IDENTIFYING TARGET TAXLOTS FOR RIPARIAN BUFFER RESTORATION ALONG JOHNSON CREEK, OREGON

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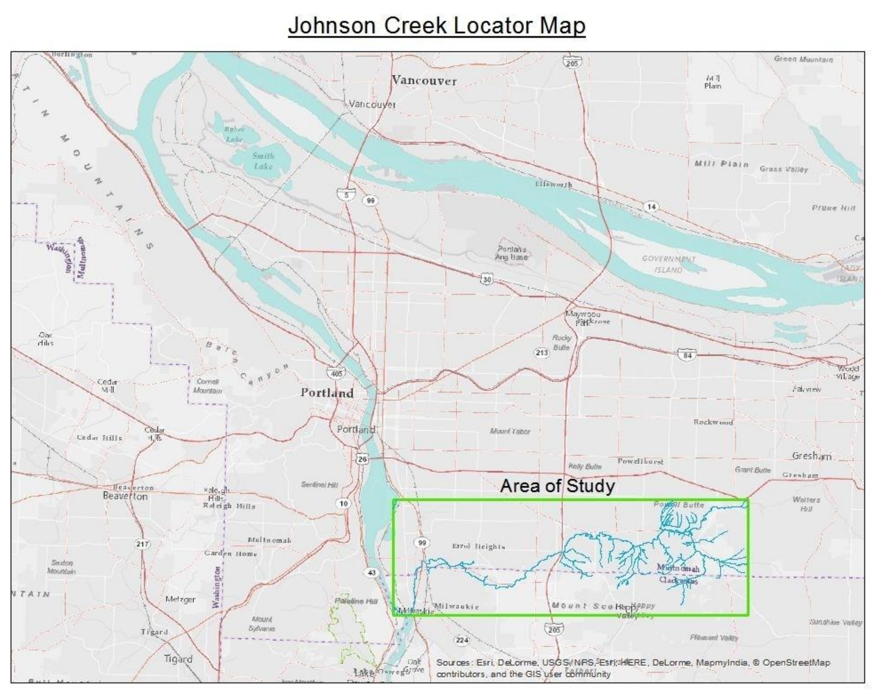
ABSTRACT

The purpose of our project is to identify priority areas for restoration of the Johnson Creek riparian buffer. We outline areas where watershed protection and flood mitigation may be addressed through an acquisition or payments for ecosystem services approach. To accomplish this, we created riparian buffer delineation models of flood vulnerable areas and degraded riparian habitat based on local factors and land use. Our results designate tax lots that coincide with high priority zones for both models. This will help inform urban restoration initiatives and maximize the effectiveness of riparian buffers in flood mitigation, watershed protection and habitat connectivity.

BACKGROUND AND AREA OF STUDY



The area of study area spans the western 9 miles of Johnson Creek from its location near Jenne Butte (182nd street and highway 26) to its end where it enters the Willamette River in NW Milwaukie.

