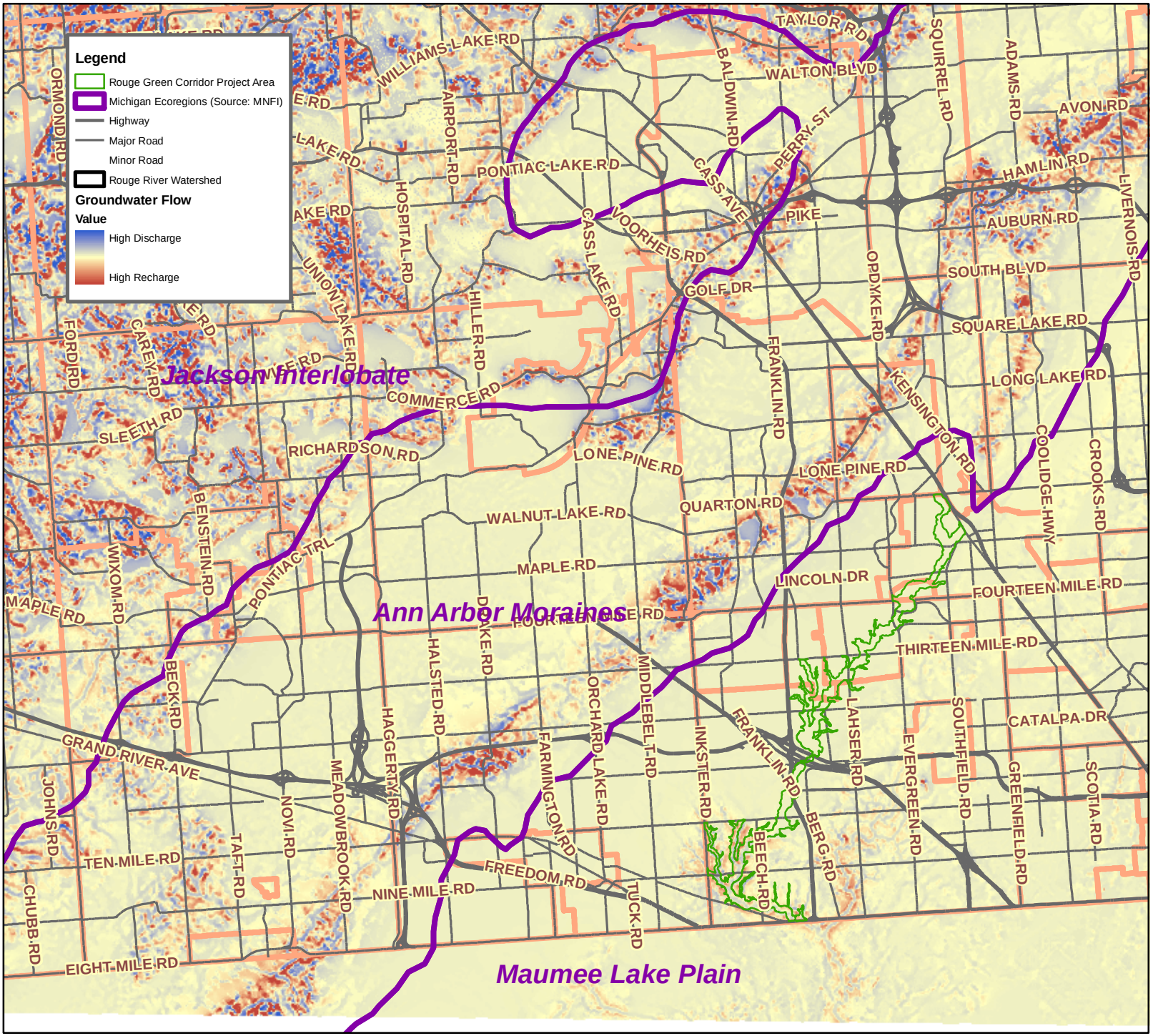
## *Soil Infiltration*

Oakland County, MI

1 inch equals 2,889 feet

Created for: Oakland Land Conservancy
Created by: Oakland County, 2/7/08, ASTI Project 6602

Figure 4 - Soil Infiltration



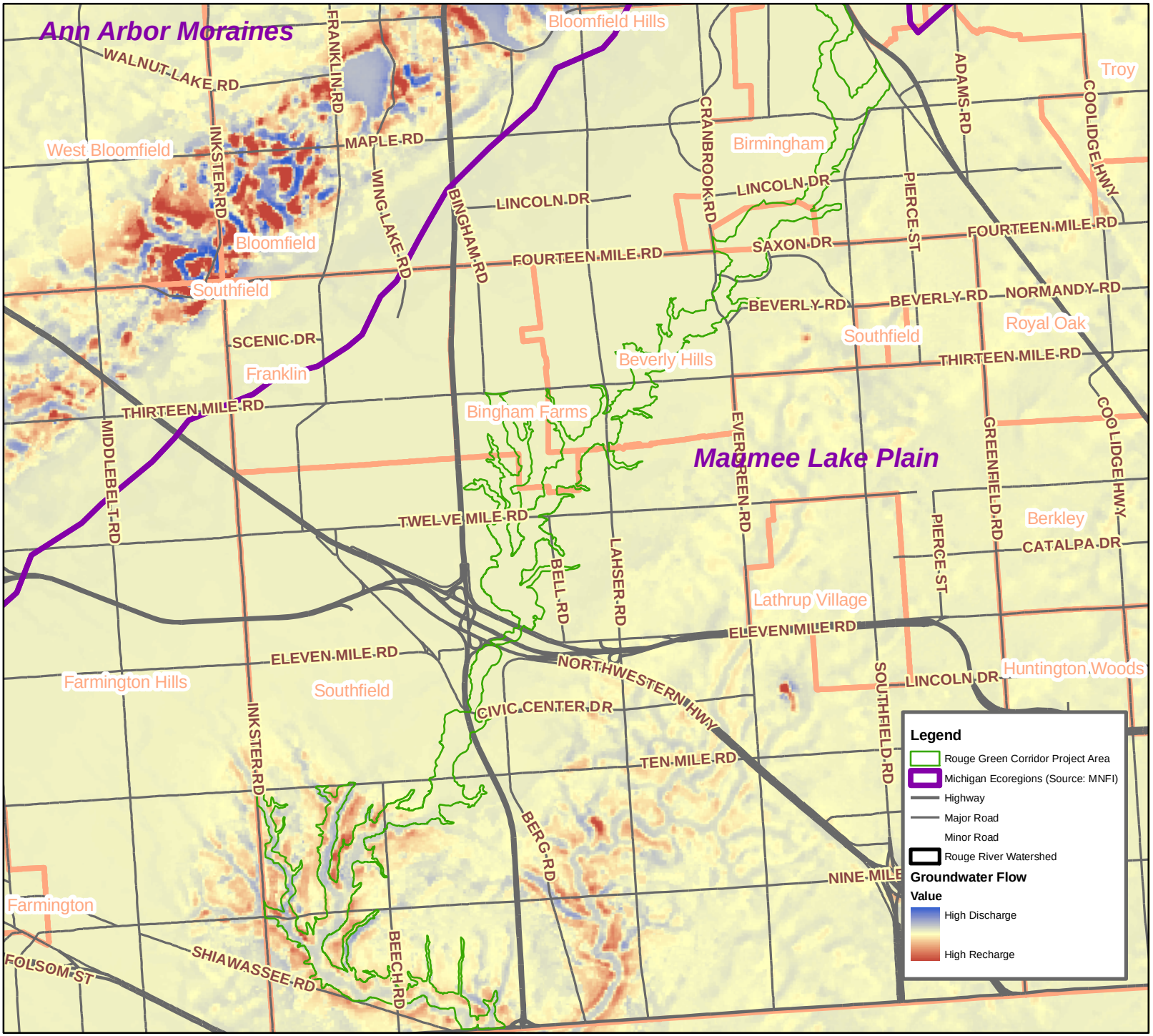

Rouge Green Corridor Habitat Assessment
Groundwater Flow (Basin Scale)
(Source: DarcyIO Model, University of Michigan School of Natural Resources)

1 inch equals 13,890 feet

Created for: Oakland Land Conservancy
Created by: Oakland County, 2/7/08 ASTI Project 6602

Oakland County, MI

Figure 5a- Groundwater Flow (Basin Scale)



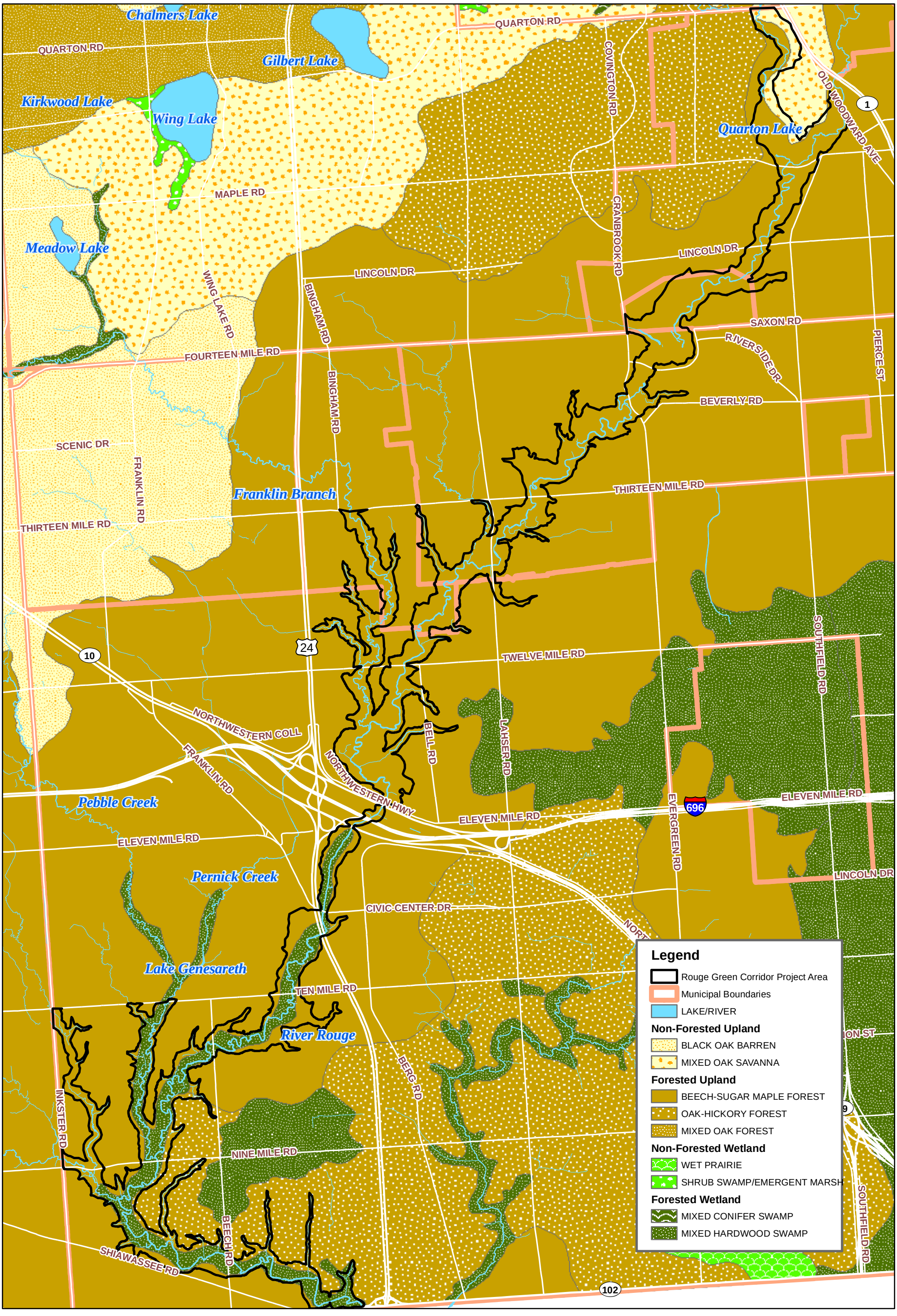

Rouge Green Corridor Habitat Assessment
Groundwater Flow (Corridor Scale)
(Source: DarcyIO Model, University of Michigan School of Natural Resources)

1 inch equals 5,710 feet

Created for: Oakland Land Conservancy
Created by: Oakland County, 2/7/08, ASTI Project 6602

Oakland County, MI

Figure 5b- Groundwater Flow (Corridor Scale)




# Rouge Green Corridor Habitat Assessment
# Presettlement Vegetation

Oakland County, MI

1 inch equals 2,889 feet

Created for: Oakland Land Conservancy
Created by: Oakland County, 2/7/08, ASTI Project 6602

Figure 6 - Presettlement Vegetation

Elsewhere in Michigan, GLO survey records have been used to compare existing wetland acreage to pre-European settlement values. This comparison is somewhat problematic within the RGC, in that maps of current conditions (Figure 7) show wetlands north (upstream) of I-696, whereas the pre-settlement maps do not. It is unlikely that these all represent wetland gains over time. It is more likely that most of these wetlands were not included in the early survey notes because of their smaller size. GLO records indicate that approximately 340 acres of wetland, all mixed hardwood swamp, existed within the RGC prior to European settlement. Current mapping, conducted by the Friends of the Rouge (FOTR), indicates that there are 231.3 acres of wetland within the RGC as a whole, approximately 14.3% of the RGC total area.[17] Of this total, approximately 170 acres are downstream of I-696, indicating a potential loss of 50% of the RGC wetland acreage, within this section at least, since settlement. Ninety-three percent (93%) of the total existing RGC wetland acreage is forested wetland. Only small acreages of emergent and riverine wetlands are identified and no scrub-shrub wetlands are noted.

A similar comparison of wetland loss has been done for Oakland County as a whole. Comer found that, historically, the county contained 113,937 acres of wetland (19.6% of the total county area).[18] Pre-settlement percentages of lowland hardwood swamp, lowland conifer swamp, and emergent wetlands were all similar in areal extent (5 to 7.4%). Scrub-shrub wetland was only a minor component of the county wetland acreage. By the mid-1990s, Oakland County contained only 61,029 acres of wetland. While this value included significantly more scrub-shrub wetland acreage, the county had lost 46% of its wetlands overall.

Ten percent (10%) of a watershed, and a minimum of 6% of any subwatershed, should be comprised of wetlands.[19] Despite the loss of approximately 50% of its original wetland acreage, the 14.3% of land in the RGC that is still wetland exceeds this minimum planning threshold.

*Current Setting*

Land Use and Land Cover Characteristics

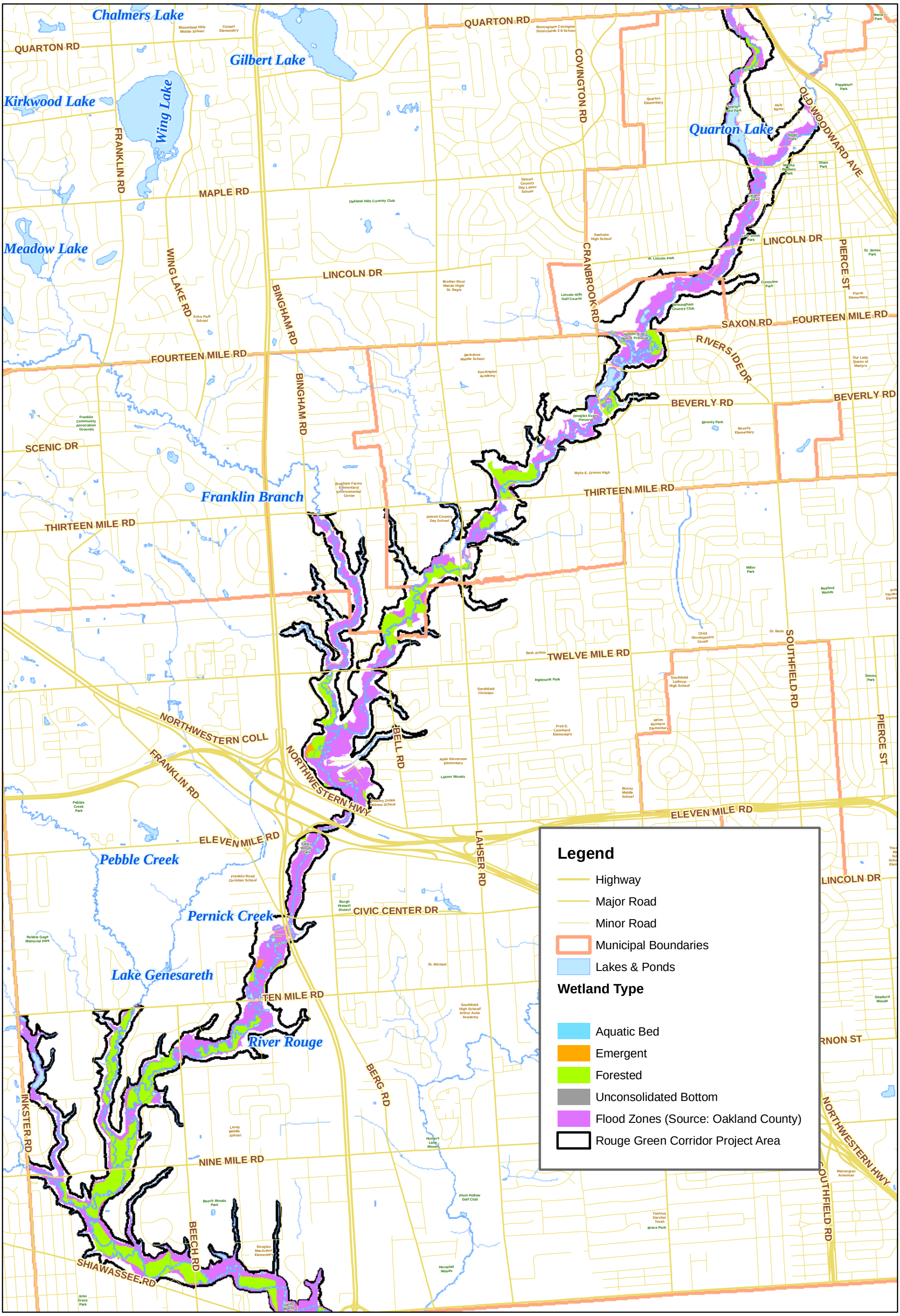
The Rouge River Watershed is the most urbanized of Michigan's major river basins.[20] The Main 1-2 subwatershed, of which the RGC is part, makes up 22% of the Rouge River drainage and exhibits a greater percentage of urbanized lands than the Rouge basin as a whole (83.6% vs. 72.5%, respectively). The Main 1-2 contains the greatest percentage and acreages of medium and high density residential uses of any of the Rouge subwatersheds. Despite the 11 parks and

[17] Friends of the Rouge, 2007. Rouge River Habitat & Database Mapping Project 2007. Dearborn, Michigan.

[18] Comer, Patrick J. 1996. Wetland Trends in Michigan Since 1800: A Preliminary Assessment. Michigan Natural Features Inventory. Lansing, Michigan.

[19] Environment Canada. 2004. How Much Habitat is Enough? 2nd Edition. Environment Canada, Canadian Wildlife Service, Ontario Region. 12 pages. http://www.on.ec.gc.ca/wildlife/factsheets/pdf/fs-howmuchhabitat-e.pdf

[20] Wiley, M.J., Seelbach, P.W., and S.P. Bowler. 1998. Ecological targets for rehabilitation of the Rouge River. Final Report for the Rouge River National Wet Weather Demonstration Project, RPO-PI-SR21.00, April 30, 1998. University of Michigan, School of Natural Resources and Environment, Ann Arbor.




# Rouge Green Corridor Habitat Assessment
## Wetlands

Oakland County, MI

1 inch equals 2,869 feet

Created for: Oakland Land Conservancy
Created by: Oakland County, 2/7/08, ASTI Project 6602

Figure 7 - Wetlands

preserves inventoried in this report, the Main 1-2 also contains a lower percentage of wetland, forest, and rural and urban open lands than the Rouge River Watershed as a whole.[21]

Figure 8 presents 2007 land use within the RGC and surrounding areas. The majority of the RGC consists of single family housing, with a few areas of multiple family housing. Commercial uses are primarily centered on the I-696 and Telegraph Road interchange and corridors. Figure 8 presents land use designations for each parcel but differs from land cover. Although much of the underlying use in the RGC is residential housing, much of the area still exhibits a forest canopy above and adjacent to that housing.

This is shown in Figure 9, which presents remaining habitat cover within the corridor. The land cover information presented in Figure 9 is a composite of the habitat typing conducted by ASTI within the 11 RGC parks and preserves and more generalized habitat typing assembled through ASTI's aquatic surveys and digital mapping data provided by FOTR.

Figure 10 presents a combination of both the land use and the existing habitat maps, showing areas that are still in vegetated cover and those where the underlying land use has resulted in a loss of the natural cover. Although numerous homes are located just outside the Rouge River floodplain or at the top of bluffs overlooking the river, much of the immediate river valley remains in forest or some other vegetated cover.

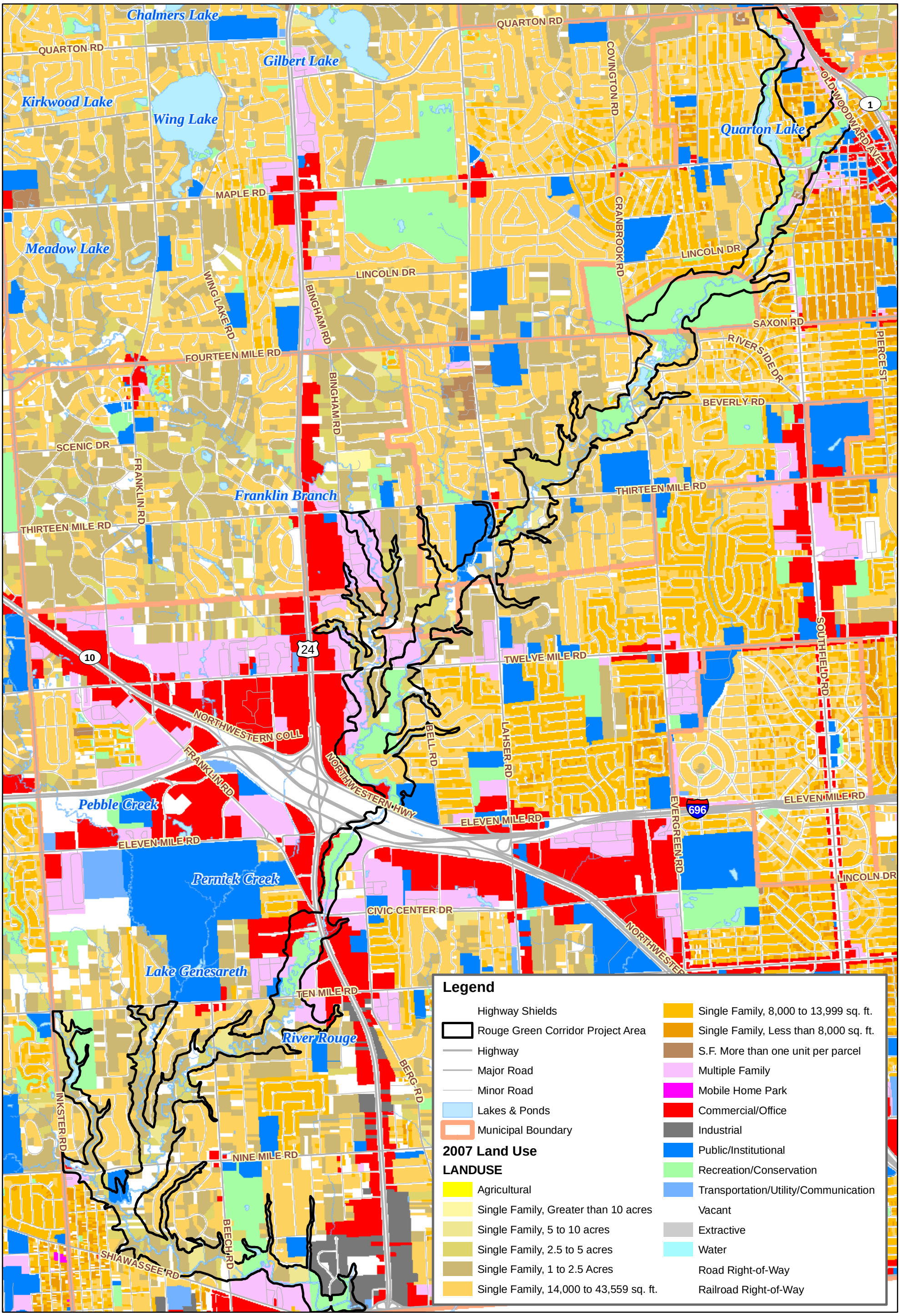
The importance of this intact riparian forest is exhibited in Figure 11. The RGC is shown as both a "hub," the key anchoring piece in a larger network of open spaces, and a "link" to other smaller "sites." Hubs serve as both an origin and a destination for area wildlife and help maintain important ecological processes such as nutrient cycling, pollination, flood control, etc. Links are the connections that hold the network together and enable it to function. They facilitate movement from one hub to another. Sites are defined as smaller landscape features that may serve as a point of origin or destination for wildlife or that incorporate less extensive areas of ecological importance.

Figure 11 is the result of open space mapping and prioritization conducted by Oakland County Planning and Economic Development.[22] The open space network mapped identifies areas that provide crucial green infrastructure services. The functions or services provided by these open spaces include:

- storm water storage and filtration
- flood control
- water quality improvement
- groundwater recharge
- erosion control
- temperature modification and climate regulation
- carbon sequestration

[21] Catalfio, C., Hughes, C., and S. Rood. 2005. 2005 Rouge River Ecosystem Monitoring and Assessment Report, RPO-WMGT-TR65. Rouge River National Wet Weather Demonstration Project, Wayne County, Michigan.

[22] Oakland County Planning & Economic Development Services. 2006. Making the Economic Case for Green Infrastructure and Green Development. Oakland County Planning & Economic Development Services, Environmental Stewardship Program, Waterford, MI. http://www.oakgov.com/peds/assets/docs/es_docs/gi_econ_all.pdf



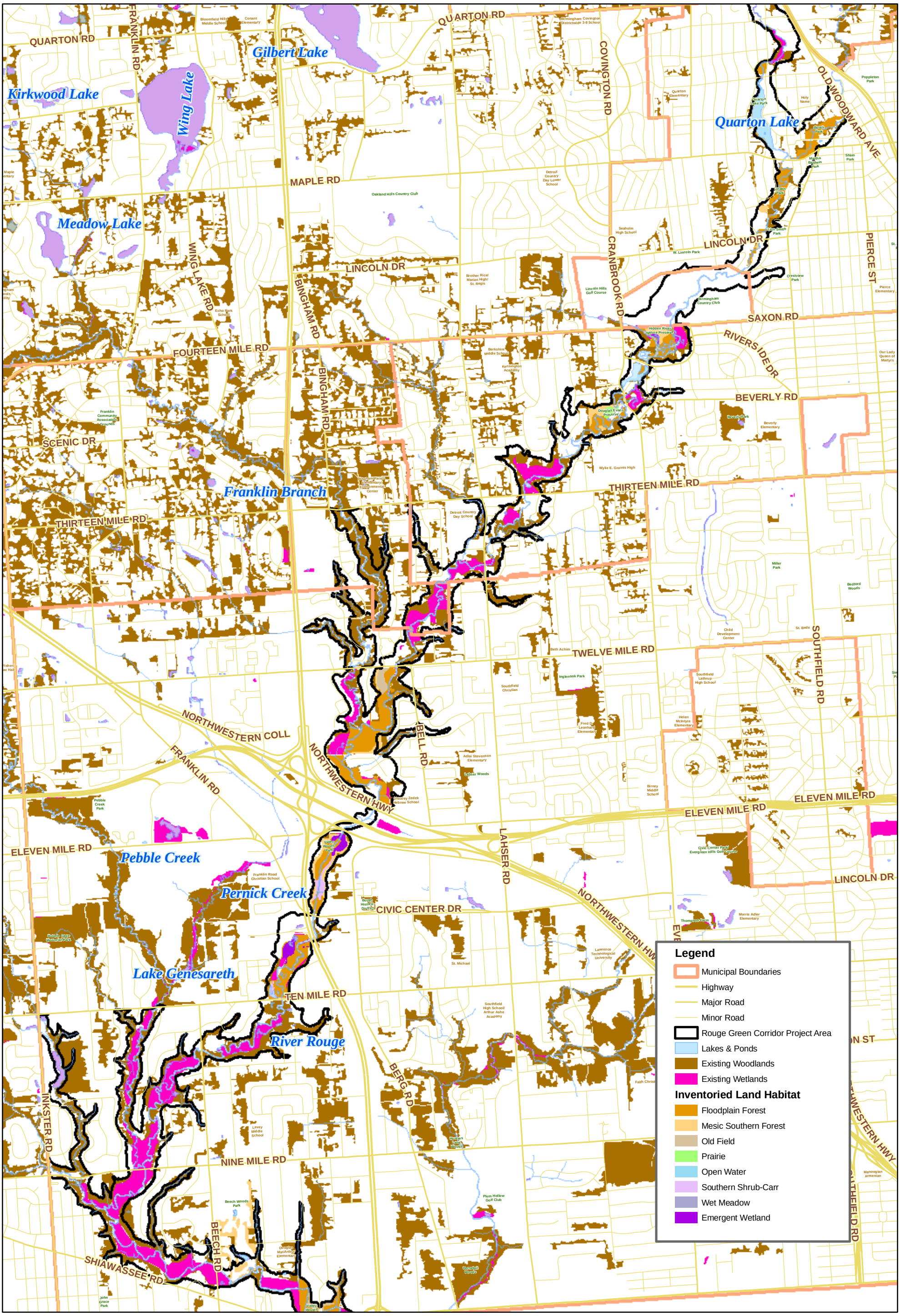

# Rouge Green Corridor Habitat Assessment
## 2007 Land Use

Oakland County, MI

1 inch equals 2,889 feet

Created for: Oakland Land Conservancy
Created by: Oakland County, 2/7/08, ASTI Project 6602

Figure 8 - 2007 Land Use




# Rouge Green Corridor Habitat Assessment
## Existing Habitat

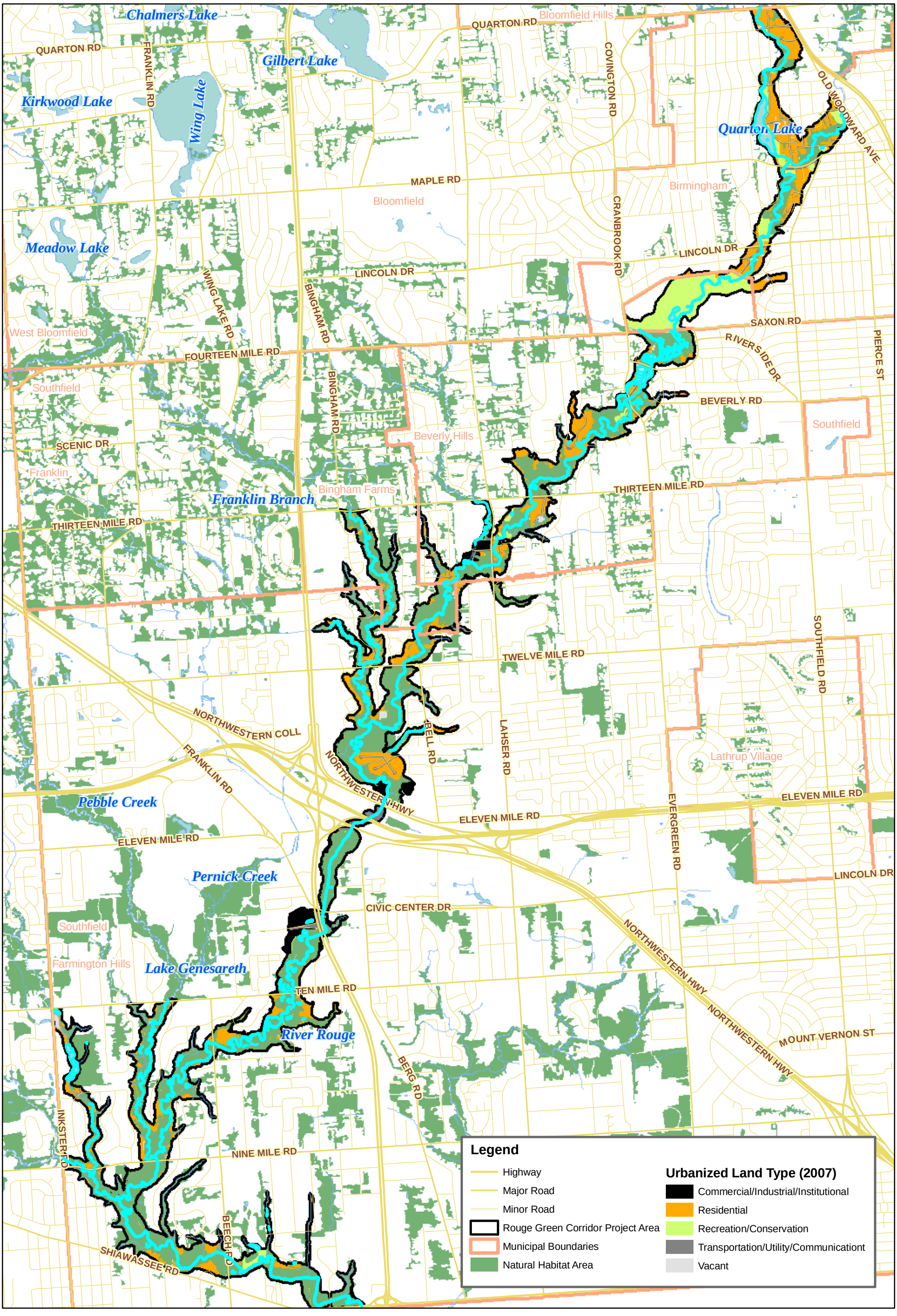
Oakland County, MI

1 inch equals 2,848 feet

N

Created for: Oakland Land Conservancy
Created by: Oakland County, 2/7/08, ASTI Project 6602

Figure 9 - Existing Habitat




# Rouge Green Corridor Habitat Assessment
## Urban-Natural Interface

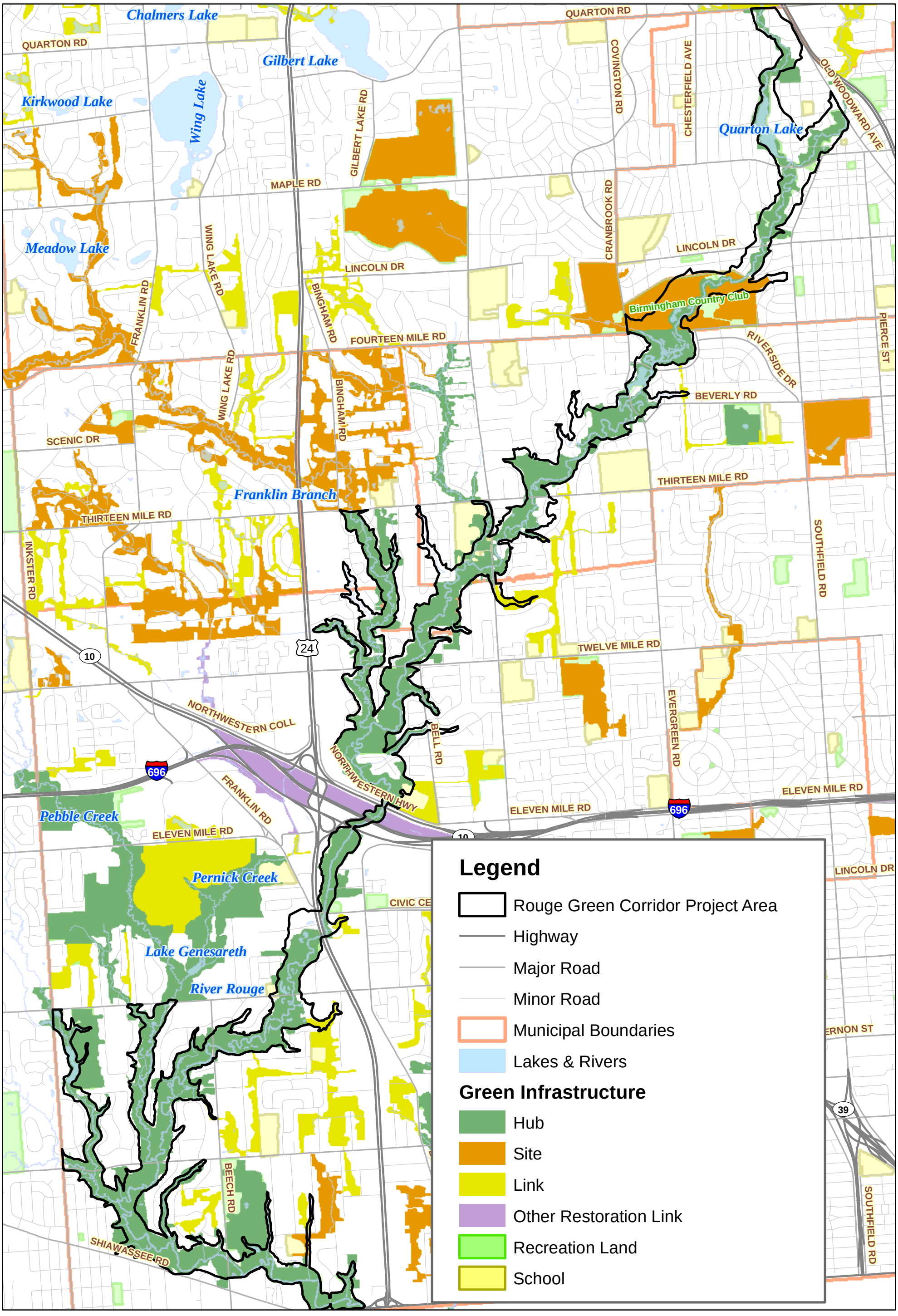
Oakland County, MI

1 inch equals 2,889 feet

N

Created for: Oakland Land Conservancy
Created by: Oakland County, 2/7/08 ASTI Project 6602

Figure 10 - Urban- Natural Interface




# Rouge Green Corridor Habitat Assessment
# Green Infrastructure Vision Plan

Oakland County, MI

1 inch equals 2,889 feet

Created for: Oakland Land Conservancy
Created by: Oakland County, 2/7/08 ASTI Project 6602

Figure 11- Green Infrastructure Vision Plan

- air purification
- nutrient cycling
- timber and fuel wood
- conservation of biodiversity
- wildlife habitat
- aesthetics and recreation

These services help improve public health, well-being, and quality of life. They can also be quantified in terms of their economic benefit to the region. By providing the ecological services listed above, RGC open space reduces the need for, and costs of, built infrastructure that would otherwise be required to perform these functions. These open spaces also elevate the value of properties that are adjacent or nearby.

In an Urban Ecosystem Analysis study, covering a 9 county area of southeast Michigan, American Forests found that the amount of developed land increased at a rate 3 times the rate of population growth (1990-2000).[23] They found that tree canopy and open space declined by 7 and 36 percent, respectively from 1991 through 2002 and that urban land use increased by 26% during the same period. This loss in tree cover measured in this study period does not include the 50% loss in regional canopy cover from 1950 to 1990 due to Dutch elm disease, nor does it include the roughly 16 million trees lost in Michigan due to the more recent emerald ash borer.

These trends have important implications in terms of reduced ecosystem services resulting from the loss of open space. Oakland County is already one of 25 Michigan counties that fail to meet one or more air quality standards. Trees help filter the air and remove nitrogen dioxide ($NO_2$), sulfur dioxide ($SO_2$), carbon monoxide (CO), ozone, ($O_3$), and particulates ($PM_{10}$).

Tree cover also dramatically affects storm water runoff. Although the American Forests study did not calculate a dollar value for these services within the Rouge basin, it did quantify these values for the neighboring Ecorse River Watershed. From 1991 to 2002, the Ecorse Watershed lost 18% of its forest cover and 35% of its open space, while experiencing a 23% increase in urban uses. This resulted in the following estimated losses:

- 68 million cubic feet of storm water storage capacity — Valued at $136 million
- 194,000 lbs of air pollutants otherwise absorbed — Valued at $459,000
- 107,000 fewer pounds of carbon stored
- 800 fewer pounds of carbon sequestered each year

Although urban tree plantings do not provide these services in the same way that natural forests do, the planting of greenways, or establishing canopy coverage goals for new development can add significant benefits. American Forests calculated that the Dequindre Cut Greenway proposed in the City of Detroit, which would increase tree canopy coverage from the existing 31% to 40% (150 foot vegetated buffer), would provide 227,000 cubic feet of storm water storage, valued at $445,000.[24]

[23] American Forests. 2006. Urban Ecosystem Analysis SE Michigan and City of Detroit: Calculating the Value of Nature. American Forests. Washington, DC. 15 pages.
[24] Ibid

Plant Communities and Floristic Quality

ASTI inventoried the plant communities within the 11 RGC parks and preserves, but did not inventory riparian areas outside the parks in the same manner because these areas are privately owned. Results of the plant surveys within the individual parks and preserves are provided in Section 3.2 of this report, as each park and preserve is described in more detail. A summary of this information is also presented here in Figure 12.

