

Advancing Stormwater Management through Comprehensive Wetland and Riparian Mapping in Kansas City, MO

(Funded by R7 EPA 2024 Wetland Program Development Grant)

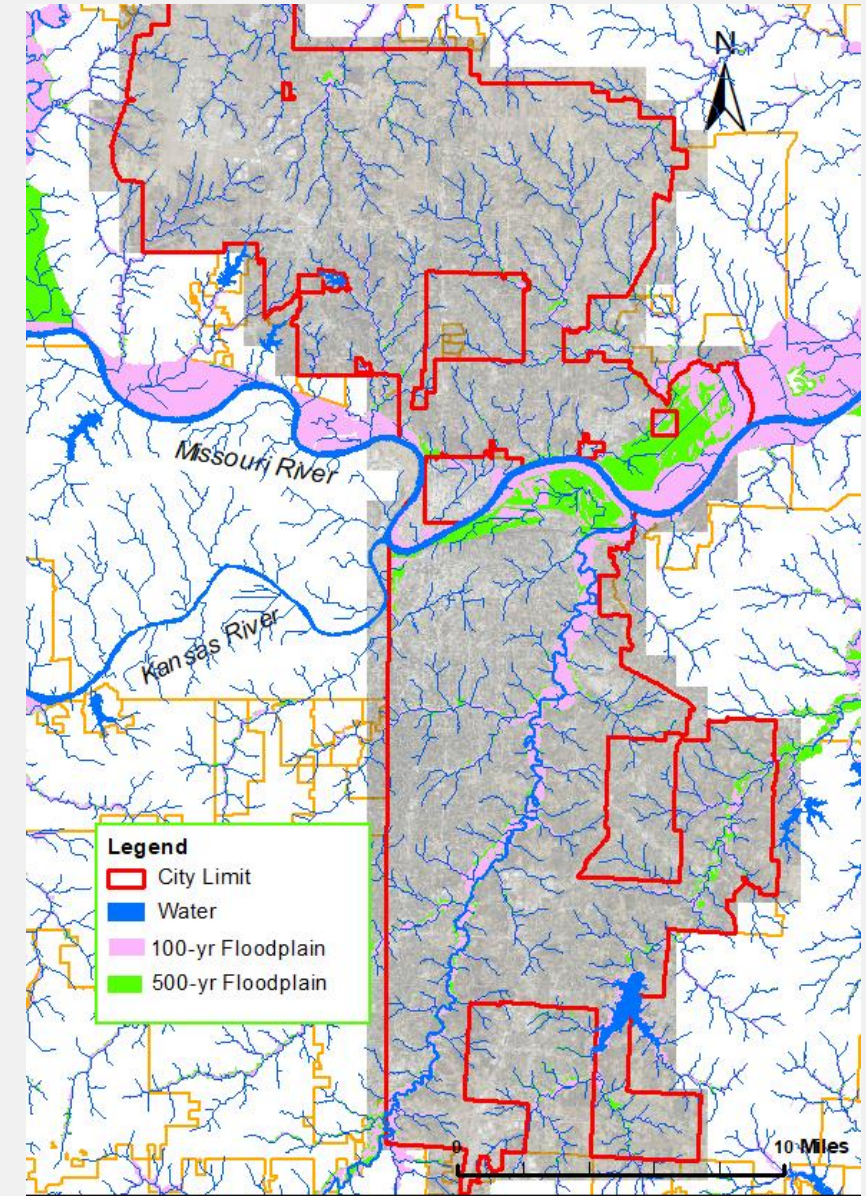
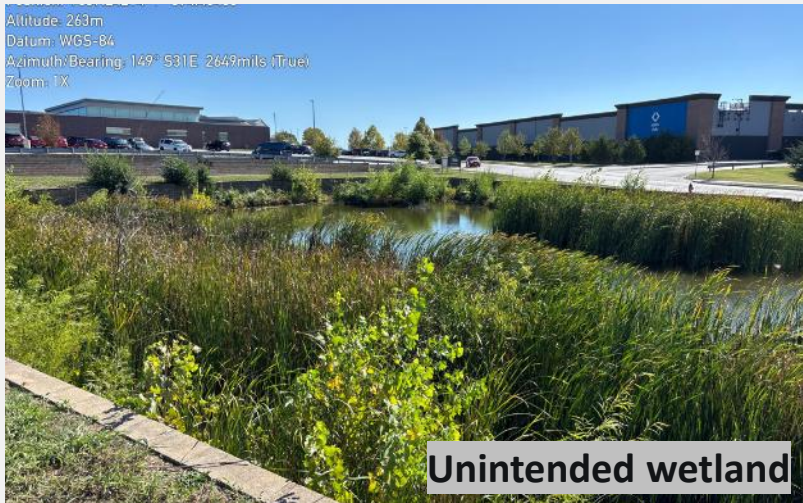
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The Origin of the Project (Background Info.)