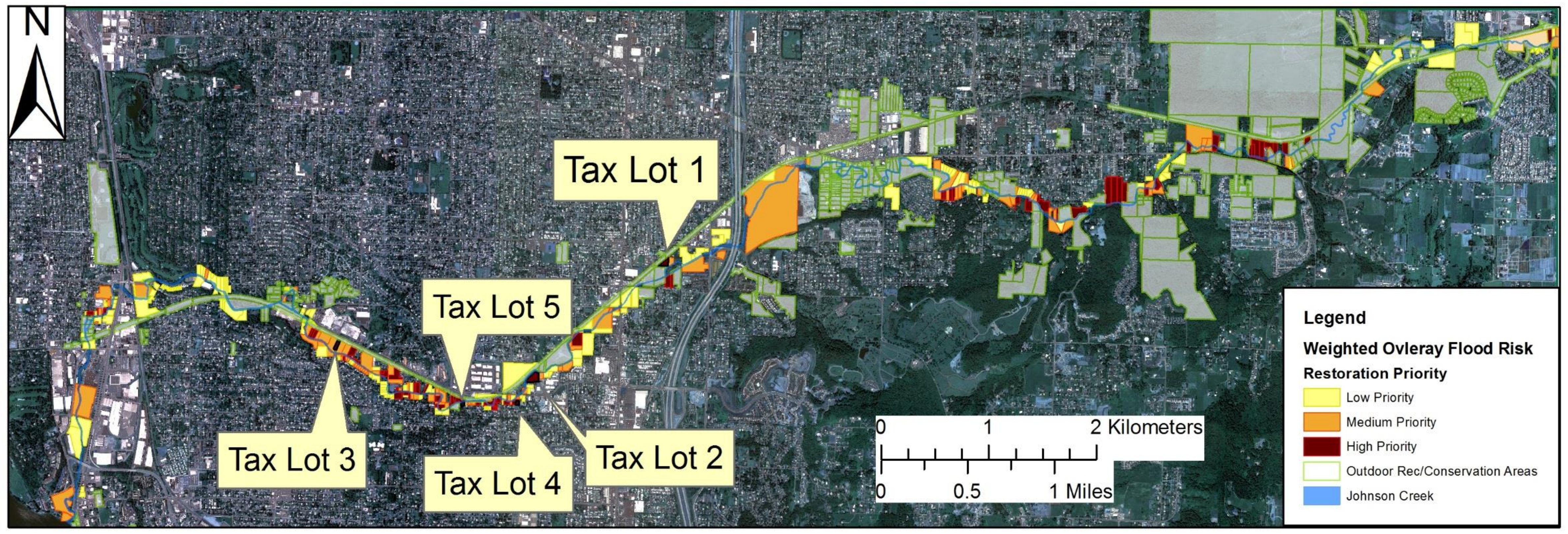
Johnson Creek is one of the last free-flowing urban streams of the Pacific Northwest region. A federally listed native fish habitat, this watershed has been significantly degraded by channelization and surrounding urban and suburban development. This has made the creek prone to flooding in commercial, industrial, and residential areas (City of Portland, 2016). Adequate riparian buffers are a key component of flood mitigation, riparian habitat, and overall health of the watershed ecosystem. Sixty six percent of the watershed has less than the minimum 100ft of streamside vegetation, or none at all (City of Portland Bureau of Environmental Services, 2005).

MODEL CRITERIA & DATA

Layer	Significance	Qualifier/Weight	Data Source
Impervious/Pervious Cover	Impervious reduces infiltration and increases runoff, collects pollutants, causes bank erosion, incises channels, and reduces groundwater recharge. These impair habitat and reduces species diversity (City of Portland Bureau of Environmental Services 2005)	Runoff coefficient set at .90 for impervious surfaces (ODOT 2014).	Lidar Vegetation Layer, City of Portland 2015
Vegetative Canopy Height-High	Shade controls stream water temperature (Lee, K.K., and Snyder, D.T., 2009) Vegetative cover in general serves for bank stabilization, erosion and sedimentation control, improved soil infiltration, intercepts and filter nutrients and pollutants, habitat, nutrient assimilation (Wenger, S. 1999.)	Canopy height >10ft (Withrow-Robinson et al. 2011)	Lidar Vegetation Layer, City of Portland 2015
Slope	Runoff increases by a coefficient of 0.10 per 10% gradient (ODOT 2014)	Slope of 9% or more included in weighted analysis .20 coefficient (Wenger 1999).	1m DEM 2014, City of Portland
Flood Zone	Indicates areas especially prone to flooding along Johnson Creek	Floodplain and 1996 flood extent	FEMA 100 year Floodplain; February 1996 Flood RLIS Metro 2012
Outdoor Recreation & Conservation Areas	Buffers are most effective when they are contiguous; create riparian habitat connectivity (Wenger, S. 1999).	For future analysis: Shared boundary/no shared boundary	RLIS ORCA 2014

