

Urban River Restoration:

The Reach 1 Habitat Improvements Project
on the North Branch of the Chicago River
Glenview, Illinois

Fluvial Geomorphology & River Restoration



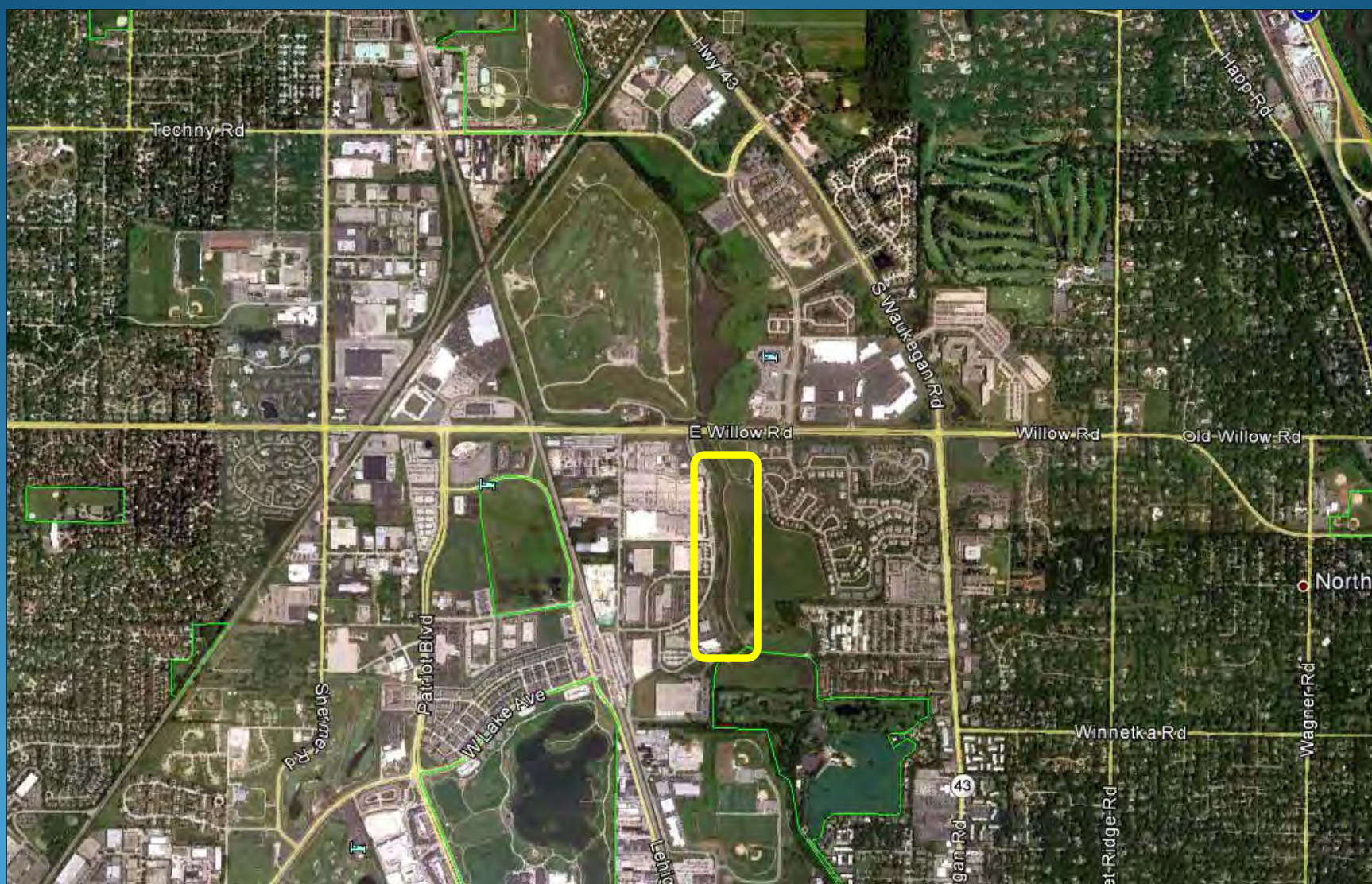
- *Fluvial Geomorphology*: the study of landforms created by flowing water.
- *River Restoration*: channel design based upon an understanding of fluvial geomorphology incorporated with concepts of ecological restoration.
- The Reach 1 project utilized “stream naturalization” approach and restoration methods described by Bruce Rhoads, Ed Herricks, and others from the University of Illinois.
- Other approaches, such as the Rosgen classification system, fail to integrate and quantify fluvial processes and channel response.