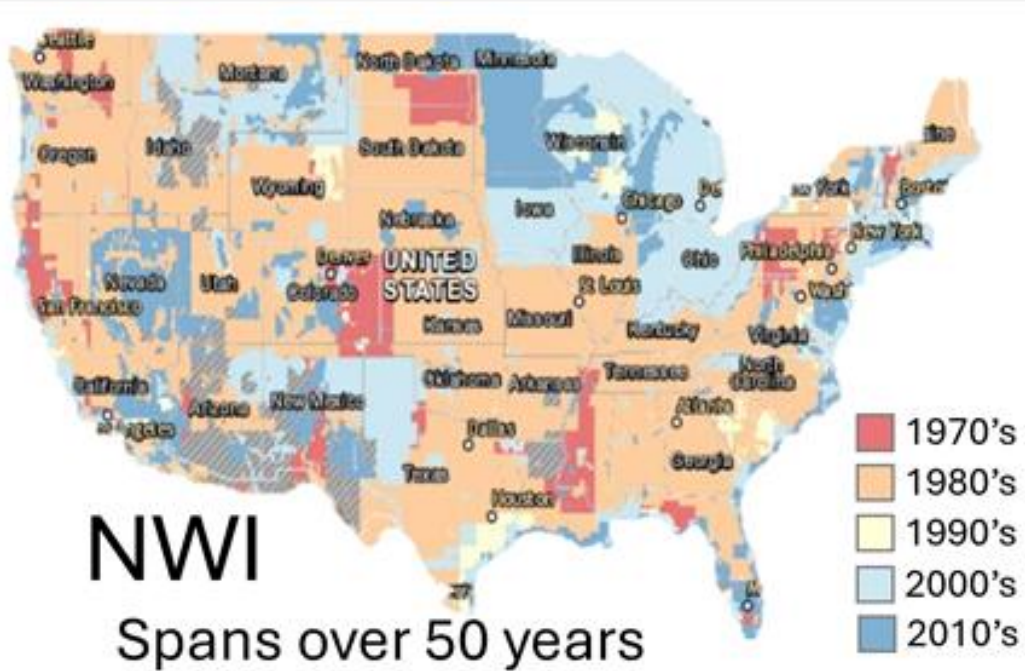
Current Condition of Local Wetlands (Background Info. – Cont'd)

- **Multiple Unknowns:**
location, extent abundance, type, quality, function
- **Urban Impact:** sources, types and levels



Current Status of Wetland Mapping (Background Info. – Cont'd)

- **U.S. Fish & Wildlife Service:** National Wetlands Inventory (NWI) Program
- **Missouri State:** 2023-2028 Missouri Wetland Program Plan
- **City:** 1980s