The various parks and preserves within the RGC exhibit different plant communities where floristic quality varies widely, reflecting both current and historic land use. In general, however, all the parks are dominated by two distinct forest types: floodplain forest and southern mesic forest. The floodplain forests found within the RGC are either slightly more upland black maple/ash/sycamore dominated forests or slightly wetter and less permanent cottonwood/willow dominated floodplain forests. The black maple/ash/ sycamore forests tend to be slightly higher elevation floodplain forests on soils less susceptible to river erosion, while the lower cottonwood/willow floodplain forests are in flux and subject to river erosion and deposition. Upland side slopes leading from the floodplain up to developed areas tend to be oak/hickory dominated southern mesic forests with scattered maple species and American beech. Other community types that are represented, but less dominant, within the parks and preserves include emergent wetland, scrub-shrub wetland, and old field.

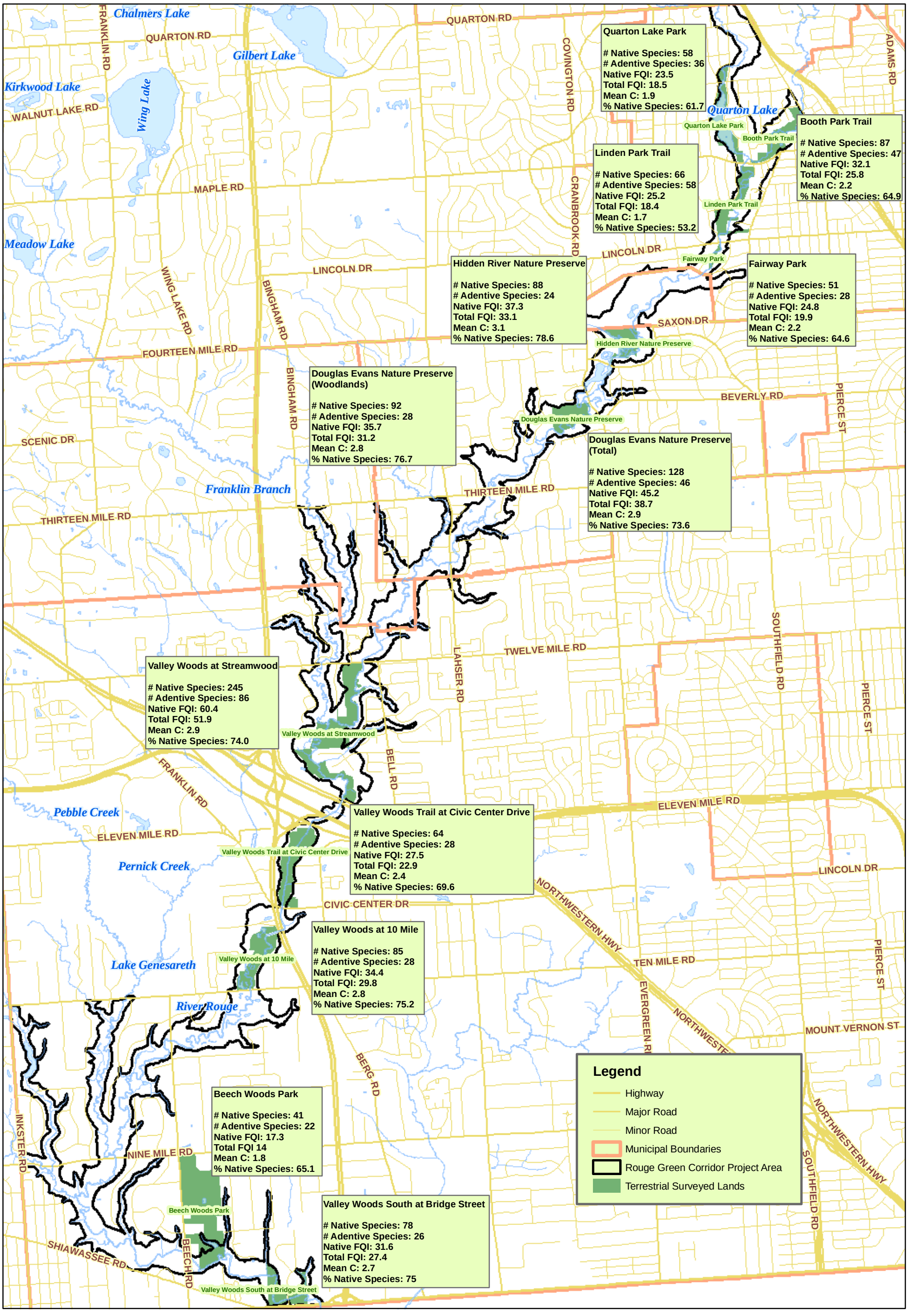
The number of plant species observed and recorded in the individual parks/preserves ranged from 63 species (Beech Woods Park) to 331 species (Valley Woods Park at Streamwood). It should be noted that survey efforts have not been equal among all the parks and preserves and thus, the resulting scores and plant counts are not fully comparable. Plant lists for the various parks and preserves do represent inventories during the same seasons. However, Valley Woods at Streamwood in particular, has received more intensive survey effort than the other parks. The floristic quality scores presented for Valley Woods at Streamwood are likely influenced to some extent by this intensive effort, however, the woods and other plant communities present there are certainly exceptional in quality.

FQI scores for the different parks and preserves ranged from 14.0 (Beech Woods Park, typical of most undeveloped land in Michigan) to 51.9 (Valley Woods Park at Streamwood, of statewide importance). Plant lists for each park and preserve are provided in Appendix C.

State-listed special concern, threatened, or endangered plant species are known to occur at one park/preserve in each of the 3 cities: Booth Park Trail in the City of Birmingham, the Douglas Evans Nature Preserve in Beverly Hills, and the Valley Woods Nature Preserve in Southfield (see individual park sections). Michigan Natural Features inventory records for the Rouge Main 1-2 subwatershed list records of 22 plant species from within the watershed and United States Fish and Wildlife Service records for Oakland County list one rare plant species (Table 2).

Herbivory by white-tailed deer (*Odocoileus virginianus*) can also lead to the suppression and loss of native plants within forest types found in the RGC. Although adapted to shade, many native forest plants have not developed mechanisms to cope with or deter heavy grazing.[25] Deer population densities, and thus the potential for over-grazing, within the RGC are not known at this time. However, deer sign was observed in many of the parks and numerous deer were sighted

[25] Cohen, J.G. 2004. Natural community abstract for mesic southern forest. Michigan Natural Features Inventory, Lansing, MI. 12 pp.




# Rouge Green Corridor Habitat Assessment
# Floristic Quality Assessment

Oakland County, MI

1 inch equals 2,884 feet

Created for: Oakland Land Conservancy
Created by: Oakland County, 2/7/08, ASTI Project 6602

Figure 12 - Floristic Quality Index

**Table 2. State- and Federally-Listed Rare Species Occurrences in the Main 1 - 2 Subwatershed.**

| State listed species | | |
|---|---|---|
| **Common Name** | **Scientific Name** | **Status** |
| Climbing fumitory | *Adlumia fungosa* | SC |
| Hairy Angelica | *Angelica venenosa* | SC |
| Small love grass | *Eragrostis pilosa* | SC |
| Showy orchis | *Galearis spectabilis* | T |
| Kentucky coffee tree | *Gymnocladus dioicus* | SC |
| Green violet | *Hybanthus concolor* | SC |
| Twinleaf | *Jeffersonia diphylla* | SC |
| Seedbox | *Ludwiga alterifolia* | SC |
| Three-awned grass | *Aristida longespica* | T |
| False hop sedge | *Carex lupuliformis* | T |
| Clinton's bulrush | *Scirpus clintonii* | SC |
| Least shrew | *Cryptotis parva* | T |
| Woodland vole | *Microtus pinetorum* | SC |
| Canadian milk vetch | *Astragalus canadensis* | T |
| Nodding mandarin | *Disporum maculatum* | X |
| Gattiner's gerardia | *Agalinis gattingeri* | E |
| Richardson's sedge | *Carex richardsonii* | SC |
| Hill's thistle | *Cirsium hillii* | SC |
| Downy gentian | *Gentiana puberulenta* | E |
| Stiff gentian | *Gentianella quinquefolia* | T |
| American burying beetle | *Nicrophorus americanus* | E |
| American chestnut | *Castanea dentata* | E |
| Vasey's pondweed | *Potamogeton vaseyi* | T |
| Goldenseal | *Hydrastis canadensis* | T |
| Pugnose shiner | *Notropis anogenus* | SC |
| **Federally-listed species** | | |
| Indiana Bat | *Myotis sodalis* | Endangered |
| Eastern massasauga rattlesnake | *Sistrurus catenatus catenatus* | Candidate |
| Rayed bean mussel | *Villosa fabalis* | Candidate |

on park- and private lands throughout the RGC. High deer populations are a problem for land managers and restoration efforts in much of the region.

Invasive Plant Species

All of the parks and preserves investigated contained adventive (non-native) plant species. The percentage of adventive species ranged from 21% at Hidden Rivers Nature Preserve and

Riverside Park to 47% at Linden Park Trail. Not all adventive species are necessarily invasive and, within parks, the distribution and dominance of both adventive and invasive species was somewhat variable. Some parks, for example Linden Park Trail, have a number of widespread and relatively dominant invasive species, while at other locations, such as Douglas Evans Preserve, these same species are uncommon or only locally dominant within small patches of the park.

Only the Berberian tract of Valley Woods at Streamwood is nearly free of areas where invasive species are dominant. ASTI's surveys of invasive plant species was primarily restricted to the 11 surveyed parks and preserves, but invasive plant species were observed throughout the RGC and are likely similarly distributed and abundant throughout all of the woodlands within the RGC. Notable invasive species observed within the RGC include those presented in Table 3 (in approximate order of abundance).

The initial infestation and subsequent spread of many of these invasive plants is facilitated by disturbances that create openings in the canopy and allow light to reach the forest floor. Causes are likely variable, but anthropogenic actions such as construction, trail building, clearing, intentional plantings, and escaped landscape plants and seed within the RGC are probably the leading causes. Other disturbances important to the spread of invasive species include the loss of mature tree species due to disease or pests, river erosion and deposition, seed spread by pets and wildlife, and browsing of native vegetation by white-tailed deer.

Controlling the spread of invasive plant species is likely to be inherently difficult within the RGC parks and preserves because of their relatively small and linear shapes, active nearby seed sources (private parcels and the river itself), and relatively high rates of disturbance. Non-native plant invasion occurs more readily in areas with more edge and less undisturbed interior area. Because of this, invasive species control in some of the parks may not be cost or time effective relative to the potential benefits that may be incurred. Priority for invasive plant removal should be given those areas where invasive species are not yet well established and where native plant communities are generally intact and thus restorable.

Flow Regime

Due to their flatter slopes and poorly drained soils, lake plain rivers such as the Rouge naturally tend to exhibit large fluctuations in flow and water elevation. During the drier summer months (August, September) they typically exhibit low base flow, low flow velocities, and extensive deposition of fine sediments. During the rainy season (March – June) they typically exhibit rapid runoff, dramatic increases in water depth, and extensive flooding. This condition of extreme high and low flows is termed "flashiness."[26]

Urbanization, with its associated increase in impervious surfaces, tends to exacerbate these tendencies of lakeplain river systems. Increased imperviousness leads to reduced base flow yields, reduced floodplain storage, increased storm water volume and the rate of its delivery to the stream channel, and increased sediment transport. All of these changes lead to further in-channel erosion and the downstream deposition of eroded materials.[27] Channel widening

[26] Wiley, M.J., Seelbach, P.W., and S.P. Bowler. 1998. Ecological targets for rehabilitation of the Rouge River. Final Report for the Rouge River National Wet Weather Demonstration Project, RPO-PI-SR21.00, April 30, 1998. University of Michigan, School of Natural Resources and Environment, Ann Arbor.

[27] Ibid

**Table 3. Notable Invasive Plants Observed within the RGC**

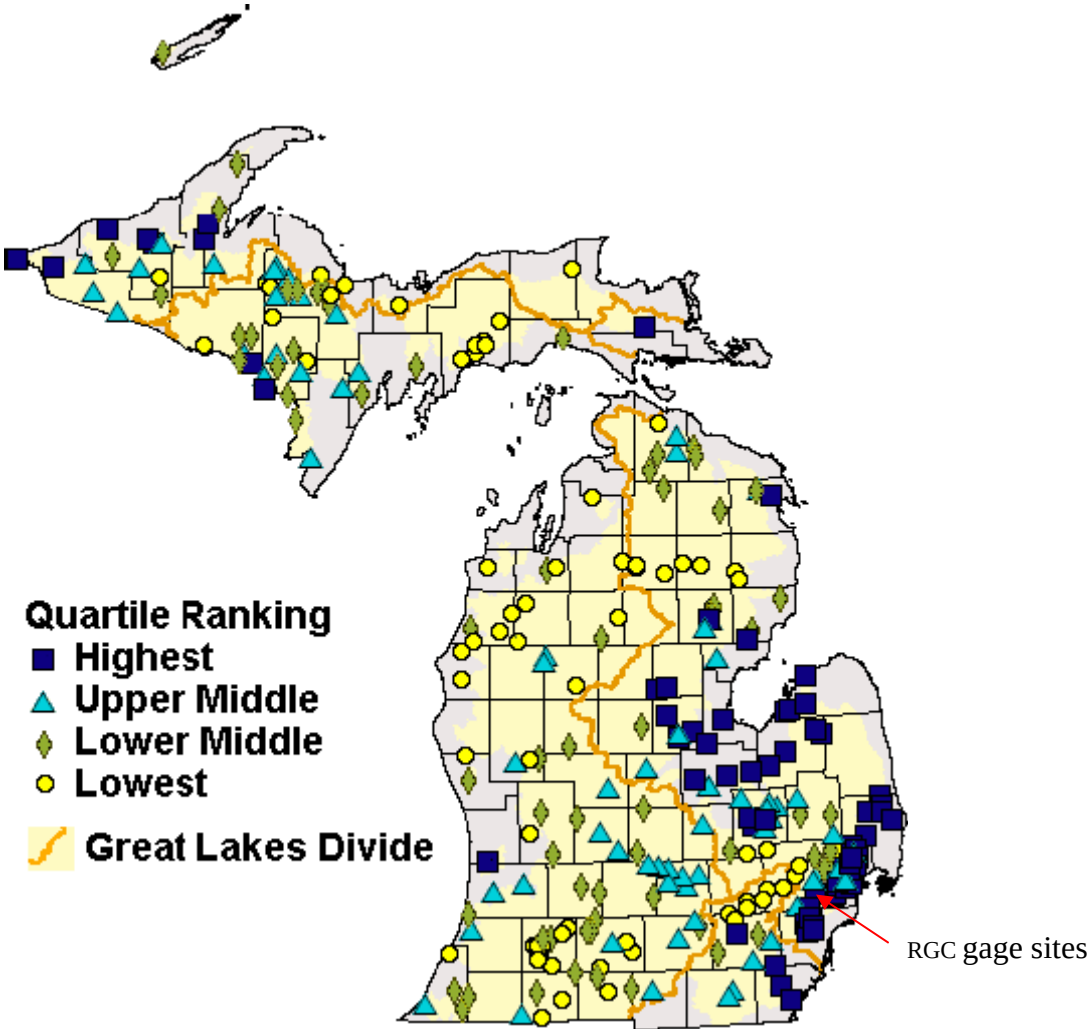
| Common Name | Scientific Name |
|---|---|
| Garlic mustard | *Alliaria petiolata* |
| Dame's rocket | *Hesperis matronalis* |
| Amur honeysuckle | *Lonicera maackii* |
| Smooth Tartarian honeysuckle | *Lonicera tatarica* |
| Glossy buckthorn | *Rhamnus frangula* |
| Common buckthorn | *Rhamnus cathartica* |
| Multiflora rose | *Rosa multiflora* |
| Reed canary grass | *Phalaris arundinacea* |
| Periwinkle | *Vinca minor* |
| English ivy | *Hedera helix* |
| Japanese barberry | *Berberis thunbergii* |
| Prickly ash | *Zanthoxylum americanum* |
| Tree-of-Heaven | *Ailanthus altissima* |
| Common reed | *Phragmites australis* |
| Purple loosestrife | *Lythrum salicaria* |
| Winged wahoo | *Euonymous alata* |
| Norway maple | *Acer platanoides* |
| Japanese knotweed | *Polygonum cuspidatum* |

caused by erosion leads to lower water levels during the summer dry period. This is of particular concern in a system like the Rouge River that already receives little groundwater input.

Analysis of stream flow records has shown that the RGC is experiencing an increase in flashiness. The Richards-Baker Flashiness Index for both the USGS stream gage stations at Birmingham (Maple Road – between Quarton Lake and Booth Parks) and at Southfield (Beech Road) rank in the upper quartile for rivers across Michigan and exhibit a trend toward greater flashiness over time (Figure 13).[28] Note that most of the gaged river sites exhibiting the highest flashiness index ratings are located in coastal areas, on lake plain clay or other finely grained

[28] Fongers, D., Manning, K., and J. Rathbun. 2007. Application of the Richards-Baker Flashiness Index to Gaged Michigan Rivers and Streams. Michigan Department of Environmental Quality, Land and Water Management Division, Lansing.

**Figure 13. Richards-Baker Flashiness Index Quartile Rankings**[29]




soils (gray). The flashy hydrology of most of those located in the Lower Peninsula is doubly influenced by a combination of lacustrine soils and either agricultural or urban land use.

Analysis conducted by Wiley et al., comparing flow duration curves for the Rouge to flow regimes favored by different target fish species, indicates that high flows in the RGC exceed targets developed for rehabilitating fisheries, while low flows are below fisheries targets, as measured at Maple, Lahser, and Beech Roads.[30] All 20 of the river reaches evaluated by ASTI,

[29] Figure reprinted from Fongers, D., Manning, K., and J. Rathbun. 2007. Application of the Richards-Baker Flashiness Index to Gaged Michigan Rivers and Streams. Michigan Department of Environmental Quality, Land and Water Management Division, Lansing.

[30] Wiley, M.J., Seelbach, P.W., and S.P. Bowler. 1998. Ecological targets for rehabilitation of the Rouge River. Final Report for the Rouge River National Wet Weather Demonstration Project, RPO-PI-SR21.00, April 30, 1998. University of Michigan, School of Natural Resources and Environment, Ann Arbor.

encompassing the entire length of the RGC, scored poorly for Procedure 51 metrics rating the stability of the river's flow regime. Observations of severe bank erosion and marked differences between high and low water levels were evidence of flashy hydrology.

Groundwater (base flow) yields tend to be high in morainal deposits, such as those running parallel to the RGC to the northwest. As noted previously, however, much of the RGC mainstem and the major tributaries that feed it (e.g., the Franklin Branch and Pebble Creek) flow through glacial lakeplain. As a result, the upstream portions of the RGC do not contribute a great deal of groundwater. Areas of the sandier soils near the river and tributary channels, downstream of 10 Mile Road, are predicted to contribute greater quantities of groundwater to the river system (Figure 5). Land use protections that encourage, and hopefully facilitate, storm water infiltration near the channels of these tributaries would help maintain already limited base flows.

Aquatic Habitat

MDNR Fisheries Division researchers have developed an ecological classification system for river valley segments (V-SEC) in Michigan.[31] Variable in length (~2-40 miles), river valley segments are characterized by relative homogeneity in terms of catchment size, hydrology, water chemistry, temperature, valley character, channel morphology, and fish assemblages. Valley segments are generally similar in scale to factors that govern the presence and movements of fish and other aquatic organisms. One or several adjacent valley segments likely contain the variety of habitats required by fish during their life cycle. Under this classification system, the RGC mainstem consists of a single V-SEC designation and the major tributaries (e.g., the Franklin Branch and Pebble Creek) are classified as another (Figure 14). V-SEC designations do not differentiate impounded sections of the RGC, nor do they note the change in slope between I-696 and 10 Mile Road.

The tributaries are classified as "runoff-driven with fair baseflow and moderate peakflows" (hydrology code R1). The geologic make-up of their drainages is a mixture of moderate-relief, coarse, end moraines; coarse till plains; and outwash plains, and their valleys are alluvial and unconfined as these streams cut across the till and outwash plains (valley character code AU). Valley slopes in these systems tend to be low (~4-10 ft. mi.) (valley slope code L), but they do contain some riffle habitat. They exhibit eutrophic (high nutrient) water chemistry (water chemistry code E2). Mean stream temperatures are cool but these tributaries exhibit high diurnal variation (water temperature code KH).[32]

The RGC mainstem is described as "runoff-driven with low baseflow and high peak flow" (hydrology code R3). The geologic make-up of the RGC drainage is primarily medium and fine textured till and lacustrine plains, and their valleys too are alluvial and unconfined as these streams cut across broad till and lacustrine plains (valley character code AU). End moraines, where they exist in these V-SECs, tend to be low in relief and medium to finely textured. Valley slopes in the RGC are also low (~4-10 ft. mi.) (valley slope code L), and they also contain some

[31] Seelbach, P.W., Wiley, M.J., Kotanchik, J.C. and M.E. Baker. 1997. A landscape-based ecological classification system for river valley segments in lower Michigan (MI-VSEC version 1.0). Michigan Department of Natural Resources, Fisheries Research Report 2036, Ann Arbor.

[32] Seelbach, P.W., Wiley, M.J., Kotanchik, J.C. and M.E. Baker. 1997. A landscape-based ecological classification system for river valley segments in lower Michigan (MI-VSEC version 1.0). Michigan Department of Natural Resources, Fisheries Research Report 2036, Ann Arbor.

Quarton Rd. to Quarton Lake Park

Aquatic Habitat: Marginal
Bank Stability: At Risk
Frogs/Toads: 2 (of possible 8)
Invertebrates: NA

Booth Park Trail

Aquatic Habitat: Marginal
Bank Stability: At Risk to Unstable
Frogs/Toads: 0 (of possible 8)
Invertebrates: Good

Quarton Lake Park

Aquatic Habitat: NA
Bank Stability: Stable to At Risk
Frogs/Toads: 1 (of possible 8)
Invertebrates: Fair

Linden Park Trail

Aquatic Habitat: Good
Bank Stability: Unstable
Frogs/Toads: 0 (of possible 8)
Invertebrates: NA

Fairway Park

Aquatic Habitat: Good
Bank Stability: At Risk
Frogs/Toads: 1 (of possible 8)
Invertebrates: Excellent

Hidden River Nature Preserve & Riverside Park

Aquatic Habitat: NA
Bank Stability: Stable to At Risk
Frogs/Toads: 0-6 (of possible 8)
Invertebrates: NA

Fairway Park to Hidden Rivers Park

Aquatic Habitat: Poor
Bank Stability: At Risk to Unstable
Frogs/Toads: 0-6 (of possible 8)
Invertebrates: NA

Douglas Evans to Thirteen Mile Rd.

Aquatic Habitat: Good
Bank Stability: Unstable
Frogs/Toads: 3 (of possible 8)
Invertebrates: NA

Douglas Evans Nature Preserve

Aquatic Habitat: Good
Bank Stability: At Risk to Unstable
Frogs/Toads: 2 (of possible 8)
Invertebrates: Fair

Lahser to Twelve Mile Rd.

Aquatic Habitat: Good
Bank Stability: Unstable
Frogs/Toads: 4 (of possible 8)
Invertebrates: Fair

Thirteen Mile Rd. to Lahser

Aquatic Habitat: Good
Bank Stability: Unstable
Frogs/Toads: NA
Invertebrates: NA

Valley Woods at Streamwood

Aquatic Habitat: Good
Bank Stability: Unstable
Frogs/Toads: 2 (of possible 8)
Invertebrates: NA

Valley Woods at Ten Mile Road

Aquatic Habitat: Good
Bank Stability: Unstable
Frogs/Toads: 0-2 (of possible 8)
Invertebrates: NA

Valley Woods Trail at Civic Center

Aquatic Habitat: Marginal
Bank Stability: Stable
Frogs/Toads: 2 (of possible 8)
Invertebrates: Poor

Beech Rd. to Nine Mile Rd.

Aquatic Habitat: Marginal to Good
Bank Stability: Unstable
Frogs/Toads: 2 (of possible 8)
Invertebrates: NA

Ten Mile Rd. to Beech Rd.

Aquatic Habitat: Marginal to Good
Bank Stability: Unstable
Frogs/Toads: 3-7 (of possible 8)
Invertebrates: NA

Beech Woods Park

Aquatic Habitat: Marginal
Bank Stability: Unstable
Frogs/Toads: NA
Invertebrates: NA

Nine Mile Rd. to Beech Rd.

Aquatic Habitat: Marginal to Good
Bank Stability: Unstable
Frogs/Toads: 3
Invertebrates: NA

Beech Woods Park to Valley Woods South

Aquatic Habitat: Marginal
Bank Stability: Unstable to Very Unstable
Frogs/Toads: 5 (of possible 8)
Invertebrates: NA

Valley Woods Park South

Aquatic Habitat: Marginal
Bank Stability: Unstable to Very Unstable
Frogs/Toads: NA
Invertebrates: NA

**Legend**

- Park Boundaries
- Rouge Green Corridor Limit
- Rivers, Lakes, & Ponds
- Creek Chub, Mottled Sculpin
- Creek Chub, White Sucker, Pumpkinseed
- Figure Index

# Rouge Green Corridor Habitat Assessment

Oakland County, Michigan

0 3,200 6,400 Feet

Created by: AGS, August 1, 2008, ASTI Project 6602
Aerial Photograph: USDA 2005

Figure 14 - Aquatic Habitat Quality

riffle habitat. The RGC exhibits eutrophic water chemistry with high concentrations of nutrients and other urban pollutants (water chemistry code EU). Mean stream temperatures are cool but the RGC exhibit high diurnal variation (water temperature code KH).[33]

The differences between the mainstem and tributaries result in somewhat different fish communities. The tributaries are described as creek chub (*Semotilus atromaculatus*) and mottled sculpin (*Cottus bairdi*) streams. The creek chub and mottled sculpin clusters are generally thought of as headwater groups, with standing crop numbers correlated with small catchment areas (both) and cool stream temperatures (sculpin).

The RGC mainstem exhibits species from the creek chub, white sucker (*Catostomus commersoni*) and pumpkinseed sunfish (*Lepomis gibbosus*) fish associations. In models predicting standing stock of individual fish species in southern Michigan rivers, white sucker is the only species that exhibits a positive correlation for urban land use.[34]

Member species of the fish associations correlated with the V-SEC designations of the RGC tributaries and mainstem are presented in Table 4. Table 5 presents lists of fish species predicted for individual gage sites within the RGC, based upon flow duration curves,[35] compared with the list of species recorded within the Rouge basin as a whole.[36]

As indicated above, RGC in-stream substrate attributes and habitat characteristics are closely related to the regional geology and soils and the slope of the river valley. The upper reaches of the RGC are characterized as riffle/run stream segments, whereas glides and pools are the dominant habitat types downstream (south) of 10 Mile Road. Riffle/run streams characteristically exhibit a repeating sequence of riffles and runs; exhibit a bottom substrate composed of coarser grained materials such as sand, gravel, cobble or boulders; and tend to have moderate to high gradients. Glide/pool streams, by contrast, are typified by a repeating sequence of glides and pools as the dominant habitat types, exhibit finer-grained substrate (i.e., sand, silt, and/or clay), and have low to moderate gradient.[37]

This is in keeping with the findings of other researchers that river size, catchment geology, and gradient are the major forces governing site-level habitat characteristics important to river fishes in Lower Michigan rivers.[38] Procedure 51 aquatic habitat ratings determined by ASTI were

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[33] Ibid

[34] Zorn, T.G., Seelbach, P.W., and M.J. Wiley. 2004 Utility of species-specific, multiple linear regression models for prediction of fish assemblages in rivers of Michigan's Lower Peninsula. Michigan Department of Natural Resources, Fisheries Research Report 2072, Ann Arbor.

[35] Wiley, M.J., Seelbach, P.W., and S.P. Bowler. 1998. Ecological targets for rehabilitation of the Rouge River. Final Report for the Rouge River National Wet Weather Demonstration Project, RPO-PI-SR21.00, April 30, 1998. University of Michigan, School of Natural Resources and Environment, Ann Arbor.

[36] Beam, Jennifer D. and Jeffrey J. Braunscheidel. 1998 Rouge River Assessment. Michigan Department of Natural Resources, Fisheries Division, Special Report 22. Ann Arbor, Michigan.

[37] MDEQ. 2002. Qualitative Biological and Habitat Survey Protocols for Wadeable Streams and Rivers. Michigan Department of Environmental Quality, Surface Water Quality Division, Great Lakes and Environmental Assessment Section, Procedure #51, Lansing, Michigan. Revised May, 28, 2002.

[38] Zorn, T.G., and M.J. Wiley. 2004. Untangling relationships between river habitat and fishes in Michigan's lower peninsula with covariance structure analysis. Michigan Depart of Natural Resources, Fisheries Research Report 2073, Ann Arbor.

generally good for riverine stretches upstream of 10 Mile Road and generally poor downstream of 10 Mile Road (Figure 14).

**Table 4. Valley Segment Fish Associations within the RGC**

| Common Name | Scientific Name |
|---|---|
| **creek chub** | ***Semotilus atromaculatus*** |
| central stoneroller | *Campostoma anomalum* |
| Johnny darter | *Etheostoma nigrum* |
| common shiner | *Luxilus cornutus* |
| redfin shiner | *Lythrurus umbratilis* |
| bluntnose minnow | *Pimephales notatus* |
| **mottled sculpin** | ***Cottus bairdi*** |
| blacknose dace | *Rhinichthys atratulus* |
| **white sucker** | ***Catostomus commersoni*** |
| fathead minnow | *Pimephales promelas* |
| **pumpkinseed sunfish** | ***Lepomis gibbosus*** |
| pirate perch | *Aphredoderus sayanus* |
| bowfin | *Amia calva* |
| northern pike | *Esox lucius* |
| golden shiner | *Notemigonus crysoleucas* |
| blackside darter | *Percina maculata* |
| central mudminnow | *Umbra limi* |

Although much of the RGC is privately owned, the riparian corridor is generally well vegetated. Even where individual landowners have, in places, cleared vegetation to the stream edge, the dominant condition of the overall river reach tends to be a wooded buffer greater than 75 feet in width. All sites evaluated tended to score high for metrics rating the width and protection of a vegetated riparian corridor.

Soil Erosion & Deposition

The downstream transport of sediment is one of the principal functions of a river system and streambank erosion and channel meandering are natural responses to watershed land cover and hydrology. However, the erosion and sediment deposition observed within the RGC appear much greater than what would be expected under natural conditions and are the result of urban and impervious land cover and altered hydrology from piped conveyance of storm water inputs.

**Table 5. Fish Species Predicted and Recorded within the Rouge Green Corridor**

| Scientific Name | Common Name | Predicted in Upper RGC (MR5)[31] | Predicted in Lower RGC (MR4)[31] | Recorded in RGC[33] |
|---|---|---|---|---|
| *Ambloplites rupestris* | rock bass | | X | X |
| *Ameiurus melas* | black bullhead | X | X | |
| *Ameiurus natalis* | yellow bullhead | X | X | |
| *Ameiurus nebulosus* | brown bullhead | | X | |
| *Aphredoderus sayanus* | pirate perch | X | | |
| *Campostoma anomalum* | central stoneroller | X | X | X |
| *Carassius auratus* | goldfish | | | X |
| *Catostomus commersoni* | white sucker | X | X | X |
| *Cluaea inconstans* | brook stickleback | X | | X |
| *Cottus bairdi* | mottled sculpin | X | | X |
| *Cyprinus carpio* | common carp | | | X |
| *Erimyzonsucetta kennerlyi* | lake chubsucker | X | X | |
| *Esox americanus vermiculatus* | grass pickerel | X | X | |
| *Esox lucius* | northern pike | | X | |
| *Etheostoma caeruleum* | rainbow darter | X | | |
| *Etheostoma nigrum* | Johnny darter | X | X | X |
| *Lepomis cyanellus* | green sunfish | X | X | X |
| *Lepomis gibbosus* | pumpkinseed sunfish | X | X | X |
| *Lepomis x Lepomis spp.* | hybrid sunfish | X | | X |
| *Lepomis macrochirus* | bluegill | X | X | X |
| *Lepomis megalotis* | longear sunfish | | X | |
| *Luxilus cornutus* | common shiner | X | X | X |
| *Lythrurus umbratilis* | redfin shiner | X | X | X |
| *Micropterus salmoides* | largemouth bass | | X | X |
| *Nocomis biguttatus* | hornyhead chub | X | X | |
| *Notemigonus crysoleucas* | golden shiner | | X | |
| *Noturus gyrinus* | tadpole madtom | X | X | |
| *Perca flavescens* | yellow perch | | | X |
| *Percina maculata* | blackside darter | X | X | X |
| *Pimephales notatus* | bluntnose minnow | X | X | X |
| *Pimephales promelas* | fathead minnow | X | X | X |
| *Pomoxis nigromaculatus* | black crappie | X | X | X |
| *Rhinichthys atratulus* | blacknose dace | X | | X |
| *Semotilus atromaculatus* | creek chub | X | X | X |
| *Umbra limi* | central mudminnow | X | | X |

Erosion is generally ubiquitous throughout the RGC, both within individual parks/preserves and on private lands. Limno-Tech (LTI) conducted a streambank inventory in 2004, identifying over 2,200 erosion sites within the Main 1-2 Subbasin.[39] Their analysis prioritized sites where erosion threatened some form of infrastructure (e.g., pipes, bridges, etc.). ASTI re-analyzed the LTI data to identify areas that might be contributing the greatest quantity of sediment annually, based upon
LTI's field categorization. The resulting estimates of annual soil loss from individual streambank erosion sites ranged from 2 to more than 1,000 tons per year. Many of these sites contribute

[39] Limno-Tech, Inc. 2004. Rouge Main 1-2 Streambank Erosion Inventory and Site Prioritization Report. Ann Arbor, Michigan.

significant amounts of soil to the river. However, there is a great deal of difference between the majority of sites and those exhibiting the greatest erosion. Ninety-five percent of the sites are estimated to erode less than 100 tons per year, whereas two sites are estimated to contribute more than 1,000 tons per year. These two have been identified as the highest priority sites on the individual river segment maps included in this report (Section 3.2).

Both parks and private lands along the river exhibit a variety of measures to combat streambank erosion. These include broken concrete rip rap or other concrete debris; stacked (imbricated) stone, rip rap, and cement bags; poured concrete; sheet pile sea walls; gabions; and vegetative measures – generally the planting of English ivy.

Hardening of streambanks in this fashion reduces stream edge habitat and cover for fish and other aquatic organisms, and tends to simply deflect the river's erosive force. These treatments are applied on individual properties and tend to be poorly tied into the streambanks at the upstream and downstream limits. The result is frequently severe erosion at those transitions as the force is deflected downstream (or sometimes across the channel). If the ends of these treatments are not properly buried within the streambanks, water tends to get behind the structures and erode until the wall fails.

Gabions, rock enclosed in wire mesh, appear to have worked well where applied within the RGC. They appear stable, and vegetation has become established between the rocks. In most cases however, the vegetation that has become established within the gabions is dominated by invasive species. Much of the RGC is difficult to access and widespread application of gabions or other treatments would require extensive tree removal.

Despite the bank erosion observed within the RGC, analysis of gage sites within the Rouge basin (at Garden City, Inkster, and Detroit – all outside the RGC) indicate that the Rouge River exhibits a narrower and deeper channel compared to other Michigan rivers.[40] Even with a narrow channel, low flows in the RGC, particularly in riffle habitats, result in very shallow conditions and have the potential to limit larger fish access to upstream or downstream habitat. In areas where substrate materials are sorted and deposited in point bars, up to 50% of the RGC channel was observed above the water line at low flows.

If channel erosion is not leading to notably wider channels within the RGC, then the erosion observed may be primarily in the form of channel down-cutting (degradation). Down-cutting may ultimately result in the channel dropping below the water table, which can detrimentally affect riparian wetlands, and may also result in a loss of floodplain connectivity and function, changes in floodplain moisture regimes, and subsequent changes in riparian plant communities.

Channel degradation in the RGC may be the result of a number of factors. Narrow, deep channels, like that in the RGC carry their sediment load low in the water column, exacerbating bed-scour. The Great Lakes and their connecting channels have exhibited a general decline in water surface elevations since around 1900,[41] and down-cutting in the Rouge may at least in part be a response to that phenomenon. The rate of channel incision in the RGC is not known, nor is it known how this may affect the frequency of overbank flooding.

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[40] Wiley, M.J., Seelbach, P.W., and S.P. Bowler. 1998. Ecological targets for rehabilitation of the Rouge River. Final Report for the Rouge River National Wet Weather Demonstration Project, RPO-PI-SR21.00, April 30, 1998. University of Michigan, School of Natural Resources and Environment, Ann Arbor.

[41] National Oceanic and Atmospheric Administration data. tidesandcurrents noaa.gov

Large Woody Debris and Channel Obstructions

Bank erosion naturally leads to streamside trees falling into the channel. The presence of large, stable, woody debris is extremely important for aquatic habitat. Large woody debris (LWD) provides a substrate for the growth of periphyton and the collection of leaf packs, which are utilized as food supplies by stream macroinvertebrates, which in turn are fed upon by fish and other fauna. Studies show that a minimum of 100 feet of riparian forest is required to ensure successful recruitment of LWD to streams.[42] GIS and aerial photo analysis, and field observations, indicate that the majority of the RGC exhibits forest cover equal to or greater than 100 feet in width.

Tree fall is a natural and important process in streams, but in the RGC two factors likely cause this process to occur at faster than normal rates. First, urban/suburban imperviousness and storm sewer runoff conveyance generate storm water volumes that the RGC channel is still adapting to. Secondly, the accelerated death of American elm (*Ulmus americana*) and red ash (*Fraxinus pennsylvanica*) caused by Dutch elm disease and the emerald ash borer (*Agrilus planipennis*) reduce these trees' resistance to toppling.

The relatively narrow channel of the RGC results in downed trees that cross most, or all, of the channel. Downed trees lying near the banks may direct stream flow against the banks, initiating new or accelerating existing bank erosion. Fallen trees that span the channel tend to capture other debris and more wood to create logjams. LTI inventoried over 600 logjams within the Main 1-2 subbasin. ASTI surveys found that almost all of these are still in place three years later, although some may have moved short distances downstream. Logjams can cause backwater flooding, create localized erosion problems, and limit recreational use of the river.

In addition to logjams, culverts and dams may also create obstructions to flow or fish migration. Three dams within the RGC, at Quarton Lake Park and at Hidden Rivers Park, obstruct upstream and downstream fish passage and impede some recreational uses.

Wildlife

Although ASTI ecologists did not conduct detailed wildlife surveys, numerous animals were observed, or their sign noted, during survey activities. Michigan Natural Features Inventory and U.S. Fish and Wildlife Service records of rare plant and animal species are listed in Table 2. Mammals, birds, and fish observed or noted during ASTI habitat assessments are listed in Table 6. Mussel species recorded in the RGC by the MDEQ and frog and toad species identified by FOTR volunteers are presented in Table 7.

From 1998 to 2003, the Michigan Department of Environmental Quality inventoried freshwater mussels at 80 sites within the Rouge River Watershed.[43] The most diverse mussel beds in the watershed occurred within the upper Main Branch and central Middle Branch of the river, an area centered on the RGC. These areas tended to occur in stream reaches with high quality riparian

[42] Tonello, M., Freiburger, C., Nufer, A., and S. Sutton. 2002. Riparian Zone Management and Trout Streams: 21st Century and Beyond. Michigan Department of Natural Resources, Fisheries Division.

[43] Rathbun, J.E. Qualitative Survey of the Distribution of Freshwater Mussels (Bivalva:Unionidae) in the Rouge River, Michigan (U.S.A.) Watershed: 1998-2003. Michigan Department of Environmental Quality.