Weighted Overlay of Flooding Susceptibility in Johnson Creek

Tax lots to target for flood mitigation

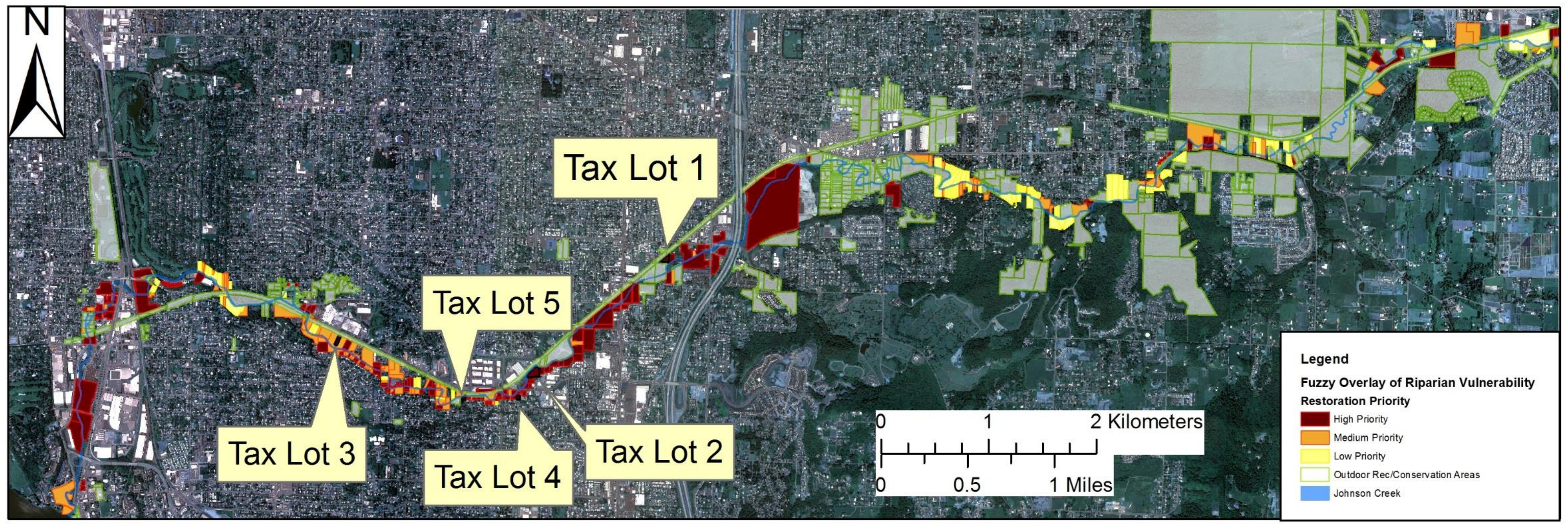


This map shows areas within 100ft of Johnson Creek classified by their need for restoration based on flood susceptibility.

Weighted overlay analysis assigned flood susceptibility rating according to impervious cover (weighted 90%), location within flood zone (weighted 5%), and steep slope (weighted 5%). From these ratings, we ran zonal statistics by maximum to identify privately owned tax lots with the highest priority rating.

Fuzzy Overlay of Riparian Vulnerability along Johnson Creek

Tax lots to target for riparian habitat and watershed protection



This map shows areas within 100ft of Johnson Creek classified by their need for restoration according to watershed protection and habitat connectivity value.

Fuzzy membership assigned high priority to impervious cover, absence of shade (canopy < 10ft high), and steep slope.

From these ratings, we ran zonal statistics by maximum to identify privately-owned tax lots with the highest priority rating.

RESULTS: TAX LOTS TO TARGET

Our results produced a list of tax lots within the recommended minimum 100 foot buffer zone of Johnson Creek. For watershed protection and habitat connectivity, 346 tax lots were indicated, and 343 were indicated for flood mitigation. These were ranked according to high, medium, and low priority. The table below shows the top five highest priority tax lots combined from both models.

ID	PROPERTY OWNER	SITE ADDRESS	CITY	LANDUSE	Acreage
1	ARCHER ROBERT C &	8609 SE LAMBERT ST	PORTLAND	Residential	0.915677
2	ELLIS KRISTI A	6407 SE MAY ST	MILWAUKIE	Residential	0.245384
3	GEORGE ROBERT E & LADONNA	4906 SE JOHNSON CREEK BLVD	MILWAUKIE	Industrial	0.579252
4	PILLSBURY WHITNEY JO	7235 SE LABEL LN	PORTLAND	Industrial	1.982434
5	US DEPT HOUSING & URBAN	6945 SE BREHAUT ST	MILWAUKIE	Residential	0.252483

CONCLUSIONS

This initial modeling output demonstrates how GIS can be used to delineate riparian buffers based on local factors and land use considerations. Weighted overlay and fuzzy membership analyses allow for a more accurate representation of some of the many variables involved in riparian health. Zonal statistics allow us to represent the spatial distribution of degraded or vulnerable areas along Johnson Creek.

Our results can inform restoration of this urban stream through an acquisition or payments-for–ecosystem-services approach which targets privately owned land.

Future research should further refine selection by targeting tax lots that share a boundary with Outdoor Recreation and Conservation Areas displayed above. This will facilitate the establishment of contiguous buffers and improve riparian habitat connectivity.

ACKNOWLEDGEMENTS & REFERENCES

We'd like to thank Dr. Geoffrey Duh of Portland State University and Kevin Martin of the City of Portland, Bureau of Planning Services.

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