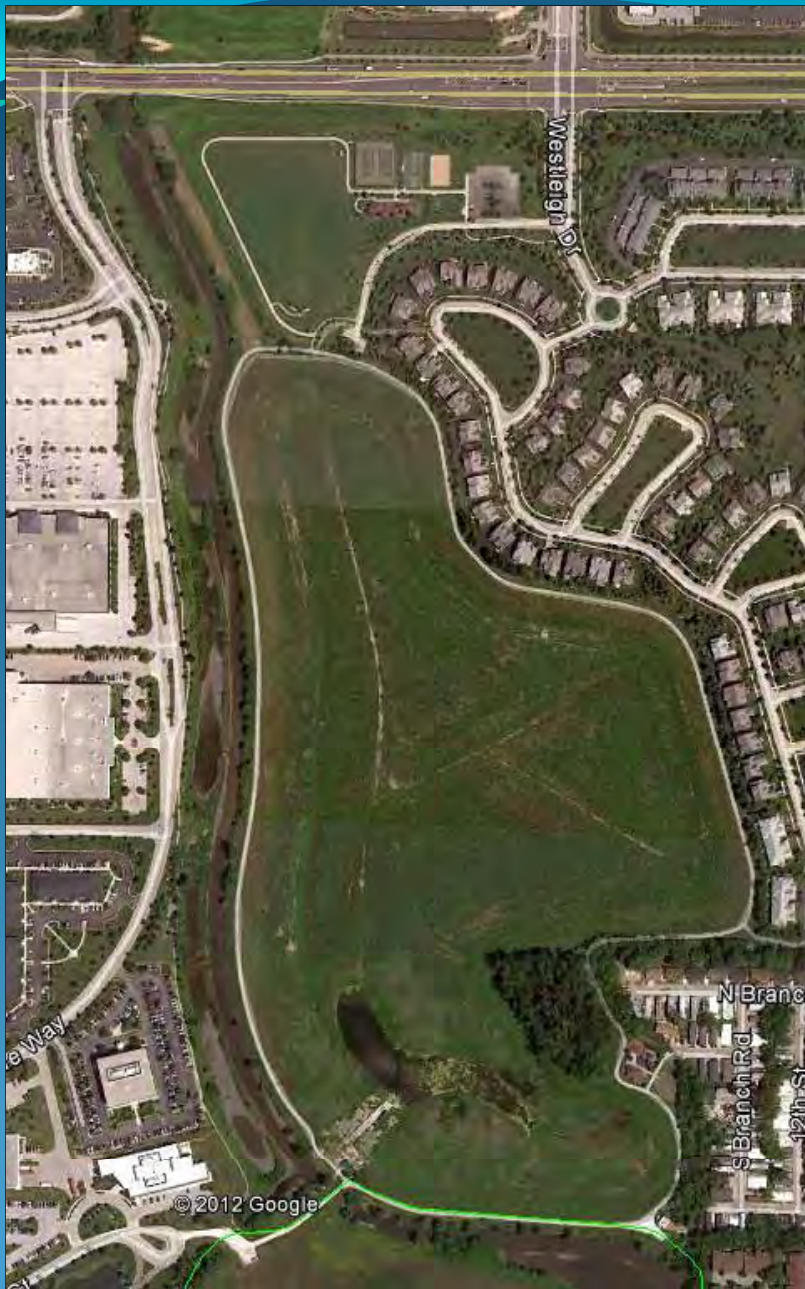


Reach 1 Project

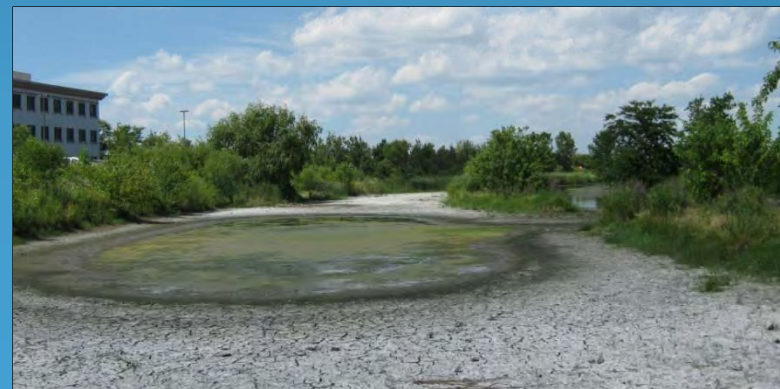
Glenview, Illinois

Location





Existing Conditions





Project Goals:

Enhancing in-stream habitat

Improving water quality

Stream restoration/meandering

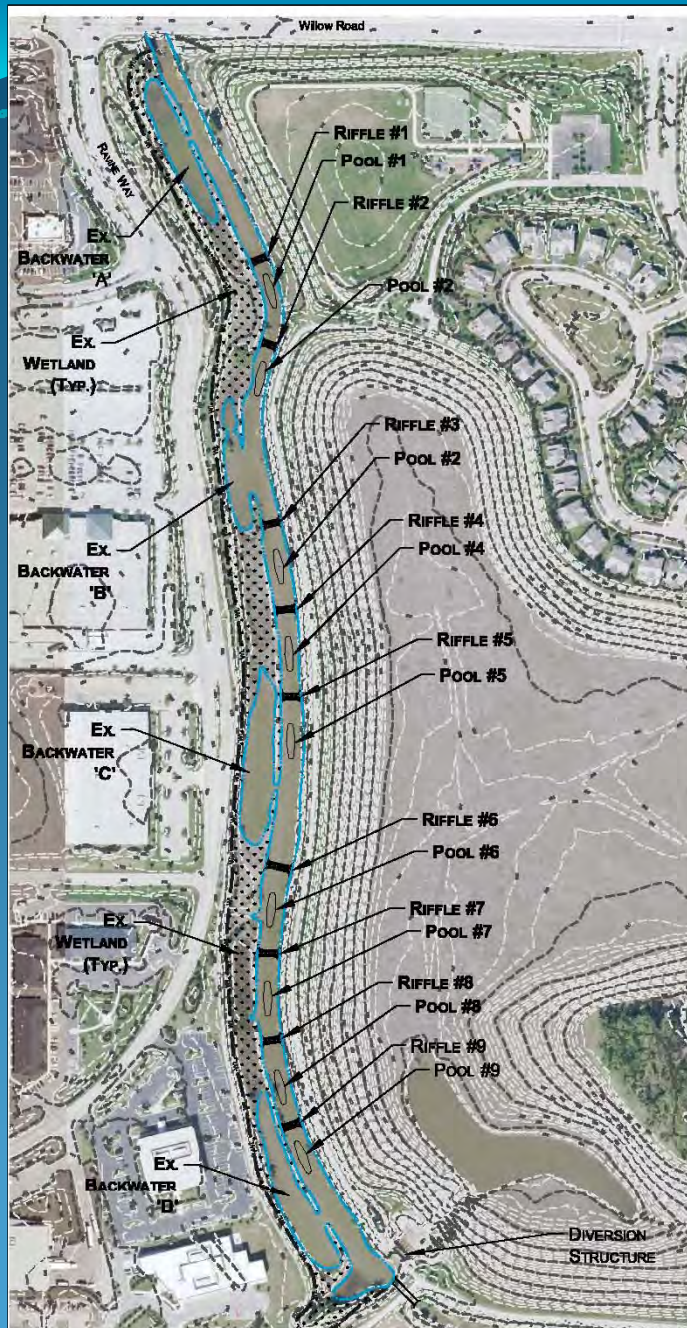
Reduction in bank erosion

Wetland creation

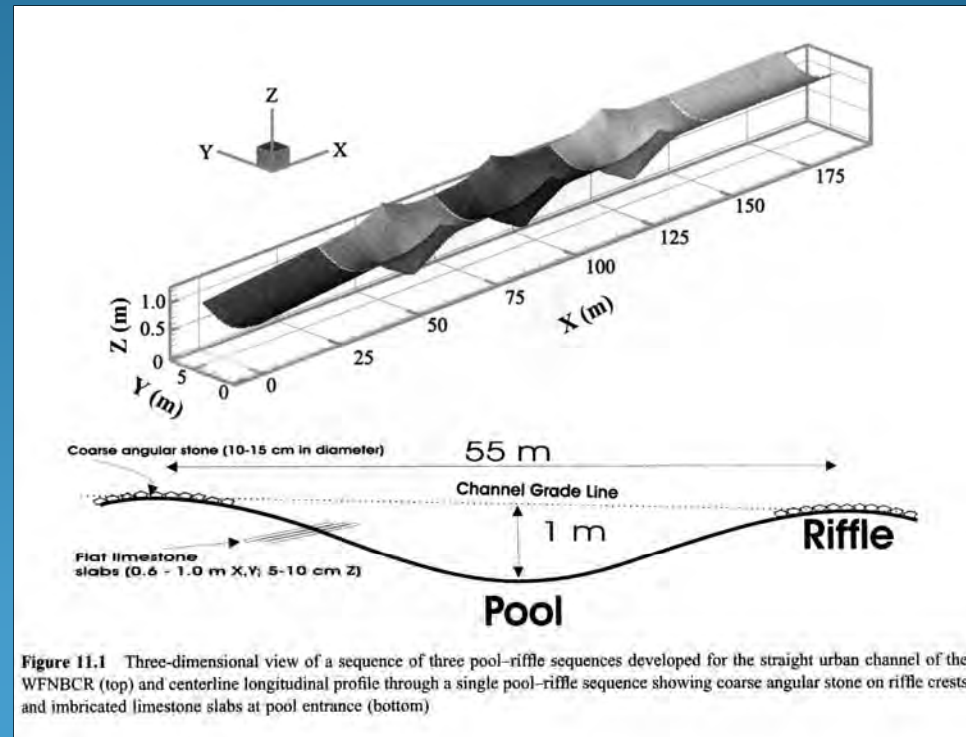