**Table 6. Wildlife Observed within the RGC during 2007 Field Investigations**

| Common Name | Scientific Name |
|---|---|
| **Mammal Species** | |
| Mink | *Mustela vison* |
| White-tailed deer | *Odocoileus virginianus* |
| Muskrat | *Ondatra zibethicus* |
| Common raccoon | *Procyon lotor* |
| Fox squirrel | *Sciurus niger* |
| Cottontail rabbit | *Sylvilagus floridanus* |
| Red squirrel | *Tamiasciurus hudsonicus* |
| Red fox | *Vulpes vulpes* |
| **Bird Species** | |
| Cooper's hawk | *Accipiter cooperii* |
| Wood duck | *Aix sponsa* |
| Blue-winged teal | *Anas discors* |
| Mallard | *Anas platyrhynchos* |
| Great blue heron | *Ardea herodias* |
| Tufted titmouse | *Baeolophus bicolor* |
| Cedar waxwing | *Bombycella cedrorum* |
| Canada goose | *Branta canadensis* |
| Red-tailed hawk | *Buteo jamaicensis* |
| Northern cardinal | *Cardinalis cardinalis* |
| American goldfinch | *Carduelis tristis* |
| Belted kingfisher | *Ceryle alcyon* |
| Northern flicker | *Colaptes auratus* |
| American crow | *Corvus brachyRhynchos* |
| Blue jay | *Cyanocitta cristata* |
| Dark-eyed junco | *Juncus hyemalis* |
| Downy woodpecker | *Picoides pubescens* |
| Black-capped chickadee | *Poecile atricapillus* |
| Eurasian starling | *Sturnus vulgaris* |
| House wren | *Trogloytes aedon* |
| American robin | *Turdus migratorius* |
| Mourning dove | *Zenaida macroura* |
| **Fish Species** | |
| Carp | *Cyprinus carpio* |
| Bluegill | *Lepomis macrochirus macrochirus* |
| Largemouth bass | *Micropterus salmoides* |
| Creek chub | *Semotilus atromaculatus* |

**Table 7. Mussels and Amphibians Observed within the RGC (MDEQ & FOTR)**

| Common Name | Scientific Name |
|---|---|
| **Mussel Species** | |
| Slippershell mussel | *Alasmidonta viridis** |
| Spike | *Elliptio dilatata* |
| Wabash pigtoe | *Fusconaia flava* |
| Fatmucket | *Lampsilis siliquoidea* |
| White heelsplitter | *Lasmigona complanata* |
| Creek heelsplitter | *Lasmigona compressa* |
| Fluted-shell | *Lasmigona costata* |
| Round pigtoe | *Pleurobema coccineum** |
| Giant floater | *Pyganodon grandis* |
| Strange floater | *Strophitus undulatus* |
| **Amphibian Species** | |
| Eastern American toad | *Bufo americanus* |
| Eastern gray treefrog | *Hyla versicolor* |
| Northern spring peeper | *Pseudacris crucifer* |
| Striped chorus frog | *Pseudacris triseriata* |
| Bullfrog | *Rana catesbeiana* |
| Green frog | *Rana clamitans melanoma* |
| Northern leopard frog | *Rana pipiens* |
| Wood frog | *Rana sylvatica* |

* Michigan species of Special Concern

forests and low stream flow variation, emphasizing the importance of storm water and riparian management for mussel persistence.

The stretch with the densest mussel populations extends from Troy downstream to Civic Center Drive in Southfield; however, mussel densities and species diversity (10 species) within the Rouge were considerably less than those observed within the neighboring Huron and Raisin watersheds (21–32 species) in other studied SE Michigan rivers). Species richness observed in the Rouge during this recent study was also much less than the 20 freshwater mussel species reported for the Rouge River in the 1930's.[44]

The FOTR trains volunteers to identify local frog and toad species by their calls and volunteers spend time each spring documenting the calls heard at selected wetland areas within the Rouge River Basin. Seventeen wetland areas within in or abutting the RGC have been monitored at least once since 2000. Of eight (8) species found locally, species counts within the RGC range from zero (0) to seven (7). The average across all sites is 2 species. Several sites have

[44] Van der Schalie, H. 1938. The Naiad Fauna of the Huron River, in Southeastern Michigan. Misc. Publication No. 40, Museum of Zoology, University of Michigan, Ann Arbor, MI. 83pp. + figures.

exhibited quite a range of results over multiple years, as many as 0 to 6. In most cases where results have differed over multiple sampling years, they have shown marked declines as the sampling has progressed.[45]

As mentioned previously, the Main 1-2 contains a lower percentage of wetland than the Rouge River Watershed as a whole.[46] Vernal pools, flooded oxbows, and broader riparian wetlands are absent or effectively drained throughout much of the corridor, substantially limiting wetland available as wildlife habitat. Other anthropogenic disturbances and barriers such as roads are also likely detrimental to wildlife within the RGC. Edge effects (e.g., higher temperatures, nest predation, adventive species invasion, etc.) caused by roads, differing land uses, the river itself, and other breaks in forest cover tend to extend 200 meters within forest blocks. GIS and aerial photo analysis indicates that the width of riparian forest within the RGC is insufficient to provide habitat for interior specialist species. However, the RGC appears to contain surprisingly substantial and diverse populations of other wildlife species given its urban context.

Water Quality

The Michigan Department of Environmental Quality has established Total Maximum Daily Load (TMDL) pollutant reduction targets for the protection of stream biota and the reduction of *E. coli* bacteria for most of the Rouge River drainage, including the RGC.[47, 48]

Combined sewer overflow (CSO) retention treatment basins have been constructed at the Douglas Evans Nature Preserve (Acacia Park) and at Linden Park, in Beverly Hills and Birmingham, respectively. These serve 0.63 square miles of Birmingham and Beverly Hills. Other sewer separation projects have been completed and have been certified by the MDEQ as meeting water quality standards at the time of discharge.[49] Figure 15 shows the sheer number of direct storm water outfalls to this urban river. There are 500 outfalls within the RGC focus area alone, with many more within the Rouge River basin upstream and downstream. The Oakland County Water Resources Commissioner's Office has surveyed all of these outfalls to identify and correct any possible cross-connections between the sanitary and storm sewer systems. Eight storm water detention basins are located within the RGC, with 373 within the Main 1-2 subbasin.

As a result of all these efforts and treatment facilities, dissolved oxygen (DO) concentrations within the RGC (Main 1-2) have improved an average of 0.15 mg/L/year since 1997. Mean DO concentrations, as measured at Maple Road, have met state water quality standards each year

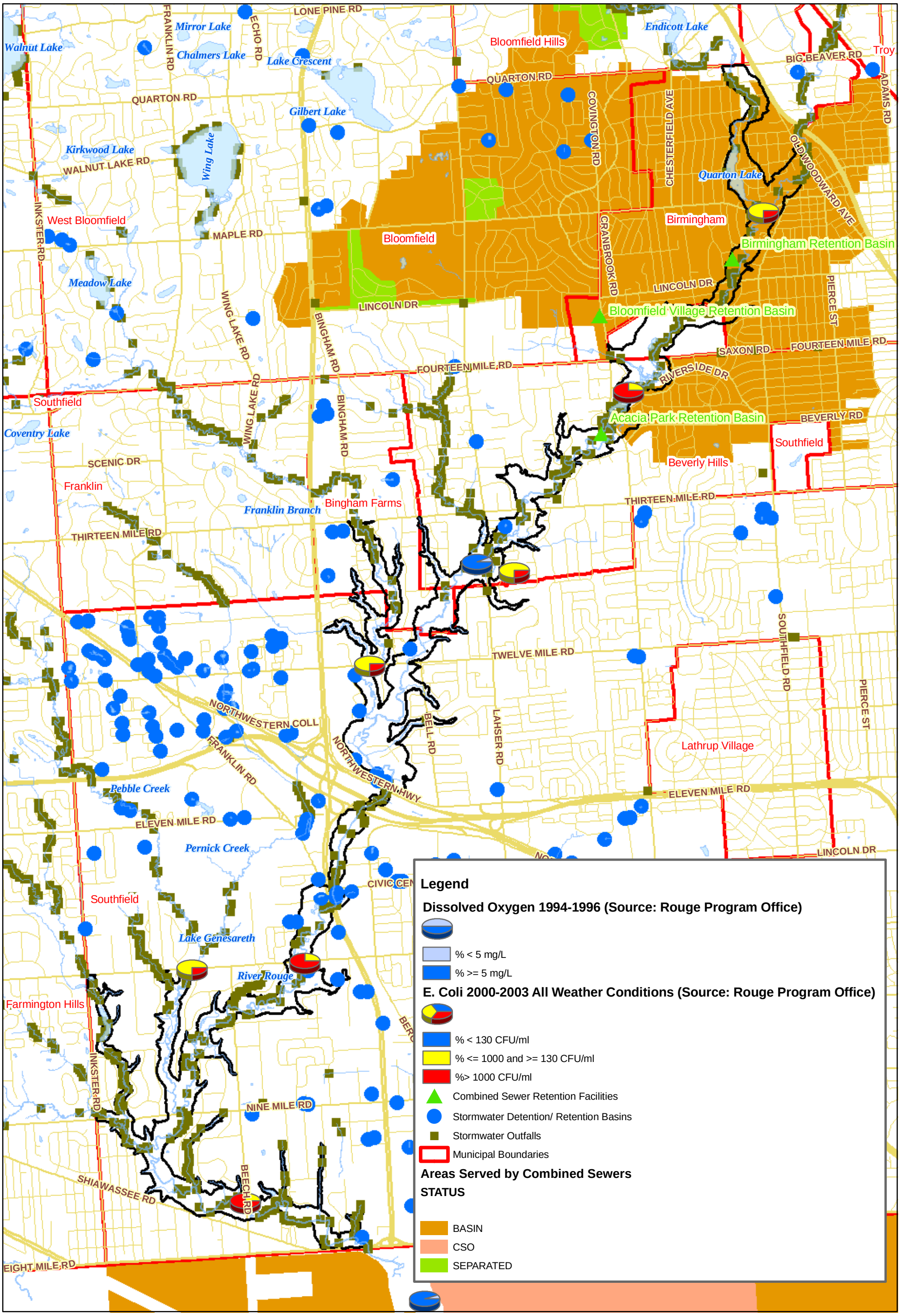
[45] Friends of the Rouge, 2007. Frog & Toad Survey GIS Records 2007. Dearborn, Michigan.

[46] Catalfio, C., Hughes, C., and S. Rood. 2005. 2005 Rouge River Ecosystem Monitoring and Assessment Report, RPO-WMGT-TR65. Rouge River National Wet Weather Demonstration Project, Wayne County, Michigan.

[47] Goodwin, Kevin. 2007. Total Maximum Daily Load for Biota for the Rouge River Watershed, Including Bishop and Tonquish Creeks Washtenaw, Wayne, and Oakland Counties. Michigan Department of Environmental Quality, Water Bureau. August 2007.

[48] Goodwin, Kevin. 2007. Total Maximum Daily Load for *E. coli*. for the Rouge River Wayne, and Oakland Counties. Michigan Department of Environmental Quality, Water Bureau. June 2007.

[49] Catalfio, C., Hughes, C., and S. Rood. 2005. 2005 Rouge River Ecosystem Monitoring and Assessment Report, RPO-WMGT-TR65. Rouge River National Wet Weather Demonstration Project, Wayne County, Michigan.




# Rouge Green Corridor Habitat Assessment
# Water Quality Controls and Sampling Data

Oakland County, MI

1 inch equals 3,177 feet

Created for: Oakland Land Conservancy
Created by: Oakland County, 2/7/08, ASTI Project 6602

Figure 15- Water Quality Sampling Data and Control Structures

during this same period. *E. coli* bacteria concentrations, however, continue to be in excess of state water quality standards (Figure 15).[65] Continuing elevated *E. coli* counts, subsequent to CSO controls, indicate that storm water is the likely source.

The Rouge River Biota TMDL focuses on reducing sediment loads to the river. The Main 1-2 Subwatershed Management Plan establishes *dry*-weather average concentrations less than 80 mg/L total suspended solids as a goal to be met by 2015. This goal is being met now, but this same concentration has been established as a *wet*-weather target in the Rouge River Biota TMDL and that will require additional effort and storm water controls.

In general, urban storm water runoff impacts the RGC through both pollutant loading and the erosive forces described previously. Ideally, efforts to protect and restore habitat within the RGC will result in increased recreational use of the corridor. Improving water quality must continue to be a priority before full utilization of the river for recreation is advocated by RGC governments and partners.

Recreational Potential

The RGC offers a wealth of recreational opportunities including ball fields and golf, walking, bird watching, and fishing. During ASTI field investigations in fall 2007, people were seen walking or running with children in strollers, with dogs, with friends, or by themselves; sitting on benches; and one person was observed fishing.

Sections of the RGC, particularly between 13 Mile and 10 Mile Roads, provide opportunities for a scenic and enjoyable canoe or kayaking experience. Yet, it seems that few people utilize the river in this way. Logjams and low flows can impede this use of the river, and portaging around logjams is sometimes difficult due to steep river banks, sea walls, or private property. Logjams could be cut to allow kayak and/or canoe passage while leaving LWD in place as overhead structure and habitat. Signage, and/or informational brochures, maps, etc., noting where one can enter or leave individual park or preserve properties, and alerting paddlers to nearby trails could facilitate connections between the river and other park/preserve resources. Advocating use of the river as a water trail would allow improved connections between parks as well, connections that otherwise are limited due to private land ownership.

### 3.1.1 Management Goals and Target Metrics

Based upon the river inventory, a series of twelve (12) goals were established for protection and rehabilitation of the RGC. Likewise, many of the same indices that were used to assess habitat quality or the health of the RGC were translated into quantifiable targets to identify when goals have been met. Some goals, such as public education, can be tracked by the number of presentations made, or the number of brochures distributed, etc., but are harder to quantify in terms of results. Pre- and post-education surveys may be used as measures of efficacy, but goals regarding public education and promoting recreational use of the river have not been assigned numeric targets here. The following metrics have been used to establish specific targets for the RGC as a whole, for individual stretches of river, or for individual parks and preserves:

1. AC – Amphibian Counts
2. AHR – Aquatic Habitat Ranking
3. BSI – Bank Stability Index

4. FC – Fish Community
5. FQI – Floristic Quality
6. MC – Macroinvertebrate Community
7. RBFI – Richards-Baker Flashiness Index
8. WFV – Wetland Functional Value
9. WQ – Water Quality (DO, *E. coli*, and TSS)

Many of the goals and targets in this document are closely related. Actions taken to address one problem may directly or indirectly also address other issues and concerns. The 12 goals identified for parts or all of the RGC, with their corresponding most closely related metrics, are:

1. Connect river and floodplain (AHR, BSI, FC, RBFI, WQ, WFV)
2. Educate and involve residents in riparian corridor stewardship (no targets established)
3. Expand survey and monitoring efforts (AC, AHR, MC, WFV, WQ)
4. Improve in-stream aquatic habitat (AHR, FC, MC)
5. Improve water quality to meet TMDL and water quality criteria (FC, MC, WQ)
6. Maintain/expand vegetated riparian buffer (AHR, FQI, WFV, WQ)
7. Manage invasive species (FQI, WFV)
8. Manage woody debris (AHR, BSI)
9. Promote the river and the RGC as a recreational asset (no targets established)
10. Reduce erosion and sedimentation (AHR, BSI, FC, MC, WQ)
11. Reduce flashiness (AHR, BSI, RBFI)
12. Restore wetlands (FQI, WFV)

### 3.1.2 Corridor-Wide Target Metrics

The following metrics were established for the RGC as a whole. Metrics for individual parks, preserves, and river segments, which in some cases may be more specific or intended to reach a higher level of quality, are presented in subsequent sections of this report corresponding to those specific areas.

**Location: Entire Rouge Green Corridor**

| Metric | Desired Target |
|---|---|
| AC – Amphibian Community | Increase average species count from 2 to 4 |
| AHR – Aquatic Habitat Ranking | "Acceptable" Procedure. 51 ratings |
| BSI – Bank Stability Index | Improve to, or maintain at, "Stable" |
| FC – Fish Community | "Acceptable" Procedure 51 ratings |
| FQI – Floristic Quality Index | Minimum FQI of 20 |
| | Average % native species $\geq$75% |
| MC – Macroinvertebrate Community | "Acceptable" Procedure 51 ratings |
| RBFI – Richards-Baker Flashiness Index | Halt trend to increasing flashiness |
| WFV – Wetland Functional Value | Suitable for Floodflow Alteration |
| WQ – Water Quality | Average wet-weather TSS $\leq$ 80 mg/L<br>Dissolved oxygen $\geq$ 5 mg/L<br>*E. coli* bacteria $\leq$ 130 mg/L |

### 3.1.3 CORRIDOR-WIDE MANAGEMENT RECOMMENDATIONS

Watershed planning fundamentals establish a hierarchy of priorities that are worth repeating here, they are (in order of importance and cost effectiveness):

(1) *Preserve Existing Natural Features*

(2) *Focus on Protection and Pollution Prevention*

(3) *Retrofits and Restoration*

ASTI has developed a series of management recommendations that can be applied to all lands within the RGC, in public or private ownership. These are presented below. Later portions of this report present management recommendations specific to individual parks and preserves, or river reaches, within the RGC.

Each management recommendation is first listed as it appears in Table 1 at the beginning of this document. Additional narrative follows each group of recommendations listed under a single goal. In many cases these are actions that can be applied globally throughout one or more municipalities (e.g., new zoning ordinances or development standards) and that we hope will be applied by all three municipalities within the RGC.

Table 1 presents additional information for each management recommendation that the RGC communities may use to prioritize these. The RGC Steering Committee will use this report in their own deliberations to develop priorities, budgets, and action plans.

As community leaders review the management recommendations herein, it is suggested that they keep in mind the hierarchy of priorities listed above. Invasive species removal and treatment and other forms of ecological restoration have received a great deal of emphasis and attention in the past decade. These are indeed important and will play a key role in protecting and rehabilitating the RGC. However, implementing actions that first, protect remaining natural areas and, second, prevent their further degradation are recommended as precursors, or at least parallel, to restoration. Efforts will need to be conducted in parallel at both the regional and park-specific levels.

Implicit in all of these recommendations is the notion that they be implemented in a coordinated way, with all three of the RGC communities (the Village of Beverly Hills, the City of Birmingham, and the City of Southfield) participating in a coordinated effort to protect and restore the RGC river corridor. The habitat assessments conducted as part of this project focused on the mainstem of the RGC, but the tributary systems contributing to the RGC are a vital and integral part of the system. The three RGC communities that sponsored this work are encouraged to work with the neighboring communities along these tributaries, as well, to implement coordinated actions.

The majority of the following recommendations share an over-arching emphasis on controlling the volume and timing of storm water runoff to the river. Reducing peak-flows, and maintaining or increasing baseflows to the river, are central to reducing erosion, improving in-channel habitat, improving water quality, and managing large woody debris. Additionally, storm water volume controls have implications for efforts to combat invasive species, for riparian resident education, for park acquisition, for efforts to improve recreational use of the RGC, and for municipal policies and investments in infrastructure.

**Goal: Reduce Flashiness** (Targets: AHR, BSI, RBFI)

*Recommendation 1:* Review policies and procedures to capture, detain, and treat storm water. Revise to further reduce peak flow runoff.

*Recommendation 2:* Build upon the existing RGC storm water infrastructure inventory and the retrofit evaluations in the Franklin Subwatershed Study to include assessments of capacity and treatment efficacy. Identify possible retrofits to increase storage, sediment retention, infiltration and/or evapotranspiration. Prioritize, design and build retrofits.

*Recommendation 3:* Develop downspout disconnection programs, where needed, to maximize runoff to porous areas. Encourage rain barrel use.

*Recommendation 4:* Identify where other direct connections and outfalls can be daylighted to treatment or infiltration systems.

*Recommendation 5:* Develop programs and policies to minimize the amount of new, and to reduce existing, impervious surface where possible.

*Recommendation 6:* Develop standards and/or incentives to reduce road/sidewalk widths, parking requirements, and building footprints, and/or encourage porous material use.

*Recommendation 7:* Explore overlay zoning in Darcy Map priority areas to facilitate infiltration and reduce imperviousness.

Storm water detention standards in Michigan were originally developed to prevent flooding and have been modified in recent years to provide additional water quality treatment. Until very recently, however, little emphasis has been placed on downstream channel protection.

Stream channels enlarge in response to watershed development. Research indicates that channel enlargement can begin at relatively low levels of watershed impervious cover. One study estimated that channel erosion rates were three to six times higher in a moderately urbanized watershed (14% impervious cover) than in a comparable rural one, with less than 2% impervious cover.[66] Recent storm water literature and model ordinances have noted that the design storms, release rates, and design traditionally used for storm water detention in Michigan reduce peak flow but fail to reduce the erosive work done on the channel. References providing guidance on alternative storm water ordinance language are provided in Table 1.[67]

The RGC communities and the Oakland County Water Resources Commissioner's (OCWRC) office are urged to review their current policies and procedures for capturing, detaining, and treating storm water runoff, and to implement changes that will further reduce peak flow runoff and the erosive force of runoff to the RGC and its tributaries. In addition to this policy review, ASTI recommends building upon the OCWRC's inventory of existing collection/detention/retention infrastructure within the drainage area of the RGC.

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[66] Storm water Manager's Resource Center. 2008. Post-Construction Runoff Model Ordinance. http://www.storm watercenter.net/Model%20Ordinances/Post%20Construction%20Storm water%20Management/Final%20Model%20Storm water%20Control.htm

[67] Center for Watershed Protection. 2008. Managing Stormwater in Your Community: A guide for building an effective post-construction program. EPA Publication No: 833-R-08-001.

The inventory should be amended to include assessments of capacity and treatment efficacy and designs for ways in which individual facilities could be retrofitted for additional storage and/or sediment retention. The focus should be on increasing infiltration or evapotranspiration to reduce the volume reaching the RGC, dissipating erosive force, and decreasing the associated sediment loads.

Opportunities to sever direct connections and outfalls, replacing them with rain gardens or other means of detention or infiltration should be considered as part of a program to reduce the amount of overland runoff to the RGC. Likewise, opportunities to enhance floodwater storage in former oxbows and meander channels and drained wetlands should be identified.

In addition to storm water detention standards, land use policies also offer means to limit, and possibly reduce, impervious surface coverage and peak flows. Review of the off-street parking requirements of the 3 RGC communities reveals that all 3 municipalities could reduce at least some formulas for use-specific parking minimums. Additionally, studies by the Center for Watershed Protection and others have shown that developers frequently opt to exceed the parking minima found in local ordinances, As such, they recommend that development standards contain not only minimums but also establish ranges or maximum ratios.

ASTI recommends developing programs and policies to both minimize the amount of impervious surface added to the RGC drainage, as new areas develop, and reduce existing imperviousness, where possible. Such practices could include developing new ordinance standards or incentives for:

- Road/street widths
- Sidewalks
- Parking requirements
- Building footprint size
- The use of porous paving materials, and
- Policies to slow land clearing in advance of development.

Areas with fluvial sediment deposits adjacent to the river, particularly along portions of the river highlighted in the Darcy map (Figure 5b), should be priority areas for impervious surface limits or reductions.

**Goal: Maintain/Expand Riparian Buffer** (Targets: AHR, FQI, WFV, WQ)

*Recommendation 8:* Develop and implement wetland and watercourse ordinances in Birmingham and Beverly Hills.

*Recommendation 9:* Conduct a detailed Urban Ecosystem Analysis (UEA) for the RGC to quantify trends in forest loss/gain, impervious surface changes, and to quantify the monetary value of green infrastructure benefits provided by the RGC riparian corridor.

*Recommendation 10:* Use the results of the UEA to educate city and village councils regarding the economic and societal value of retaining RGC open space.

*Recommendation 11:* Use the results of the UEA to develop regional and land use specific tree canopy goals.

*Recommendation 12:* Develop and implement woodland protection ordinances in Birmingham and Beverly Hills.

*Recommendation 13:* Develop and implement Environmental Features Setback ordinances in each of the 3 RGC communities.

*Recommendation 14:* Develop and implement design standards to protect steep slopes in each of the 3 RGC communities.

Developing and enacting the land use policies listed above can be done at relatively low cost but will go a long way toward protecting remaining natural features within the RGC. Although Birmingham, Beverly Hills, and Southfield are already largely developed, wetland, woodland, steep slope and related ordinances can still protect against increased imperviousness and/or the loss of additional forest canopy within the riparian corridor. Protecting this "green infrastructure" is also vital to meeting the goal of reducing peak flows and flashiness.

The following is a list of natural feature protection targets established by various natural resource planning and management agencies:

- Wetlands should constitute a minimum of 10% of the land area within a watershed, and a minimum of 6% of any subwatershed.
- Forest cover should be a minimum of 35% at the township scale.
- Protection of several large tracts (>200 ha/500 ac) is recommended to support 90-100% of expected forest bird species in an area, if possible. At least one large, contiguous patch of this size, that is a minimum of 500 meters (550 yards) wide, should be protected or restored.
- 10% of the watershed should be forest cover 100 meters or further from the forest edge; 5% of the watershed should be forest cover 200 meters or further from the forest edge.
- 75% of the length of area streams should be naturally vegetated.
- Imperviousness within a watershed should be less than 10%.[68]

- Land managers and land use planners should strive to protect and maintain patches of habitat that are greater than 55 hectares (138 acres) in size.
- In general, planners should attempt to conserve at least 20-50% of the total landscape for wildlife habitat. A minimum of 60% may be necessary to sustain long-term populations of area-sensitive and rare species.
- To avoid the negative effects of edges on wildlife habitat, buffer zones of 230 to 300 meters from edges should be established.
- The following minimum widths are recommended for riparian buffers dependent upon their desired purpose:
    - 25 meters for nutrient and pollutant removal in diffuse storm water runoff
    - 30 meters for temperature and microclimate regulation and sediment removal
    - 50 meters to provide detrital inputs and bank stabilization
    - >100 meters for wildlife corridors/habitat
    - For both water quality and wildlife buffers > 100 meters in width are recommended.[69]

[68] Environment Canada. 2004. How Much Habitat is Enough? 2nd Edition. Environment Canada, Canadian Wildlife Service, Ontario Region, Downsview, Ontario. 12 pages. http://www.on.ec.gc.ca/wildlife/factsheets/pdf/fs-howmuchhabitat-e.pdf

[69] Environmental Law Institute. 2003. Conservation Thresholds for Land Use Planners. Environmental Law Institute, Washington DC. 55 pages.

- The following are land use specific forest canopy coverage targets recommended by American Forests:

    - 40% tree canopy overall
    - 50% tree canopy in suburban residential
    - 25% tree canopy in urban residential
    - 10-15% tree canopy in the urban core; greater in areas adjacent to rivers.[70]

Of the three RGC communities, only the City of Southfield has a wetland and watercourse and a woodland protection ordinance in place. ASTI recommends that the RGC communities consider enacting protective ordinances or overlay districts to regulate development within wetlands and woodlands, and building or clearing within lands riparian to the river and its tributaries. Policies of this sort provide multiple benefits. Protecting these components of the area's "natural infrastructure" protects habitat, helps stabilize streambanks, and minimizes runoff.

Local natural features setback regulations, or a watercourse protection ordinance, would also provide a means of controlling the efficacy and aesthetics of streambank armoring within the RGC. A local ordinance governing actions at the riparian edge or below the ordinary high water mark could establish standards for erosion control methods and materials to better ensure that residents' efforts to reduce do not simply exacerbate erosion further downstream (see further discussion regarding streambank stabilization below).

**Goal: Connect River and Floodplain** (Targets: AHR, BSI, FC, RBFI, WQ, WFV)

*Recommendation 15:* Review historic topographic survey information (road crossings, etc.) and/or establish permanent monitoring stations to determine extent of channel degradation (downcutting) to determine if grade control structures are needed to prevent the river's disconnection from its floodplain.

As noted elsewhere in this report, the prevalence of overhanging tree rootwads indicates lateral stream channel erosion, and the prevalence of gravel bars and other sediment deposition indicates that the channel is aggrading in some locations. It is suspected that the channel is also degrading, or downcutting, in many locations. If the channel deepens it can reduce the frequency and severity of flooding, and hence may lead to changes in floodplain plant communities and increased sediment load within the channel rather than deposited within the floodplain. It may also reduce riparian wetlands' ability of to hold water (surface runoff or groundwater inputs), and may exacerbate already low base flows.

Understanding how and where channel morphology is changing due to increased storm water inputs informs efforts to stabilize streambanks and reduce erosion, efforts to alter in-channel habitat, and efforts to protect infrastructure and rare plant species.

**Goal: Restore Wetlands** (Targets: FQI, WFV**)**

*Recommendation 16:* Utilize maps recently developed by the Michigan Department of Environmental Quality (MDEQ) to identify areas of former wetland and/or hydric soils to develop priorities and strategies for restoring 85 acres of

[70] American Forests. 2006. Urban Ecosystem Analysis SE Michigan and City of Detroit: Calculating the Value of Nature. American Forests, Washington, DC. 15 pages.

wetland within the RGC south of I-696 (1/2 of the estimated acreage lost since European settlement).

Restoring wetlands can also assist in meeting the goals of reducing flashy hydrology and expanding the riparian corridor. It appears that approximately 50% of the pre-European settlement wetlands in the RGC have been lost. This recommendation seeks to regain half of that acreage through restoration. Other, site-specific goals seek to restore function where individual wetlands remain but have been degraded.

**Goal: Manage Invasive Species** (Targets: FQI, WFV**)**

*Recommendation 17:* Revise ordinance landscaping requirements to identify and prohibit use of invasive, exotic plant species.

As part of this study, ASTI reviewed the landscaping requirements for new development in the Birmingham, Beverly Hills, and Southfield zoning ordinances. Only the City of Birmingham's development standards contain a list of prohibited invasive species. Birmingham's list, however, does not include several invasive plants species that are prevalent within the RGC parks, preserves, and private lands. The existing list should be expanded.

Beverly Hills landscaping requirements are largely silent on either recommended native plant species or prohibiting adventive species. The City of Southfield's development standards contain a list of recommended plant species, which contains several non-native plants, including some that are invasive within the RGC. All three communities are recommended to review their existing policies and revise them as a tool for homeowners, developers, and municipal staff and committees responsible for reviewing site plans.

**Goal: Educate/Involve Residents in Riparian Stewardship**

*Recommendation 18:* Develop land owner education strategy and materials.

Although management of the 11 municipal parks and preserves within the RGC is an important element in protecting the RGC riparian corridor, they are connected by significant areas in private ownership. A number of the problem areas identified during this project (and discussed in later sections), are in the control of private property owners. These include trash disposal along the river, clearing riparian vegetation, planting exotic or invasive species, and a hodge-podge of streambank stabilization attempts that in some cases exacerbate erosion.

Involving riparian landowners, therefore, in the process of protecting and restoring the RGC's riparian forest, and providing education and tools for them to do so, is critical to maintaining river health. Suggested educational topics for private landowners in the RGC include:

- Native species for landscaping
- "Environmentally-friendly " lawn care and the use of low/no phosphorus fertilizers
- The importance of maintaining a vegetated buffer
- Woody debris management
- Deer management
- River dynamics and erosion
- Proper techniques for streambank stabilization
- Septic system maintenance
- Storm water management

- Proper trash disposal, and
- The high quality of the RGC resource (additional information is provided in Appendix D).

**Goal: Manage Woody Debris (LWD)** (Targets: AHR, BSI)

*Recommendation 19:* Expand upon LTI inventory to develop a corridor-wide large woody debris management plan. Establish priorities, identify permitting requirements, and develop budgets, schedules, and on-going maintenance programs for clearing recreational access through logjams and stabilizing the worst erosion hotspots. Encourage use of deformable, vegetative stabilization where possible.

*Recommendation 20:* Identify which LWD accumulations result from sewer/water infrastructure crossing the river. Develop plans, schedules, and budgets to replace or bury these pipes.

Previous work conducted by Limno-Tech has identified the location of logjams throughout the RGC. ASTI's investigations determined that the majority of these remain in place three years after that inventory. Those that have moved have generally become re-established a short distance downstream. ASTI recommends that the logjam inventory be expanded into a corridor-wide management plan. This plan could provide information regarding which LWD accumulations would require MDEQ permits for removal and which could be selectively cut to enhance flow and allow canoes or kayaks to pass through. Additionally, an expanded inventory should note which LWD accumulations are the result of sewer lines or other infrastructure that crosses the river. Plans to replace these pipe segments could be developed along with priorities, schedules, budgets, and plans for on-going monitoring and maintenance.

**Goal: Expand Survey and Monitoring Efforts**

*Recommendation 21:* Continue and expand volunteer water quality (macroinvertebrates) monitoring to provide coverage of main drainage network inputs.

*Recommendation 22*: Conduct follow-up mussel surveys every 5 to 10 years, expand sampling stations to identify other high quality areas and monitor over time.

This study benefited from a wealth of information regarding water quality, frog and toad populations, and lists of plant, bird, and other wildlife species collected by volunteers. However, some parks within the RGC have not had inventories conducted and the level of effort differs between parks and preserves. ASTI recommends continuing and expanding volunteer efforts to monitor water quality and wildlife populations. Existing bird, frog and toad survey data should be maintained and monitoring should continue to determine any changes to populations. Additional surveys for insects, reptiles, and fish could be added. Plant surveys should be conducted to ensure that early, mid, and late-season species are all represented. Although it is not essential to monitor aquatic invertebrates, mussels, insects, birds, etc. at each park and preserve, these forms of volunteer monitoring provide one more avenue for local residents to become involved in the management of, and take ownership for, individual parks and preserves.

**Goal: Reduce Erosion and Sedimentation (**Targets: AHR, BSI, FC, MC, WQ**)**

*Recommendation 23:* Continue to address high priority erosion identified in 2004 Limno-Tech (LTI) and Franklin Branch (Applied Science) Streambank Erosion Inventories.

*Recommendation 24:* Incorporate pollutant removal standards (particularly for TSS or TS) into municipal storm water ordinances of municipalities and or w/in OCWRC rules.

*Recommendation 25:* Continue municipal street sweeping programs. Review practices to determine if areas within the directly connected drainage area of the RGC can be swept on a more frequent basis.

*Recommendation 26:* Establish capitol budgets to replace existing street sweepers with high efficiency/regenerative air and vacuum assisted sweepers over time.

Despite the notable bank erosion throughout much of the RGC, ASTI does not recommend wholesale efforts to stabilize streambanks within the RGC. Areas previously identified as high priorities for stabilization (i.e., to protect infrastructure, to halt high volume erosion, etc.) should be stabilized, and some specific locations are identified in subsequent management recommendations. However, the RGC and the larger Rouge River system are still adjusting to the volume and intensity of runoff it now receives. Streambank stabilization efforts, particularly those utilizing hard armoring materials are likely to fail as the channel continues to move and adjust. For locations where infrastructure is at risk or where landowners seek to armor streambanks, ASTI recommends that vegetative controls be emphasized, where possible, over hardscaping. This will allow materials to deform as needed, to adjust with the channel.

In a number of RGC locations, riparian landowners have installed sheet piling, stone, brick, or other hard armor materials. These materials tend to merely deflect the river's energy to another location downstream. As a result, in many locations, erosion is most severe immediately downstream of where stabilization has been attempted. Additionally, eroding streambanks within the RGC are generally vertical and much of the river corridor lacks access. These factors make stabilization efforts difficult and expensive, favor hard materials over vegetative, or require that banks be laid back and regraded, requiring extensive tree removal. This, in and of itself, would tend to remove much of the roots systems now stabilizing the banks. Tree removal will also open additional areas to invasive species infestation. It is ASTI's opinion that the focus should be on managing the source of the erosion, excessive storm water volume and erosive power, and allowing natural processes to stabilize banks once the channel finds equilibrium.

Other programs aimed at minimizing the amount of sediment transported to the river, under local Phase II municipal storm water management permits, should be continued, expanded, and/or improved as possible.

**Goal: Improve Water Quality to Meet TMDL and Water Quality Criteria** (Targets: FC, MC, and WQ)

*Recommendation 27:* Develop and enact a Fertilizer Ordinance to require, or maximize, the use of no-phosphorus fertilizers by commercial applicators.

Although excessive algae was only noted in a few locations within the RGC (e.g., upstream and within Quarton Lake, near 12 Mile Road and Northwestern Highway, Hidden Rivers and Riverside Parks, etc.), reductions in nutrient loads to the river should aid the effort to improve oxygen concentrations within the Rouge River corridor. A fertilizer regulation is a low cost action aimed largely at the lawn care industry that will supplement education efforts aimed at local residents.

### 3.1.4 MANAGEMENT RECOMMENDATIONS COMMON TO ALL PARKS & PRESERVES

Before presenting the information specific to each park, it should be stated that all 11 of the parks and preserves share several common problems or may benefit from the same recommendations. Management recommendations common to all of the parks and preserves, presented and discussed below, apply to publicly owned lands in the RGC, so are neither true corridor-wide recommendations nor specific to only one or a few parks.

Some elements of corridor-wide or all-park recommendations are repeated for specific parks, preserves, or river reaches in subsequent sections to re-emphasize a particular action for that particular location. For example, it is recommended that frog and toad monitoring be continued and expanded throughout the RGC. Adding a monitoring site to a particular park or preserve, currently lacking one, would be repeated as a recommendation fro that particular location.

**Goal: Manage Invasive Species (**Targets: FQI, WFV**)**

*Recommendation 28:* Develop detailed invasive species inventories, databases, and maps for all RGC parks and preserves. Map locations and densities of rare plant species. Map aerial distribution of individual invasive species infestations, measure abundance, and track eradication efforts. Prioritize areas of highest floristic quality at risk of infestation.

*Recommendation 29:* Weigh the merits of using available resources for invasive species management at each park and preserve against protection of higher quality resources elsewhere. Prioritize efforts in those parks and preserves where this analysis shows the greatest risk or cost:benefit ratio. Combat invasive species as resources and priorities allow.

*Recommendation 30:* Review past and existing invasive species management actions to identify the approaches that have worked the best. Share these successes with other RGC communities, natural resource agencies, and nonprofit organizations. Incorporate these techniques into detailed invasive plant species management plans for each park and preserve.

*Recommendation 31:* Inventory density and distribution of deer within the RGC. Hold public meetings regarding deer management options, and develop a deer management strategy and budgets.

During the course of this project, RGC community land managers expressed frustration with the amount of time, effort, and financial resources required to combat invasive plant species and uncertainty regarding whether the effort expended was effective in reducing the problem. The control, and/or eradication, of invasive plants species requires significant investment in learning which techniques and products work best for certain species, long-term commitment to treatment, and continued monitoring and follow-up treatments.

Additionally, there is a significant danger that, while devoting resources to areas with the most wide-spread or dense coverage of invasive species, invasive species can become established and spread in previously unimpacted areas. Within the RGC, many of these relatively unimpacted areas may harbor rare species that could be particularly sensitive to invasive species infestation.

This project allowed only limited time on the ground to identify some invasive species hotspots. The FQA assessment allowed calculation of invasive species prevalence as a percentage of all plant species, but did not determine the prevalence of invasive plant species in terms of aerial coverage or stem densities of particular plants in any individual park or preserve. ASTI recommends that further work be done in each park and preserve to develop detailed maps and inventories of invasive plants, noting species, coverage, densities or stem counts, and proximity or threat to high quality resources or rare native species.
These inventories also provide an opportunity to assess the success and failures of past invasive control efforts. Map information may then be compared between parks within a given jurisdiction or across the three municipalities in the RGC. Information regarding what has worked well and what has not may also be shared. Collectively these data may be used to prioritize which areas should receive financial and human resources and to develop park-specific management plans for combating invasive species infestations. Those areas that are of highest floristic quality and at risk of infestation from surrounding sources should be prioritized.

Upon completion of these park/preserve-specific maps and inventories, ASTI recommends the following sequence for prioritizing invasive plant removal activities:

1. Focus first on removing invasive plant species that currently, or have the potential to, infest areas containing rare or high quality native plant species or features of local importance.
2. Work to remove invasive plants species in other outlying areas where infestation is in its early stages.
3. Work to remove invasive plants in areas of heavy infestation as remaining financial and human resources allow.

The same sequence is recommended for continued management activities. Each park should be re-inventoried every 2 years to track success and to ensure that new infestations are kept at bay. It should be noted, again, that invasive plant species control in a matrix of urban and natural lands will be an on-going effort. In all likelihood, invasive plants species will not be eliminated. Management goals, and measurement of success, should be framed in terms of actions that change the ecological role these plants play within the RGC, minimizing or reducing the negative impacts these species have on desired native plant and animal species.

Related to invasive species control is the question of deer population management. It is suspected that the deer population is quite high within the RGC and that browsing by deer may disadvantage native plant species and put rare species at risk. ASTI recommends that an attempt be made to determine the density and distribution of deer within the RGC. Public meetings could be held to determine landowners' interests and concerns with possible population management initiatives. Areas of rare species may need to be protected with enclosures until deer numbers are brought under control.