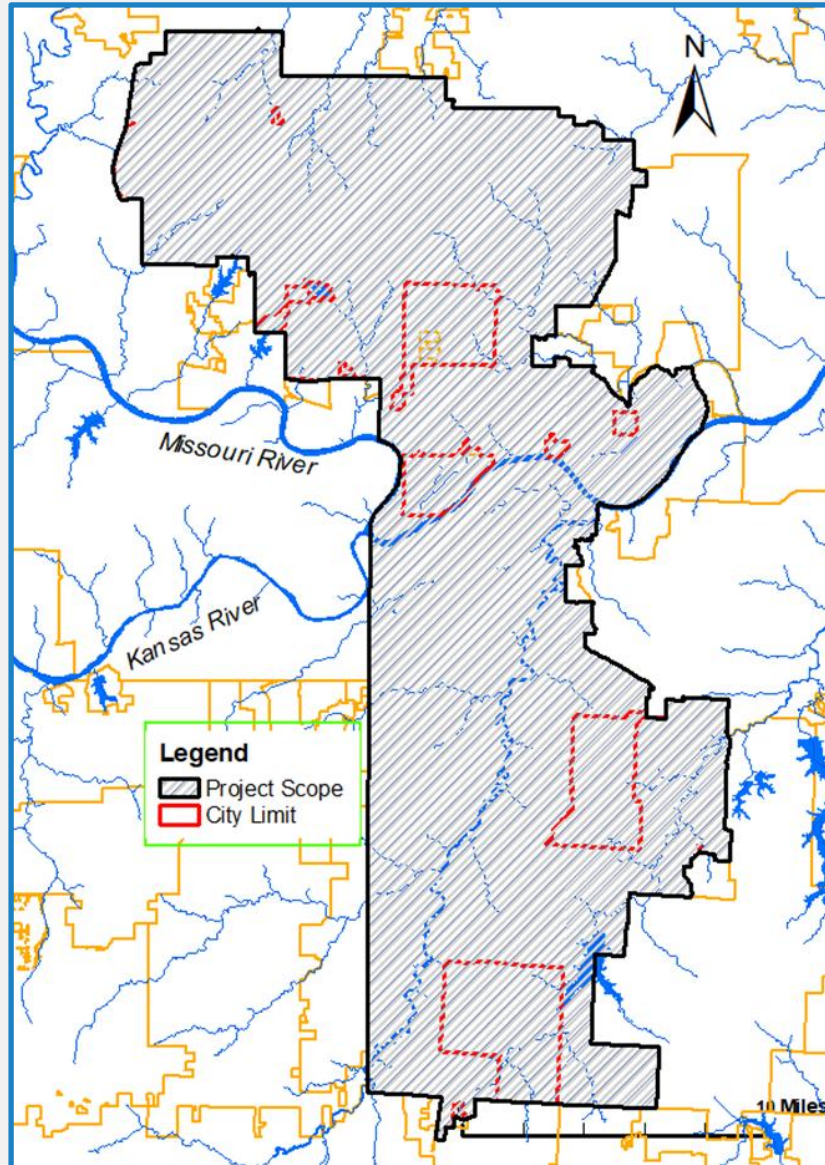
Courtesy of Megan Lang (USFWS)

Below: the confluence of Round Grove Creek and Blue River



Above: the confluence of Brush Creek and Blue River

Project Area (Background Info. – Cont'd)



- **Wetlands**
- **Riparian Forest Extents**

National Wetland Inventory

Classification of Wetlands and Deepwater Habitats of the United States



By

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U.S. Department of the Interior

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Office of Biological Services

Washington, D.C. 20240

NWI wetland delineation and classification is completed using one of the most comprehensive, scientifically based, recognized systems in the world.

“Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water.”



U.S. Fish & Wildlife Service

Mapping/Data Collection Process: Classification

Cowardin Classification System for Mapping Wetlands

Hierarchal (L1UBHh)

System (L)

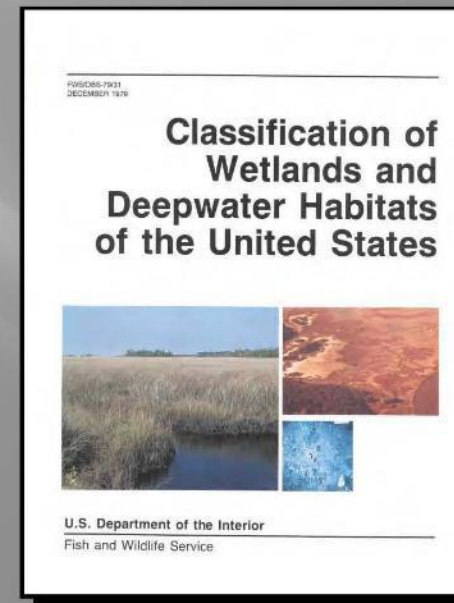
Subsystem (1)

Class (UB)

Subclass (-)

Water Regime (H)

Special Modifiers (h)