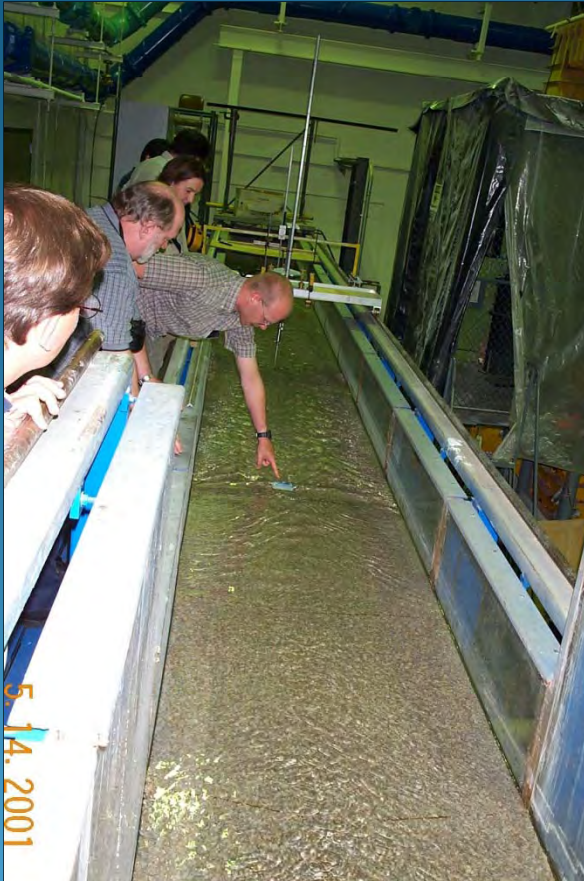
Habitat enhancement

Alternative A

- Focused on creation of in-stream habitat
- Pool-riffle units following design developed by Bruce Rhoads, Ed Herricks, and other faculty from the University of Illinois