**Goal: Expand Survey and Monitoring Efforts**

*Recommendation 32:* Continue frog and toad volunteer surveys in all parks and preserves where monitoring is currently conducted. Expand frog and toad survey efforts to include wetlands in each of the 11 RGC parks and preserves as noted in the recommendations for individual sites.

*Recommendation 33:* Conduct spring ephemeral plant surveys in all RGC parks and preserves. Recalculate FQI scores.

*Recommendation 34:* Expand bird surveys to include all parks and preserves and to incorporate annual counts, where possible, to detect population changes.

*Recommendation 35:* Expand volunteer, agency staff, and/or consultant surveys to include insects and herptiles, as resources allow, in each of the RGC Parks and preserves.

Existing surveys for frogs and toads should be continued. Existing plant surveys in all the parks and preserves would benefit greatly from survey for spring ephemeral plant species. Bird surveys may be expanded from list of species observed to include quantitative data for tracking trends in populations or habitat use.

## 3.2 Assessments for RGC Parks, Preserves, and River Stretches

The character and quality of both terrestrial and aquatic habitat at each RGC park or preserve and within each stretch of river are discussed in detail below, beginning upstream in Birmingham and ending downstream in Southfield. The results presented include floristic quality, aquatic habitat quality, the presence of invasive species, habitat types, special plant and animal species, floodplain assessments, functions and values of the park, each area's greatest asset(s) and biggest threat(s), and management recommendations for each park or preserve. The results of riparian and aquatic assessments for each of the 11 parks or river reaches within the Rouge Green Corridor are also summarized in Table 8.

Management recommendations for each park and river segment are also included in the following descriptions. These management recommendations are summarized in Table 1 at the beginning of this report. Figure 1, at the beginning of this report, provides an index for the figures/maps of each river reach and/or park or preserve.

**Table 8. Ecological Data, Habitat Information, and Management Recommendations for Parks** (in green) **and Connecting River Reaches** (white) **within the Rouge Green Corridor.**

| Park/Preserve/Reach Information | | | FQA Analysis | | | | | Habitat Types | | | | | | | Plant, Wildlife & Habitat Surveys | | | | | | | | | | | | Site Specific Management Recommendations | | | | | | | | | | | | Target Metrics | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Park/Preserve or River Reach Name | Park Location | Size (Acres) | Total Number of Plant Species | Percent Native Species | FQI Score (including invasives) | Mean Coefficient of Conservativism ("C" value) | Floristic Quality Narrative Description | Floodplain Forest | Dry-Mesic Southern Forest | Mesic Southern Forest | Prairie | Old Field | Emergent Marsh or Southern Shrub-Carr Wetland | Open Water | ASTI Plant Survey - 2007 | M. Penskar - MNFI Plant Survey - 2002 & 2004 | Other Plant Surveys | Butterfly Survey | Bird Survey | FOTR Frog and Toad Survey Data | FOTR Adopt-A-Stream Macroinvertebrate Data | Threatened/Endangered/Special Concern Species Found | Rouge Program or MDEQ Aquatic Habitat Surveys | ASTI Aquatic Habitat Survey - 2007 | Aquatic Habitat Quality Narrative Description | Bank Stability Index Rating | Connect River and Floodplain | Educate and Involve Residents in Riparian Corridor Stewardship | Expand Survey and Monitoring Efforts | Improve In-Stream Aquatic Habitat | Improve Water Quality to Meet TMDL & Water Quality Standards | Maintain/Expand Vegetated Riparian Buffer | Manage Invasive Species | Manage Woody Debris | Promote the River and RGC as Recreational Assets | Reduce Erosion and Sedimentation | Reduce Flashiness | Restore Wetlands | Amphibian Counts (AC) | Aquatic Habitat Rating (AHR) | Bank Stability Index (BSI) | Fish Community (FC) | Floristic Quality Index (FQI) | Macroinvertebrate Community (MC) | Richards-Baker Flashiness Index (RBFI) | Wetland Functional Value (WFV) | Water Quality (WQ) |
| **Quarton Road to Quarton Lake** | **City of Birmingham** | | NA | NA | NA | NA | NA | ✓ | | ✓ | | | | | | | | | | ✓ | | | | ✓ | Marginal | At Risk | | ✓ | | | | | | | | | | | ✓ | ✓ | ✓ | ✓ | | ✓ | | ✓ | ✓ |
| **Quarton Lake Park** | **City of Birmingham** | 27.6 | 94 | 62% | 18.5 | 1.9 | Poor | ✓ | | ✓ | | | ✓ | ✓ | ✓ | | | | | ✓ | ✓ | ✓ | | | ✓ | NA | At Risk - Stable | | | ✓ | ✓ | | ✓ | ✓ | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ |
| **Booth Park Trail** | **City of Birmingham** | 19.6 | 134 | 65% | 25.8 | 2.2 | Average | ✓ | | | | | | | ✓ | ✓ | | | | ✓ | ✓ | ✓ | | | ✓ | Marginal | At Risk - Unstable | | | ✓ | | | | ✓ | ✓ | | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| **Linden Park Trail** | **City of Birmingham** | 21.5 | 124 | 53% | 18.4 | 1.7 | Poor | ✓ | | ✓ | | | | | ✓ | ✓ | | | ✓ | ✓ | | | | | ✓ | Good | Unstable | | | ✓ | | | ✓ | ✓ | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ |
| **Fairway Park** | **City of Birmingham** | 3.0 | 79 | 65% | 19.9 | 2.2 | Poor | ✓ | | ✓ | | | | | ✓ | ✓ | | | | ✓ | ✓ | | ✓ | ✓ | Good | At Risk | | | | ✓ | | | ✓ | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ |
| **Fairway Park to Hidden Rivers** | **City of Birmingham** | | NA | NA | NA | NA | NA | | | | | | | | | | | | | ✓ | | | | ✓ | Poor | At Risk - Unstable | ✓ | ✓ | | ✓ | | ✓ | | | | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ |
| **Hidden Rivers Nature Preserve & Riverside Park** | **Village of Beverly Hills** | 20.0 | 112 | 79% | 33.1 | 3.1 | Average | ✓ | | ✓ | | | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | | | | | ✓ | NA | Stable - At Risk | | ✓ | ✓ | | | ✓ | | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ |
| **Douglas Evans Nature Preserve** | **Village of Beverly Hills** | 19.0 | 174 | 74% | 38.7 | 2.9 | Good; floristically important | ✓ | | ✓ | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | Good | At Risk - Unstable | | | ✓ | | | ✓ | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ |
| **Douglas Evans to 13 Mile Road** | **Village of Beverly Hills** | | NA | NA | NA | NA | NA | ✓ | | ✓ | | | | | | | | | | ✓ | | | | ✓ | Good | Unstable | | | | | | | ✓ | ✓ | ✓ | | | | ✓ | | ✓ | | | ✓ | ✓ |
| **13 Mile Road to Lahser Road** | **Village of Beverly Hills** | | NA | NA | NA | NA | NA | ✓ | | ✓ | | | | | | | | | | | | | | ✓ | Good | Unstable | | ✓ | | | | | | | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ |
| **Lahser Road to 12 Mile Road** | **Village of Beverly Hills** | | NA | NA | NA | NA | NA | ✓ | | ✓ | | ✓ | | | | | | | | ✓ | ✓ | | | ✓ | Good | Unstable | | | ✓ | | | ✓ | | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ |
| **Valley Woods Nature Preserve at Streamwood** | **City of Southfield** | 128.7 | 331 | 74% | 51.9 | 2.9 | Rare; extremely valuable | ✓ | ✓ | ✓ | | ✓ | | | ✓ | ✓ | ✓ | | | ✓ | | ✓ | | | ✓ | Good | Unstable | | | ✓ | | | ✓ | ✓ | | | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ |
| **Valley Woods Trail at Civic Center Drive** | **City of Southfield** | | 92 | 70% | 22.9 | 2.4 | Average | ✓ | | ✓ | | | ✓ | | ✓ | ✓ | | | | ✓ | ✓ | | | ✓ | Marginal | Stable | | ✓ | ✓ | | | | ✓ | | | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ |
| **Valley Woods Nature Preserve at 10 Mile Road** | **City of Southfield** | | 113 | 75% | 29.8 | 2.8 | Average | ✓ | | ✓ | | | ✓ | | ✓ | ✓ | | | | ✓ | | | | ✓ | Good | Unstable | | ✓ | | | | | ✓ | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ |
| **10 Mile Road to Beech Road** | **City of Southfield** | | NA | NA | NA | NA | NA | ✓ | | ✓ | | | ✓ | | | | | | | ✓ | | | | ✓ | Marginal - Good | Unstable | ✓ | | | | | | | | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |
| **Beech Road to 9 Mile Road** | **City of Southfield** | | NA | NA | NA | NA | NA | ✓ | | ✓ | | | | | | | | | | ✓ | | | | ✓ | Marginal - Good | Unstable | ✓ | | | | | | | | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |
| **9 Mile Road to Beech Road** | **City of Southfield** | | NA | NA | NA | NA | NA | ✓ | | ✓ | | | | | | | | | | ✓ | | | | ✓ | Marginal - Good | Unstable | ✓ | | | | | | | | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |
| **Beech Woods Park** | **City of Southfield** | 85.6 | 63 | 65% | 14.0 | 1.8 | Poor | | | ✓ | | | | ✓ | ✓ | | | | | ✓ | | | | ✓ | Marginal | Unstable | ✓ | ✓ | ✓ | | | ✓ | ✓ | | | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ |
| **Beech Woods Park To Valley Woods South** | **City of Southfield** | | NA | NA | NA | NA | NA | ✓ | | ✓ | | | | | | | | | | ✓ | | | | ✓ | Marginal | Unstable - Very Unstable | | | | | | | | | ✓ | | | | ✓ | ✓ | ✓ | ✓ | | ✓ | | ✓ | ✓ |
| **Valley Woods Preserve South at Bridge Street** | **City of Southfield** | 24.2 | 104 | 75% | 27.4 | 2.7 | Average | ✓ | | ✓ | | ✓ | | | ✓ | ✓ | | | | | | ✓ | | | ✓ | Marginal | Unstable - Very Unstable | ✓ | | ✓ | | | ✓ | | | | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

### 3.2.1 RIVER STRETCH: QUARTON ROAD DOWNSTREAM TO QUARTON LAKE PARK

*Riparian Habitat Characterization*

This reach marks the northernmost extent of the RGC. It is bound on the north by Quarton Lake Road and on the south by the north end of Quarton Lake Park, north of Oak Road (Figure 16). Here the river meanders through residential development, with both lawns and wooded areas abutting the stream. Dominant species are typical of floodplain forest and include red ash, American elm, eastern cottonwood (*Populus deltoides*), box elder (*Acer negundo*) and other species.

*Aquatic Habitat Characterization*

Aquatic habitat here is similar to that found at the upper end of Quarton Lake Park and within Booth Park Trail. Substrate in this reach is a mix of gravel, cobble, silt, and clay. Near the south end of this reach, cobble and other hard substrates are covered with algae and fine sediment deposits. Habitat types present include some pools, riffles, and runs. Erosion within this reach is patchy and moderate in severity.

*Aquatic Habitat Scores*

Aquatic habitat within this river segment rated as "marginal." Bank-stability within this reach rated as "at risk" (Appendix B).

*Invasive Plant Species*

Invasive species include glossy and common buckthorn, and some reed canary grass. Like most of the sites surveyed, invasive impacts tend to be worst near roadways and other disturbed areas.

*Wildlife*

Bird species observed nearby within Quarton Lake and Linden Park Trail include numerous waterfowl and song birds.[71] The list of species for this stretch of river is likely similar. Large mammals may not be common here given the surrounding residential uses, but signs of white-tail deer and raccoon were noted here, similar to most of the RGC. Friends of the Rouge (FOTR) frog and toad data for this quarter section list a maximum of two species recorded in any year monitored since 1998. Eight species of frogs and toads are possible and present within the RGC.

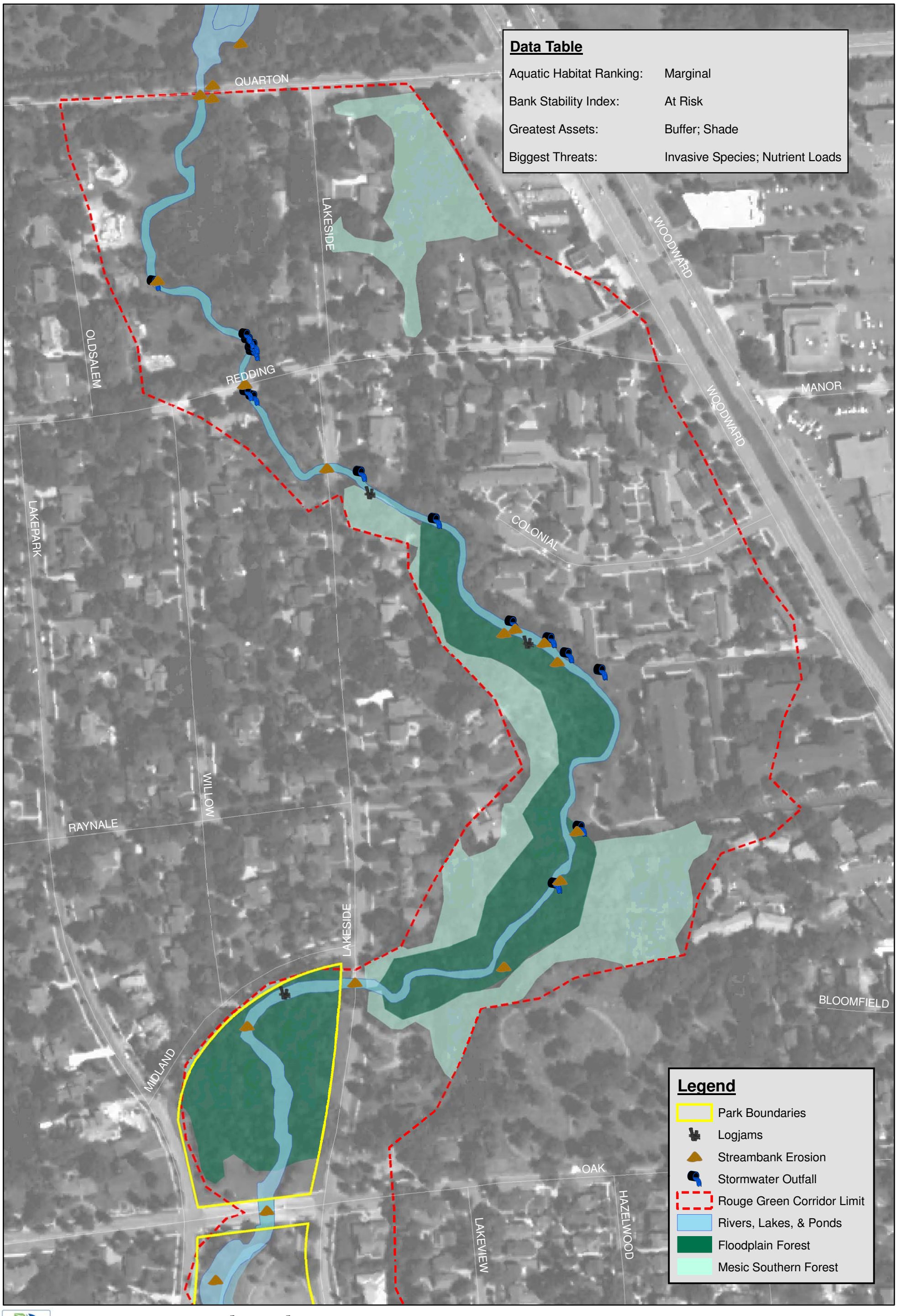
*Functions and Values*

The riparian corridor in this reach provides floodwater retention and storage, wildlife habitat, and green space.

*Greatest Asset and Biggest Threat*

The greatest assets of this reach include the forested riparian area, which buffers and shades the stream and provides a wildlife corridor through residential lands and green space for neighboring residents. Threats include invasive plants and the potential for their spread downstream, as well as storm water loads and nutrient loads.

[71] SOCWA. 2007. Birds of the Rouge Green Corridor: The Birds of Linden Park & Quarton Lake Park, Birmingham Michigan. February 2007.




# Rouge Green Corridor Habitat Assessment

Oakland County, Michigan

Feet
200 0 200

Created by: AGS, August 1, 2008, ASTI Project 6602
Aerial Photograph: USDA 2005

Figure 16 - River Stretch: Quarton Rd. to Quarton Lake Park, Birmingham

**Management Targets**

**Location: Quarton Road Downstream to Quarton Lake Park**

| Metric | Desired Target |
|---|---|
| AC – Amphibian Community | Increase average species count from 2 to 4 |
| AHR – Aquatic Habitat Ranking | "Acceptable" Procedure. 51 ratings |
| BSI – Bank Stability Index | Improve from "At Risk" to "Stable" |
| FC – Fish Community | "Acceptable" Procedure 51 ratings |
| FQI – Floristic Quality Index | Average % native species ≥75% |
| MC – Macroinvertebrate Community | Procedure 51 score > 0 |
| RBFI – Richards-Baker Flashiness Index | Halt trend to increasing flashiness |
| WFV – Wetland Functional Value | Floodflow Alteration, Wildlife, Water Quality |
| WQ – Water Quality | Average wet-weather TSS ≤ 80 mg/L<br>Dissolved oxygen ≥ 5 mg/L<br>*E. coli* bacteria ≤ 130 mg/L<br>Total Phosphorus < 0.05 mg/L |

**Management Recommendations**

**Goal: Educate/Involve Residents in Riparian Stewardship**

*Recommendation 36:* Develop and disseminate targeted land owner education materials regarding use of low/no phosphorus fertilizers and other ways to reduce nutrient runoff:

In addition to the corridor-wide recommendations for sediment and peak-flow reducing storm water controls and natural features preservation presented earlier, this segment and Quarton Lake downstream would both benefit from nutrient reductions. Focused riparian landowner education regarding lawn care and low- or no-phosphorus fertilizers is recommended.

### 3.2.2 PARK/PRESERVE: QUARTON LAKE PARK, BIRMINGHAM

*Riparian Habitat Characterization*

Quarton Lake Park is 27.6 acres in size, the majority of which is an open-water impoundment of the Rouge River. The immediate shoreline consists of a narrow fringe of emergent vegetation, while the adjacent upland areas are either steep-sloped forested areas bordered by walking paths or mown turf areas with large trees. A few private residences border the lake on the southwestern end where the park boundary corresponds to the shoreline. A small section of Quarton Lake Park that lies north of Oak Road contains relatively undisturbed floodplain forest[72] (Figure 17).

Open water impoundment within Quarton Lake Park.

*Floristic Quality Scores*

The plant community at Quarton Lake Park exhibits an FQI of 18.5 with a mean C coefficient of 1.9 (Appendix C). These scores are similar to most undeveloped land within the state of Michigan. These scores reflect the use and management of this park for recreation and the higher proportion of non-native species (38%) that have either been planted within the park or have entered due to disturbance. Complete lists of all plants species for each park and preserve inventoried are provided in Appendix C. Swamp white oak (*Quercus bicolor*, C=8) was the only species found in the park that has a C value of 8 or higher.

*Aquatic Habitat Evaluation*

The MDEQ Procedure 51 methodology was not used to assess aquatic habitat at this park because the river within the park is impounded to form Quarton Lake. Procedure 51 is appropriate only for wadeable streams. General observations of habitat and water quality within this river reach were recorded, however, and are summarized below. Bank-stability within this reach was determined to be "stable" to "at risk" (Appendix B).

As stated, this reach of river consists of a shallow impoundment of the Rouge River created by a dam with a stair-like cascade located at the downstream end of the park (Figure 17). Additional spillways to release floodwaters are located immediately east of the dam. Within this impoundment, the flow of water is slowed and in-stream habitat and water quality are affected by the settling of sediment and associated nutrients from upstream and local sources. Quarton Lake does contain hard and coarse substrate types (i.e., cobble, gravel, and sand) that could provide suitable spawning habitat for a variety of fish species, but the majority of the bottom substrate is covered with algae and a layer of fine sediment, which limits its habitat value. Bluegill, other panfish, largemouth bass, and carp were observed within the lake by ASTI and northern pike (*Esox esox*) have been recorded there previously.[73]

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[72] Tepley, A.J., J.G. Cohen, and L. Huberty. 2004. Natural community abstract for southern floodplain forest. Natural Features Inventory, Lansing, MI. 14 pp.

[73] Hubbell, Roth & Clark, Inc. 2003. Target and Game Catch Summary (spreadsheets detailing Quarton Lake electro-shocking fishery results).

1. Floodplain forest buffers the Rouge River within the upper reaches of Quarton Lake Park.

2. View across Quarton Lake.

**Data Table**

| | |
|---|---|
| FQI Rating: | Poor |
| Aquatic Habitat Ranking: | NA |
| Bank Stability Index: | Stable to At Risk |
| Greatest Asset: | Recreational Opportunity |
| Biggest Threats: | Nutrient Enrichment; Invasive Species |

**Management Note**: Remove Tree-of-Heaven Stand

**Management Note**: Continue and expand native shoreline plantings and buffers

**Legend**

- Park Boundaries
- Streambank Erosion
- Invasive Species
- Stormwater Outfall
- Logjams
- Dam
- Rouge Green Corridor Limit
- Rivers, Lakes, & Ponds
- Floodplain Forest
- Mesic Southern Forest
- 1 Photo Location

# Rouge Green Corridor Habitat Assessment

Oakland County, Michigan

Feet
300 0 300

Created by: AGS, August 1, 2008, ASTI Project 6602
Aerial Photograph: USDA 2005

Figure 17 - Park/Preserve: Quarton Lake Park, Birmingham

Quarton Lake was dredged in 2004 and various areas of the lakeshore were stabilized and landscaped with a combination of large imbricated stonework and shoreline plantings, some of which are native species.[74] Coir (coconut fiber) rolls have been staked into place below the water level in an effort to establish emergent vegetation in near shore areas of the lake. To date, however, vegetation has not become established shoreward of these coir rolls. ASTI staff was informed that initial plantings in these areas were limited and that the paucity of plant material installed may have contributed to the poor establishment.[75] Water depths that are too great for the selected species and/or grazing by waterfowl may have also contributed to plantings failure.

*Invasive Plant Species*

Quarton Lake has a high proportion of non-native species, the result of both intentional landscaping and escaped invasive species. Quarton Lake also has a number of intentionally planted native species such as red and white pine (*Pinus resinosa and P. strobus*). Some shoreline areas were seeded with native herbaceous plant seed mixes following the 2004 dredging. This practice of native landscaping should be encouraged as both a method to control invasive species and to maintain the current character and use of Quarton Lake Park.

*Threatened and Endangered Species*

ASTI did not observe any listed species at Quarton Lake Park, and the habitats contained within this park are not believed suitable for these listed species.

*Wildlife*

Waterfowl, aquatic reptiles and amphibians, and passerine birds are locally common within this park. Small mammals are probably somewhat common, and large mammals are likely uncommon given the surrounding land uses and limited native vegetation for cover. An extensive list of bird species was compiled by volunteers for this park and Linden Park combined.[76] FOTR frog and toad data for this quarter section include records of one species per year, maximum, here since 1998. A site investigation conducted by the Kalamazoo Nature Center found no amphibians within Quarton Lake Park despite the suitable habitat.[77] No other formal wildlife evaluations have been conducted.

*Floodplain Assessment*

Fish and shellfish habitat and recreation were identified as the two primary principal functions and values associated with the floodplain present at Quarton Lake Park, though other functions and values were also noted as important (Appendix B). Deeper water habitat created by the impoundment is able to support a variety of game fish species that are not likely abundant elsewhere in the RGC. However, because nearly all of the floodplain present at Quarton Lake is permanently flooded by the dam, limited floodwater alteration is possible at this site, though the impoundment does likely trap sediments and nutrients from floodwater. Because of public accessibility to the park and the recreational opportunities present here, recreation and to some extent, education, may also be principal functions provided by the floodplain within this park.

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[74] Groya, Leah, Wade Trim, pers. communication November 9, 2007.

[75] Anthony, David, Wade Trim, pers. communication November 12, 2007.

[76] SOCWA. 2007. Birds of the Rouge Green Corridor: The Birds of Linden Park & Quarton Lake Park, Birmingham Michigan. February 2007.

[77] Allen, Stephen W., 2004. Rouge River Green Corridor Selected Site Evaluations and Recommendations on Amphibian Populations in the Rouge Green Corridor. Final Report, prepared by the Kalamazoo Nature Center, Kalamazoo, Michigan. 10 pp.

*Functions and Values*
This park functions as open space within an urban environment. It appears to be an important recreational and aesthetic asset to the surrounding community. ASTI staff noted people walking or running along the paths surrounding the lake, and a fishing pier has been constructed into the lake. Although the lake has no designated boat launch, ASTI staff were able to utilize the shoreline stonework to launch a kayak on the lake. The availability of vehicle parking adjacent to the park and in close proximity to the water's edge allows easy recreational access.

*Other Observations*
As noted above, ASTI saw people walking along the paths surrounding the Lake, including several individuals walking their dogs. Signage in the park prohibits dogs within the park, but this warning seems to be routinely ignored. ASTI staff did not note any individuals collecting and disposing of dog feces, despite the ready availability of garbage cans located along the trails. Providing pet waste bags and associated signage may yield better results in limiting pet waste runoff into the lake than the current ban on dogs. Existing signage also advises people to avoid the feeding of waterfowl.

Establishment of near shore emergent plant communities may provide uptake of excess nutrients, thereby reducing algal growth within the lake. Additional near shore vegetation would improve fish and wildlife habitat and associated recreational values.

*Greatest Asset and Biggest Threat*
The best asset of this park is the recreational opportunities for local community members. Unlike many of the other parks surveyed within the RGC, this park is easily accessible to the public and offers activities such as fishing and kayaking which are generally unavailable elsewhere. The biggest threats to this park are the invasive species that are prevalent in most of the natural areas within the park and excess sediment and nutrient loadings.

**Management Targets**

**Location: Quarton Lake Park**

| Metric | Desired Target |
|---|---|
| AC – Amphibian Community | Increase frog/toad species count from 1 to 4 |
| AHR – Aquatic Habitat Ranking | Not Applicable |
| BSI – Bank Stability Index | Improve from "At Risk" to "Stable" |
| FC – Fish Community | Healthy, self-supporting sport fishery |
| FQI – Floristic Quality Index | Increase FQI from 18.5 to $\geq$ 20 |
| MC – Macroinvertebrate Community | Not Applicable |
| RBFI – Richards-Baker Flashiness Index | Not Applicable |
| WFV – Wetland Functional Value | Education, Wildlife, Water Quality |
| WQ – Water Quality | Average wet-weather TSS $\leq$ 80 mg/L<br>Dissolved oxygen $\geq$ 5 mg/L<br>*E. coli* bacteria $\leq$ 130 mg/L<br>Total Phosphorus < 0.05 mg/L |

**Management Recommendations**

**Goal: Improve Water Quality** (Targets: WQ)

**Goal: Improve In-stream Aquatic Habitat** (Targets: AHR, FC, MC)

*Recommendation 37:* Identify opportunities to redirect storm water outfalls in the park to bioswales, rain gardens, or other treatment systems prior to discharge.

*Recommendation 38:* Re-establish shallow water and shoreline plantings, particularly at upstream end and near and storm water inlets. Netting or other means to limit waterfowl herbivory should be used until plants are well established.

*Recommendation 39:* Provide pet-waste bags, trash cans, and educational signage regarding proper disposal.

*Recommendation 40:* Use only low/no phosphorus fertilizers on park lawns and avoid fertilizer use within riparian buffers.

*Recommendation 41:* Provide additional signage, or other local resident education, to reduce feeding of ducks and geese.

One of the primary management recommendations for this park is improving water quality within the park's impoundment and ultimately downstream throughout the RGC. Because this park is at the headwaters of the RGC, because it is highly manicured relative to other public lands, and because it is highly visible and receives a great deal of public use, it is a natural candidate for a variety of water quality management and education activities.

**Goal: Maintain/Expand Riparian Buffer (**Targets: AHR, FQI, WFV, WQ**)**

*Recommendation 42:* Widen existing riparian buffer with additional native species plantings.

Steps have already been taken within Quarton Lake Park to improve landscaping. These should be continued and expanded. Native plant species should be used in park plantings rather than non-natives. Wide buffer areas of un-mowed, native vegetation should be established along the borders of the impoundment and river, including stabilizing shoreline plantings. Minimal to no fertilizer (especially phosphorous) should be used on the park's manicured lawns. Pet waste bags and collection stations should be provided for park users. Shoreline plantings, with temporary netting to allow plant establishment, and signage discouraging feeding of waterfowl would help reduce the impact of these herbivores to new plantings and may reduce their use of the park, thereby reducing fecal inputs. Finally, ample signage and interpretive information should be provided to educate park users and neighbors about the water quality initiatives being used in the park and how they can apply those same initiatives into their homes.

**Goal: Expand survey and monitoring efforts**

*Recommendation 43:* Establish a frog and toad volunteer monitoring location at Quarton Lake Park.

While some wildlife and plant survey work has been conducted within Quarton Lake Park, some as a result of this project, many portions lack detailed survey data. Existing bird, frog and toad survey data should be maintained and monitored, while additional surveys for insects, reptiles, and fish would be beneficial when developing additional management recommendations. Plant

survey data at different times of year would also round-out and complete the partial survey which this report's FQA scores are based upon.

**Goal: Manage Invasive Species (**Targets: FQI, WFV**)**

*Recommendations 30, 31:* Inventory invasive plant species as described in recommendations for all parks and preserves. If inventory and comparison with other locations indicates that Quarton Lake is a high priority within Birmingham, then cut, remove and/or treat tree-of-heaven, purple loosestrife, common reed, honeysuckle, and buckthorn while numbers, densities, and coverage are fairly low.

Invasive species control is not a pressing priority at Quarton Lake Park. Non-native species are widespread; however, species that are highly invasive are not. One stand of tree-of-heaven (*Ailanthus altissima*) located along the western shore of the impoundment should be removed; this can be accomplished by drilling stems and injecting concentrated herbicide with cutting the following year, or cutting and treating the stumps with herbicide, or girdling and cutting the trees the following year. All methods will require follow-up herbicide treatments in subsequent years to kill new sprouts. Other invasive plant species that should be monitored and removed as needed include purple loosestrife (*Lythrum salicaria*) common reed (*Phragmites australis*), Japanese knotweed (*Polygonum cuspidatum*), and invasive shrubs (primarily *Rhamnus* and *Lonicera* spp.).

### 3.2.3 PARK/PRESERVE: BOOTH PARK TRAIL, BIRMINGHAM

*Riparian Habitat Characterization*

The Booth Park Trail includes 19.6 acres. Habitat at Booth Park Trail is dominated by floodplain forest (Figure 18).[78] Much of the overstory in this park is relatively intact and includes mature maples (*Acer* spp.), oaks (*Quercus* spp.), and sycamore (*Platanus occidentalis*). The understory and herbaceous layers are substantially impacted by non-native species; however, some native herbaceous plants and shrubs are still present in certain areas.

Floodplain forest within Booth Park Trail.

*Floristic Quality Scores*

A total of 134 plant species are known to occur within Booth Park, resulting in an FQI of 25.8 and a mean C value of 2.2 (Appendix C). This is greater than what most undeveloped land within the State would generally score. Many of the plant species found in this park are often found in disturbed settings. However, 5 species recorded here exhibit coefficients of conservatism of 8 or greater: eastern narrow leaved sedge (*Carex amphibole,* C=8), redbud (*Cercis canadensis*, C=8), swamp white oak (*Quercus bicolor*, C=8), Kentucky coffee tree (*Gymnocladus dioicus*, C=9), and great water dock (*Rumex orbiculatus*, C=9).

*Aquatic Habitat Characterization*

Substrate in this reach is a mix of gravel, cobble, silt, and clay. Several areas are notably shallow due to the deposition of fines, and the water was turbid at the time of ASTI's field investigation. Habitat types present include some pools, riffles, and runs. Erosion within this reach is patchy, and is severe on the outside bends along this meandering channel. Riparian homeowners have utilized articulated concrete block and stacked concrete bags to combat erosion with variable success.

*Aquatic Habitat Scores*

Aquatic habitat within this river segment rated as "marginal." Bank-stability within this reach rated as "at risk" to "unstable" (Appendix B).

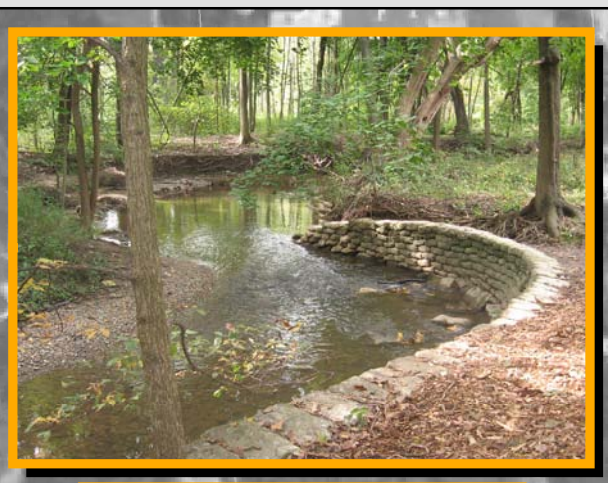
*Invasive Plant Species*

Invasive species (buckthorn, honeysuckle, Japanese barberry, garlic mustard, dame's rocket, and a variety of escaped ornamental species) are prevalent and widespread throughout the park. A few core areas of mature floodplain forest within the widest sections of the park are less impacted than the areas adjacent to roadsides and neighboring properties.

[78] Tepely, A.J., J.G. Cohen, and L. Huberty. 2004. Natural community abstract for southern floodplain forest. Natural Features Inventory, Lansing, MI. 14 pp.

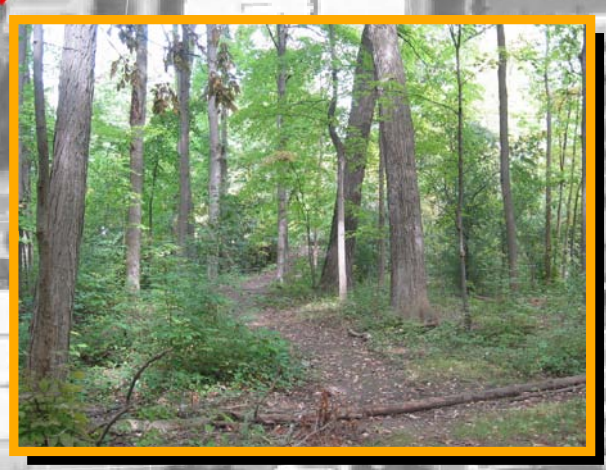
## Data Table

| | |
|---|---|
| FQI Rating: | Average |
| Aquatic Habitat Ranking: | Marginal |
| Bank Stability Index: | At Risk to Unstable |
| Greatest Assets: | Walking Trail; Floodplain Storage; Mature Trees |
| Biggest Threat: | Private Landowner Actions - Clearing, Dumping |



1. Stacked concrete as attempted erosion control, notice the erosion now cutting behind the concrete.

**Management Note**: Priority area for invasive species control



2. Typical view along the path within Booth Park Trail.



## Legend

- Park Boundary
- Invasive Species
- Streambank Erosion
- Logjams
- Stormwater Outfall
- Rouge Green Corridor Limit
- Rivers, Lakes, and Ponds
- Floodplain Forest
- 1 Photo Location

# Rouge Green Corridor Habitat Assessment

Oakland County, Michigan

Feet
200 0 200

ASTI Environmental

Created by: AGS, August 1, 2008, ASTI Project 6602
Aerial Photograph: USDA 2005

Figure 18 - Park/Preserve: Booth Park Trail, Birmingham

*Threatened and Endangered Species*
No threatened or endangered species are known to occur in this park. State special concern Kentucky coffee tree was previously inventoried by M. Penskar[79] but not re-located by ASTI. It is unknown if this is a natural occurrence or planted specimen(s). ASTI did not encounter any listed species within this park, and the habitat here has a low probability of harboring additional rare species.

*Wildlife*
It is expected that a bird survey here would include at least all of the species surveyed within the adjacent Linden and Quarton Lake Parks. ASTI staff observed a large number of waterfowl on the river within this park. The floodplain forest appears to be excellent habitat for a variety of reptiles and amphibians. However, frog and toad surveys conducted in the quarter section containing the park have not recorded any species. MDEQ mussel surveys conducted near Booth Park Trail located 3 freshwater mussel species, including the special concern slippershell (*Alasmidonta viridis*) the Wabash pigtoe (*Fusconaia flava*) and floater (*Pyganodon grandis*).[80]

*Floodplain Assessment*
Principal functions and values provided by the floodplain at Booth Park Trail include flood flow alteration and sediment/toxicant retention (Appendix B). These interrelated functions are both accomplished by areas of forested floodplain present within the park. Because these areas are hydrologically connected to the river, they likely provide flood storage capacity and floodwater moderation during high water events within the river. The dense vegetation likely slows and dissipates river energy allowing sediments, toxicants, and nutrients to settle. The floodplain within this park also offers recreation and wildlife habitat.

*Functions and Values*
This park contains a forested floodplain area that likely functions to store and slow seasonal floodwaters. Wildlife habitat and recreational uses such as nature walking and dog exercising are also important functions provided by this park.

*Greatest Asset and Biggest Threat*
From a public perspective, the walking trail and other recreational amenities are an important feature of this park. From a natural features perspective, much of the floodplain forest found here contains mature tree species and likely provides important flood control qualities for the river. The actions of adjacent homeowners, including clearing vegetation and dumping landscape litter onto park property, are generally detrimental to the floristic quality of the park.

**Management Targets**

**Location: Booth Park Trail, Birmingham**

| Metric | Desired Target |
|---|---|
| AC – Amphibian Community | Increase frog/toad species count from 0 to 4 |
| AHR – Aquatic Habitat Ranking | Improve from “Marginal” to “Good” |

[79] Penskar, M. 2004. Floristic Assessment of Selected Sites in the Rouge Green Corridor. Michigan Natural Features Inventory. Unpublished.
[80] Rathbun, J.E. Qualitative Survey of the Distribution of Freshwater Mussels (Bivalva:Unionidae) in the Rouge River, Michigan (U.S.A.) Watershed: 1998-2003. Michigan Department of Environmental Quality.

| | |
|---|---|
| BSI – Bank Stability Index | Improve from "At Risk-Unstable" to "Stable" |
| FC – Fish Community | "Acceptable" Procedure 51 ratings |
| FQI – Floristic Quality Index | Maintain FQI ≥ 25.8 |
| MC – Macroinvertebrate Community | Maintain "Good" Procedure 51 rating |
| RBFI – Richards-Baker Flashiness Index | Halt trend to increasing flashiness |
| WFV – Wetland Functional Value | Flood Attenuation, Wildlife, Recreation |
| WQ – Water Quality | Average wet-weather TSS ≤ 80 mg/L<br>Dissolved oxygen ≥ 5 mg/L<br>*E. coli* bacteria ≤ 130 mg/L |

**Management Recommendations**

**Goal: Expand Survey and Monitoring Efforts**

*Recommendation 44:* Conduct a bird survey for this park, incorporating annual counts of individuals of each species to monitor trends, if possible.

*Recommendation 45:* Conduct mussel survey within this park. Continue to monitor with other RGC sites if it contains special concern species similar to those found in location sampled nearby.

Existing survey data on frogs, toads, and freshwater mussels should be continued and updated or confirmed as needed. Additional formal wildlife surveys for birds, insects and herptiles have not been conducted and would be valuable assets for management planning. The existing plant survey would benefit greatly from a survey for spring ephemeral plant species.

**Goal: Reduce Erosion and Sedimentation (**Targets: AHR, BSI, FC, MC, WQ**)**

*Recommendation 46*: Evaluate existing streambank stabilization, work with landowners under a local watercourse protection ordinance to re-stabilize areas where previous stabilization techniques are failing or do not reduce erosion.

**Goal: Manage Woody Debris (**Targets: AHR, BSI**)**

*Recommendation 47:* Expand upon LTI inventory to develop a corridor-wide large woody debris management plan. Establish priorities, budgets, schedules, and on-going maintenance programs for clearing recreational access and stabilizing the worst erosion hotspots. Encourage use of deformable, vegetative stabilization where possible.

*Recommendation 48:* Review 2007 Booth Park Trail Woody Debris Management program. Incorporate successful techniques into corridor-wide LWD management plan.

The effectiveness of the Booth Park Woody Debris Management Habitat Implementation Project (completed in 2007) should be evaluated. Lessons learned from these efforts should be included in development of a corridor-wide LWD management plan. Riparian landowner streambank stabilization efforts should be evaluated to determine if they are stable and serve to limit in-channel erosion. The municipalities may wish to work with individual landowners, perhaps under a new wetland and water course protection ordinance, to repair or replace failing structures.