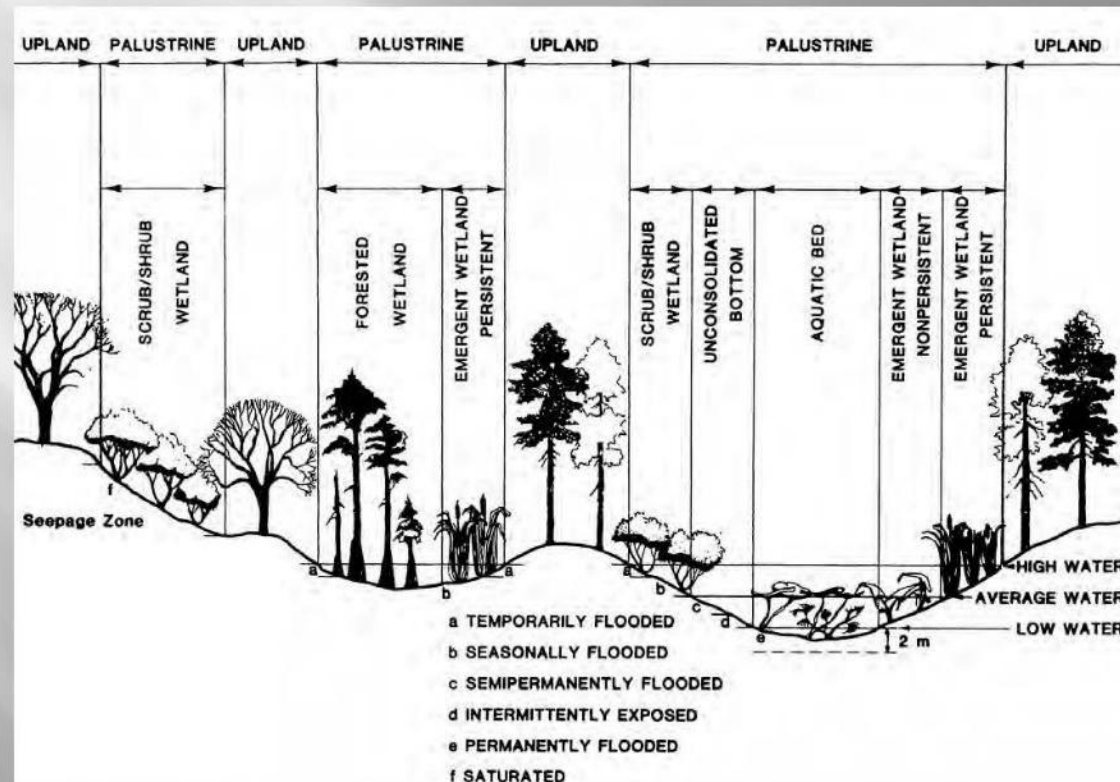


National Wetland Inventory



U.S. Fish & Wildlife Service

Mapping/Data Collection Process: Classification Generalized Wetland Structure, Relating to Classification





U.S. Fish & Wildlife Service

Mapping/Data Collection Process: Classification Examples of Cowardin Class System

<u>SYSTEM</u>	R-RIVERINE (rivers, streams, washes, arroyos, etc...)
<u>SUBSYSTEM</u>	2-LOWER PERENNIAL (low gradient) 3-UPPER PERENNIAL (high gradient) 4-INTERMITTENT (flows part of year)
<u>CLASS</u>	RB-Rock Bottom UB-Unconsolidated Bottom AB-Aquatic Bed SB-Streambed RS-Rocky Shore US-Unconsolidated Shore
<u>SYSTEM</u>	P-PALUSTRINE (marshes, swamps, ponds, bottomlands, wet prairies, etc...)
<u>SUBSYSTEM</u>	(None)
<u>CLASS</u>	RB-Rock Bottom UB-Unconsolidated Bottom US-Unconsolidated Shore AB-Aquatic Bed EM-Emergent (sedges, grasses, etc...) SS-Scrub/Shrub FO-Forested



U.S. Fish & Wildlife Service

Mapping/Data Collection Process: Classification Examples of Cowardin Class System, Cont.