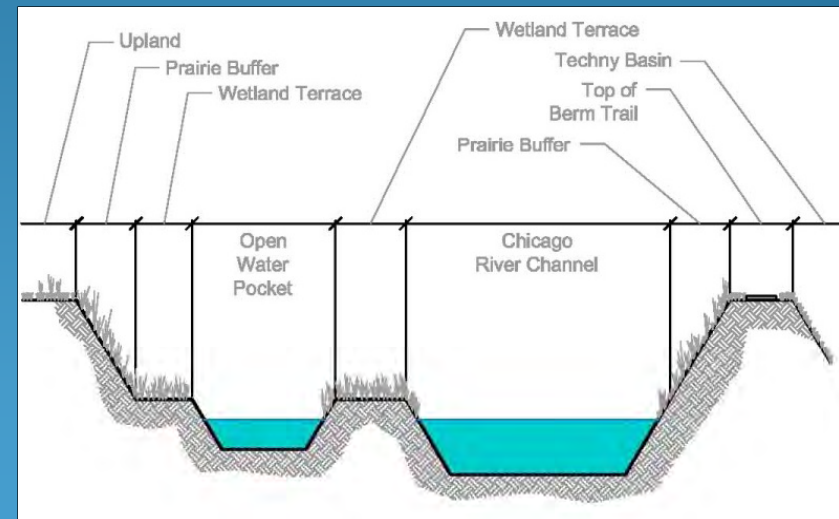
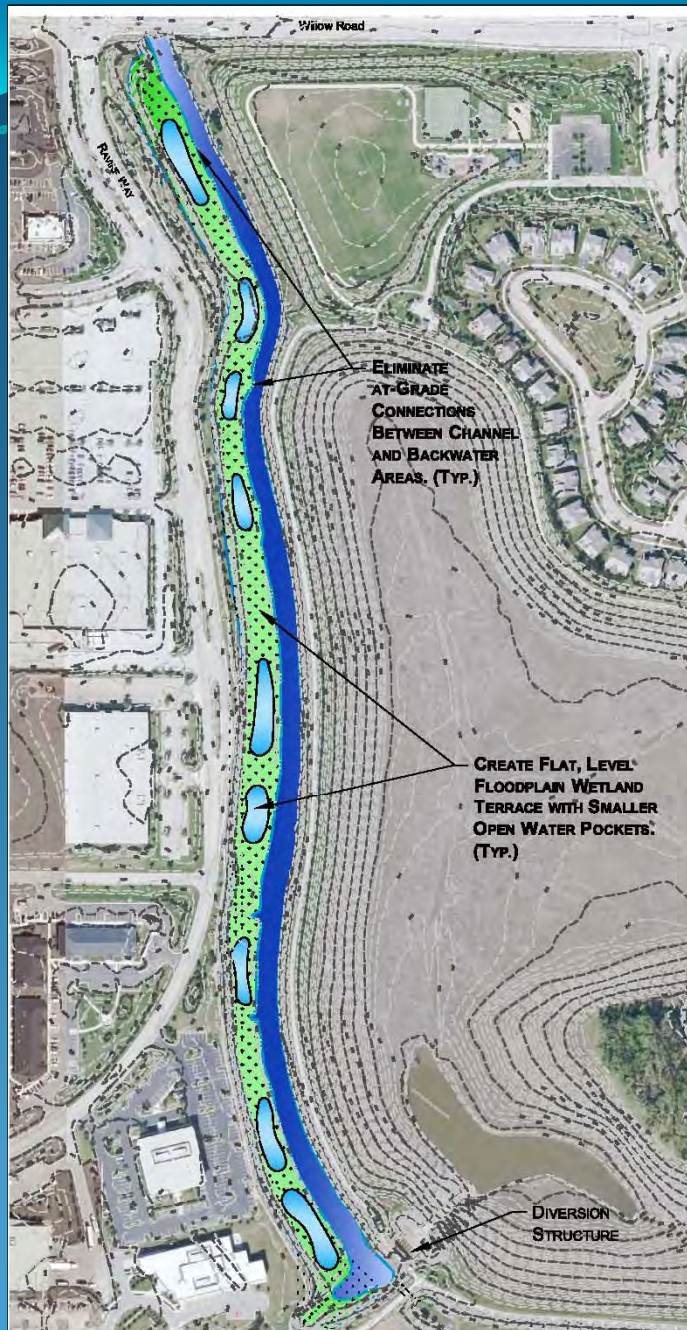