**Goal: Manage Invasive Species (**Targets: FQI, WFV**)**

*Recommendations 30, 31:* Inventory invasive plant species as described in recommendations for all parks and preserves. Conduct invasive plant management as priorities dictate and resources allow.

Control of invasive species throughout all of Booth Park would require a substantial input of resources and may not be a worthwhile venture in many areas of the park where remnant plant communities do not exist. Instead, invasives species control within this park should be targeted at two areas: a) conducting limited invasives control within a few key native vegetation communities and b) monitoring for, and removing as needed, key invasive species that are not yet established but pose a threat to the park. Areas of the park where invasive species control may be most effective are found within the wooded floodplain and primarily north of Willits Road. Areas where mature, native trees species are present and where the understory is not yet dominated or just beginning to be dominated by non-native shrub species are likely the best candidates for invasive plant control, as they have the most potential for restoration. Control measures within these areas will be long-term management projects, since abundant invasive species seed sources will always exists nearby. Invasive species not yet present or uncommon but which should be closely monitored include tree-of-heaven, japanese knotweed, common reed, and black locust (*Robinia pseudoacacia*). The costs and benefits of the current, and any future, invasive species removal programs should be carefully evaluated prior to continuation or implementation.

### 3.2.4 PARK/PRESERVE: LINDEN PARK TRAIL, BIRMINGHAM

*Riparian Habitat Characterization*

The habitat within the natural areas of this park is almost exclusively low-lying floodplain dominated by cottonwood, box elder, and willows (*Salix* spp.) and containing northern catalpa (*Catalpa speciosa*) and black maple (*Acer nigrum*) (Figure 19).

*Floristic Quality Scores*

Linden Park Trail includes 21.5 acres and contains 124 plant species, 53% (66) of which are native. This yields an FQI of 18.4 points and a mean C value of 1.4 (Appendix C). These scores are similar to most undeveloped land in Michigan. These scores are likely related to the absence of mature floodplain forest found in nearby similar parks (i.e., Booth Park Trail) and the number of non-native plants species present. High scoring species found within this park include green dragon (*Arisaema dracontium*, C=8), great water dock (C=9), pin oak (*Quercus palustris*, C=8), and swamp white oak (C=8).

Rouge River winding through floodplain forest within Linden Park Trail.

*Aquatic Habitat Characterization*

Substrate in this reach includes gravel, cobble, and sand. Habitat types present include a variety of shallow and deep pools, riffles, and runs.

Erosion within this reach is patchy, though notable. Fresh sediment deposition in point bars is evident throughout much of this reach. LWD is concentrated in logjams, which collect trash.

*Aquatic Habitat Scores*

In-stream habitat in this reach is riffle/run dominated, with pools scoured on the outside bends. Aquatic habitat within this river segment rated as “good.” Bank-stability within this reach rated as “unstable” (Appendix B).

*Invasive Plant Species*

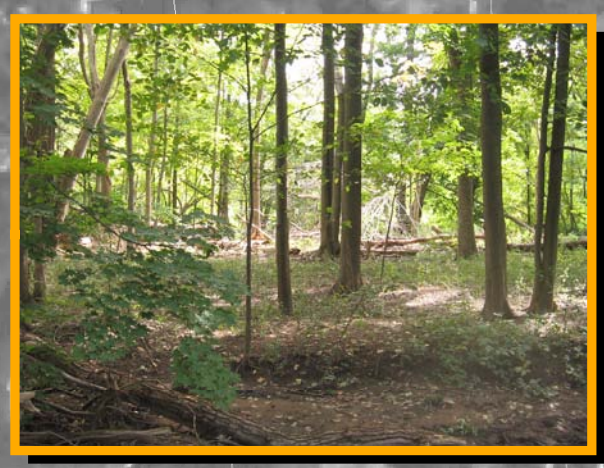
Non-native and invasive plant species are persistent within all strata of the park: garlic mustard and dame’s rocket are persistent herbaceous species throughout the understory; honeysuckle and buckthorn dominate the shrub layer; and tree-of-heaven and Norway maple are found in the overstory. Escaped landscape plant species (e.g., orange daylily [*Hemerocallis fulva*] and periwinkle [*Vinca minor*]) are also particularly prevalent within this park.

*Threatened and Endangered Species*

No threatened, endangered, or special concern species are known to occur in this park. ASTI did not observe any listed species or habitats suitable for listed species at this park.

## Data Table

| | |
|---|---|
| FQI Rating: | Poor |
| Aquatic Habitat Ranking: | Good |
| Bank Stability Index: | Unstable |
| Greatest Assets: | Greenspace; Public Trail |
| Biggest Threats: | Invasive Species; Dumping and Clearing |



1. Forested floodplain within Linden Park Trail.

**Management Note**: Encourage private land stewardship protection

2. Mature trees and deadfalls along the Rouge River within Linden Park Trail.

BALDWIN
VALLEYVIEW
MAPLEHILL
WOODLANDVILLA
SOUTHFIELD
LINDEN

## Legend

- Park Boundary
- Logjams
- Invasive Species
- Streambank Erosion
- Stormwater Outfall
- Rouge Green Corridor Limit
- Rivers, Lakes, & Ponds
- Floodplain Forest
- Mesic Southern Forest
- 1 Photo Location

# Rouge Green Corridor Habitat Assessment

Oakland County, Michigan

200 0 200 Feet

ASTI Environmental

Created by: AGS, August 1, 2008, ASTI Project 6602
Aerial Photograph: USDA 2005

Figure 19 - Park/Preserve: Linden Park Trail, Birmingham

*Wildlife*
Wildlife use of this park appears to be limited to small mammals, birds, insects, and reptiles and amphibians. FOTR frog and toad surveys conducted in the quarter section containing the park have not recorded any species. The Kalamazoo Nature Center survey found no frogs or toads; even though they noted that suitable habitat exists in the park.[81] A bird list has been developed for this and Quarton Lake Park combined; it notes an exceptional number of wood-warblers.[82] Wildlife use by large mammals is likely limited by the urban surroundings and human disturbance. MDEQ mussel surveys conducted nearby located 3 species of native freshwater mussels including the white heelsplitter (*Lasmigona complanata*), floater, and squawfoot (*Strophitus undulatus*).[83]

*Floodplain Assessment*
Functions and values present at Linden Park Trail are very similar to those provided by the floodplain at Booth Park Trail (Appendix B). Here, sections of floodplain forest appear to flood regularly, providing flood flow alteration, sediment and toxicant retention, and to some degree nutrient removal for the RGC. Though not part of the Linden Park Trial, the private land immediately east and across the river also contributes to these functions within this stretch of the river. Wildlife habitat and recreational functions are also present within the floodplain of Linden Park Trail.

*Functions and Values*
This park provides wildlife habitat and green space and recreation. Despite its relatively low floristic quality, this park and some of the neighboring private parcels appear to provide a substantial amount of floodplain storage for the RGC. This park offers seclusion and quiet, and the trail along the river is used for walking and exercise.

*Greatest Asset and Biggest Threat*
The greatest asset of this park is the public access trail which connects to other adjacent parks and offers a large recreational area for local residents. This could be further improved by linking the trails directly to Booth Park. The biggest detriment to this park is the fully established invasive species that are likely a seed source for downstream and neighboring areas. Continuing threats to the park include encroachment and disturbance by neighboring homeowners (e.g., brush clearing, dumping landscape debris, storm water conveyance) up to and within the park.

**Management Targets**

**Location: Linden Park Trail, Birmingham**

| Metric | Desired Target |
|---|---|
| AC – Amphibian Community | Increase frog/toad species count from 0 to 4 |
| AHR – Aquatic Habitat Ranking | Maintain “Good” rating |

[81] Allen, Stephen W., 2004. Rouge River Green Corridor Selected Site Evaluations and Recommendations on Amphibian Populations in the Rouge Green Corridor. Final Report, prepared by the Kalamazoo Nature Center, Kalamazoo, Michigan. 10 pp.

[82] SOCWA. 2007. Birds of the Rouge Green Corridor: The Birds of Linden Park & Quarton Lake Park, Birmingham Michigan. February 2007.

[83] Rathburn, J.E. Qualitative Survey of the Distribution of Freshwater Mussels (Bivalva:Unionidae) in the Rouge River, Michigan (U.S.A.) Watershed: 1998-2003. Michigan Department of Environmental Quality.

| | |
|---|---|
| BSI – Bank Stability Index | Improve from "Unstable" to "Stable" |
| FC – Fish Community | "Acceptable" Procedure 51 ratings |
| FQI – Floristic Quality Index | Increase FQI from 18.4 to ≥ 20 |
| MC – Macroinvertebrate Community | Maintain "Good" Procedure 51 rating |
| RBFI – Richards-Baker Flashiness Index | Halt trend to increasing flashiness |
| WFV – Wetland Functional Value | Flood Attenuation, Wildlife, Water Quality |
| WQ – Water Quality | Average wet-weather TSS ≤ 80 mg/L<br>Dissolved oxygen ≥ 5 mg/L<br>*E. coli* bacteria ≤ 130 mg/L |

**Management Recommendations**

Because of their similarities in size, location, plant communities (in general), and uses, the management recommendations for Linden Park Trail will generally be the same as Booth Park Trail.

**Goal: Maintain/Expand Riparian Buffer** (Targets: AHR, FQI, WFV, WQ)

*Recommendation 49:* Explore possibility and mechanisms for purchasing additional parcels or placing them under conservation easements.

The floodplain lying alongside this stretch of the river, while it may not be of exceptional floristic quality, plays an invaluable and important role in protecting the water quality of the river and the RGC. There currently exists at least one parcel of undeveloped and privately-owned floodplain immediately east of Linden Park Trail. The RGC and Linden Park Trail would benefit if this parcel and other similar parcels were under permanent protection, either in the form of public ownership or privately-held conservation easements. As noted above, bird surveys of this area note a number of warbler species. Protection of the forest canopy for warbler habitat is another reason for investigating ways to expand the protected buffer here.

**Goal: Expand Survey and Monitoring Efforts**

*Recommendation 50:* Conduct mussel survey within this park. Continue to monitor with other RGC sites if it contains special concern species similar to those found in location sampled nearby.

*Recommendation 51:* Add a volunteer macroinvertebrate monitoring station within Linden Park Trail.

Existing surveys for frogs, toads, and freshwater mussels should be continued and the data updated or confirmed as needed. Additional formal wildlife surveys for birds, insects and herptiles have not been conducted and would be valuable assets for management planning. The existing plant survey would benefit greatly from survey for spring ephemeral plant species.

**Goal: Manage Invasive Species** (Targets: FQI, WFV)

*Recommendations 30, 31:* Inventory invasive plant species as described in recommendations for all parks and preserves. Conduct invasive plant management as priorities dictate and resources allow.

# Habitat Assessment & Management Recommendations

Invasive species are pervasive throughout Linden Park Trail, making large-scale invasive species control unrealistic. Invasive species control within this park should include monitoring for, and removing, key invasive species that are newly established or likely to establish within the park. Both tree-of-heaven and Japanese knotweed are presently established within the park (along the west side of the walking trail mid-way through the park) and should be removed. All invasive species not yet present should be closely monitored for, with common reed and black locust being likely candidates to invade. The costs and benefits of the current, and any future, invasive species removal programs should be evaluated prior to continuation or implementation.

### 3.2.5 PARK/PRESERVE: FAIRWAY PARK, BIRMINGHAM

*Riparian Habitat Characterization*

Habitat within this small park consists of a narrow band of low-lying floodplain dominated by eastern cottonwood, box elder, and willow, and small areas of mesic southern forest[84] dominated by maple and oak tree species higher on surrounding slopes. Other areas are open lawn and the surrounding land use is primarily residential (Figure 20).

Wooded slopes and floodplain forest within Fairway Park.

*Floristic Quality Scores*

Similar to Linden Park Trail, low FQI scores for this 3.0-acre park are a direct reflection of the presence of non-native species, including many escaped ornamental species. A total of 79 plant species were observed and recorded within Fairway Park. Of these, 65% (51) are native, resulting in an FQI of 19.9 and a mean C coefficient of 2.2 (Appendix C). High scoring species found in this park include eastern narrow leaved sedge (C=8), swamp white oak (C=8), and great water dock (C=9).

*Aquatic Habitat Characterization*

This reach exhibits primarily run habitat, with less riffle habitat than in Linden Park. Substrate materials include sand, clay, cobble, and some gravel.

Erosion is patchy and does not appear to be a severe problem within Fairway Park. Bank angles within this reach tend to be flatter and several areas that have eroded previously are now revegetated. A bridge is being replaced (Lincoln Street) crossing this segment with new stone walls along the banks.

*Aquatic Habitat Scores*

Aquatic habitat within this river segment rated as "good." Bank-stability within this reach rated as "at risk" (Appendix B).

*Invasive Plant Species*

Invasive species are present but not dominant here and include honeysuckle, buckthorn, garlic mustard and dame's rocket. Escaped ornamental plants such as orange daylily and yellow iris (*Iris pseudacorus*) are also present.

*Threatened and Endangered Species*

No endangered, threatened, or special concern species are known to occur in this park. In addition, ASTI did not observe any listed species or habitats suitable for listed species at this site.

*Wildlife*

Because of its small size, wildlife usage is rather limited, although white-tailed deer tracks were common. Bird use and abundance is likely similar to the adjacent Linden and Quarton Lake

[84] Cohen, J.G. 2004. Natural community abstract for mesic southern forest. Michigan Natural Features Inventory, Lansing, MI. 12pp.

1. Typical river view within Fairway Park.

SHIRLEY

LINCOLN

**Management Note**: Educate public on natural areas stewardship

1

FAIRWAY

LATHAM

LATHAM

**Legend**

- Park Boundary
- Invasive Species
- Streambank Erosion
- Logjams
- Stormwater Outfall
- Rouge Green Corridor Limit
- Rivers, Lakes, & Ponds
- Floodplain Forest
- Mesic Southern Forest
- 1 Photo Location

**Data Table**

| | |
|---|---|
| FQI Rating: | Poor |
| Aquatic Habitat Ranking: | Good |
| Bank Stability Index: | At Risk |
| Greatest Asset: | Greenspace |
| Biggest Threats: | Clearing; Dumping |

Rouge Green Corridor

# Rouge Green Corridor Habitat Assessment

Oakland County, Michigan

Feet
0 125 250

ASTI Environmental

Created by: AGS, August 1, 2008, ASTI Project 6602
Aerial Photograph: USDA 2005

Figure 20 - Park/Preserve: Fairway Park, Birmingham

Parks, which have been surveyed. Frog and toad count data for this quarter section have recorded a maximum of 1 species per year.[85] No other formal wildlife surveys have been conducted at Fairway Park.

*Floodplain Assessment*
Fairway Park is small and thus contains a limited amount of floodplain. In general, Fairway Parks provides an extension of some of the functions and values present within Linden Park Trail, though flooding likely occurs on only one small portion of Fairway Park with enough frequency to provide flood flow alteration. Fairway Park does provide some wildlife habitat, but recreational opportunities do not exist here (Appendix B).

*Functions and Values*
This small park functions as a natural buffer between adjacent homeowners and the river, and as a continuation of a series of parks which add valuable green space in a developed area.

*Greatest Asset and Biggest Threat*
The buffering and green space functions of this small park are its greatest assets. Similar to Linden Park, this small riverside natural area suffers from the historical and current impacts of well-intentioned homeowners. Homeowners adjacent to this park currently clear understory vegetation, mow to the riverbanks, and dump ornamental and non-native plant clippings within the park, all actions that are generally detrimental to the native floristic quality of the site.

**Management Targets**

**Location: Fairway Park, Birmingham**

| Metric | Desired Target |
|---|---|
| AC – Amphibian Community | Increase frog/toad species count from 1 to 4 |
| AHR – Aquatic Habitat Ranking | Maintain "Good" Rating |
| BSI – Bank Stability Index | Improve from "At Risk" to "Stable" |
| FC – Fish Community | "Acceptable" Procedure 51 ratings |
| FQI – Floristic Quality Index | Increase FQI from 19.9 to $\geq$ 20 |
| MC – Macroinvertebrate Community | Maintain "Excellent" Procedure 51 rating |
| RBFI – Richards-Baker Flashiness Index | Halt trend to increasing flashiness |
| WFV – Wetland Functional Value | Floodflow Alteration, Wildlife, Water Quality |
| WQ – Water Quality | Average wet-weather TSS $\leq$ 80 mg/L<br>Dissolved oxygen $\geq$ 5 mg/L<br>*E. coli* bacteria $\leq$ 130 mg/L |

**Management Recommendations**

Due to its small size and proximity to Linden Park Trail, management recommendations directed at Fairway Park are limited and essentially the same as those for Linden Park Trail.

[85] Friends of the Rouge. 2007. Rouge River Habitat Mapping Project 2007. Data on CD for GIS Users.

**Goal: Expand Survey and Monitoring Efforts**

*Recommendation 52:* Conduct a bird survey for this park, incorporating annual counts of individuals of each species to monitor trends, if possible.

*Recommendation 53:* Investigate mussel fauna within Fairway Park. Conduct follow-up mussel surveys every 5 to 10 years.

No formal wildlife surveys have been conducted within Fairway Park. Due to its small size and proximity to Linden Park Trial, surveys which are conducted within Linden Park Trail should be expanded to encompass Fairway Park as well. Freshwater mussels, birds, and spring ephemeral plants would be particularly interesting investigations within this park.

**Goal: Manage Invasive Species** (Targets: FQI, WFV)

*Recommendations 30, 31:* Inventory invasive plant species as described in recommendations for all parks and preserves. Conduct invasive plant management as priorities dictate and resources allow.

Invasive species are present within Fairway Park, but they do not represent a pressing management need at this time. Both buckthorns and honeysuckles are present and could be removed. Monitoring for, and removal of, new invasive species such as tree-of-heaven and Japanese knotweed should be conducted as part of similar monitoring within Linden Park Trail.

### 3.2.6 River Stretch: Birmingham Country Club Between Fairway Park and Hidden Rivers Nature Preserve, Bloomfield Township

*Riparian Habitat Characterization*

This river reach through the Birmingham Country Club (Figure 21) is largely devoid of riparian vegetation other than golf course turf.


Stone stabilization and lack of riparian vegetation at Birmingham C.C.

Streambanks at the upper end of this reach have been armored with large boulders, but the banks through much of this stretch are unarmored. Evidence of high water eroding behind these rocks is evident along the left bank (photo, right). Grass-lined banks also exhibit erosion and slumping and some areas of sloughed soil have become established as vegetated islands within the channel.

It appears that large black willows (*Salix nigra*) and eastern cottonwood lined the stream at one time (some perhaps recently judging from stumps). Although these have been removed, it is worth noting that the root mass of these large trees still serves to hold streambanks soils in place. This reach may experience increased bank erosion over time as these roots decay.

*Aquatic Habitat Characterization*

The channel is meandering, and long stretches consist of riffles that span the channel and are only a few inches in depth. Some pools and run habitat are also found within the golf course limits, but much of the channel appears over-wide for low flows. Substrate materials consist of sand, fine gravel, cobble, and boulder where streambank stabilization materials have collapsed into the channel. Caddisfly nets were abundant on cobble and larger substrates.

Filamentous alga (*Cladophera*), which was observed in only a few locations within the RGC, was observed within this reach. This may be an indicator of golf course fertilizer runoff and is likely also a product of the full sunlight and shallow depths in this river segment. Water drained from the golf course surfaces is pumped into the river at various points along its length. The river exits the golf course, entering the Douglas Evans Preserve, passing under a bridge with a plastic curtain hung below. This curtain may have been put in place to capture debris, but its purpose is unclear.

*Aquatic Habitat Scores*

Aquatic habitat within this river segment rated as “poor.” Bank-stability within this reach rated as “at risk” to “unstable” (Appendix B).

*Invasive Plant Species*

Although some reed canary grass is found along the streambank, the predominant exotic plant species in this reach is the golf course turf grass.

WOODLEA
GLENHURST
WESTCHESTER
LARCHLEA
DONMAR
LINCOLN
ARLINGTON
FAIRWAY
PLEASANT
NORTHLAWN
1
NORFOLK
FAIRCREST
RIVERSIDE
BEACONSFIELD
HILLCREST
INGLEWOOD

1. Sloughing streambanks and a flat bottomed shallow channel characterize much of the RGC in the Birmingham Golf Course.

**Data Table**

| | |
|---|---|
| Aquatic Habitat Ranking: | Poor |
| Bank Stability Index: | At Risk to Unstable |
| Greatest Assets: | Recreation; Greenspace |
| Biggest Threats: | Nutrient Runoff; Warming |

**Legend**

- Park Boundaries
- Logjams
- Invasive Species
- Streambank Erosion
- Stormwater Outfall
- Rouge Green Corridor Limit
- Rivers, Lakes, & Ponds
- Floodplain Forest
- Mesic Southern Forest
- 1 Photo Location

Rouge Green Corridor

# Rouge Green Corridor Habitat Assessment

Oakland County, Michigan

Feet
300 0 300

ASTI Environmental

Created by: AGS, August 1, 2008, ASTI Project 6602
Aerial Photograph: USDA 2005

Figure 21 - River Stretch: Fairway Park to Hidden Rivers, Birmingham

*Wildlife*
No wildlife was observed at the time of ASTI's site investigation, but it is likely that the open space of the golf course is traversed by larger wildlife and birds traveling between Fairway and Hidden Rivers Parks. FOTR frog and toad surveys conducted in the quarter sections including the golf course range from 0 to 6 species recorded. Species records at the site with the most species have declined from 6 to 2 species in recent years.

*Functions and Values*
The riparian corridor in this reach provides some limited floodwater retention, green space, the pleasing aesthetics of a manicured landscape, and active recreation in the form of golf.

*Greatest Asset and Biggest Threat*
Benefits provided by this reach are recreation and the green space provided by the golf course. Threats include nutrient runoff, warming, and potential decreases in dissolved oxygen as a result.

**Management Targets**

**Location: Birmingham Country Club between Fairway Park and Hidden Rivers Preserve**

| Metric | Desired Target |
|---|---|
| AC – Amphibian Community | Re-establish previous frog/toad count of 6 |
| AHR – Aquatic Habitat Ranking | Improve from "Poor" to "Good" |
| BSI – Bank Stability Index | Improve from "At Risk-Unstable" to "Stable" |
| FC – Fish Community | "Acceptable" Procedure 51 ratings |
| FQI – Floristic Quality Index | Not Determined, Average % native species $\geq$75% |
| MC – Macroinvertebrate Community | "Acceptable" Procedure. 51 ratings |
| RBFI – Richards-Baker Flashiness Index | Halt trend to increasing flashiness |
| WFV – Wetland Functional Value | Flood Attenuation, Water Quality |
| WQ – Water Quality | Average wet-weather TSS $\leq$ 80 mg/L<br>Dissolved oxygen $\geq$ 5 mg/L<br>*E. coli* bacteria $\leq$ 130 mg/L |

**Management Recommendations**

**Goal: Restore Wetlands (**Targets: FQI, WFV**)**

**Goal: Connect River and Floodplain (**Targets: AHR, BSI, FC, RBFI, WQ, WFV**)**

*Recommendation 54:* Identify areas out of play that could be used/restored as created wetlands for flood storage and water quality protection.

**Goal: Maintain/Expand Riparian Buffer (**Targets: AHR, FQI, WFV, WQ**)**

*Recommendation 55:* Design and plant deep rooted, native species to create no-mow buffer along stream and to replace the stabilizing effects of the trees that have been cut there. Work with Country Club managers to design in context of course layout.

There are a number of landscaping and management activities that could be expanded or undertaken at the golf course to enhance the aquatic and terrestrial habitat here. A native vegetation buffer or no-mow strip should be created at river's edge to capture nutrients and to

provide shade and improved bank stabilization. An integrated pest management program and soil fertility testing on the golf course would help alleviate unnecessary utilization of herbicides, pesticides, and fertilizers. Finally, flood storage on the golf course could be enhanced through floodplain restoration and wetland creation within the low-lying riparian areas of the golf course.

**Goal: Educate/Involve Residents in Riparian Stewardship**

*Recommendation 56:* Work with golf course personnel to change management practices, particularly to allow or create a natural vegetation buffer along the river and to reduce fertilizer use in proximity to the river:

**Goal: Improve In-stream Aquatic Habitat** (Targets: AHR, FC, MC)

*Recommendation 57:* Evaluate whether portions of this reach could be narrowed and deepened to add habitat diversity.

### 3.2.7 PARK/PRESERVE: HIDDEN RIVERS NATURE PRESERVE & RIVERSIDE PARK, BEVERLY HILLS

*Riparian Habitat Characterization*

Hidden Rivers Nature Preserve and Riverside Park contain a variety of habitat types within approximately 20 acres. Riverside Park is dominated by an open water impoundment containing a small island of floodplain forest. Hidden Rivers Nature Preserve lies just upstream of the impoundment and contains a variety of branches of the river, oxbow and riverside emergent wetlands, floodplain forest and a small stand of mesic southern forest (Figure 22).

MNFI mesic southern forest near the center of Hidden Rivers.

*Floristic Quality Scores*

Hidden Rivers Nature Preserve and Riverside Park contain 112 plant species, of which 79% (88) are native. High scoring species found in this park include wild calla (*Calla palustris*, C=10), redbud (C=8), pin oak (C=8), swamp white oak (C=8), and great water dock (C=9). Originally surveyed by M. Penskar in 2004, this preserve scored low relative to the other sites surveyed at that time (FQI of 13.0 and mean C of 2.2).[86] However, as M. Penskar suggested, this low score may be due to the very brief nature of the survey, which was conducted only along the riverbanks from a kayak.

Beyond the riverbanks, ASTI was able to access an isolated tract of mesic southern forest in the northern end of the preserve adjacent to the golf course. This tract is relatively free of invasive species and the intact overstory and forest floor plant community present here is reflected in the FQI score of 33.1 and mean C value of 3.1 (Appendix C). These scores are well above the average for undeveloped land within Michigan, and only slightly below the threshold indicating floristic quality of statewide significance.

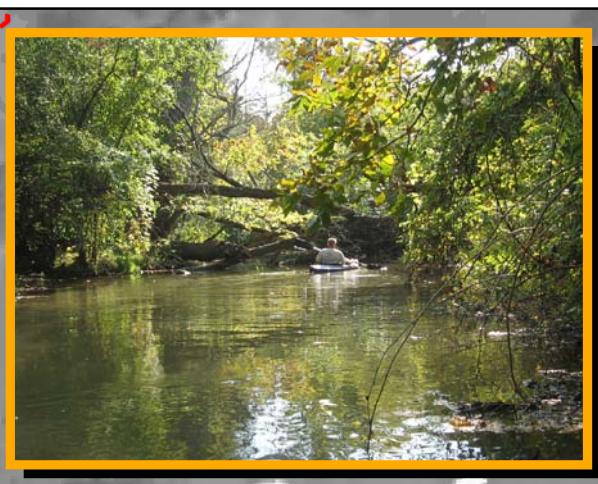
*Aquatic Habitat Evaluation*

The MDEQ Procedure 51 methodology was not used to assess aquatic habitat at Hidden Rivers and Riverside Park because these sections are impounded behind two dams at, and northeast of, Evergreen Road near Old Pond Road.

This segment is shallow, with fine sediments predominant throughout and exhibiting numerous areas of sediment deposition in the form of both point bars and mid-channel deposits. Water clarity is limited in this stretch as a result of the fine colloidal sediments and in part exacerbated by activities of carp, which were numerous in this reach.

Not all areas within these parks are shallow, however. Deep water habitat is abundant in a side channel that enters the main branch from the northwest, where it flows out of a pipe near the intersection of West 14 Mile and South Cranbrook Roads, and skirts the southern limit of the

[86] Penskar, M. 2004. Floristic Assessment of Selected Sites in the Rouge Green Corridor. Michigan Natural Features Inventory. Unpublished.



2. Kayaker enjoying a leisurely paddle on the Rouge River in Hidden Rivers Preserve.

**Management Note**: Priority area for invasive species monitoring and control

1. Emergent oxbow wetland within Hidden Rivers Preserve.

**Management Note**: Address water quality e.g. dredging, dam removal

## Legend

- Park Boundaries
- Invasive Species
- Streambank Erosion
- Logjams
- Stormwater Outfall
- Dam
- Rouge Green Corridor Limit
- Rivers, Lakes, & Ponds
- Emergent Wetland
- Floodplain Forest
- Mesic Southern Forest
- 1 Photo Location

**Data Table**

| | |
|---|---|
| FQI Rating: | Average |
| Aquatic Habitat Ranking: | NA |
| Bank Stability Index: | Stable to At Risk |
| Greatest Asset: | Mix of Wetlands, Floodplain, and Mesic Forest |
| Biggest Threat: | Invasive Species |

# Rouge Green Corridor Habitat Assessment

Oakland County, Michigan

200 0 200 Feet

Created by: AGS, August 1, 2008, ASTI Project 6602
Aerial Photograph: USDA 2005

Figure 22 - Park/Preserve: Hidden River Nature Preserve and Riverside Park, Beverly Hills

Birmingham Country Club. This area provides a picturesque still water paddling experience, although access is made difficult by abundant LWD and logjams. Bank-stability within this reach was determined to be "stable" to "at risk (Appendix B).

*Invasive Plant Species*
With the exception of the mesic southern forest portions of the preserve, Hidden Rivers Nature Preserve contains a number of invasive species. These are mostly found alongside the river, which likely acts as a corridor to introduce species into the preserve. These species include buckthorn, honeysuckle, Japanese barberry, purple loosestrife, northern catalpa, and Japanese knotweed.

Riverside Park has historically been negatively impacted by the construction of an impoundment in the river and substantial human use. ASTI surveyed a small island within the impoundment. This island is overrun with invasive shrubs, yet is the only site within the RGC where tamarack (*Larix laricina*) was observed.

*Threatened and Endangered Species*
The MDNR Endangered Species Assessment indicates no listed features near this specific site. ASTI did not observe any listed species within this preserve during this survey, but Hidden Rivers Nature Preserve does contain intact habitat that may harbor rare woodland species.

*Wildlife*
Hidden Rivers Nature Preserve and Riverside Park offer the best waterfowl habitat of the parks and preserves surveyed (though Valley Woods at 10 Mile and at Civic Center both contain some notable waterfowl habitat). Mallards, wood ducks, blue-winged teal, Canada geese, and great blue heron were observed here. Signs of both large and small mammals were abundant, and although few reptiles or amphibians were observed, it is expected that many are present within the many river channels, wetlands, and open-water areas. During a one-hour visit, staff of the Kalamazoo Nature Center observed a single eastern American toad (*Bufo americanus americanus*) at the Hidden Rivers Preserve.[87] Frog and toad count data list a maximum of 6 species records per year for this quarter section, among the highest diversity of the sites surveyed. These waterfowl and amphibian observations are likely directly related to the abundance and diversity of wetland habitats present within these parks. Flooded oxbows, old river channels, vernal pools, and riverside margins are all present within this park despite being relatively uncommon throughout the other surveyed parks. Bluegill and bass, as well as thhe carp mentioned previously, are reportedly caught within the Riverside Park impoundment. An extensive bird list has also been compiled for the park by volunteers,[88] but no other wildlife surveys have been conducted.

*Floodplain Assessment*
The floodplain within Hidden Rivers Preserve and Riverside Park provides a wide variety of functions and values for the RGC. Principal functions here include flood flow alteration, sediment and toxicant retention, and nutrient removal (Appendix B). Though much of the floodplain is

[87] Allen, Stephen W., 2004. Rouge River Green Corridor Selected Site Evaluations and Recommendations on Amphibian Populations in the Rouge Green Corridor. Final Report, prepared by the Kalamazoo Nature Center, Kalamazoo, Michigan. 10 pp.

[88] SOCWA. 2005. Birds of the Rouge Green Corridor: Birds of Douglas Evans Nature Preserve & Riverside Park, Beverly Hills Michigan – also including Butterflies of the Douglas Evans Nature Preserve. April 2005.

permanently flooded by dams, Hidden Rivers Preserve still contains a large amount of floodplain within its river branches and tributaries that likely retain a significant amount of water during flood events. These areas are also well vegetated and in many cases include oxbow wetlands that likely permanently detain flood water, thus facilitating sediment and nutrient removal. Together, the floodplains of these two parks also offer relatively abundant wildlife habitat and recreational opportunities (i.e., kayaking, canoeing, fishing) for the RGC.

*Functions and Values*
This preserve provides wildlife habitat, flood control and storage, and green space within this developed area. Riverside Park also offers recreation opportunities for the local community.

*Greatest Asset and Biggest Threat*
The best natural asset of this preserve is the central portion of Hidden Rivers Nature Preserve. Here, a variety of riverine and oxbow wetlands are present along the various river channels; these features combine with the mesic southern forest to create a somewhat isolated mix of habitat communities. The biggest threat to this preserve is invasive species, in particular Japanese knotweed and purple loosestrife along the riverbanks and honeysuckle and Japanese barberry along the margins of the hardwood forest.

**Management Targets**

**Location: Hidden Rivers Nature Preserve and Riverside Park, Beverly Hills**

| Metric | Desired Target |
|---|---|
| AC – Amphibian Community | Re-establish previous frog/toad count of 6 |
| AHR – Aquatic Habitat Ranking | Not Applicable |
| BSI – Bank Stability Index | Improve from "Stable-At Risk" to "Stable" |
| FC – Fish Community | Not Applicable |
| FQI – Floristic Quality Index | Increase FQI from 33.1 to $\geq$ 35 |
| MC – Macroinvertebrate Community | Not Applicable |
| RBFI – Richards-Baker Flashiness Index | Halt trend to increasing flashiness |
| WFV – Wetland Functional Value | Flood Attenuation, Wildlife, Water Quality |
| WQ – Water Quality | Average wet-weather TSS $\leq$ 80 mg/L<br>Dissolved oxygen $\geq$ 5 mg/L<br>*E. coli* bacteria $\leq$ 130 mg/L |

**Management Recommendations**

**Goal: Educate/Involve Residents in Riparian Stewardship**

*Recommendation 58:* Develop and disseminate targeted land owner education materials regarding use of low/no phosphorus fertilizers and other ways to reduce nutrient runoff:

While Hidden Rivers does not, and is not intended to, receive substantial public use, it still shares a border with a variety of residential neighbors. Riverside Park, on the other hand, does receive use now and recreational use is encouraged. This area would be an excellent location for water quality education and demonstration projects, for example signs discouraging feeding waterfowl and collecting pet wastes, and invasive species removal demonstration on the island.

**Goal: Manage Invasive Species (**Targets: FQI, WFV**)**

*Recommendations 30, 31:* Inventory invasive plant species as described in recommendations for all parks and preserves. Conduct invasive plant management as priorities dictate and resources allow.

*Recommendation 59:* Consider conducting invasive species removal on the island within Riverside Park and involve riparian residents as a form of outreach and education.

Hidden Rivers Nature Preserve contains a small, isolated, section of quality mesic southern forest along the northernmost boundary. During the 2007 survey, much of this area was relatively free of invasive species and a number of native understory plants were noted. This area should be a target for preventive invasive species monitoring and management, especially because much of the surrounding floodplain forest and riverbanks have been impacted by invasive species. The most likely potential invaders within this area include buckthorn, honeysuckle, Japanese barberry, oriental bittersweet, multiflora rose, and garlic mustard. Elsewhere in Hidden Rivers Nature Preserve and Riverside Park existing stands of purple loosestrife and Japanese knotweed should be removed from the river banks and careful monitoring for these species and other wetland invasives should be continued. Ongoing invasive species removal projects should be evaluated and monitored to track their success.

Invasive species are well established throughout much of Riverside Park. Native plantings have been created along the river within the mainland portion of the Park. Similar initiatives and maintenance of the existing plantings should be maintained. Because the island is a prominent feature in the pond, and assuming, as such, it is valued by local residents, it may serve as a site for a pilot project for involving volunteers in invasive species management. Removal of invasive woody plants from the island within Riverside Park could improve both the aesthetics and accessibility of this park for the local residents. Again, this idea would need to be evaluated as part of a detailed invasive species management plan for the park. A project of this sort on an island would offer challenges for access and ensuring the safety of volunteers, but the island could be reached with small boats. Care should be taken to avoid damage to the tamarack, oak, and other native tree species still present on this island.

**Goal: Reduce Erosion and Sedimentation** (Targets: AHR, BSI, FC, MC, WQ)

**Goal: Improve In-stream Aquatic Habitat** (Targets: AHR, FC, MC)

*Recommendation 60:* Analyze how changes in dam operation might impact area wetlands and floodplain forest. Develop cost-benefit analysis of no action, dredging, or dam removal.

*Recommendation 61:* Hold public meetings regarding dam removal or impoundment management options.

The historic creation of the impoundment at Riverside Park at one time provided a deep stretch of water, however, after many years the slowing of the water caused by the impoundment has allowed the Rouge River to accumulate deep deposits of sediments in this area that are visible well upstream into Hidden Rivers Nature Preserve. The accumulation of these sediments has left the water in the impoundment only inches deep and unsuitable for quality recreation. These sediment deposits may also detrimentally affect downstream water quality by slowing and warming the waters, removing oxygen, and adding nutrients. Furthermore, large populations of

carp, domestic geese, and wild waterfowl remove needed vegetation adding suspended sediments and nutrients to the waters.

Addressing water quality within this park is a challenging issue from both a recreational and ecological perspective. Benefits derived from dam removal include:

- Restoring a more natural flow regime to the Rouge River
- Reducing temperatures in waters downstream
- Increasing dissolved oxygen concentrations by reducing water temperature and by reducing sediment oxygen demand
- Creating recreational opportunities for individuals wishing to paddle extended portions of the river. At present the dams must be portaged and adjacent lands are in private ownership.

Drawbacks to dam removal include:

- The potential loss of any flood control benefits the impoundment may provide (It is likely that the impoundment, with the existing deposition of sediments, provides no flood control, but it may if dredged).
- Loss of lake-like, still water recreational opportunities (e.g., fishing, boating)
- A change in the way that current lake-side homes relate to the waterfront (the river would be narrower than the current impoundment and so the waterfront would be farther from peoples' homes).
- Potential resuspension and downstream transport of stored sediments
- The cost of engineering and demolition

Hydraulic dredging, while maintaining the existing impoundment, could provide additional depth and a harder bottom to improve fisheries habitat and could, temporarily, increase the impoundments capacity to capture sediment.

**Goal: Expand Survey and Monitoring Efforts**

*Recommendation 62:* Expand bird surveys to incorporate annual counts of individuals within each species, where possible, to monitor population changes.

*Recommendation 63:* Expand volunteer, agency staff, and/or consultant surveys to include insects and herptiles.

Existing survey data on frogs, toads, and birds should be continued and updated or confirmed as needed, especially because Hidden Rivers has been a relative hotspot for frog and toads surveys in the past. Additional formal wildlife surveys for aquatic insects and herptiles have not been conducted and would be valuable assets for management planning. The existing plant survey would benefit greatly from survey for spring ephemeral plant species, especially within the high-quality mesic southern forest of Hidden Rivers.

### 3.2.8 PARK/PRESERVE: DOUGLAS EVANS NATURE PRESERVE, BEVERLY HILLS

*Riparian Habitat Characterization*

The majority of this 19-acre preserve is a mixture of mature mesic southern forest and floodplain forest (Figure 23). These areas contain several extremely large, mature oaks and a nearly intact overstory. The understory plant community is in places dominated by invasive species, whereas in other areas the native plant community is more intact and represented by several native spring ephemerals and woodland herbaceous plants.

The Rouge River meanders through the Douglas Evans Nature Preserve.

The planted prairie and wet meadow areas (planted in 1995) surrounding the municipal buildings is an alternate method to maintain this open space that would otherwise revert to old field and ultimately succeed to mesic forest habitat. This prairie is also rather unique in that it contains a variety of plant species that have proven difficult to establish in other planted prairies throughout southeast Michigan.

*Floristic Quality Scores*

A total of 174 plant species were recorded at the Douglas Evans Nature Preserve, 74% (128) of which are native. The Douglas Evan Nature Preserve exhibits an FQI of 38.7 points with a mean C coefficient of 2.9 (Appendix C). This high score is due, in part, to many of the species planted within the prairie (many of which have a high C value and are relatively uncommon as natural occurrences within Michigan), but also in part due to the relatively high-quality mesic southern forest present in the park which contains redbud (C=8), pin oak (C=8), swamp white oak (C=8), state-listed species of special concern wahoo (*Euonymous atropurpurea*, C=8), and great water dock (C=9). Even with the prairie species omitted from the FQI scoring, this preserve still receives an FQI of 31.2 with a mean C of 2.8, significantly higher than most undeveloped land within the state (Appendix C).