<u>CLASS</u>	SS-Scrub/Shrub and FO-Forested
<u>SUBCLASS</u>	1 Broad-leaved Deciduous (ex. willow, cottonwood) 2 Needle-leaved Deciduous (ex. Salt cedar) 3 Broad-leaved Evergreen 4 Needle-leaved Evergreen 5 Dead 6 Deciduous 7 Evergreen
MODIFIERS	
WATER REGIME	A Temporarily Flooded B Saturated C Seasonally Flooded E Seasonally Flooded/Saturated F Semi-permanently Flooded H Permanently Flooded J Intermittently Flooded K Artificially Flooded
SPECIAL MODIFIERS	b Beaver d Partially drained/Ditched f Farmed h Diked/Impounded x Excavated



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Wetland Examples;

Emergent & scrub-shrub wetland
(PEM1F & PSS1C).



Intermittent streambed with forested
wetland (R4SBJ & PFO1J).



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Wetland Examples;

Impounded pond, with adjacent emergent
Wetlands (PUBHh & PEM1Fh).



Emergent wetland, former river channel
(PEM1F).

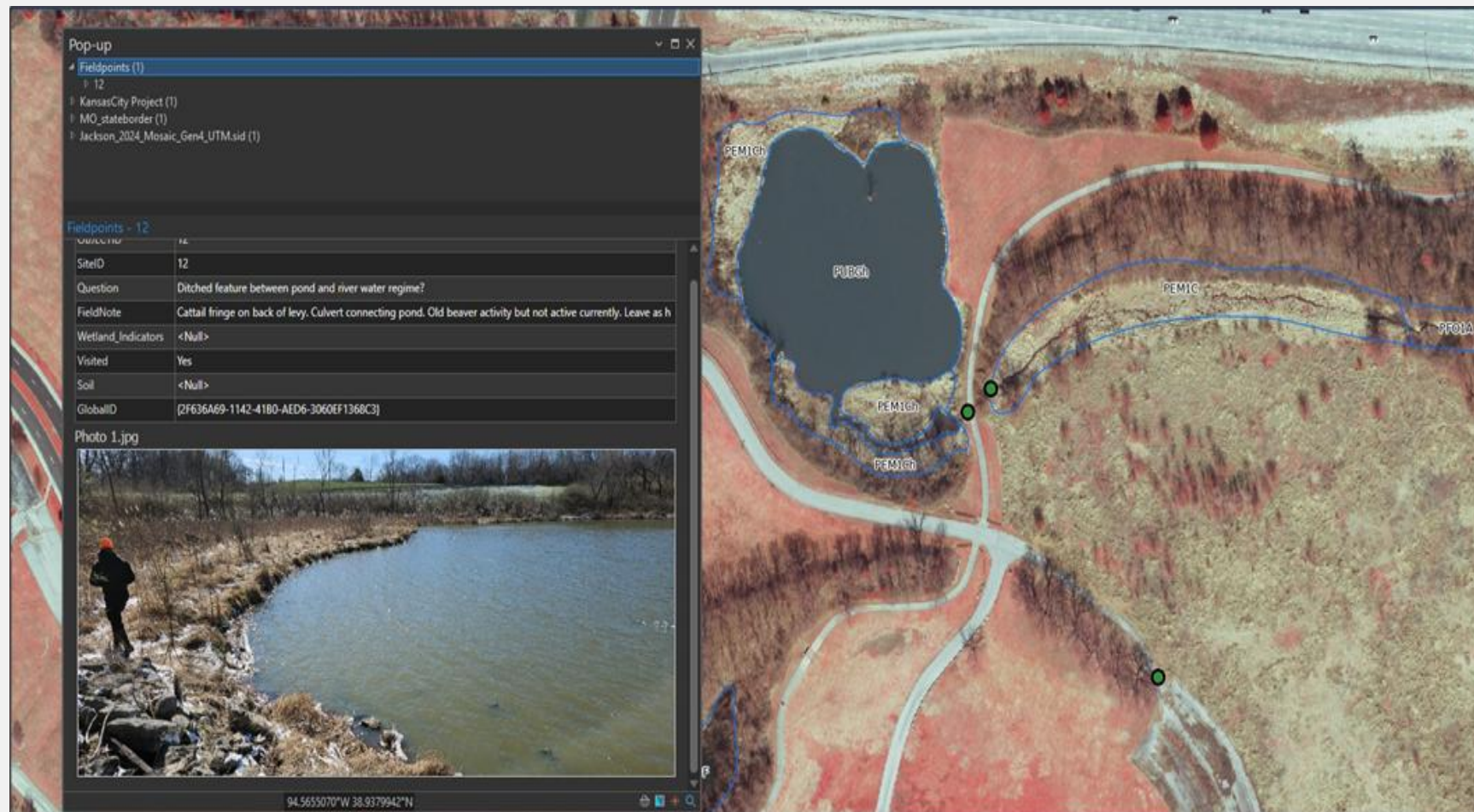
Wetland Intrinsic Potential (WIP)