Riffle-pool units



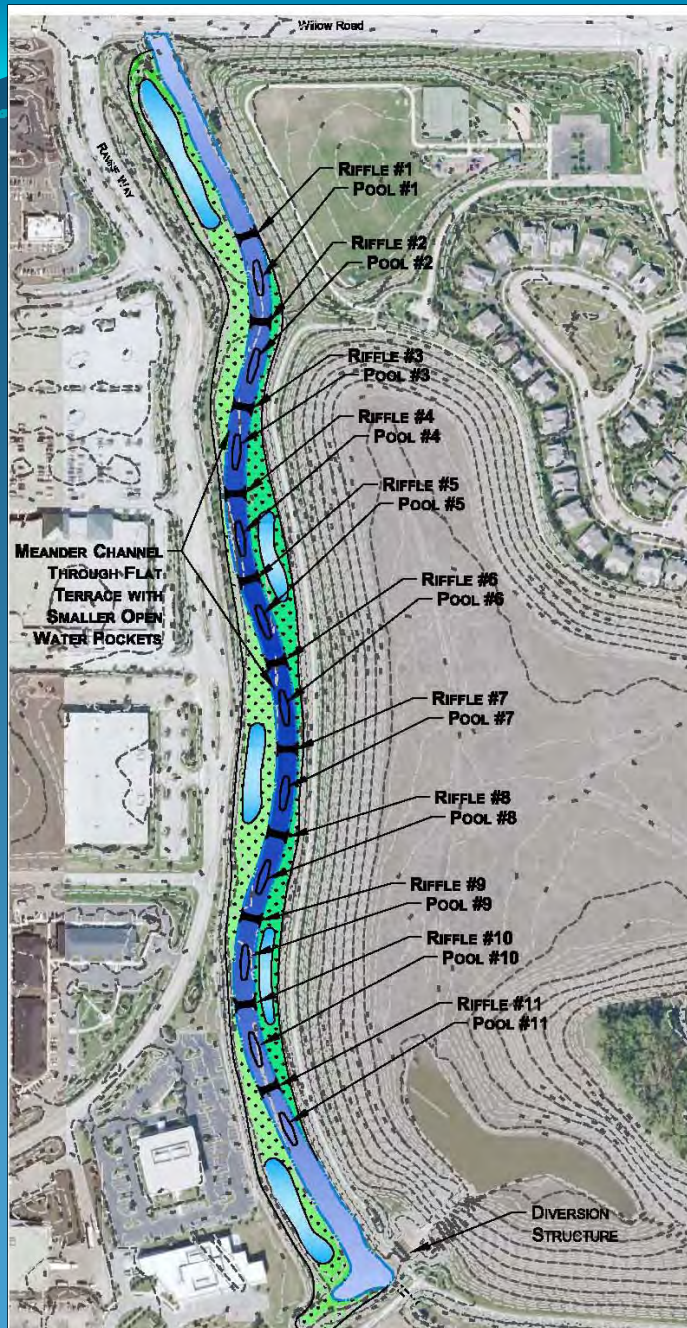
Alternative B

- Focused on creation/enhancement of habitat adjacent to stream channel
- Streamside habitat refuge concept described by Ed Herricks and other faculty from the University of Illinois



Alternative C

- Combined Alternatives A & B
- Added “meandering” the channel within the available corridor



The Village of Glenview received approximately \$750,000 in federal stimulus funds (ARRA) in October 2009 to implement Alternative C with the condition that a contract for construction be awarded no later than the end of February 2010.

80% of the funds must be paid back within 20 years (0% interest loan).

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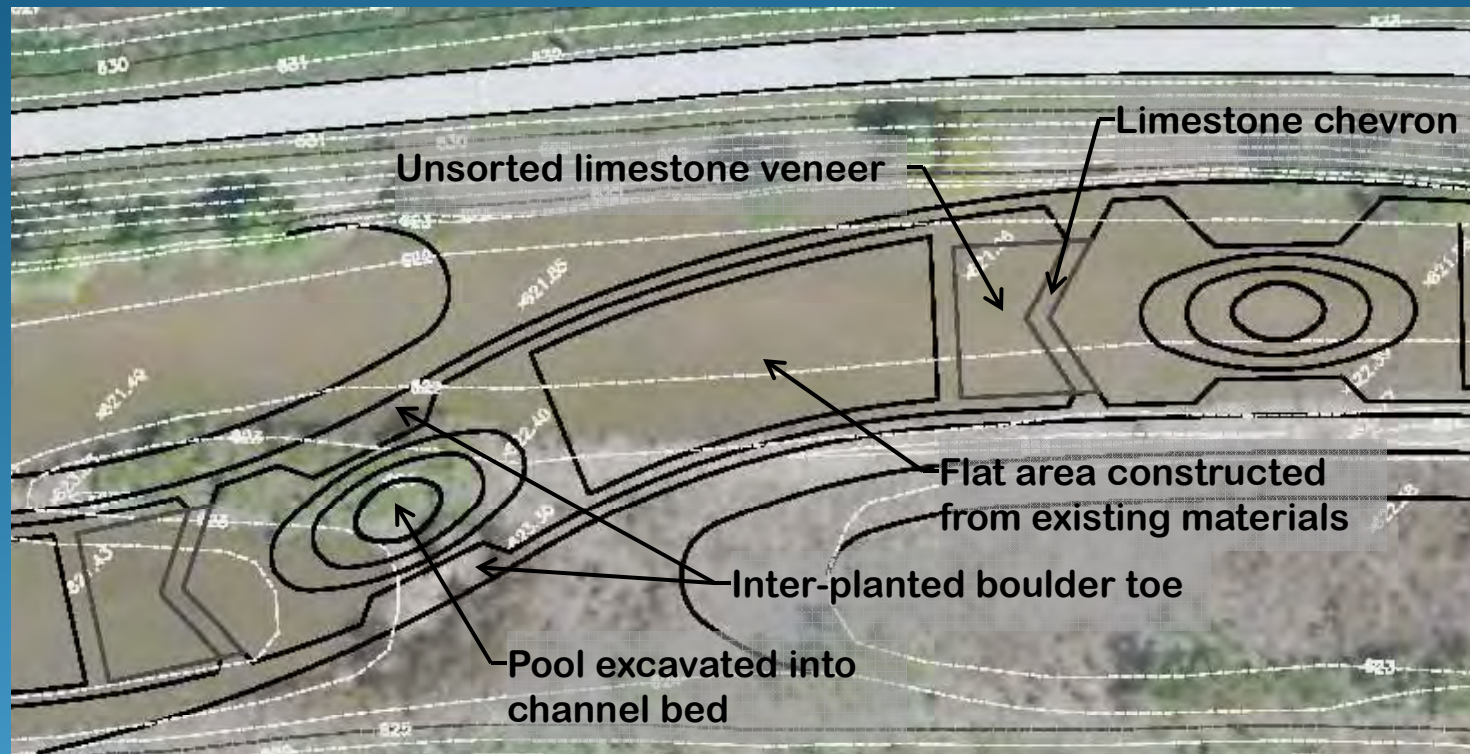
Project Design