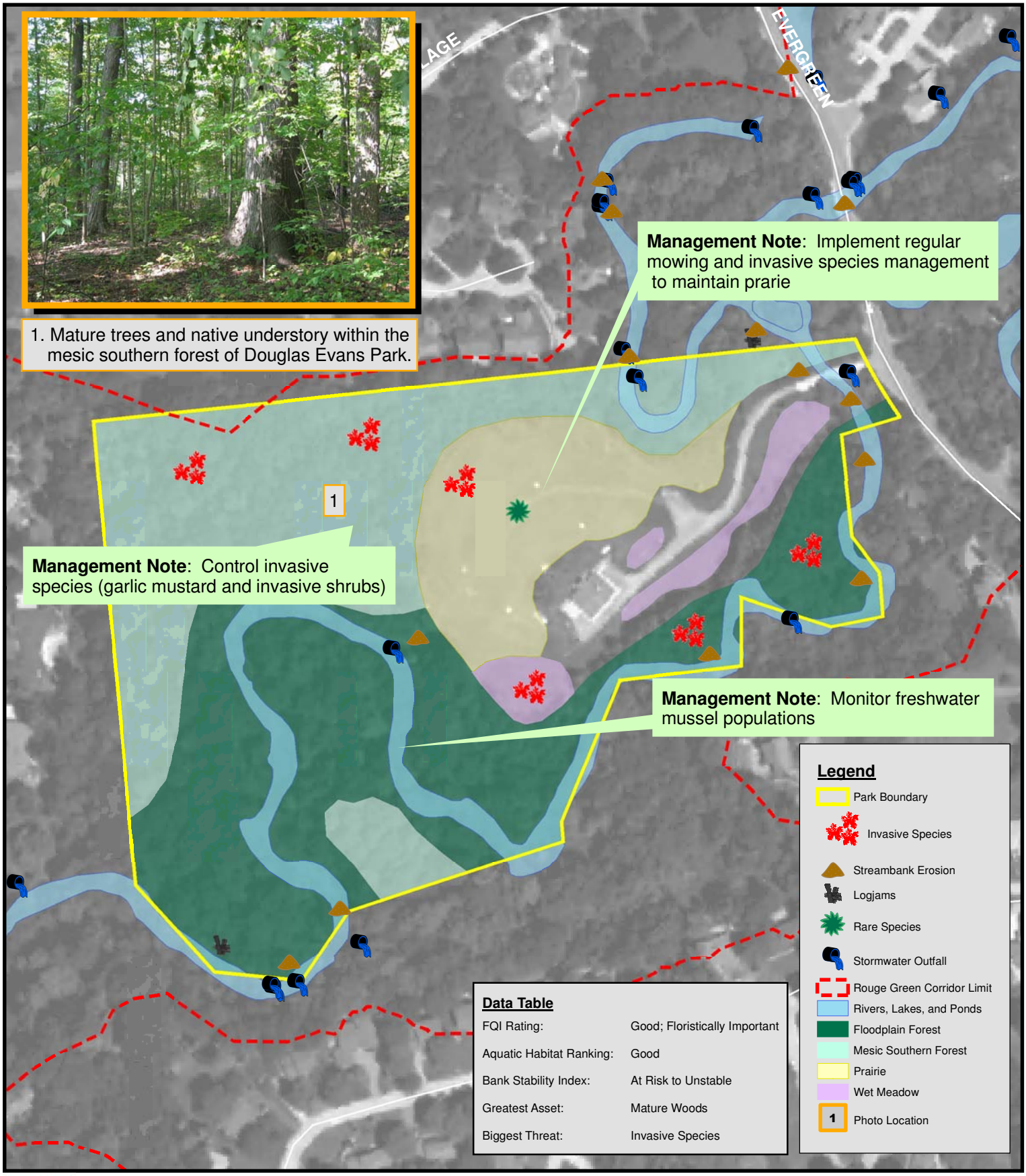
*Aquatic Habitat Characterization*

Substrate in this reach is a mix of gravel, cobble, silt, and sand. Habitat types present include a variety of pools, riffles, and runs. LWD is present but primarily concentrated in logjams. Erosion within this reach is patchy and severe in some locations.

If passage was provided through logjams on the river, this preserve could serve as the upstream entry for a rather enjoyable kayak trip downstream through much of the remainder of the RGC. As noted previously, there are 2 dams at the downstream limit of Hidden Rivers Park (upstream of this site) and, at present, it is not possible to portage around the northeastern dam without trespass on private lands.

*Aquatic Habitat Scores*

In-stream habitat in this reach is riffle/run dominated, with pools scoured on the outside bends. Aquatic habitat within this river segment rated as “good.” Bank-stability within this reach rated as “at risk” to “unstable” (Appendix B).




Rouge Green Corridor

# Rouge Green Corridor Habitat Assessment

Oakland County, Michigan

Feet
200 0 200

ASTI Environmental

Created by: AGS, August 1, 2008, ASTI Project 6602
Aerial Photograph: USDA 2005

Figure 23 - Park/Preserve: Douglas Evans Nature Preserve, Beverly Hills

*Invasive Plant Species*
Buckthorn, honeysuckle, garlic mustard, dame's rocket, and a variety of other invasives (mostly shrubs) are all locally abundant in wooded areas but not necessarily widespread throughout the preserve. For example, the peninsula south of the river and the central core of the wooded western half of the preserve are reasonably free of invasives, while the edges of the mesic and floodplain forests are more impacted by non-native and invasive species. Many invasive species are also present within the planted prairie and wet meadow, including old-field and turf grasses, spotted knapweed (*Centaurea maculosa*), teasel (*Dipascus fullonum*), crown vetch (*Coronilla varia*), white sweet clover (*Melilotus alba*) and prickly ash. Intensive management of both native and non-native woody species will be required to deter succession to forest in this area.

*Threatened and Endangered Species*
The planted prairie contains a number of species that are considered special concern or threatened in Michigan, including state special concern leadplant (*Amorpha canescens*), state threatened side oats grama (*Bouteloua curtipendula*), state extirpated (Michigan genotype) purple coneflower (*Echinacea purpurea*), state threatened downy sunflower (*Helianthus mollis*), state threatened compass plant (*Silphium laciniatum*), and state threatened cup plant (*Silphium perfoliatum*). The remaining wooded area of the preserve contains state special concern wahoo. With invasive species control, this portion of the preserve could potentially be a site where rare woodland plants could be re-introduced.

*Wildlife*
The Douglas Evans Preserve does not show much evidence of wildlife usage from large mammals. Community officials have noted that residents allow their dogs to run freely within the Nature Preserve. This practice may negatively impact ground nesting birds and large mammals.

A substantial list of bird and butterfly species (25 butterfly species) has been produced for this preserve.[89] Frog and toad count data list maximums of 2 and 4 species per year recorded since 1998 for these quarter sections. MDEQ mussel surveys conducted within and just downstream of Douglas Evans Preserve identified 6 species of mussels, including the spike (*Elliptio dilatata*), Wabash pigtoe, fat mucket (*Lampsilis siliquoidea*), white heelsplitter, squawfoot, and the special concern round pigtoe (*Pleurobema coccineum*).[90] No inventories of other animal groups have been completed.

*Floodplain Assessment*
Douglas Evans Preserve contains a narrow band of floodplain alongside the Rouge River, and much of that floodplain appears to flood rarely (i.e., only during extreme high-water). The floodplain that is present likely provides flood flow alteration during these high-water periods, though sediment and nutrient removal is likely minimal as a whole. Similar to the surrounding uplands, the floodplain within Douglas Evans Preserve offers wildlife habitat (Appendix B).

*Functions and Values*
Douglas Evans Nature Preserve maintains a variety of functions and values important from both a natural and community perspective. The preserve provides wildlife habitat, protects a stand of

[89] SOCWA. 2005. Birds of the Rouge Green Corridor: Birds of Douglas Evans Nature Preserve & Riverside Park, Beverly Hills Michigan – also including Butterflies of the Douglas Evans Nature Preserve. April 2005.
[90] Rathburn, J.E. Qualitative Survey of the Distribution of Freshwater Mussels (Bivalva:Unionidae) in the Rouge River, Michigan (U.S.A.) Watershed: 1998-2003. Michigan Department of Environmental Quality.

exceptional mature hardwood trees, and provides valuable green space within an urban environment.

*Greatest Asset and Biggest Threat*
The most significant asset of this preserve is the mature woods located here. The woods largely intact, locally uncommon, and only moderately impacted by invasive understory species. Secondly, the planted prairie and wet meadow areas (though newly created) offer insight into the composition and management of these plant communities which are rare in Michigan as natural occurrences. The biggest threat to this preserve is the presence of moderately-established invasive species within all habitats that could potentially spread and expand within other areas of the preserve.

**Management Targets**

**Location: Douglas Evans Nature Preserve, Beverly Hills**

| Metric | Desired Target |
|---|---|
| AC – Amphibian Community | Increase frog/toad species count from 2 to 4 |
| AHR – Aquatic Habitat Ranking | Maintain "Good" Procedure 51 rating |
| BSI – Bank Stability Index | Improve from "At Risk-Unstable" to "Stable" |
| FC – Fish Community | "Acceptable" Procedure 51 ratings |
| FQI – Floristic Quality Index | Maintain FQI $\geq$ 45 |
| MC – Macroinvertebrate Community | Improve from "Fair" to "Acceptable" |
| RBFI – Richards-Baker Flashiness Index | Halt trend to increasing flashiness |
| WFV – Wetland Functional Value | Flood Attenuation, Wildlife, Water Quality |
| WQ – Water Quality | Average wet-weather TSS $\leq$ 80 mg/L<br>Dissolved oxygen $\geq$ 5 mg/L<br>*E. coli* bacteria $\leq$ 130 mg/L |

**Management Recommendations**

**Goal: Manage Invasive Species (**Targets: FQI, WFV**)**

*Recommendations 30, 31:* Inventory invasive plant species as described in recommendations for all parks and preserves. Conduct invasive plant management as priorities dictate and resources allow.

*Recommendation 64*: Actively manage invasive and woody species to maintain the planted prairie and wet meadow areas at the Douglas Evans Preserve. Maintain with periodic prescribed burns in late winter - early spring (every 2-3 years) or mowing and overseeding.

*Planted Prairie and Wet Meadows*
Maintaining the planted prairie and wet meadow areas within Douglas Evans Nature Preserve will require regular maintenance and management. In the absence of management, this area will eventually be invaded by woody species. Ideally, spring burns would be conducted within this area every two to three years. If prescribed burning is not a reasonable option for this site, it is recommended that over-seeding and regular mowing be adopted to manage this site as an open prairie. The following steps are recommended:

1. Spot-treat individual plants and small areas currently dominated by undesirable plant species (i.e. teasel, spotted knapweed, crown vetch, and cool-season grasses) with glyphosphate herbicide.
2. Follow with additional spot treatments or hand-held torches to kill new sprouts
3. Reseed treated areas with desirable prairie species (or plant with plugs/rootstock). Seeding can be done by broadcast seeding and light raking in early May or by broadcast seeding in mid November.
4. Develop a schedule of regular mowing (every other year initially) or prescribed fire
5. Mow approximately 6" high in spring when undesirable species are well-sprouted and prior to the later emergence of most prairie species, typically in late-April to early May.
6. Remove thatch and previous year's growth, where possible, to allow soils to warm faster
7. Mowing should be postponed until the following year if desirable species are at a height where they may be cut by the mower
8. Mowing may be targeted in select locations where undesirable species and shrubs are establishing.
9. Mowing should never be conducted in July through winter, as these are the key times when the desirable species are vigorously growing, setting seed, and developing root systems needed for successful resprouting in the following year.
10. Reduce mowing to every three to five years once native plant cover density is achieved
11. Continue spot controls for undesirable plant species as needed.

The key goal of management in this area will be to set back the undesirable species in the spring prior to the emergence of the desirable species, thereby facilitating the dense, vigorous growth and seed production of the desirable native species that is needed to out-compete and naturally control the undesirable species with reduced management. Control of woody species within this area will likely be best accomplished with a combination of spring mowing and selected hand-cutting followed by application of concentrated glyphosphate to the cut stumps.

*Quality Woodland Areas*

Many of the wooded areas on Douglas Evans Nature Preserve contain somewhat intact natural communities with a handful of native plant species that are not commonly located within many of the other parks and preserves of the RGC. Many of these same wooded areas also currently contain, or are threatened with invasion by, a number of highly undesirable non-native and invasive plant species. Because of this, Douglas Evans may be a good candidate for invasive species control programs. The cost, effort, and effectiveness of these programs must be carefully weighed as they are extremely labor intensive and their effectiveness in many cases remains unproven.

Priority species for invasive control in Douglas Evans wooded areas should begin with undesirable woody species such as buckthorns, honeysuckles, and mulitiflora rose (*Rosa multiflora*). These species are present with varying abundance and will be the easiest to remove and control. All of these species can be controlled by cutting the plants, applying concentrated glyphosphate to the stumps, and piling/removing the cut plants. This work will be most effective in fall when the concentrated herbicide will be drawn into the root system of the shrub.

Unfortunately, cutting and removing these undesirable shrubs will most-likely only facilitate the entry of Douglas Evans' other invasive problem, which is the woodland understory invasive garlic mustard. This invasive species has already established dense stands in several areas of Douglas Evans. Persistent and intensive efforts will be needed to limit this species and allow native understory plants to return.

Methods of controlling garlic mustard are diverse and depend upon the degree of establishment. In areas where garlic mustard is not yet established, annual monitoring and removal of individual plants prior to seed-set is best. Individual plants may be removed by pulling the plant (including the deep taproot), bagging, and disposing of the plant. Alternatively, spot treatment with glyphosphate herbicide may also be used but with risk of overspray damaging nearby desirable species. In areas where garlic mustard is already fully-established, a more time and labor intensive approach is needed. Because garlic mustard is a biannual, removing the current year's seed source and depleting the existing seed bank should be the main management objectives. These can be accomplished by removing individual plants during flowering each year by hand-pulling, mowing at ground level, or herbicide application. Removal of plants will need to be completed annually over a period as long as 5 years, or until all seeds within the seed bank have germinated and been removed. Dame's rocket is much-less abundant at Douglas Evans and is somewhat less invasive, but control methods for this undesirable species are similar and should be undertaken as desired.

A number of other non-native trees, shrubs, and herbaceous plants are present within the Douglas Evans woodlands, but because they are not particularly aggressive their control should be lower-priority than those already mentioned. These species include, but are not limited to, northern catalpa, winged wahoo (*Euonymus alata*), European privet (*Ligustrum vulgare*), white mulberry (*Morus alba*), black locust, and wayfaring tree (*Viburnum lantana*).

**Goal: Expand Survey and Monitoring Efforts**

*Recommendation 65:* Expand volunteer, consultant and/or agency staff surveys to include insects and herptiles.

*Recommendation 66*: Conduct follow-up mussel surveys every 5 to 10 years, expand sampling stations to identify other high quality areas and monitor over time.

Collection of biological information is essential for the understanding and management of natural areas. Existing information compiled for Douglas Evans should be updated and amended as needed. For example, the current plant species list used to generate FQA scores would greatly benefit from the addition of spring ephemeral wildflowers and woodland plants that have never been surveyed. Similarly, existing bird and butterfly species lists should be updated and expanded as necessary, including tracking species that were once surveyed but are no longer present.

Frog, toads, and freshwater mussels should continue to be monitored at Douglas Evans, as these are good indicators of the health of the river corridor, and since Douglas Evans, at last survey, contained an exceptional assemblage of freshwater mussels. In addition to continuing existing surveys, additional surveys for reptiles, mammals, and freshwater invertebrates would provide additional information on the health of the river and the needs for preserve management.

### 3.2.9 River Stretch: Douglas Evans Preserve Downstream to 13 Mile

*Riparian Habitat Characterization*

This reach from the south end of the Douglas Evans Preserve downstream to 13 Mile Road (Figure 24) is very similar in character to the river within the Douglas Evans Preserve. The riparian corridor is primarily floodplain forest, which provides wildlife habitat, urban green space, and a forested buffer for the river.

*Aquatic Habitat Characterization*
Substrate in this reach is a mix of gravel, cobble, silt, and sand. Habitat types present include a variety of pools, riffles, and runs. LWD is present but primarily concentrated in logjams. Erosion within this reach is patchy, and severe in some locations.

*Aquatic Habitat Scores*
In-stream habitat in this reach is riffle/run dominated, with pools scoured on the outside bends. Aquatic habitat within this river segment rated as "good." Bank-stability within this reach rated as "unstable" (Appendix B).

*Invasive Plant Species*
A number of invasive species are present along this reach, including buckthorn, honeysuckle, and garlic mustard.

*Wildlife*
White-tailed deer, raccoon and a variety of passerine birds utilize the riparian corridor along this reach. FOTR frog and toad count data for this quarter section list a maximum of 3 species recorded per year.

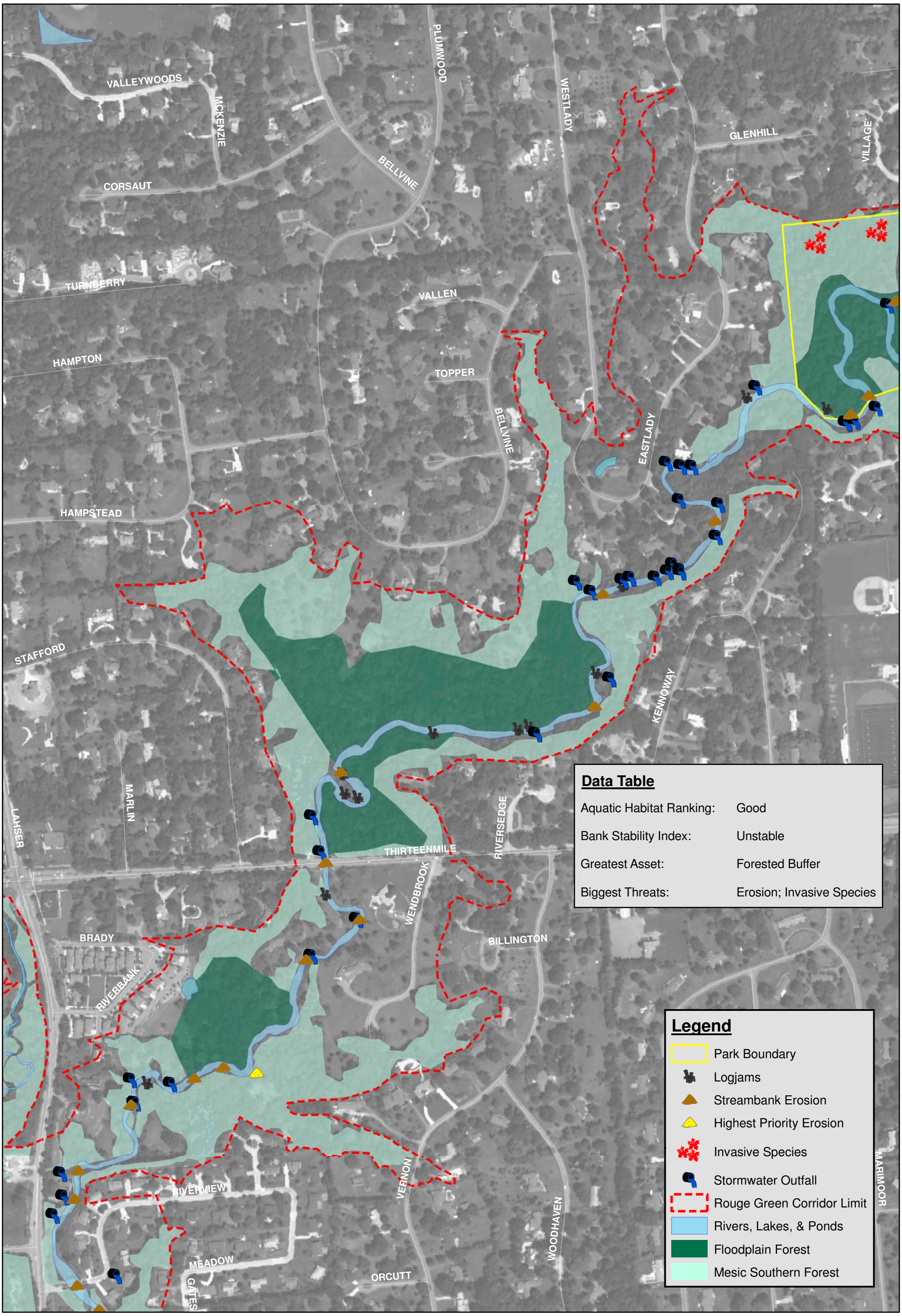
*Functions and Values*
The corridor in this reach provides wildlife habitat, green space, and floodwater storage.

*Greatest Asset and Biggest Threat*
The most significant asset of this reach is the forested buffer to the river. The native plant community therein is threatened by erosion and invasive forbs and shrubs.

**Management Targets**

**Location: Douglas Evans Preserve Downstream to 13 Mile Road**

| Metric | Desired Target |
|---|---|
| AC – Amphibian Community | Increase frog/toad species count from 3 to 4 |
| AHR – Aquatic Habitat Ranking | Maintain "Good" Procedure 51 rating |
| BSI – Bank Stability Index | Improve from "Unstable" to "Stable" |
| FC – Fish Community | "Acceptable" Procedure 51 ratings |
| FQI – Floristic Quality Index | Not Determined, Average % native species $\geq$75% |
| MC – Macroinvertebrate Community | Not Available |
| RBFI – Richards-Baker Flashiness Index | Halt trend to increasing flashiness |
| WFV – Wetland Functional Value | Flood Attenuation, Wildlife, Water Quality |
| WQ – Water Quality | Average wet-weather TSS $\leq$ 80 mg/L<br>Dissolved oxygen $\geq$ 5 mg/L<br>*E. coli* bacteria $\leq$ 130 mg/L |




# Rouge Green Corridor Habitat Assessment

Oakland County, Michigan

Feet
400 0 400

Created by: AGS, August 1, 2008, ASTI Project 6602
Aerial Photograph: USDA 2005

Figure 24 - River Stretch: Douglas Evans to Thirteen Mile Rd., Beverly Hills

**Goal: Maintain/Expand Riparian Buffer** (Targets: AHR, FQI, WFV, WQ)

*Recommendation 67:* Conduct targeted outreach to landowners to maintain the wooded buffer within this reach.

This stretch exhibits a wide forested buffer protective of the river. However, it also contains a number of logjams, stream bank erosion sites, and an abundance of invasive shrubs. Targeted, hands-on work with landowners in this reach may help to maintain this buffer. Planting of deep rooted native species along the shoreline should go hand-in-hand with invasive shrub removal to maintain the integrity of high and steep stream banks.

### 3.2.10 River Stretch: 13 Mile Road Downstream to Lahser Road

*Riparian Habitat Characterization*

Immediately downstream of 13 Mile Road the riparian corridor (Figure 25) is largely mown lawn with scattered trees and single family housing. A few invasive honeysuckles grow at the streambank along with turf, reed canary grass, and burdock (*Arctium minus*). Areas of bank failure have been treated with lava rock, concrete rip rap, and poured concrete. Approximately 300 feet south of 13 Mile Road the riparian cover changes to floodplain forest. The floodplain forest here is somewhat poor in quality and is dominated by eastern cottonwood, American elm, black willow, red ash, and Norway maple.

*Aquatic Habitat Characterization*

In-stream habitat in this reach is riffle/run dominated with pools scoured on the outside bends. Substrate in this reach is a mix of sand, gravel, cobble, and broken concrete. Hard substrates and pools exhibit a layer of fine sediment deposition. Substantial deposition of fines and gravel immediately upstream of, and within, the 4-culvert span at Riverview Road limits low flows to the far left side of the channel. Habitat types are primarily riffles and runs.

A portion of this reach, paralleling Lahser upstream of Riverview Road, appears to have been straightened to accommodate the road. Streambanks at this location have been lined with gabion baskets. These are stable with vegetation, primarily buckthorn and honeysuckle, established within the rocks. LWD is present but primarily concentrated in logjams. Erosion within this reach is patchy and severe in some locations. At Lahser, the streambanks are high, steep, and eroding. Riparian vegetation helping to stabilize the banks is dominated by invasive shrub species.

*Aquatic Habitat Scores*

This reach scored well with regard to habitat type diversity and available stable substrate, but factors limiting the assessment scoring included historic channelization within one portion of the reach, bank instability, and the lack of riparian vegetation in residential areas. The overall aquatic habitat rating for this segment was “good.” Bank-stability within this reach rated as “unstable” (Appendix B).

*Invasive Plant Species*

A number of invasive species are present along this reach, including buckthorn, honeysuckle, and reed canary grass. Honeysuckle is prevalent.

*Wildlife*

White-tailed deer, blue jays, and chickadees were observed along this reach. No FOTR frog and toad data are available for the quarter section containing this river segment.

*Functions and Values*

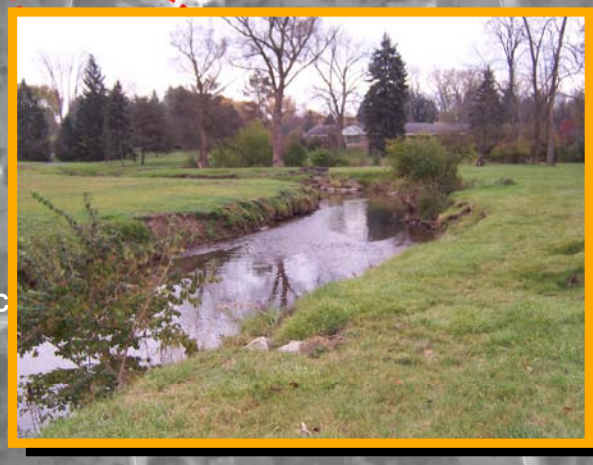
The riparian corridor in this reach provides wildlife habitat and green space. The channel appears incised and likely provides little over-bank floodwater storage.

*Greatest Asset and Biggest Threat*

The most significant asset of this reach is the forested buffer adjacent to the river in much of this stretch. Yet a vegetated buffer is lacking at the upstream end of this reach and adjacent to scattered residences. Severe erosion threatens in-stream habitat and water quality at several

1. Sedimentation has blocked low flow in three of these four culverts at Riverview.

2. Erosion has created this vertical bank on a bend in the river.



3. The riparian corridor immediately downstream of 13 Mile Road lacks a vegetative buffer to hold soil in place.

**Data Table**

| | |
|---|---|
| Aquatic Habitat Ranking: | Good |
| Bank Stability Index: | Unstable |
| Greatest Asset: | Forested Buffer (where present) |
| Biggest Threats: | Erosion; Invasive Species |

**Legend**

- Stormwater Outfall
- Logjams
- Streambank Erosion
- Highest Priority Erosion
- Rivers, Lakes, & Ponds
- Rouge Green Corridor Limit
- Floodplain Forest
- Mesic Southern Forest
- 1 Photo Location

# Rouge Green Corridor Habitat Assessment

Oakland County, Michigan

300 0 300 Feet

Created by: AGS, August 1, 2008, ASTI Project 6602
Aerial Photograph: USDA 2005

Figure 25 - River Stretch: Thirteen Mile Rd. to Lahser, Beverly Hills

locations within this section of river. The native plant community is threatened by erosion and invasive forbs and shrubs.

**Management Targets**

**Location: 13 Mile Road Downstream to Lahser Road**

| Metric | Desired Target |
|---|---|
| AC – Amphibian Community | Establish frog/toad monitoring station |
| AHR – Aquatic Habitat Ranking | Maintain "Good" Procedure 51 rating |
| BSI – Bank Stability Index | Improve from "Unstable" to "Stable" |
| FC – Fish Community | "Acceptable" Procedure 51 ratings |
| FQI – Floristic Quality Index | Not Determined, Average % native species ≥75% |
| MC – Macroinvertebrate Community | Not Available |
| RBFI – Richards-Baker Flashiness Index | Halt trend to increasing flashiness |
| WFV – Wetland Functional Value | Floodflow Alteration, Wildlife, Water Quality |
| WQ – Water Quality | Average wet-weather TSS ≤ 80 mg/L<br>Dissolved oxygen ≥ 5 mg/L<br>*E. coli* bacteria ≤ 130 mg/L |

**Management Recommendations**

**Goal: Educate/Involve Residents in Riparian Stewardship**

*Recommendation 68:* Work with riparian landowner(s) immediately south of 13 Mile Road to establish deep rooted native plantings along river banks.

*Recommendation 69:* Investigate funding/incentive programs to plant and establish riparian buffer plantings.

This reach is one of the few areas in the RGC that is devoid of vegetation, outside of grass, on both sides of the river and is perhaps the largest such area. RGC Committee partners are encouraged to work with the landowner(s) to encourage planting some or all of this area to provide shade, flood plain roughness, and increased streambank stability. Although perhaps utilized more in agricultural watersheds, incentive payments or funding for plantings may be pursued to facilitate restoration of a forested buffer.

**Goal: Reduce Erosion and Sedimentation (**Targets: AHR, BSI, FC, MC, WQ**)**

*Recommendation 70:* Stabilize high load stream bank erosion within this reach.

*Recommendation 71:* Explore alternative designs and orientation for the Riverview Road bridge.

*Recommendation 72:* Remove accumulated sediments and re-establish narrower river cross-section when a new bridge is constructed.

The existing Riverview Road Bridge consists of 4 large elliptical culverts. Sediment deposition immediately upstream of the Riverview Road Bridge and shoreline erosion on private property immediately downstream of the bridge appears to be, in part as least, due to the angle of the river

relative to the bridge, bridge design, and an over-wide channel cross-section upstream of the bridge.

The benefits of realigning the road crossing at Riverview Road, perpendicular to the river, and removing accumulated sediment should be evaluated. The benefits of such an action would presumably be:

- Improved access for paddlers
- A deeper, narrower river cross-section for better aquatic habitat, and
- Reduced shoreline erosion.

Alternatives to the existing bridge could include a clear-span bridge or culvert, a design utilizing fewer spans, or a design similar to the existing with one or more culverts set at higher elevations. This would force low flows to pass through a narrower cross-section, but still provide adequate area to pass flood flows.

In essence, the sediment deposition within the 3 western-most tubes is forcing low flows to the left (facing downstream) and creating a situation where elevations to the right are slightly higher. However, the river is over-wide and the flow is still split between multiple tubes, leaving low flows through the tube on the left insufficient to scour a deeper channel. A detailed assessment of alternatives and the pros and cons of each will require hydraulic analysis.

Also, although perhaps difficult to access, this reach contains one of the two stream bank erosion sites calculated to contribute more than 1,000 tons of sediment to the river annually (north of Riverview Road).

**Goal: Promote the River and RGC as Recreational Assets**

*Recommendation 73:* Focus initial LWD Management on section of RGC between 13 and 10 Mile Roads as this affords the most enjoyable paddling experience.

*Recommendation 74:* Explore options and possible locations for a stable and accessible canoe/kayak launch site.

The section of river between 13 Mile and 10 Mile Roads provides an enjoyable paddling experience and provides greater opportunity for sighting wildlife than foot travel in some of the parks. Recreational access is limited by shallow depths during summer low flow and numerous logjams. This stretch may be considered a high priority for initial LWD removal efforts as part of a corridor-wide management plan.

A dedicated launch site for canoes and kayaks, somewhere between 13 and 10 Mile Roads, could also improve paddler access and use. Possible locations and unobtrusive design alternatives should be explored. Such an access point could potentially be incorporated into a new bridge design at Riverview or at other publicly owned locations bound by these Mile Roads.

### 3.2.11 River Stretch: Lahser Road Downstream to 12 Mile Road

*Riparian Habitat Characterization*

The riparian corridor in the upper end of this reach is low quality floodplain forest dominated by box elder, eastern cottonwood, American elm, black willow, and red ash (Figure 26). Some areas have been cleared to the river's edge. Some areas of bank erosion have been treated with imbricated, or loosely placed, broken concrete rip rap.

South of Highbank Street is a small area of mesic hardwood forest containing sugar maple (*Acer saccharum*), black walnut (*Juglans nigra*), and white ash (*Fraxinus americana*). Scrubby floodplain forest continues again south of this area to 12 Mile Road. The overall quality of this forest appears diminished by the loss of elms and ash to disease.

*Aquatic Habitat Characterization*

Although the riparian forest in this reach is similar to the reach directly upstream, there is a marked change in the character of the channel and water quality within this reach. Water clarity was notably lower, perhaps due to greater clay content in the soils here. Substrate in this reach is a mix of gravel, some cobble, and clay hard-pan. Hard substrates and pools exhibit a layer of fine sediment deposition. LWD is present but primarily concentrated in logjams. Erosion within this reach is largely continuous and severe in some locations.

*Aquatic Habitat Scores*

In-stream habitat in this reach is riffle/run dominated, with pools scoured on the outside bends. This reach scored well with regard to habitat type diversity and available stable substrate, but factors limiting the assessment score included historic channelization within one portion of the reach, bank instability, and the lack of riparian vegetation in residential areas. The overall aquatic habitat rating for this segment was "good." Bank-stability within this reach was rated as "unstable" (Appendix B).

*Invasive Plant Species*

A number of invasive species are present along this reach, including buckthorn, honeysuckle, reed canary grass, and English ivy used as streambank stabilization. Honeysuckle and garlic mustard are pervasive.

*Wildlife*

A great blue heron, robins, and red and fox squirrels were observed within the riparian corridor. Northern flicker, downy woodpecker, black-capped chickadee, titmouse, and robins were also observed with the small mesic southern forest area. Frog and toad count data list a maximum of 4 species per year recorded for this quarter section.

*Functions and Values*

The riparian corridor in this reach provides wildlife habitat and green space. The channel appears incised in many places and may provide limited over-bank floodwater storage.

*Greatest Asset and Biggest Threat*

The most significant asset of this reach is the forested buffer to the river and the wildlife habitat it provides. The native plant community is threatened by erosion and invasive forbs and shrubs.


# Rouge Green Corridor Habitat Assessment

Oakland County, Michigan

Created by: AGS, August 1, 2008, ASTI Project 6602
Aerial Photograph: USDA 2005

Figure 26 - River Stretch: Lahser to Twelve Mile Rd., Beverly Hills

**Management Targets**

**Location: Lahser Road Downstream to 12 Mile Road**

| Metric | Desired Target |
|---|---|
| AC – Amphibian Community | Increase frog/toad species count from 4 to 6 |
| AHR – Aquatic Habitat Ranking | Maintain "Good" Procedure 51 rating |
| BSI – Bank Stability Index | Improve from "Unstable" to "Stable" |
| FC – Fish Community | "Acceptable" Procedure 51 ratings |
| FQI – Floristic Quality Index | Not Determined, Average % native species ≥75% |
| MC – Macroinvertebrate Community | Improve from "Fair" to "Acceptable" rating |
| RBFI – Richards-Baker Flashiness Index | Halt trend to increasing flashiness |
| WFV – Wetland Functional Value | Flood Attenuation, Wildlife, Water Quality |
| WQ – Water Quality | Average wet-weather TSS ≤ 80 mg/L<br>Dissolved oxygen ≥ 5 mg/L<br>*E. coli* bacteria ≤ 130 mg/L |

**Management Recommendations**

**Goal: Maintain/Expand Riparian Buffer (**Targets: AHR, FQI, WFV, WQ**)**

*Recommendation 75:* Work with riparian landowner(s), encouraging reestablishment of cleared streamside vegetation.

**Goal: Reduce erosion and sedimentation (**Targets: AHR, BSI, FC, MC, WQ**)**

*Recommendation 76:* Work with riparian landowner(s) to replace existing riprap with vegetative or more aesthetically pleasing erosion control methods. (see photo insets 2 and 3, Figure 26).

*Recommendation 77:* Expand existing streambank stabilization area further downstream (likely in different ownership) to capture the section of bank eroded, in part, due to riprap immediately upstream (see photo insets 2 and 3, Figure 26).

The landowners at this location obviously value the river. They, or former owners, have cleared vegetation to better the view of the river and have placed lawn chairs at the river's edge to sit and enjoy it. They may be open to suggestions for protecting and beautifying this section of river.

**Goal: Manage Woody Debris (**Targets: AHR, BSI**)**

*Recommendation 78:* Investigate options to replace/bury elevated pipes crossing the river and causing log jams.

The pipe crossing the river near the intersection of Lincoln and Highbank Streets will continue to capture LWD (photo inset 1, Figure 26) and, as such, restricts paddling access and paddlers are forced to portage on private property. As is, this location will require on-going, perhaps annual log removal if paddling access is to be maintained in this section of the RGC. Alternatives to the current infrastructure may eliminate this LWD collection point.

**Goal: Expand Survey and Monitoring Efforts**

*Recommendation 79*: Consider sampling for mussels in this reach. Conduct follow-up mussel surveys every 5 to 10 years if found to contain diverse mussel assemblage.

### 3.2.12 PARK/PRESERVE: VALLEY WOODS NATURE PRESERVE AT STREAMWOOD, SOUTHFIELD

*Riparian Habitat Characterization*

This 66-acre preserve is bound on the north by 12 Mile Road and on the south by Northwestern Highway/ Lodge Freeway (Figure 27). The Rouge River flows through this preserve with parkland on either side through the middle of the site, but bordered on one side by private land (east bank in the north, west bank to the south) at the upper and lower ends of the preserve.

Mature MNFI floodplain forest dominated by maples (*Acer* spp.) within the Berberian parcel of Valley Woods Nature Preserve at Streamwood.

The central (a.k.a. Berberian) parcel of this preserve contains mature, intact floodplain forest, mesic southern hardwood forest, and possible small remnants of dry-mesic southern forest.[91] The lower portions of this parcel are dominated by mature sugar and black maples and likely flood infrequently; although a number of oxbow wetlands probably pool water seasonally.

The tree canopy on the slopes and upper elevations within the parcel are dominated by white (*Quercus alba*), bur oak (*Quercus macrocarpa*), and red oaks (*Quercus rubra*), black walnut, bitternut, pignut, and shagbark hickories (*Carya cordiformis, C. glabra, and C. ovata*) and American beech (*Fagus grandifolia*) and are nearly free of invasives in all vegetative strata.

The preserve extends north of the Berberian parcel towards 12 Mile Road (Figure 27). A similar maple-dominated forested floodplain with seasonally-flooding oxbow wetlands exists throughout most of this section, in addition to an old field area and some limited upland hardwood forest.

The portion of Valley Woods at Streamwood extending south of the Berberian parcel, towards I-696, is of much lower natural quality than the two upper sections. Here, cottonwoods, box elder, and elms dominate the forest canopy in most places (Figure 27). Overall, this portion more closely resembles the Valley Woods Trail and Valley Woods Nature Preserve at 10 Mile rather than the plant communities located upstream within the rest of the preserve.

*Floristic Quality Scores*

A total of 331 plant species have been identified at Valley Woods Nature Preserve at Streamwood. Of these, 74% (245) are native. This portion of the Valley Woods Nature Preserve exhibits an FQI of 51.9 with a mean C value of 2.9 (Appendix C). The floristic quality of this preserve is exceptional and represents a significant component of Michigan's native flora.

High-scoring species located here include American bladdernut (*Staphylea triflora*, C=9), state special concern twinleaf (*Jeffersonia diphylla*, C=9), state special concern wahoo (*C=8*), state threatened goldenseal (*Hydrastis canadensis,* C=10), state special concern broad-leaved puccoon (*Lithospermum latifolium,* C=10), harbinger of spring (*Erigenia bulbosa*, C=10), beech drops (*Epifagus virginiana,* C=10), state special concern field dodder (*Cuscuta campestris,*

[91] Lee, J.G. 2007. Natural community abstract for dry-mesic southern forest. Michigan Natural Features Inventory, Lansing, MI. 15pp.