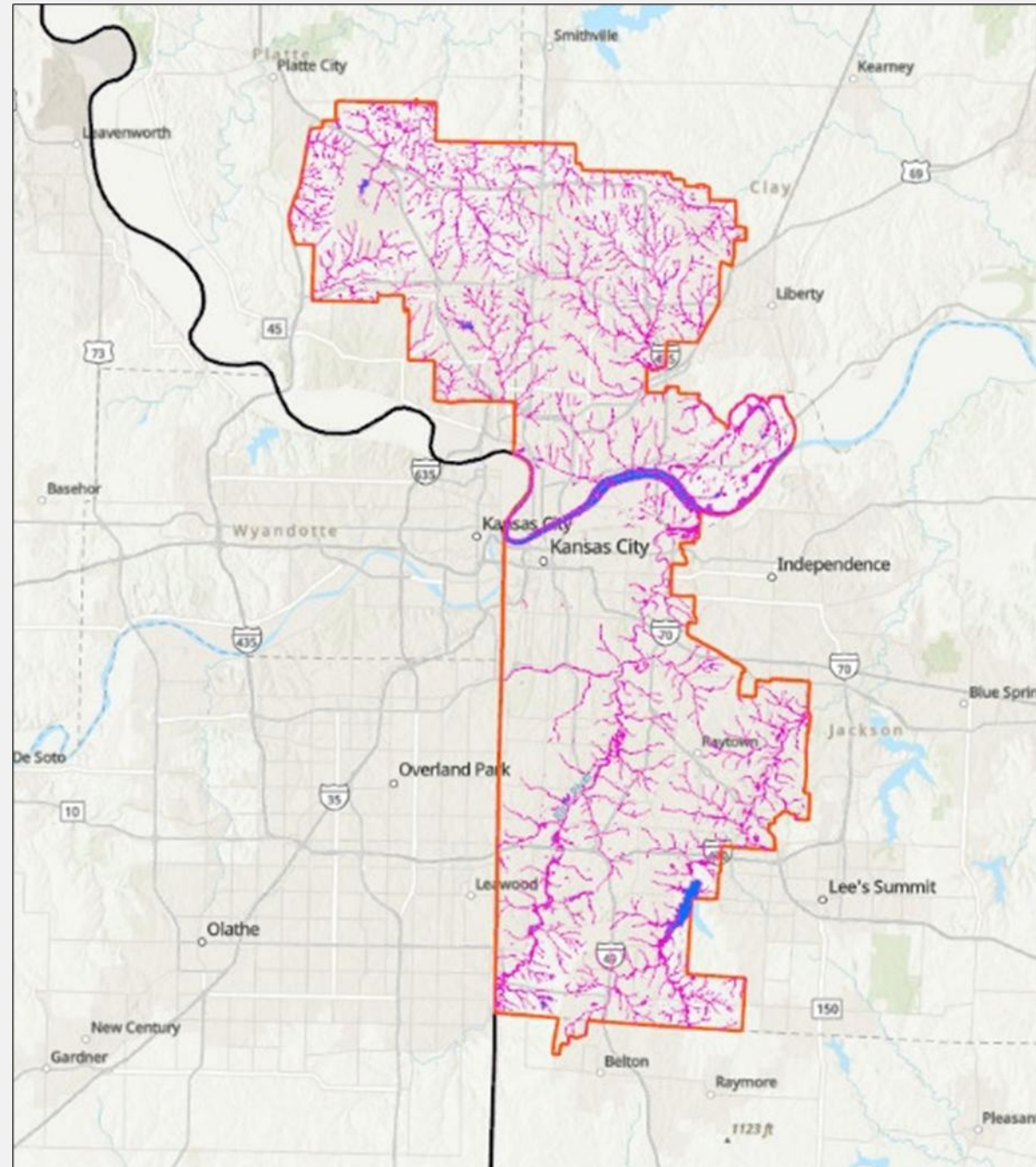
- High resolution imagery (12 in)
- Derived LiDAR elevation surfaces (CTI, TPI, DTW)
- Machine learning framework ESRI ArcPro geoprocessing environment
- Field confirmed wetland data for model training
- Used to guide and validate image interpreters and to identify potentially restorable wetland landscapes



Figure 1. Field verification check site locations within the KCMO project area.



Wetland Extent



Wetland Descriptive Classes

NWI System / Class	Area (acres)	Number of Features	% of Total Area
Palustrine (P)			
Aquatic Bed (AB)	27.5	80	0.2%
Emergent (EM)	1,586.5	3,094	12.6%
Forested (FO)	4,525.6	3,581	36.0%
Scrub-Shrub (SS)	284.4	509	2.3%
Unconsolidated Bottom (UB)	1,534.6	1,771	12.2%
Unconsolidated Shore (US)	79.4	160	0.6%
Subtotal – Palustrine (P)	8,038.0	9,195	63.9%
Lacustrine (L)			
Aquatic Bed (AB)	1.3	1	0.0%
Unconsolidated Bottom (UB)	859.4	8	6.8%
Unconsolidated Shore (US)	4.6	14	0.0%
Subtotal – Lacustrine (L)	865.2	23	6.9%
Riverine (R)			
Rocky Bottom (RB)	1.1	1	0.0%
Streambed (SB)	1,141.1	534	9.1%
Unconsolidated Bottom (UB)	2,303.1	117	18.3%
Unconsolidated Shore (US)	222.8	271	1.8%
Subtotal – Riverine (R)	3,668.1	923	29.2%
GRAND TOTAL	12,571.3	10,141	100.0%

Wetland Water Regimes

Water Regime	Area (acres)	Number of Features	% of Total Area
All Systems Combined			
Temporarily Flooded (A)	6,027.8	5,998	47.9%
Seasonally Flooded (C)	1,791.9	2,105	14.3%
Semipermanently Flooded (F)	452.7	814	3.6%
Intermittently Exposed (G)	916.7	963	7.3%
Permanently Flooded (H)	3,341.2	242	26.6%
Artificially Flooded (K)	41.0	19	0.3%
Subtotal – All Systems	12,571.3	10,141	
Palustrine (P)			
Temporarily Flooded (A)	5,944.6	5,928	47.3%
Seasonally Flooded (C)	506.6	1,356	4.0%
Semipermanently Flooded (F)	145.4	718	1.2%
Intermittently Exposed (G)	778.7	959	6.2%
Permanently Flooded (H)	621.6	215	4.9%
Artificially Flooded (K)	41.0	19	0.3%
Subtotal – Palustrine (P)	8,038.0	9,195	
Lacustrine (L)			
Temporarily Flooded (A)	0.8	1	0.0%
Seasonally Flooded (C)	3.7	13	0.0%
Semipermanently Flooded (F)	1.3	1	0.0%
Intermittently Exposed (G)	138.0	4	1.1%
Permanently Flooded (H)	721.4	4	5.7%
Subtotal – Lacustrine (L)	865.2	23	
Riverine (R)			
Temporarily Flooded (A)	82.4	69	0.7%
Seasonally Flooded (C)	1,281.5	736	10.2%
Semipermanently Flooded (F)	306.0	95	2.4%
Permanently Flooded (H)	1,998.2	23	15.9%
Subtotal – Riverine (R)	3,668.1	923	
GRAND TOTAL	12,571.3	10,141	100.0%

Riparian Forest Extent



Riparian plant communities:

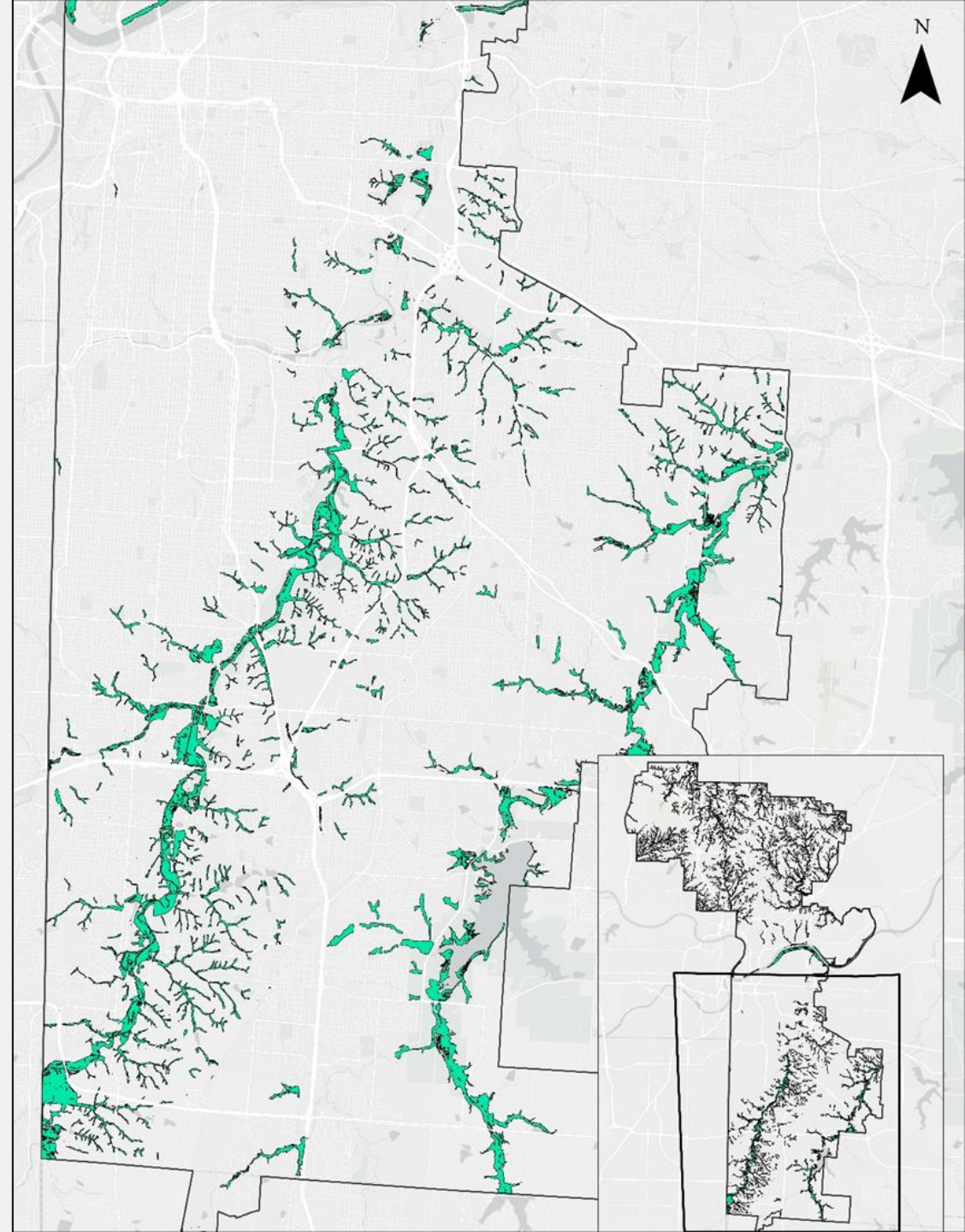
- Contiguous to and affected by surface and subsurface hydrologic features
- Distinctly different vegetative species than adjacent areas, or
- Species similar to adjacent areas but exhibiting more vigorous or robust growth forms.
- Usually transitional between wetland and upland.



KANSAS CITY
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Riparian Forest Extent

- Derivation of Riparian Extent
 - HAND Tool – Height Above Nearest Drainage
 - Stratified by stream order and depth of flooding
 - Hydro-conditioned DEM, LiDAR and EDH streamlines
- Tree Canopy Extraction
 - nDSM and canopy height model
- Retain Canopy with HAND extent



Riparian Forest Extent



- Flood Attenuation
- Natural Habitat Degradation
- Infrastructure Damage
- Economic Impacts
- Federal, State, Local Gov't
- Landowners
- Stakeholders
- Body of Science Knowledge



Acknowledgements

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Missouri Department of Conservation

Questions?

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