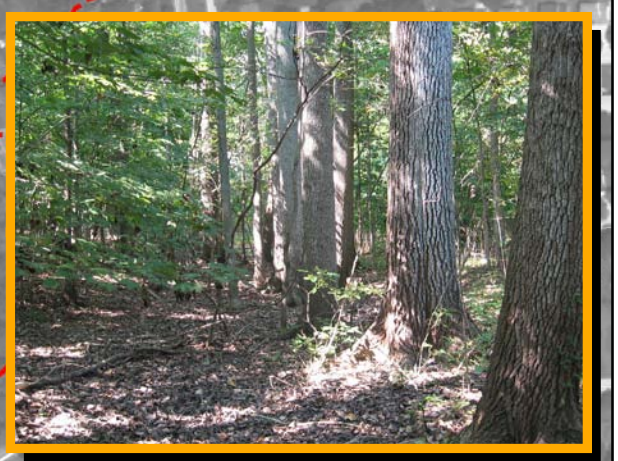
**Data Table**

| | |
|---|---|
| FQI Rating: | Rare, Extremely Valuable |
| Aquatic Habitat Ranking: | Good |
| Bank Stability Index: | Unstable |
| Greatest Asset: | High Quality Forest with Rare Plants |
| Biggest Threats: | Invasive Species, Erosion |

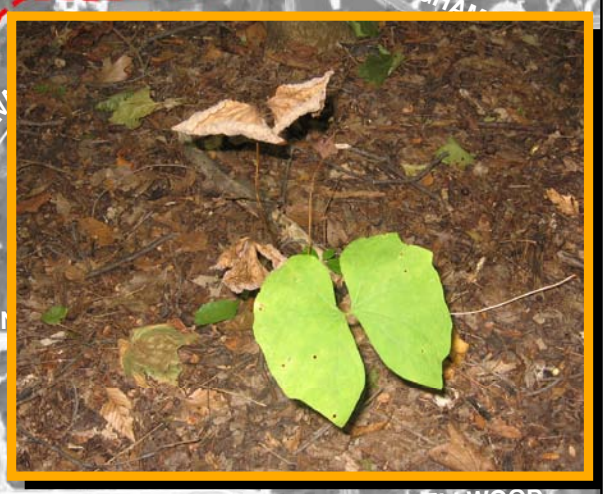
**Management Note**: Potential site for prairie planting

**Management Note**: Monitor and limit encroachment of invasive species

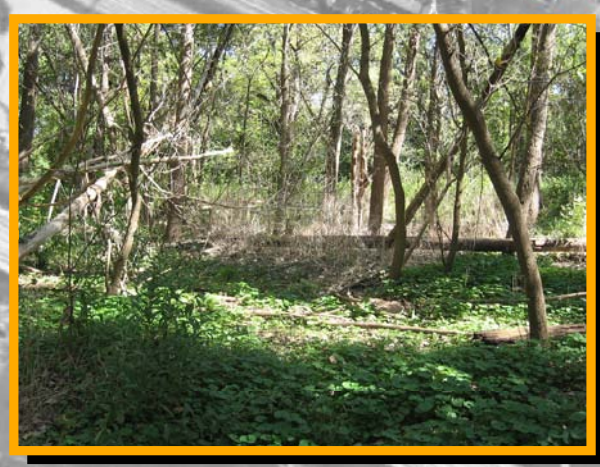
Possible Remnants of Dry-Mesic Southern Forest



1. Mature cottonwoods line an old river channel within the Valley Woods Preserve.



2. Twinleaf (*Jeffersonia diphylla*) located on the Berberian Parcel.



3. Typical floodplain forest in the southern portion of Valley Woods Preserve.

## Legend

- Park Boundaries
- Logjams
- Invasive Species
- Streambank Erosion
- Highest Priority Erosion
- Rare Species
- Stormwater Outfall
- Berberian Property
- Rouge Green Corridor Limit
- Rivers, Lakes, & Ponds
- Floodplain Forest
- Mesic Southern Forest
- Old Field
- 1 Photo Location

# Rouge Green Corridor Habitat Assessment

Oakland County, Michigan

400 0 400 Feet

Created by: AGS, August 1, 2008, ASTI Project 6602
Aerial Photograph: USDA 2005

Figure 27 - Park/Preserve: Valley Woods at Streamwood, Southfield

C=10), state threatened red mulberry (*Morus rubra*, C=9), tulip tree (*Liriodendron tulipifera,* C=9), rue anemone (*Anemonella thalictroides*, C=8), green dragon (C=8), Jame's sedge (*Carex jamesii*, C=8), spreading sedge (*Carex laxiculmis*, C=8), redbud (C=8), riverbank wild rye (*Elymus riparius*, C=8), creeping love grass (*Eragrostis hypnoides*, C=8), swamp white oak (C=8), and pawpaw (*Asimina triloba,* C=9).

*Aquatic Habitat Characterization*
Substrate in this reach is a good mix of gravel, cobble, boulder, sand, and hard-plan clay. Habitat types present include a variety of shallow and deep pools, riffles, runs, and overhanging banks and rootwads. LWD, although primarily concentrated in logjams, is also present as single, submerged trees/logs. The size and amount of LWD (whole trees) caught in the bridge at 12 Mile Road demonstrates the power of Rouge River storm flows even this high in the drainage.

Despite the relatively high gradient, the natural riparian cover, and the sorting and deposition of sediment, the water was fairly turbid in this reach during dry weather. Filamentous green algae are present in a short section of this reach downstream of 12 Mile Road. Its presence here is likely a response to storm water inputs at 12 Mile Road.

Erosion within this reach is largely continuous, though recent deposition is allowing some eroded areas to be re-vegetated. Fresh sediment deposition in both point and mid-channel bars is evident throughout much of this reach. At the time of ASTI's surveys, water levels were low and much of this depositional habitat was exposed above the water line. Residents along the river have responded to erosion problems with a variety of different measures and materials including stone, stacked concrete bags, block and sheet pile seawalls and gabions.

The latter appear the most stable and most readily naturalized. Each resident is understandably responding to the erosion as evidenced on their property. The collective result, however, is a haphazard response that detracts from the aesthetics of the river corridor and, in some cases, simply exacerbates erosion at the upstream or downstream terminus of the treatment.

The Franklin Branch enters the Rouge main branch near the midpoint of the preserve, opposite the Berberian parcel. This channel exhibits significant bank erosion and a mobile substrate dominated by sand. It appears to serve as a source of finer grained sediments entering the main branch.

*Aquatic Habitat Scores*
In-stream habitat in this reach is riffle/run dominated, with pools scoured on the outside bends. Aquatic habitat within this river segment rated as "good." The width and high quality of an undisturbed riparian forest and the variety of in-stream habitat types were key factors in the score for this reach. Negative observations include extensive bank erosion, the amount of exposed sand/gravel bar habitat, and areas where vegetative cover has been removed by residents. Bank-stability within this reach rated as "unstable" (Appendix B).

*Invasive Plant Species*
The central Berberian parcel is relatively free of invasive species with the exception of occasional Japanese barberry, garlic mustard, and dame's rocket. Elsewhere within the preserve, the understory is somewhat compromised by invasive shrubs (honeysuckle, buckthorn, and multiflora rose) and invasive herbaceous plants. Garlic mustard and dame's rocket are prevalent in some riparian areas, primarily near 12 Mile Road and south of the Berberian parcel. Due to their proximity, they may potentially spread into the central portion of the preserve. Small areas of

reed canary grass are also present along the river channel, especially south of the Berberian Parcel.

*Threatened and Endangered Species*
Five state special concern or threatened species are known from within this preserve: the state special concern twinleaf, state threatened goldenseal, state special concern broad-leaved puccoon, and state special concern field dodder, and state special concern wahoo. The federally endangered Indiana bat could potentially utilize the site. Given the integrity of the native plant community, it is also likely that additional surveys for rare plant and animal species could identify additional species within this preserve.

*Wildlife*
Because of its large size and diversity of mature, intact habitats, Valley Woods Nature Preserve at Streamwood supports a variety of wildlife. Its mature hardwood forests likely provide habitat for a wide variety of migratory and nesting passerine birds. ASTI observed whitetail deer, muskrat and other small mammals, mallards and wood ducks, belted kingfisher, and a wide variety of songbirds within the preserve. Frog and toad count data for the northern sections of this preserve list a maximum of 2 species per year since 1998; the southern portion is not surveyed. No other detailed fish or wildlife surveys have been conducted within this preserve.

*Floodplain Assessment*
Similar to other parks, flood flow alteration and sediment removal are principal functions and values for Valley Woods Preserve at Streamwood (Appendix B). Both north and south of the central Berberian parcel the floodplain appears to flood regularly and in doing so stores and slow floodwaters and settles sediment. The Berberian floodplain appears to flood with less frequency, but a number of oxbow wetlands here and south of the Berberian parcel likely detain floodwaters and may provide nutrient removal. The Berberian floodplain plant community is also of state-wide significance, making biodiversity conservation a principal function of this floodplain.

*Functions and Values*
Valley Woods Nature Preserve at Streamwood provides wildlife habitat and green space, flood control and storage, and has an intrinsic value as a preserve for a significant plant community. The preserve harbors a number of plant species not found in other sites surveyed within the RGC, including species that are rare within the state.

*Greatest Asset and Biggest Threat*
The best asset of this preserve is the nearly-undisturbed floodplain forest, dry-mesic southern forest, and mesic southern forest that represent significant natural features within the state. These communities harbor many species not surveyed at other sites (and possibly not present elsewhere along the RGC), further highlighting the significance of this preserve.

The biggest threats to this preserve are the potential spread of existing invasive species and the potential for increased human disturbance (i.e., public use, trail building), which may further increase the spread of invasives and compromise sensitive native species. Much of this park has persisted as a high-quality remnant habitat because of the absence of human disturbance that has been detrimental to most of the other parks and preserves within the RGC. This particular parcel and its plant community are at risk from any human activities that change the natural ecological and hydrological processes of this woodland and floodplain community.

**Management Targets**

**Location: Valley Woods Nature Preserve at Streamwood, Southfield**

| Metric | Desired Target |
|---|---|
| AC – Amphibian Community | Increase frog/toad species count from 2 to 4 |
| AHR – Aquatic Habitat Ranking | Maintain "Good" Procedure 51 rating |
| BSI – Bank Stability Index | Improve from "Unstable" to "Stable" |
| FC – Fish Community | "Acceptable" Procedure 51 ratings |
| FQI – Floristic Quality Index | Maintain FQI $\geq$ 50, retain rare plant species |
| MC – Macroinvertebrate Community | Add macroinvertebrate monitoring station |
| RBFI – Richards-Baker Flashiness Index | Halt trend to increasing flashiness |
| WFV – Wetland Functional Value | Flood Attenuation, Wildlife, Water Quality |
| WQ – Water Quality | Average wet-weather TSS $\leq$ 80 mg/L<br>Dissolved oxygen $\geq$ 5 mg/L<br>*E. coli* bacteria $\leq$ 130 mg/L |

**Management Recommendations**

**Goal: Manage Invasive Species (**Targets: FQI, WFV**)**

*Recommendations 30, 31:* Inventory invasive plant species as described in recommendations for all parks and preserves. Conduct invasive plant management as priorities dictate and resources allow.

*Recommendation 80:* Identify opportunities to eradicate or reduce early infestations on or near the Berberian Property before they can threaten rare plant species.

*Recommendation 81:* Evaluate the need for/install a deer exclosure(s) within the Berberian tract to protect rare plant concentrations.

*Recommendation 82*: Consider invasive species response when planning for/designing new trails, roads, and other openings in the canopy within the central portion of Valley Woods at Streamwood. Maintain the minimum widths possible for trails and minimize tree clearing to avoid disturbance that may facilitate invasive species introductions.

*Recommendation 83*: Explore opportunities for removing invasives species and restoring native species at the north end of the park, while allowing for planned parking and trails.

*Recommendation 84*: Provide trail signage encouraging local native landscaping and discouraging invasive non-native plant species and tying that effort to protection of the park.

Preventive invasive species monitoring and control should be a priority within the central portion of this site (the Berberian parcel and extending northwards approximately half-way towards 12 Mile Road). Currently, this area is relatively undisturbed by invasive species, though several species are present and not yet fully established. Invasives species currently present or threatening include Japanese barberry, dame's rocket, garlic mustard, buckthorn, and

honeysuckle. The success of current invasive species control programs should be monitored and evaluated.

The large area of fill dirt in the northwest corner of the preserve and adjacent to 12 Mile Road could be seeded/planted with native prairie vegetation. This establishment would be best accomplished by two applications of glyphosphate herbicide (early spring and late summer) followed by a late fall broadcast or no-till seeding of the site with a native prairie seed mix. Regular spring mowing (see Douglas Evans Nature Preserve: *Planted Prairie and Wet Meadows*) could then be used to maintain this open, native, vegetation community in place of the predominantly non-native vegetation currently present.

**Goal: Maintain/Expand Vegetated Riparian Buffer** (Targets: AHR, FQI, WFV, WQ)

*Recommendation 85:* Explore opportunities to purchase additional parcel across river from the Berberian Property at the mouth of the Franklin Branch.

*Recommendation 86:* Design trail network to maximize contiguous habitat acreage unimpacted by edge effects.

Land on the west side of the river, along the Franklin Branch outside of the park, exhibits a great deal more invasive shrubs and may be a threat for spreading across the river. This parcel has been considered for additional land acquisition, which would allow greater invasive species control to protect the existing Berberian parcel.

**Goal: Expand survey and monitoring efforts**

*Recommendation 87:* Establish a volunteer macroinvertebrate monitoring station at Valley Woods at Streamwood.

*Recommendation 88:* Conduct bird surveys including annual counts of individuals in each species, where possible, to detect population changes.

*Recommendation 89:* Consider adding a frog and toad monitoring site within the southern half of the park.

*Recommendation 90:* Expand volunteer, contractor, and/or agency staff surveys to include insects and herptiles.

*Recommendation 91*: Conduct mussel survey within the park and resample every 5 to 10 years if mussel assemblage is found to be diverse or sensitive.

*Recommendation 92*: Monitor known rare plant communities to determine if deer browsing is negatively impacting plants.

*Recommendation 93:* Record frequency and extent of flooding within the central area of the park. Assess whether changing stream morphology is altering the historic flood frequency and negatively impacting plant communities.

Substantial effort has been put into surveying plant species within this park, particularly within the Berberian section. It does not appear, however, that spring wildflowers and other ephemeral plants have been surveyed. Also, given some of the rare plant species located here regular surveys should be conducted to monitor their persistence over time. Other than frog and toad data, very little other survey information exists from this area. Given the exceptional qualities of the habitat found here, surveying for aquatic and terrestrial wildlife should be a priority at this site.

Although significant lateral erosion is noted throughout most of the RGC, the degree of channel down-cutting (degradation) has not been measured. Channel degradation, with attendant reduction in over-bank flooding or changes in local water table, could threaten the viability of floodplain wetlands and the rare species found there. Long-term monitoring should be established to track floodplain dynamics and floodplain connectivity should be restored if necessary.

**Goal: Reduce Erosion and Sedimentation (**Targets: AHR, BSI, FC, MC, WQ**)**

*Recommendation 94:* Evaluate older, private property streambank stabilization within this reach; determine need for replacing to improve aesthetics or function.

*Recommendation 95:* Continue stream bank stabilization for high priority sites identified in the Franklin Branch Erosion Inventory.

The success and need for current steambank erosion and woody debris management activities should be carefully evaluated within this park and river reach, as these activities could have potential unintended consequences related to further erosion and the introduction of invasive plant species. A coordinated strategy for replacing or eliminating existing streambank stabilization treatments, over time, should be considered to improve aesthetics and reduce end-of-treatment erosion hot spots.

The Franklin Branch enters the RGC within this park and appears to transport notable sand bedload to the mainstem. This tributary system has been inventoried and the City of Southfield has been constructing streambank stabilization projects to address high priority sites. These efforts are encouraged to reduce sediment loading to the RGC mainstem.

### 4.2.13 PARK/PRESERVE: VALLEY WOODS TRAIL AT CIVIC CENTER DRIVE, SOUTHFIELD

*Riparian Habitat Characterization*

Forested and shrub-carr wetlands are present along the toe of the floodplain slope within Valley Woods Trail at Civic Center.

This 34-acre park is bound by the Lodge Freeway (M-10) on the north, Telegraph Road (US-24) on the west, and Civic Center Drive to the south. This park contains a diversity of emergent and southern shrub-carr wetlands[92] interspersed within cottonwood and willow-dominated floodplain forest. This park also contains some fairly intact mesic southern hardwood forest at the edges of the floodplain, along the park boundary (Figure 28).

This park has been historically disturbed by trail building, river channelization, and from fill and debris pushed into the floodplain from outside the current park boundaries. The relatively intact floodplain forest present in parks immediately upstream and downstream of this park is absent here, likely cleared in activities related to this site's history as a mill pond and celery farm.

*Floristic Quality Scores*

The plant community within Valley Woods Trail at Civic Center Drive exhibits an FQI of 22.9 and a mean C value of 2.4 (Appendix C). These scores are only slightly higher than those exhibited by most undeveloped land within Michigan. A total of 92 species were recorded for this park, 70% (64) of which are native species. High scoring species observed in this park include beaked agrimony (*Agrimonia rostellata*, C=8), pin oak (C=8), swamp white oak (C=8), and great water dock (C=9).

*Aquatic Habitat Characterization*

As noted above, this river reach has been dredged historically. Both river banks have been stabilized with either concrete rip rap or a synthetic, honeycomb, geocellular containment material. The channel can be characterized as having recovered from dredging, in that the channel appears to be stable and exhibits little erosion compared to other reaches within the RGC. But the channel exhibits little sinuosity, and the formation of a meandering pattern is constrained by the streambank armoring.

The cellular containment system appears to have worked well to stabilize erosion above the ordinary high water mark (OHWM) (i.e., the cells are filled with soil and vegetation has become established within the grid system). However, below the OHWM, any soil that once occupied the cells has been washed away. The honeycomb cells extending into the water, along with scattered rip rap, degrade the aesthetics of this reach, though they likely help to dampen erosive velocities in the channel and provide a form of overhanging structure for small fish.

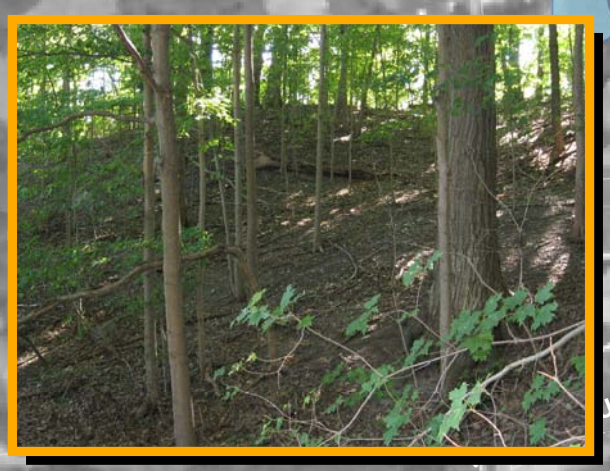
[92] Kost, M.A., D.A. Albert, J.G. Cohen, B.S. Slaughter, R.K. Schillo, C.R. Weber, and K.A. Chapman. 2007. Natural Communities of Michigan: Classification and Description. Michigan Natural Features Inventory, Report No. 2007-21, Lansing, MI.

1. Emergent wetlands in the north end of the Valley Woods Trail.

**Management Note**: Potential site for large-scale wetland restoration project

**Data Table**

| | |
|---|---|
| Aquatic Habitat Ranking: | Marginal |
| Bank Stability Index: | Stable |
| Greatest Asset: | Wetland Diversity |
| Biggest Threat: | Invasive Species |



2. Mesic southern forest lines the up slope from the floodplain to developed land.

**Legend**

- Park Boundaries
- Invasive Species
- Streambank Erosion
- Stormwater Outfall
- Rouge Green Corridor Limit
- Rivers, Lakes, & Ponds
- Emergent Wetland
- Southern Shrub-Carr
- Floodplain Forest
- Mesic Southern Forest
- 1 Photo Location

Rouge Green Corridor Habitat Assessment

Oakland County, Michigan

200 0 200 Feet

ASTI Environmental

Created by: AGS, August 1, 2008, ASTI Project 6602
Aerial Photograph: USDA 2005

Figure 28 - Park/Preserve: Valley Woods Trail at Civic Center, Southfield

Due to historic dredging and the lack of a meandering channel configuration, aquatic habitat in this reach is simplified. Pools are largely lacking, although one large, deep pool is present along the right bank (looking downstream) near the northern end of the park. This was the only location in the RGC where ASTI personnel observed anyone fishing along the river. Riffle habitat and LWD are also limited throughout this reach.

*Aquatic Habitat Scores*
This river segment scored at the upper end of the "marginal" category. Previous channel modifications have simplified the habitat within this reach and the lack of pools, riffles, LWD, and native vegetation protecting the banks within portions of the park are the key factors in its lower score. Efforts at bank stabilization and adding structure to the channel were conducted here previously by the Michigan Wildlife Habitat Council. Bank-stability within this reach was determined to be "stable" (Appendix B).

*Invasive Plant Species*
Valley Woods Trail is dominated by a variety of low quality species, including reed canary grass, eastern cottonwood, and box elder. Non-native invasives are also prevalent, especially buckthorn and honeysuckle along roadways, adjacent to development, and along the banks of the river. Purple loosestrife is well-established in many of the wetlands; common reed is present, but not yet well established.

*Threatened and Endangered Species*
No endangered, threatened or special concern species are known to occur in this park. ASTI did not observe any listed species at this park.

*Wildlife*
Wildlife usage is moderate at this park, helped by the diversity of habitats and the presence of adjacent natural areas, although travel between the natural areas by land mammals is likely compromised by the isolating presence of M-10 and M-24. Emergent and shrub wetlands within the park likely provide habitat for a variety of reptiles and amphibians (frog and toad count data lists a maximum of 2 species per year for this quarter section).

Channelization of the river has degraded in-stream fish habitat, but a sign immediately south of Civic Center Drive identifies this reach as an experimental, catch-and-release river segment where tagged smallmouth bass (*Micropterus dolomieu*) have been planted by the MDNR. ASTI ecologists noted that, whereas in-stream habitat at this location is simplified, better fisheries habitat exists both upstream and downstream of this point and wondered how far these tagged fish may have traveled from the initial planting location. Follow-up telephone conversation with MDNR fisheries biologist revealed that this was a municipally-sponsored release of 17 tagged fish in 1989. Additional small releases of smallmouth were conducted in 1981 and 1991, but the MDNR has not studied the efficacy of these stocking efforts.[93] MDEQ mussel surveys located 3 species of native freshwater mussels within this park including the white heelsplitter, floater, and the fluted-shell (*Lasmigona costata*).[94]

[93] Francis, James, Michigan Department of Natural Resources Fisheries Biologist, pers. comm., November 7, 2007.
[94] Rathburn, J.E. Qualitative Survey of the Distribution of Freshwater Mussels (Bivalva:Unionidae) in the Rouge River, Michigan (U.S.A.) Watershed: 1998-2003. Michigan Department of Environmental Quality.

*Floodplain Assessment*
The floodplain at Valley Woods at Civic Center is closer in elevation to the river and thus floods at a greater frequency than many of the other parks and preserves evaluated. This floodplain is also mostly wetland and contains a number of densely-vegetated emergent wetlands that are not typically found at the other parks and preserves. Because of this, the floodplain here likely provides greater flood flow alteration and sediment removal than other parks, and the emergent wetlands and vegetation also provide nutrient removal functions (Appendix B). All of these functions, however, have likely been degraded due to channelization of the river and ditching to drain floodplain wetlands. The floodplain areas also offer valuable wildlife habitat.

*Functions and Values*
The main functions of this park are wildlife habitat, floodwater storage, recreation, and green space. This park also provides valuable public access to the river and walking trails within this urban environment.

*Other Observations*
The proximity of major roads and highways to the north, west, and south of this park, and the resulting traffic noise give this park a decidedly urban feel. This is exacerbated by the straightened channel and streambank armoring throughout most of the park. However, as noted above, this park's primary function is as an urban park, readily accessible to high-rise, multi-family housing near the southeastern corner of the park.

People were observed sitting on park benches, walking the trail, and fishing along the river. The trail, along with a stairway from the sidewalk along Civic Center Drive, connects this park with the next river segment downstream as well. Although no formal boat access is provided in this park, the river is readily accessible from the trail.

*Greatest Asset and Biggest Threat*
The best natural asset at this park is the diversity of wetland habitats found here, including emergent, shrub-carr, and forested wetlands. This park also provides a public walking trail, something not readily available in nearby parks. The biggest threat to this park is the presence of well-established population of invasive species.

**Management Targets**

**Location: Valley Woods Trail at Civic Center Drive, Southfield**

| Metric | Desired Target |
|---|---|
| AC – Amphibian Community | Increase frog/toad species count from 2 to 4 |
| AHR – Aquatic Habitat Ranking | Improve from "Marginal" to "Acceptable" |
| BSI – Bank Stability Index | Maintain "Stable" rating |
| FC – Fish Community | "Acceptable" Procedure 51 ratings |
| FQI – Floristic Quality Index | Maintain FQI $\geq$ 20 |
| MC – Macroinvertebrate Community | Improve from "Poor" to "Acceptable" |
| RBFI – Richards-Baker Flashiness Index | Halt trend to increasing flashiness |
| WFV – Wetland Functional Value | Flood Attenuation, Wildlife, Water Quality |
| WQ – Water Quality | Average wet-weather TSS $\leq$ 80 mg/L<br>Dissolved oxygen $\geq$ 5 mg/L<br>*E. coli* bacteria $\leq$ 130 mg/L |

**Management Recommendations**

**Goal: Restore Wetlands** (Targets: FQI, WFV)

*Recommendation 96:* Restore capacity of wetlands to store and detain storm water by removing or blocking existing culverts and shallow ditches and placing rock-armored inlets within spoil banks and upstream and downstream ends of park.

Large areas of floodplain wetland exist up and down the sides of the Rouge River throughout this park, and these wetlands have a long history of disturbance, as evidenced by the number of shallow ditches, culverts, and spoils banks within these partially-drained wetlands. It would be a large undertaking, but a substantial opportunity exists to utilize these spoils banks to enhance the capacity and ability of these wetlands to store and detain watershed storm water and to store and detain Rouge River floodwaters.

In essence, the existing culverts and shallow ditches which are draining water from the floodplain wetlands into the river channel could be removed or blocked, essentially pooling and storing rainfall and storm water from neighboring streets and properties within the wetland areas rather than having it flow more-or-less directly into the river channel. Additionally, rock-armored inlets could be placed within the spoils banks at the upstream and downstream ends of the park allowing and encouraging floodwaters from the river to over-top and flood the wetland areas, thus providing additional floodwater storage within the RGC. These wetland enhancements would also have many other side-benefits, including improved wildlife habitat, aesthetic values, and deeper water levels that may discourage many of the invasive wetland plants currently present.

Valley Woods Nature Preserve at 10 Mile Road contains a variety of wetland habitat types, including emergent wetland.

**Goal: Expand Survey and Monitoring Efforts**

*Recommendation 97:* Expand volunteer, contractor, and/or agency staff surveys to include insects and herptiles.

*Recommendation 98:* Consider conducting a fish survey within this reach to determine if previous efforts to provide fish cover were successful or if more should be done to enhance fishing opportunities.

Surveys for freshwater mussels have been conducted within this park and should be repeated periodically. Annual monitoring of frogs and toads and macroinvertebrates should also continue. Additional surveys for aquatic insects, birds, and terrestrial wildlife would also be beneficial. Expanded plant survey data, particularity for spring plants, would help round-out the FQA scores and increase their interpretability.

**Goal: Educate/Involve Residents in Riparian Stewardship**

*Recommendation 99:* Provide pet-waste bags and educational signage in park regarding proper disposal.

*Recommendation 100:* Create signage/kiosks in park to provide education on other relevant topics as well.

*Recommendation 101:* Design and post signage connecting hiking trail to a water trail for canoes and kayaks.

Public access to Valley Woods Trial at Civic Center Drive is provided by a north-south walking trail. This trailhead provides an opportunity for interpretive and educational signs promoting good watershed and river stewardship on the part of the users and the community. Additionally, many residential homes and streets along the eastern edge of the park intentionally or unintentionally discharge storm water and other debris into the park, and public education on storm water management, "green" landscaping, and floodplain stewardship would be beneficial for both the park and the RGC.

**Goal: Manage Invasive Species (**Targets: FQI, WFV**)**

*Recommendations 30, 31:* Inventory invasive plant species as described in recommendations for all parks and preserves. Conduct invasive plant management as priorities dictate and resources allow.

*Recommendation 102:* Work with MDOT to manage invasive species within their ownership as a continuous unit with other portions of this park to minimize potential for neighboring seed sources.

Given the history of disturbance within this park, invasive species are generally pervasive throughout and controlling or eliminating them would be a substantial task. Wetland species such as common reed, reed canary grass, and purple loosestrife are well established within the wetland areas, and a variety of invasive shrub species have colonized the spoils banks alongside the straightened river. Targeted efforts at controlling the spread of common reed and purple loosestrife would be effective here. If purple loosestrife stands are sufficiently dense, using *Galerucella* spp. beetles as a natural control agent for the purple loosestrife may also warrant consideration.

**Goal: Reduce Erosion and Sedimentation (**Targets: AHR, BSI, FC, MC, WQ**)**

*Recommendation 103:* Replace geo-grid erosion control and riprap with vegetative stabilization to improve shoreline aesthetics, as resources allow.

This river segment has had extensive shoreline stabilization, some of which was purportedly to encourage meandering. The existing structures however appear to be holding the channel in place. ASTI recommends evaluating replacing the existing rip rap and geo-cellular material with natural stone and/or vegetative materials to improve aesthetics and to further facilitate habitat diversity. These changes could incorporate more in-stream habitat structures to increase pool habitat and provide overhead cover for fish and improve angling opportunities. Signage and dedicated access points could improve connections between the walking trail and water-trail and, thereby, encourage paddler or angler use.

**Goal: Promote the River and RGC as Recreational Assets**

*Recommendation 104*: Develop a formal walking trail through this park with designated fishing/viewing access to river's edge to limit erosion.

*Recommendation 105*: Design and post signage connecting hiking trail to a water trail for canoes and kayaks.

*Recommendation 106:* Develop a map/brochure for paddling the RGC.

*Recommendation 107*: Develop a dedicated walking trail connecting Southfield RGC parks and preserves between 12 and 10 Mile Roads.

The recommendation for a canoe/kayak launch site is placed here because Valley Woods Trail at Civic Center Drive offers the most proximal connection between a foot trail and the river between 13 and 10 Mile Roads, but they could also be listed wherever a dedicated launch site might be developed. The City of Southfield desires to develop a continuous walking trail along the river between 12 and 10 Mile Roads. This should be encouraged, but planned with a narrow footprint in areas currently lacking invasive species or harboring rare or highly valued plant species.

### 3.2.14 PARK/PRESERVE: VALLEY WOODS NATURE PRESERVE AT 10 MILE RD., SOUTHFIELD

*Riparian Habitat Characterization*

This 27-acre preserve is bound on the northeast, where the Rouge River enters the preserve, by Telegraph Road (US-24) and on the south by 10 Mile Road (Including the adjacent slope on the DENSO property; Figure 29). The river channel meanders through a relatively intact floodplain forest containing mature sycamore, oak and red ash trees. A variety of other tree species, including maple and elm, complete the overstory composition of this significantly large, functioning, floodplain forest. The plant communities within this preserve are diverse relative to many of the other park/preserve sites; a large emergent marsh is present in the northern end and a shrub-carr wetland is present at the southern end of the preserve.

*Floristic Quality Scores*

The plant community at Valley Woods at 10 Mile (including the adjacent forested slope on the DENSO property) exhibits an FQI of 29.8 with a mean C coefficient of 2.8 (Appendix C). These scores reflect the high number of native species of this preserve (75% [85] of 113 species observed). These scores indicate that the plant species composition of Valley Woods at 10 Mile Road is somewhat better than most remaining undeveloped lands across the state, but does not exhibit sufficient conservatism or species richness to be considered of statewide significance. High scoring species found in this preserve include green dragon (C=8), eastern narrow leaved sedge (C=8), swamp white oak (C=8), and great water dock (C=9).

Characteristic view of the Rouge River channel at Valley Woods Preserve at 10 Mile Road.

*Aquatic Habitat Characterization*

Although the northeast end of this preserve is bound by Telegraph Road, the river loses both its urban feel and regains a meandering form within a short distance from the highway. Substrate in this reach is a mix of coarser-grained gravel and cobble, with sand and finer-grained materials making up the majority of the mix. Due to a flattening of the valley slope below 10 Mile Road, Valley Woods at 10 Mile Road is the southern limit of parks/preserves characterized as riffle/run streams. Downstream of this park aquatic habitat is dominated by glide/pool habitat and softer, finer, more mobile substrate.

Erosion is prevalent and severe on outside bends throughout most of this reach, but the banks are seemingly more cohesive than in many areas upstream

Although still exhibiting significant bank erosion, cohesive soils provide overhanging cover for fish.

1. View across the emergent wetland located downslope of the DENSO property.

**Data Table**

| | |
|---|---|
| FQI Rating: | Average |
| Aquatic Habitat Ranking: | Good |
| Bank Stability Index: | Unstable |
| Greatest Assets: | Intact Forest; Habitat Diversity |
| Biggest Threats: | Invasive Species; Erosion |

**Management Note**: Potential site for large-scale wetland restoration project

**Management Note**: Control invasive common reed

2. Forested floodplain found within the Valley Woods Preserve.

**Legend**

- Park Boundary
- Invasive Species
- Streambank Erosion
- Logjams
- Stormwater Outfall
- Rouge Green Corridor Limit
- Rivers, Lakes, & Ponds
- Emergent Wetland
- Southern Shrub-Carr
- Floodplain Forest
- Mesic Southern Forest
- 1 Photo Location

# Rouge Green Corridor Habitat Assessment

Oakland County, Michigan

Feet
200 0 200

Created by: AGS, August 1, 2008, ASTI Project 6602
Aerial Photograph: USDA 2005

Figure 29 - Park/Preserve: Valley Woods at Ten Mile Road, Southfield

or downstream. Numerous trees have large portions of their rootwads hanging out over the stream. However, the rootwads here tend to hold onto the soil better, resulting in overhanging bank over/habitat lacking throughout most of the RGC.

Fresh sediment deposition and point bar formation is evident throughout much of this reach. Much of this depositional habitat is exposed above the water line during low flow times of the year. LWD is largely lacking in this reach outside of concentrated logjams. The upper end of this reach receives storm water inputs from several 36" pipes at and immediately downstream of Telegraph Road.

*Aquatic Habitat Scores*

In-stream habitat in this reach is riffle/run dominated with pools scoured on the outside bends. Aquatic habitat within this river segment rated as "good" and includes some of the best aquatic habitat observed within the RGC. The width and high quality of the undisturbed riparian forest and the variety of in-stream habitat types were key factors in the ranking of this reach. Negative observations included extensive bank erosion, the amount of exposed sand/gravel bar habitat, and the limited amount of stable, wetted, woody debris outside of logjams. Bank-stability within this reach was rated as "unstable" (Appendix B).

*Invasive Plant Species*

Invasive species are locally common within areas of the preserve; common reed is present in dense stands within the northwestern emergent marsh, and while much of the floodplain forest is relatively intact, portions of the understory are dense with invasive shrubs. Like most of the sites surveyed, invasive impacts tend to be worst near roadways and other disturbed areas.

*Threatened and Endangered Species*

No endangered, threatened, or special concern species are known to inhabit this site. ASTI did not observe any listed or candidate species within this preserve. The emergent wetlands could provide foraging habitat for Indiana bat, and dead elms, ash, or other trees in the floodplain with sloughing bark could potentially serve as roosting or maternity sites. However, bitternut hickory (*Carya cordiformis*) is the only hickory species recorded at this site, and it does not exhibit the shaggy bark of some other hickory species favored by the Indiana bat.

*Wildlife*

ASTI observed more signs of wildlife here than at any of the other sites surveyed. The relatively high use by wildlife is likely directly related to the larger size, presence of adjacent natural areas, the diversity of habitats available, and minimal human activity. Signs of red fox, numerous white-tailed deer, mink, a variety of other small mammals, waterfowl, belted kingfisher, and songbirds were all observed within the preserve. With the presence of permanent open water in wetland habitats and both emergent and shrub-carr wetland habitats, this site should support a variety of reptiles and amphibians. Frog and toad data for the surrounding quarter sections, however, only indicate maximums of 0 and 2 species recorded per year since 1998. No freshwater mussel species were found in the Rouge River at 10 Mile Road when surveyed by the MDEQ.[95]

*Floodplain Assessment*

Similar to Valley Woods at Civic Center, the emergent wetlands and low-lying floodplain forest found closer to 10 Mile Road likely provide substantial flood flow alteration, sediment retention,

[95] Rathburn, J.E. Qualitative Survey of the Distribution of Freshwater Mussels (Bivalva:Unionidae) in the Rouge River, Michigan (U.S.A.) Watershed: 1998-2003. Michigan Department of Environmental Quality.

and nutrient removal functions for the RGC (Appendix B). However, ditching of the wetlands and floodplain into the river decreases flood flow retention times and thus impairs these functions from their optimal abilities. The floodplain habitats present here also offer valuable wildlife habitat.

*Functions and Values*
This preserve provides a variety of natural functions, including floodwater retention and storage, wildlife habitat and green space. It also offers an unmarked hiking trial, though public access is difficult.

*Greatest Asset and Biggest Threat*
The greatest assets of this preserve are its large size, habitat diversity, and relatively intact floodplain forests and adjacent hardwood forests on the floodplain slopes. Threats to this preserve include common reed within the emergent wetland areas and invasive shrubs species within selected areas of the forested floodplain. Within the river channel, the greatest threat to aquatic habitat is the continued high volumes and velocities of Rouge River storm flows and the resulting erosion and sediment deposition.

**Management Targets**

**Location: Valley Woods Nature Preserve at 10 Mile Rd., Southfield**

| Metric | Desired Target |
|---|---|
| AC – Amphibian Community | Increase frog/toad species count from 2 to 4 |
| AHR – Aquatic Habitat Ranking | Maintain "Good" Procedure 51 rating |
| BSI – Bank Stability Index | Improve from "Unstable" to "Stable" |
| FC – Fish Community | "Acceptable" Procedure 51 ratings |
| FQI – Floristic Quality Index | Improve FQI to $\geq$ 35 |
| MC – Macroinvertebrate Community | "Acceptable" Procedure 51 rating |
| RBFI – Richards-Baker Flashiness Index | Halt trend to increasing flashiness |
| WFV – Wetland Functional Value | Flood Attenuation, Wildlife, Water Quality |
| WQ – Water Quality | Average wet-weather TSS $\leq$ 80 mg/L<br>Dissolved oxygen $\geq$ 5 mg/L<br>*E. coli* bacteria $\leq$ 130 mg/L |

**Management Recommendations**

**Goal: Restore Wetlands** (Targets: FQI, WFV)

*Recommendation 108:* Restore capacity of wetlands to store and detain storm water by removing or blocking existing culverts and shallow ditches and placing rock-armored inlets at upstream end of park.

*Recommendation 109:* Explore the potential for a conservation easement on the hillside owned by the DENSO Corporation to facilitate restoration and protection activities.

Similar to Valley Woods Nature Preserve at Civic Center Drive, large areas of floodplain wetland exist up and down the sides of the Rouge River, especially within the northern end of this preserve. The emergent wetland in the northwestern corner of the preserve could be restored and utilized as a storm water and floodwater detention area. This wetland is well-drained by a

number of artificially-dug and naturally-eroded channels that carry water quickly out of the wetland area and into the Rogue River. If these channels were filled and a low dike were completed along the wetlands edge, storm water from surrounding properties and roadways could be captured and detained prior to discharge into the river. This would allow a variety of sediments and pollutants to settle prior to entering the river. Additionally, constructed rock inlets and outlets would allow spring floodwaters to overtop and store within the restored floodplain. This project would involve substantial design, planning, and permitting, but would restore this invasive-dominated, drained wetland from its current state into a shallow-water marsh.

**Goal: Manage Invasive Species (**Targets: FQI, WFV**)**

*Recommendations 30, 31:* Inventory invasive plant species as described in recommendations for all parks and preserves. Conduct invasive plant management as priorities dictate and resources allow.

Similar to Valley Woods Trail at Civic Center Drive, controlling or eliminating invasive species within this park would require a substantial investment of resources, as a wide variety of species are widespread here. If invasive species control is desired, targeted efforts should first be made to eliminate common reed and purple loosestrife from the preserve (especially within the northwestern wetland). Annual late-summer/early-fall spot spraying of the common reed and purple loosestrife with glyphosphate should accomplish the task. Reed canary grass is widespread throughout the northern part of the preserve and would be difficult to control, but higher water-levels resulting from restoration of the wetland would likely reduce much of the reed canary grass. Invasive shrubs species are prevalent within the wooded areas of the preserve and their complete control is likely unrealistic; however, limited control in areas of higher ecological value (for example, areas containing sycamore and green dragon [*Arisaema dracontium*]) may be beneficial.

**Goal: Expand Survey and Monitoring Efforts**

*Recommendation 110:* Establish macroinvertebrate monitoring station at this park.

*Recommendation 111:* Expand volunteer, contractor, and/or agency staff surveys to include insects, herptiles, and/or mammals.

Surveys for freshwater mussels have been conducted within this park and should be repeated at some point. Annual monitoring of frog and toad count data should also continue. Additional surveys for aquatic insects, birds, and terrestrial wildlife would also be beneficial. Expanded plant survey data, particularity for spring plants, would help round-out the FQA scores and increase their interpretability.

**Goal: Educate/Involve Residents in Riparian Stewardship**

*Recommendation 112*: Continue and celebrate the existing active partnership with the management and employees of the DENSO Corporation. Encourage their participation in local monitoring and restoration activities, both within the park and on DENSO property.

The DENSO Corporation owns high quality upland adjacent to Valley Woods at Ten Mile Road And has a strong, on-going working relationship with the Six Rivers Regional Land Conservancy. This relationship promises numerous opportunities for education and stewardship.

### 3.2.15 River Stretch: 10 Mile Road to Beech Road Between 9 and 8 Mile Roads

*Riparian Habitat Characterization*

This reach was surveyed as 3 different reaches (i.e., 10 Mile to Beech, Beech to 9 Mile, and 9 Mile downstream to Beech Road) and are presented in Figures 30, 31, and 32; however, they exhibit similar habitat characteristics and are described together here.

The riparian corridor in this section contains floodplain forest, dominated by American elm, willows, and box elder, and including black maple and large specimens of sycamore. On steep, or higher, slopes floodplain forest is replaced by southern mesic forest dominated by sugar maple, American basswood (*Tilia americana*) and beech (*Fagus grandifolia*).

*Aquatic Habitat Characterization*

The Rouge River exhibits a marked change downstream of 10 Mile Road. The larger, harder substrates, that were prevalent within the channel north of 10 Mile Road, disappear. In their stead, substrate materials are finer, sandier, and less stable. The river meanders within these reaches more than it does upstream of 10 Mile Road and sediment deposition within the channel is also greater. During ASTI's field investigation the segment south of 9 Mile Road was actively short-circuiting two meanders; incising overflow channels in times of high flow and depositing sediment to seal off the old meander channel.

Rather than riffles and runs, habitat within these reaches is dominated by larger, deeper pools with glide habitat between them. LWD is concentrated in logjams. Erosion within these reaches is largely continuous and severe.

*Aquatic Habitat Scores*

For the most part these river sections exhibit a good riparian buffer, but erosion is severe and the substrate is more mobile. The habitat rating for each of these reaches is "marginal" to "good." Bank-stability rated as "unstable" (Appendix B).

*Invasive Plant Species*

A number of invasive species are present along these reaches, including buckthorn, honeysuckle, garlic mustard, and Japanese knotweed. Some black maple stands toward the north end of this river segment are relatively free of invasive species cover.

*Wildlife*

Deer, fox squirrels, and a variety of common songbirds were observed in these sections. FOTR data indicates 3 to 7, 2, and 3 species of frogs and toads within the quarter sections containing these river segments, upstream to downstream, respectively.

*Functions and Values*

The riparian corridor in these reaches provides wildlife habitat and green space. The dramatic change in the river's morphology, precipitated by a change in the river/valley slope, coupled with the forested riparian corridor, provides an interesting and enjoyable paddling experience.

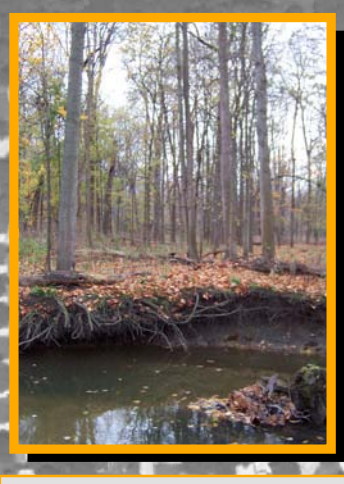
*Greatest Asset and Biggest Threat*

These sections offer a number of valuable assets, benefits and opportunities. These include the forested buffer to the river and the wildlife habitat it provides. Wetlands in abandoned oxbows

MAPLEBROOKE
GLENBROOKE
MCALLISTER
GREENBROOKE
CEDARBROOKE
OAKBROOKE
OAKBROOKE
TENMILE
GREENBORO
GRODAN
BEECH
FORESTVIEW
INGLESIDE
1
TIOGA
SUNNYPOINT
LARKINS
PLUMRIDGE
OAKGLEN
ANDYWYNNE

**Data Table**

| | |
|---|---|
| Aquatic Habitat Ranking: | Marginal to Good |
| Bank Stability Index: | Unstable |
| Greatest Assets: | Baseflow Discharge (near Beech Rd.); Forested Buffer |
| Biggest Threats: | Erosion; Invasive Species |



1. Overhanging banks created by stream erosion and meandering.

**Legend**

- Park Boundaries
- Invasive Species
- Streambank Erosion
- Logjams
- Stormwater Outfall
- Rouge Green Corridor Limit
- Rivers, Lakes, & Ponds
- Mesic Southern Forest
- Emergent Wetland
- Southern Shrub-Carr
- Floodplain Forest
- 1 Photo Location

# Rouge Green Corridor Habitat Assessment

Oakland County, Michigan

Feet
400 0 400

Created by: AGS, August 1, 2008, ASTI Project 6602
Aerial Photograph: USDA 2005

Figure 30 - River Stretch: Ten Mile Rd. to Beech Rd., Southfield

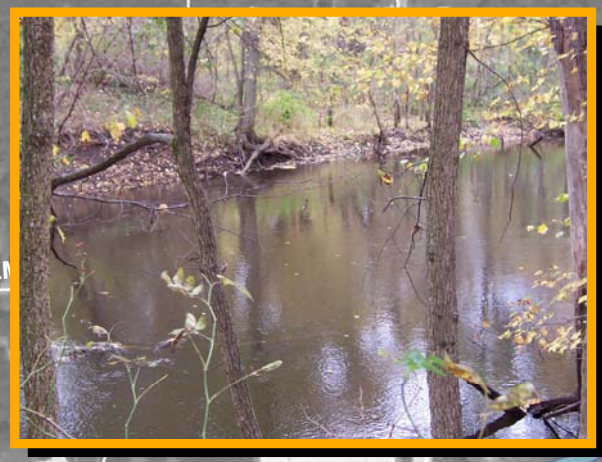
**Data Table**

| | |
|---|---|
| Aquatic Habitat Ranking: | Marginal to Good |
| Bank Stability Index: | Unstable |
| Greatest Assets: | Baseflow Discharge; Forested Buffer |
| Biggest Threats: | Erosion; Invasive Species |

**Management Note**: Limit impervious surface cover in area of high groundwater recharge

**Legend**

- Logjams
- Stormwater Outfall
- Invasive Species
- Streambank Erosion
- Rouge Green Corridor Limit
- Rivers, Lakes, and Ponds
- Floodplain Forest
- Mesic Southern Forest
- Oxbow
- 1 Photo Location



1. A view of the RGC Between Beech and Nine Mile Roads.

# Rouge Green Corridor Habitat Assessment

Oakland County, Michigan

Feet
400 0 400

Created by: AGS, August 1, 2008, ASTI Project 6602
Aerial Photograph: USDA 2005

Figure 31 - River Stretch: Beech Rd. to Nine Mile Rd., Southfield

**Management Note**: Limit impervious surface cover in area of high groundwater recharge

THORNCLIFFE
REXFORD
SAMOSET
OUTWOOD
OAKGLEN
BEECH
STAUNTON
LAKE RAVINES
NINEMILE
RANGEMORE
ROUGEMONT
RIVERDALE
MAPLEWOOD
ROUGEWOOD
ADELEIN
INDIAN
SHIAWASSEE
SEDALIA
DELAWARE
EMMETT
EAST
ROUGE

1

1

1

## Legend

- Park Boundaries
- Logjams
- Invasive Species
- Streambank Erosion
- Stormwater Outfall
- Rouge Green Corridor Limit
- Rivers, Lakes, & Ponds
- Floodplain Forest
- Oxbow
- Mesic Southern Forest
- 1 Photo Location

## Data Table

| | |
|---|---|
| Aquatic Habitat Ranking: | Marginal to Good |
| Bank Stability Index: | Unstable |
| Greatest Assets: | Baseflow Discharge; Flood Control |
| Biggest Threat: | Erosion |

1. Connections to old meander scars and floodplains could be enhanced to provide added stormwater control in the lower RGC.

Feet
500 0 500

# Rouge Green Corridor Habitat Assessment

Oakland County, Michigan

Created by: AGS, August 1, 2008, ASTI Project 6602
Aerial Photograph: USDA 2005

Figure 32 - River Stretch: Nine Mile Rd. to Beech Rd., Southfield

add further habitat diversity and may provide opportunities to re-connect the river with its floodplain (or at least to engineer more frequent overbank flow). The potential exists to improve flood attenuation, sediment deposition, and nutrient processing in the lower RGC.

Also, GIS-based models indicate that near shore areas at the bend in the river between Beech Road south of 10 Mile Road and the downstream limit of the RGC at 8 Mile Road, and near shore areas associated with tributaries entering the river here from the west, provide the highest rates of groundwater discharge within the RGC. Minimizing the amount of impervious surface and artificial storm water conveyance within these areas may help maintain river base flows. Given the shallow water depths throughout the RGC, this is important at least for these lower reaches.

Threats to habitat integrity within these reaches include severe banks erosion, sediment deposition, and a number of invasive forbs and shrub species. Side-gully erosion in these reaches may also be a significant source of sediment loading to the Rouge.

**Management Targets**

**Location: 10 Mile Road to Beech Road Between 9 and 8 Mile Roads**

| Metric | Desired Target |
|---|---|
| AC – Amphibian Community | Re-establish frog/toad species count of 7 |
| AHR – Aquatic Habitat Ranking | Maintain "Good" Procedure 51 rating |
| BSI – Bank Stability Index | Improve from "Unstable" to "Stable" |
| FC – Fish Community | "Acceptable" Procedure 51 ratings |
| FQI – Floristic Quality Index | Not Determined, Average % native species $\geq$75% |
| MC – Macroinvertebrate Community | "Acceptable" Procedure 51 rating |
| RBFI – Richards-Baker Flashiness Index | Halt trend to increasing flashiness |
| WFV – Wetland Functional Value | Flood Attenuation, Wildlife, Water Quality |
| WQ – Water Quality | Average wet-weather TSS $\leq$ 80 mg/L<br>Dissolved oxygen $\geq$ 5 mg/L<br>*E. coli* bacteria $\leq$ 130 mg/L |

**Management Recommendations**

**Goal: Reduce Erosion and Sedimentation (**Targets: AHR, BSI, FC, MC, WQ**)**

*Recommendation 113:* Stabilize eroding gullies and crumbling infrastructure in all 3 of these reaches.

**Goal: Connect River and Floodplain (**Targets: AHR, BSI, FC, RBFI, WQ, WFV**)**

*Recommendation 114:* Enhance floodwater storage in former oxbows, meanders and wetlands.

This section of the river exhibits a number of eroded side channels or gullies, some with damaged infrastructure. Planting or otherwise stabilizing these will reduce sediment loads to the river and help restore fish habitat. Additionally, old meander scars or oxbows could be engineered to augment flood storage, sediment deposition, and nutrient cycling.

**Goal: Reduce Flashiness** (Targets: AHR, BSI, RBFI)

*Recommendation 115:* Explore overlay zoning in Darcy Map priority areas to facilitate infiltration and reduce imperviousness.

Alluvial soils within the river valley should be protected, with limits on the amount of impervious cover allowed, to protect groundwater recharge zones.

### 3.2.16 PARK/PRESERVE: BEECH WOODS PARK, SOUTHFIELD

*Riparian Habitat Characterization*

Mature trees line the fairways of Beech Woods Park.

The 86-acre Beech Woods Park is comprised almost entirely of golf course fairways, greens, and associated structures. Natural habitat is limited to the river and a few areas of mature mesic southern forest. A number of scattered mature trees are located in turf areas, and there are two man-made ponds on the property (Figure 33).

*Floristic Quality Scores*

Only 63 plant species were recorded at Beech Woods Park. Of these, 35% (22) are adventive (non-native) species. Given its use and management this may be expected, but as a result, Beech Woods Park has the lowest FQI score of 14.0 and mean C value of 1.8 (Appendix C).

These scores are lower than most undeveloped land within Michigan and reflect the fact that this park is developed and contains limited natural area.

*Aquatic Habitat Characterization*

The river makes up the southern boundary of Beech Woods Park along the 4th hole/fairway of the golf course. This reach is straight along much of this boundary, but begins meandering near the southeast corner of the park.

Although erosion is relatively severe throughout this reach, it is in these meanders where bank erosion is most prominent. Along the westernmost meander (Figure 20) the outside bank along the golf course is nearly vertical, extending 4-6 feet above the water. A concrete storm sewer pipe and headwall have broken off due to the erosion and have fallen into the river channel at this point (accompanying photo). High flows bypass a logjam at the upstream end of this same meander, and it appears that the river will soon cut off the meander to create a braided channel or oxbow at this point. The riparian corridor is wooded on both sides throughout most of this reach, but is only 4-feet wide at the golf course meander. Erosion on the outside of that meander has cut the bank back to the golf course turf.

Eroded storm pipe, headwall, and bank at Beech Woods Park

In addition to the severe streambank erosion, this reach is characterized by excessive deposition in pools, on point bars, and in mid-channel. A few deep pools are present on the outside of bends and shallow pools have been scoured on either side of the channel surrounding mid-stream sediment deposits. Several tributary gullies exhibit heavy erosion in this reach and contribute to the sediment load.

## Data Table

| | |
|---|---|
| FQI Rating: | Poor |
| Aquatic Habitat Ranking: | Marginal |
| Bank Stability Index: | Unstable |
| Greatest Assets: | Mature Trees; Active Recreation |
| Biggest Threat: | Erosion |

1. Golf course water hazard.

## Legend

- Logjams
- Invasive Species
- Streambank Erosion
- Stormwater Outfall
- Rouge Green Corridor Limit
- Park Boundary
- Rivers, Lakes, & Ponds
- Mesic Southern Forest
- 1 Photo Location

**Management Note**: Implement "Green" landscaping throughout the park

MCALLISTER
RIVERDALE
MAPLEWOOD
BEECH
ROUGEWOOD
DAISY
ROUGE
RAMPART

Rouge Green Corridor

# Rouge Green Corridor Habitat Assessment

Oakland County, Michigan

Feet
300 0 300

ASTI Environmental

Created by: AGS, August 1, 2008, ASTI Project 6602
Aerial Photograph: USDA 2005

Figure 33- Park/Preserve: Beech Woods Park, Southfield

The river is bound on the south by multi-family residential development. Trash, particularly shopping carts, is prevalent on the slope below the adjacent apartments, within the river channel, and captured by logjams. Small and moderate-size woody debris has accumulated in a number of locations within this reach, where it has become anchored, at least temporarily, by sediment deposition. LWD is present in the form of both logjams that span the entire channel and logs and logjams that have been pushed against the banks by heavy storm flows.

*Aquatic Habitat Scores*
In-stream habitat in this reach is dominated by glides. Aquatic habitat within this river segment was rated as "marginal." The predominance of fine-grained sediments, the paucity of stable habitat for epifauna or periphyton growth, a lack of vegetation on the streambanks (primarily due to scour and erosion), and low streambank stability were the key factors limiting habitat quality. Bank-stability within this reach was determined to be "unstable" (Appendix B).

*Invasive Plant Species*
Invasive shrubs are persistent in the understory of most of the mesic southern forest. Species include buckthorn, honeysuckle, Japanese barberry, and garlic mustard.

*Threatened and Endangered Species*
There are no records of any endangered, threatened or special concern species in this park. ASTI did not observe any listed species within this park, nor are the habitats contained within this site believed suitable for state or federally listed or candidate species.

*Wildlife*
Wildlife usage at this park is somewhat limited by the golf course and human activity, although species associated with riverine habitats may utilize portions of the park near the river. A number of songbirds may utilize the mature trees within the fairways for migratory stopovers, nesting, and foraging. A maximum of 5 species of frogs and toads have been recorded within the quarter section containing the southern end of this park. The quarter section containing most of the park has not been sampled. Raccoon, white-tailed deer, and wading bird sign was observed along sediment bars in the river channel.

*Floodplain Assessment*
Beech Woods Park does not contain any area that appears to flood with enough frequency and duration to provide any significant floodplain function, and thus was not evaluated with respect to this metric.

*Functions and Values*
Beech Woods Park's primary value is active recreation, open space and aesthetics. It supplies important recreational functions for the community.

*Greatest Asset and Biggest Threat*
Many of the mature native oaks and other trees in the park are an important aesthetic asset for the surrounding area. Threats include the presence of invasive species, severe streambank erosion along the Rouge River, and the (assumed) use of herbicides and pesticides on the golf course which may affect water quality within the river itself. In some areas, golf course turf is mowed to the riverbank, limiting the development of natural areas as a buffer and providing little root mass to help stabilize the streambanks. Use of the river for disposal of household items and other trash (e.g., shopping carts) is notable here.

**Management Targets**

**Location: Beech Woods Park, Southfield**

| Metric | Desired Target |
|---|---|
| AC – Amphibian Community | Re-establish frog/toad species count of 5 |
| AHR – Aquatic Habitat Ranking | Maintain "Good" Procedure 51 rating |
| BSI – Bank Stability Index | Improve from "Unstable" to "Stable" |
| FC – Fish Community | "Acceptable" Procedure 51 ratings |
| FQI – Floristic Quality Index | Increase from 14 to $\geq$ 20 |
| MC – Macroinvertebrate Community | "Acceptable" Procedure 51 rating |
| RBFI – Richards-Baker Flashiness Index | Halt trend to increasing flashiness |
| WFV – Wetland Functional Value | Flood Attenuation, Wildlife, Water Quality |
| WQ – Water Quality | Average wet-weather TSS $\leq$ 80 mg/L<br>Dissolved oxygen $\geq$ 5 mg/L<br>*E. coli* bacteria $\leq$ 130 mg/L |

**Management Recommendations**

**Goal: Maintain/expand Riparian buffer (**Targets: AHR, FQI, WFV, WQ**)**

*Recommendation 116:* Design no-mow buffer along stream and plant deep rooted, native species.

**Goal: Connect river and floodplain (**Targets: AHR, BSI, FC, RBFI, WQ, WFV**)**

*Recommendation 117:* Identify areas out of play that could be used/restored as created wetlands for flood storage and water quality protection.

Allowing rough areas to naturalize and creating a wide vegetated buffer along the rivers edge, can help reduce erosion and provide need flood storage and dissipation of erosive energy.

**Goal: Reduce erosion and Sedimentation (**Targets: AHR, BSI, FC, MC, WQ**)**

*Recommendation 118:* Stabilize eroding gullies and crumbling infrastructure in all 3 of these reaches.

*Recommendation 119:* Repair infrastructure and stabilize stream bank erosion at 4$^{th}$ hole of golf course.

Like the previous river segment, this section too exhibits eroded side channels or gullies near the northwest end of the park. Planting or otherwise stabilizing these will reduce sediment loads to the river and help restore fish habitat. Failed infrastructure and the eroded bank at the golf course meander should be repaired.

**Goal: Educate/Involve Residents in Riparian Stewardship**

*Recommendation 120:* Work with golf course personnel to change management practices, particularly leaving a natural vegetation buffer along the river and reducing fertilizer use in proximity to river.

*T*his park could be utilized as a demonstration site for "green" landscaping practices that residents can apply on their properties within the RGC. Formal tours and demonstrations could be coupled with interpretive signage and pamphlets at the course itself to explain and promote these practices. Herbicide, fertilizer, and irrigation management and vegetated buffers would all make excellent demonstration projects within this park. A targeted education program for riparian residents and golf course users may help reduce dumping and debris in this river segment.

**Goal: Expand Survey and Monitoring Efforts**

*Recommendation 121:* Establish macroinvertebrate monitoring at this park.

*Recommendation 122*: Conduct follow-up mussel surveys every 5 to 10 years, expand sampling stations to identify other high quality areas and monitor over time.

Little survey data exists for plants and wildlife within this park, with the exception of frog and toad data from this quarter section and the results of this study's plant survey. Because of the intended recreational nature of this park, additional plant and wildlife surveys are unnecessary. Expanded information on spring plants and any survey data related to the health of the river itself (aquatic invertebrates or freshwater mussels) should be higher priorities.

**Goal: Manage Invasive Species (**Targets: FQI, WFV**)**

*Recommendations 30, 31:* Inventory invasive plant species as described in recommendations for all parks and preserves. Conduct invasive plant management as priorities dictate and resources allow.

Excluding vegetation found within the greens, fairways, and gardens of Beech Woods Park, invasive species are fairly limited within this park. Effort to control key patches of invasive species could be made here as part of a program to promote native landscaping, but a concentrated invasive species removal program isn't necessary.

### 3.2.17 River Stretch: Between Beech Woods and Valley Woods South

*Riparian Habitat Characterization*

The riparian corridor in this section is primarily floodplain forest, dominated by eastern cottonwood, American elm, willows, silver maple (*Acer saccharinum*), and box elder (Figure 34).

Streambanks in this section are steep clay soils. Overbank flows into the floodplain may be frequent, but they represent a significant increase in water stage.

*Aquatic Habitat Characterization*

This reach is similar to that in Valley Woods Park – South, primarily glide and pool habitat with a mobile sandy substrate, except that this reach exhibits a steeper gradient and more varied substrates and channel bottom forms. Substrate materials include cobble, gravel, leaf packs, angular (artificial) boulders, concrete rip rap, and an old dock or log crib. Small and large woody debris are prevalent but are either concentrated in large logjams or pushed against the channel sides by the force of flows in this reach.

Erosion within this reach is largely continuous and severe. Canopy openings caused by dying ash trees are allowing more light to the stream surface than was seemingly the case before the emerald ash borer invasion.

*Aquatic Habitat Scores*

Erosion in this reach is severe and the substrate is relatively mobile. The habitat rating for this reach is "marginal." Bank-stability within this reach rated as "unstable" to "very unstable" (Appendix B).

*Invasive Plant Species*

A number of invasive species are present along this reach, including buckthorn, honeysuckle, garlic mustard, and Japanese knotweed.

*Wildlife*

Crayfish, fox squirrels, belted kingfisher, wood ducks, robins and other common songbirds, mussels, and numerous Cyprinids (minnows) were observed in this reach. FOTR data records a maximum of 5 frog and toads species in this quarter section, but records have declined to 3 species in recent years.

*Functions and Values*

The riparian corridor in this reach provides wildlife habitat, green space, and some flood storage.

*Greatest Asset and Biggest Threat*

Significant assets of this reach include the forested buffer, wildlife habitat, and floodplain storage. Gully erosion is a threat within this reach.

CARLETON

FREDERICK

NANCY

DAISY

SHIAWASSEE

EIGHTMILE

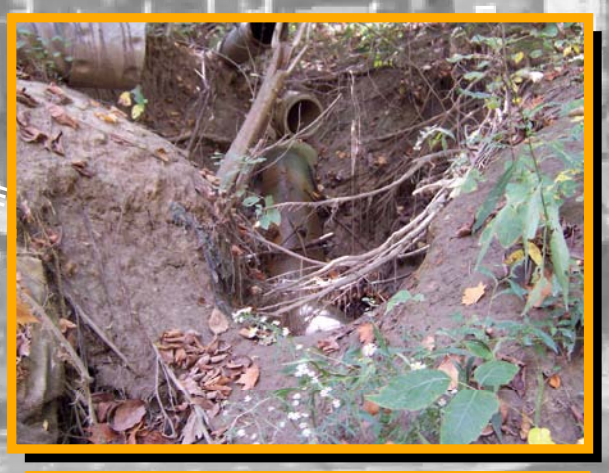
1

**Data Table**

| | |
|---|---|
| Aquatic Habitat Ranking: | Marginal |
| Bank Stability Index: | Unstable to Very Unstable |
| Greatest Asset: | Wildlife Habitat |
| Biggest Threat: | Gully Erosion |

**Legend**

- Invasive Species
- Streambank Erosion
- Logjams
- Stormwater Outfall
- Rouge Green Corridor Limit
- Rivers, Lakes, and Ponds
- Floodplain Forest
- Mesic Southern Forest
- 1 Photo Location



1. Eroding gully and strormwater infrastructure along the Rouge River.

# Rouge Green Corridor Habitat Assessment

Oakland County, Michigan

Feet
0 200 400

Created by: AGS, August 1, 2008, ASTI Project 6602
Aerial Photograph: USDA 2005

Figure 34 - River Stretch: Beech Park to Valley Woods South, Southfield

**Management Targets**

**Location: BETWEEN BEECH WOODS AND VALLEY WOODS SOUTH PARKS**

| Metric | Desired Target |
|---|---|
| AC – Amphibian Community | Improve frog/toad species from 5 to 6 |
| AHR – Aquatic Habitat Ranking | Improve from "Marginal" to "Good" |
| BSI – Bank Stability Index | Improve from "Unstable-Very Unstable" to "Stable" |
| FC – Fish Community | "Acceptable" Procedure 51 ratings |
| FQI – Floristic Quality Index | Not Determined, Average % native species ≥75% |
| MC – Macroinvertebrate Community | "Acceptable" Procedure 51 ratings |
| RBFI – Richards-Baker Flashiness Index | Halt trend to increasing flashiness |
| WFV – Wetland Functional Value | Floodflow Alteration, Wildlife, Water Quality |
| WQ – Water Quality | Average wet-weather TSS ≤ 80 mg/L<br>Dissolved oxygen ≥ 5 mg/L<br>*E. coli* bacteria ≤ 130 mg/L |

**Management Recommendations**

**Goal: Reduce Erosion and Sedimentation (**Targets: AHR, BSI, FC, MC, WQ**)**

*Recommendation 123:* Stabilize eroding gullies and crumbling infrastructure in all 3 of these reaches.

Like the previous two river segments, this section too exhibits eroded side gullies and failed infrastructure. Planting or otherwise stabilizing these will reduce sediment loads to the river and help restore fish habitat.

### 3.2.18 PARK/PRESERVE: VALLEY WOODS NATURE PRESERVE SOUTH, SOUTHFIELD

*Riparian Habitat Characterization*

Young floodplain forest within Valley Woods Nature Preserve South

The 24-acre Valley Woods Preserve South is located at the downstream end of the RGC, bound on the south by 8 Mile Road and bisected by Bridge Road (Figure 35). Habitat within the preserve is primarily floodplain forest[96] associated with the Rouge River. These floodplain forests are dominated by silver maple, red maple, eastern cottonwood, and elm. Other tree species observed include American basswood, black willow, box elder, northern catalpa, and hawthorn (*Crataegus* spp.) Elsewhere within the preserve, there are isolated areas of upland forest on the slopes leading out of the floodplain, and there are several old field and shrub areas likely associated with construction of the road and bridge. Portions of the preserve have been highly disturbed by human activities, including channelization of the river, construction of Bridge Street and commercial development, and various anthropogenic impacts associated with 8 Mile Road.

*Floristic Quality Scores*

In total, 104 species, of which 75% are native, were recorded at Valley Woods Nature Preserve South. This preserve scored 27.4 FQI points with a mean C score of 2.7 (Appendix C). An FQI score greater than 20, but less than 35, indicates that the floristic quality of this area is greater than that which is typical for undeveloped land in Michigan, but not of statewide significance. High scoring species found in this preserve include rue anemone (*Anemonella thalictroides*, C=8), green dragon (C=8), swamp white oak (C=8), great water dock (C=9), and bladdernut (*Staphylea trifolia*, C=9).

*Aquatic Habitat Characterization*

This river reach is characterized by high, steep, slick streambanks, affording limited and difficult access to the channel; severe streambank erosion; mobile substrate; and active deposition in pools, on point bars, and surrounding accumulations of woody debris.

Small and moderate-size woody debris has accumulated in a number of locations within this reach, where it has become anchored, at least temporarily, by sediment deposition. LWD is present in the form of both logjams that span the entire channel and capture other debris and trash, and logs and logjams that have been pushed against the banks by heavy storm flows. In some locations, whole trees have fallen, spanning the channel above the ordinary high water mark. These provide river crossings for small mammals, but they are wetted only infrequently and therefore provide little aquatic habitat value. They can provide some degree of additional channel roughness during flood flows and may add to backwater flooding of riparian areas.

[96] Tepely, A.J., J.G. Cohen, and L. Huberty. 2004. Natural community abstract for southern floodplain forest. Natural Features Inventory, Lansing, MI. 14 pp.

**Data Table**

| | |
|---|---|
| FQI Rating: | Average |
| Aquatic Habitat Ranking: | Marginal |
| Bank Stability Index: | Unstable to Very Unstable |
| Greatest Asset: | Floodplain Storage |
| Biggest Threats: | Erosion; Human Disturbance; Invasive Species |

HILLTOP

HILLTOP

1

2

**Management Note**: Possible site for native plantings

**Management Note**: Control invasive purple loosestrife and common reed

**Management Note**: Breach levees to reconnect floodplain and river

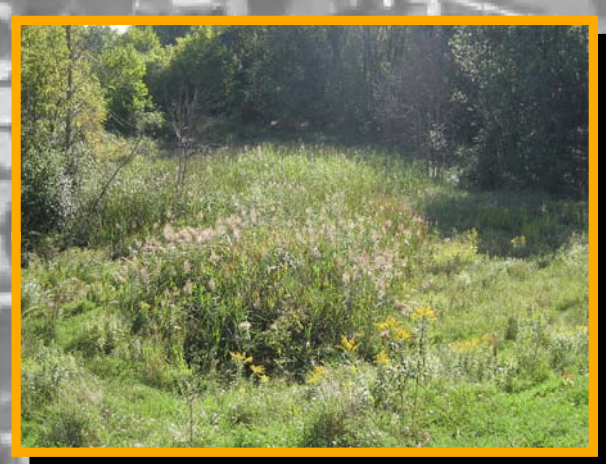
SHIAWASSEE

EIGHTMILE

EIGHTMILE

BRIDGE

1. Floodplain forest typical of the Valley Woods Park South.



2. Stand of invasive common reed (*Phragmites australis*) adjacent to the bridge.

**Legend**

- Park Boundaries
- Invasive Species
- Streambank Erosion
- Logjams
- Rare Species
- Stormwater Outfall
- Rouge Green Corridor Limit
- Rivers, Lakes, & Ponds
- Old Field
- Floodplain Forest
- Mesic Southern Forest
- 1 Photo Location

Rouge Green Corridor

# Rouge Green Corridor Habitat Assessment

Oakland County, Michigan

Feet

200 0 200

ASTI ENVIRONMENTAL

Created by: AGS, August 1, 2008, ASTI Project 6602
Aerial Photograph: USDA 2005

Figure 35 - Park/Preserve: Valley Woods Park South, Southfield

Sediment deposition above the top of the sheetpiling under Bridge Street and the width of the bridge beyond the active river channel indicate that storm flows and/or backwater flooding extend more than 10-feet higher than the water surface observed during field investigations.

Although it is obvious that this section floods regularly, the connection between floodplain and river channel appears to be reduced under certain flow conditions. Sediment deposited along the shoreline has created levees higher than the adjacent wetlands that limit some overbank flooding. Portions of the channel within Valley Woods Park South have likely also been straightened as part of bridge construction, with dredge spoils adding to levee deposits.

Leaf packs captured by woody debris provide habitat and a food supply for shredder invertebrates. Much of the LWD present is located above the water line. Diatoms were noted growing on the sand substrate, and periphyton was present on wetted small and large woody debris.

*Aquatic Habitat Scores*
In-stream habitat in this reach is dominated by glides (glide/pool) and lacks any riffle habitat other than short drops and turbulence created by woody debris. Aquatic habitat within this river segment was rated as "marginal," with both portions west and east of Bridge Road scoring similarly. The predominance of fine-grained sediments, scarce stable habitat for epifauna or periphyton growth, a lack of vegetation on the streambanks (primarily due to scour and erosion), and low streambank stability were the key factors limiting habitat quality. Bank-stability within this reach was determined to be "unstable" to "very unstable" (Appendix B).

*Invasive Plant Species*
This preserve has a relatively low proportion of invasive species (i.e., number of taxa), but those invasive species that are present here are well-established. Invasive shrubs such as buckthorn, honeysuckle, and multiflora rose are well established throughout most of the preserve with the exception of the west-central floodplain forest. Purple loosestrife and common reed are also present within the wetter portions of the old field area and small amounts of reed canary grass are present along the river banks.

*Threatened and Endangered Species*
There are no known records of endangered, threatened or special concern species in this preserve. In addition, ASTI did not observe any listed species within this preserve; the habitats contained within this site are not believed suitable for state or federally listed or candidate species.

*Wildlife*
Wildlife usage at this preserve is somewhat limited by its size and location relative to other open space, but ASTI did observe sign of white-tailed deer, a variety of small mammals including common raccoon and eastern fox squirrels, wood ducks, great blue heron, and song birds. The floodplain forest may support populations of reptiles and amphibians; however, frog and toad count data have not been collected in the quarter-section containing this preserve. Within the river channel, minnow species (Cyprinidae) and crayfish were observed. No formal wildlife surveys have been conducted at this preserve.

*Floodplain Assessment*
Valley Woods South contains several areas of floodplain forest that appear to flood with regularity. These areas provide important flood flow alteration for the Rouge River within this

park, as well as providing some sediment removal and wildlife habitat functions (Appendix B). Visual evidence of sediment deposits, woody debris piles, and scour marks were present within the forested floodplain. It is unknown whether channelization has reduced over-bank flows, and thus altered the floodplain hydrology.

*Functions and Values*
Valley Woods Nature Preserve South provides green space within an urban setting and the floodplain forest provides important flood storage and water polishing functions for this section of the river.

*Greatest Asset and Biggest Threat*
The best natural asset of this preserve is the functioning floodplain forest. While relatively young and lacking some of the impressive mature trees located in other nearby parks, some sections of this forest are generally intact. The biggest threats faced by this preserve are continued human disturbance from adjacent roads and landowners, the presence of invasive species, and the severe erosion within the river channel.

**Management Targets**

**Location: BETWEEN BEECH WOODS AND VALLEY WOODS SOUTH PARKS**

| Metric | Desired Target |
|---|---|
| AC – Amphibian Community | Establish frog/toad monitoring |
| AHR – Aquatic Habitat Ranking | Improve from "Marginal" to "Good" |
| BSI – Bank Stability Index | Improve from "Unstable-Very Unstable" to "Stable" |
| FC – Fish Community | "Acceptable" Procedure 51 ratings |
| FQI – Floristic Quality Index | Increase FQI from 27.4 to $\geq$ 35 |
| MC – Macroinvertebrate Community | "Acceptable" Procedure 51 rating |
| RBFI – Richards-Baker Flashiness Index | Halt trend to increasing flashiness |
| WFV – Wetland Functional Value | Flood Attenuation, Wildlife, Water Quality |
| WQ – Water Quality | Average wet-weather TSS $\leq$ 80 mg/L<br>Dissolved oxygen $\geq$ 5 mg/L<br>*E. coli* bacteria $\leq$ 130 mg/L |

**Management Recommendations**

**Goal: Expand survey and monitoring efforts**

*Recommendation 124:* Establish macroinvertebrate monitoring at this park.

*Recommendation 125:* Conduct bird surveys at Valley Woods Preserve South, including annual counts, if possible, to detect population changes.

*Recommendation 126:* Establish frog and toad volunteer survey station at this park.

*Recommendation 127:* Expand volunteer, contractor, and/or agency staff surveys to include insects, mammals, and herptiles.

*Recommendation 128*: Establish mussel monitoring here. Conduct follow-up mussel surveys every 5 to 10 years.

Other than plant survey data collected during this study and M. Penskar's work, no plant and animal surveys have been conducted within this preserve. Additional valuable survey data includes spring plant surveys to round-out the FQA analysis and wildlife surveys (such as aquatic insects, freshwater mussels, and reptiles and amphibians) to assess the riparian and aquatic health. Other survey data including birds and other wildlife would also be beneficial for crafting specific, focused management recommendations.

**Goal: Manage Invasive Species (**Targets: FQI, WFV**)**

*Recommendations 30, 31:* Inventory invasive plant species as described in recommendations for all parks and preserves. Conduct invasive plant management as priorities dictate and resources allow.

*Recommendation 129:* Remove invasive species near Bridge Street and restore areas as mesic to wet meadow.

Invasive plants are generally well established at this preserve, and complete eradication may not be possible. Rather, focused efforts on key species and areas may be warranted. Common reed and purple loosestrife are present within the open areas along the edges of the bridge and represent the most pressing need, since these species are likely to eventually dominate these disturbed areas if left unchecked. Invasive shrub species, including buckthorn, honeysuckle, and multiflora rose are prevalent within the park, especially along roadsides, but controlling these species within the more-ecologically intact floodplain areas may be most beneficial.

Open areas along Bridge Street and adjacent to the bridge could be ideal areas for native mesic/wet meadow seeding. This seeding would help restore these disturbed areas to native vegetation and may help control invasive species currently present within these areas. See the Valley Woods Nature Preserve at Streamwood and Douglas Evans Nature Preserve sections for discussion on establishment and maintenance of native grasslands.

**Goal: Connect river and floodplain (**Targets: AHR, BSI, FC, RBFI, WQ, WFV**)**

*Recommendation 130:* Breach levees to enhance floodwater storage in former oxbows, meander channels and drained wetlands.

Certain areas within the preserve have large levees or spoils piles stocked alongside the river. These levees could be removed or breached to increase the rivers connection to the floodplain, allowing for better storm flow storage and floodplain sediment deposition. This would also improve vernal and seasonal wetland availability with the floodplain for reptiles and amphibians.

**Goal: Reduce erosion and sedimentation (**Targets: AHR, BSI, FC, MC, WQ**)**

*Recommendation 131:* Stabilize eroding gullies and crumbling infrastructure in all 3 of these reaches.

*Recommendation 132:* Remove logjams causing localized erosion and new channel formation.

Within the context of a corridor-wide LWD management plan, logjams in this river segment could be removed to reduce backwater flooding and localized erosion. Logjam removal could also eliminate trash traps and improve aesthetics. Again, eroded gullies could be stabilized to reduce sedimentation and improve habitat.

## 4.0 SUMMARY

The Rouge Green Corridor is located within the most urbanized river basin of Michigan, and not surprisingly, many perturbations associated with an urban environment have impacted the RGC since European colonization of Michigan. These perturbations include direct disturbances such as impoundment, channelization, dredging, channel armoring, and bridges and culverts. These perturbations also include indirect, yet no less important, disturbances such as invasive species introductions, floodplain alterations, vegetation clearing, and changes in storm water quality and quantity. All of these factors have affected the RGC corridor to some extent and have resulted in the current state of the river.

Impoundments in some areas of the RGC have created unique recreational areas, but also warm and alter the quality of natural water flows within the river, affecting native fish populations. At the same time, river channelization and bank armoring work don't allow high energy floodwater to dissipate energy as it travels, further compounding down-cutting and streambank erosion. Increased modern storm water loads, which are dumped quickly into the river channel, further compound channel flashiness, increase erosion and likely negatively affect aquatic wildlife populations, for example freshwater mussels.

Despite all of these negative influences the RGC has managed to maintain much of its natural character. The river follows a natural course throughout much of the RGC and has been channelized within only a few areas. In fact, the river is able to freely cut and fill in many areas, naturally meandering and functioning as the entire river once did and helping to offset some upstream negative influences.

For the most part, many areas of the river's natural floodplain are still intact and generally functioning well. However, the river's hydrology is much flashier than in the past and, in many places, floodplain wetlands have been ditched to speed runoff. This reduces the retention time for flood storage and storm water polishing, functions that are even more important given today's storm water loads. Drainage of these floodplain wetlands has also reduced or eliminated important amphibian habitat within the RGC, and their absence may be noted in recent FOTR frog and toad data.

Valley Woods at Streamwood is recognized for its state-significant plant community, and ASTI identified several other parks that, while not at a level of state significance, certainly contain high-quality plant communities worthy of protection and/or restoration (e.g., Douglas Evans and Hidden Rivers). For the most part, the RGC has a floodplain plant community that is slightly better than average undeveloped land within the state. Many pre-settlement species and plant communities are present, and while a number of non-native and invasive plant species are present and pervasive, these species are often only locally abundant or widespread but not yet dominant. Control of these invasive species should be carefully evaluated on a case-by-case basis for cost-effectiveness, the probability of success, and the final goal.

Overall, the Rouge Green Corridor is relatively healthy and functioning in a natural manner. Its quality and significance is striking, especially when compared to downstream portions of the Rouge River and to other southeast Michigan urbanized river corridors. While direct and indirect anthropogenic disturbances have increased flashiness and created erosion concerns, the river is still buffered by a substantial forested floodplain in many areas and maintains much of its natural character and functions. Careful discussion of management actions detailed within the final report will be an important step forward in recognizing the challenges and priorities facing this unique river corridor.