Riffle-pool units

Enhanced/created streamside wetlands

Meandering channel

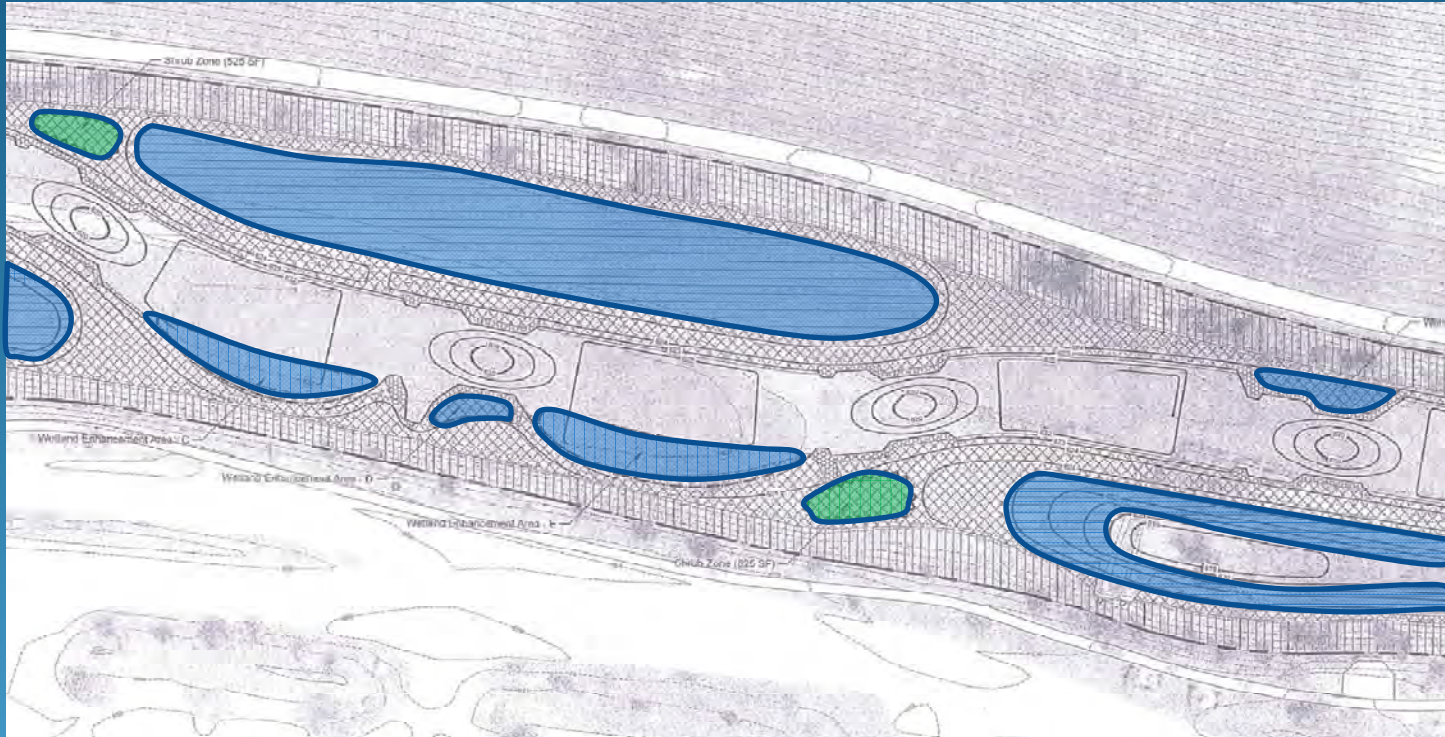
Riffle-pool units



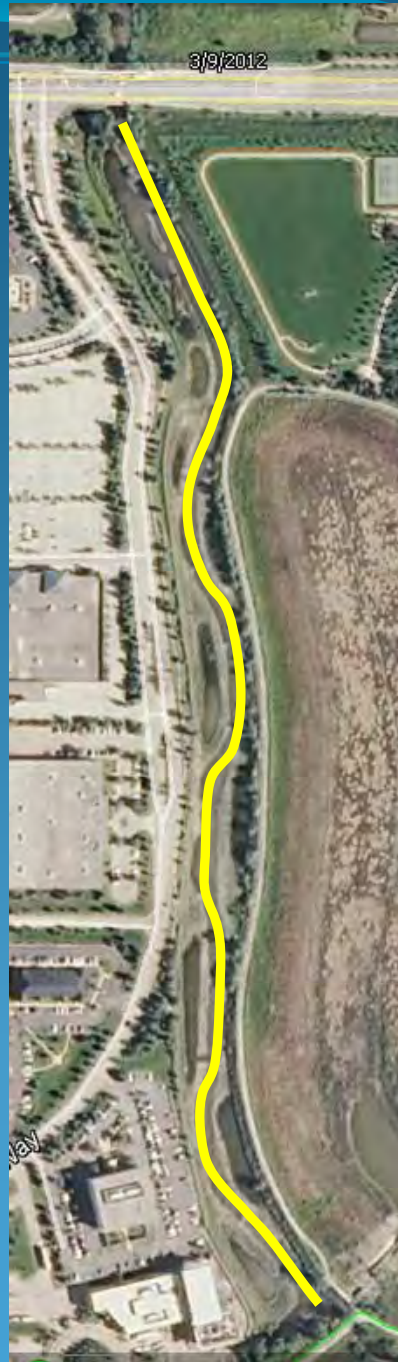
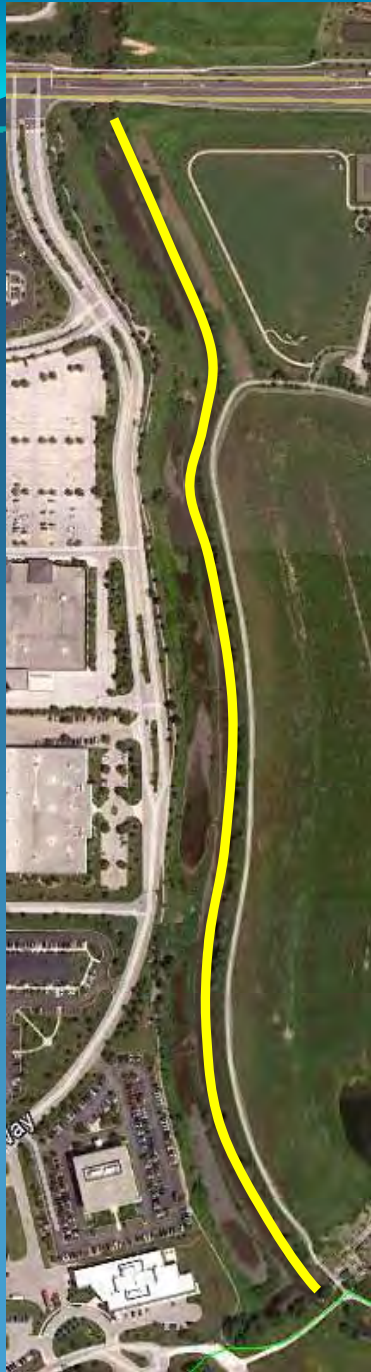
Fluvial geomorphology based design

- Improve/create in-stream habitat by creating hydrodynamic variability
- Riffles are wide and shallow with rapid flow
- Pools are narrow and deep with tranquil flow

Enhanced/created streamside wetlands



Rather than focusing on floristic quality, wetlands were enhanced/created to provide a variety of streamside habitats. Whenever possible, culverts within the corridor were discharged into a wetland rather than directly into the channel in an effort to achieve some water quality benefits.



Meandering channel

Very laterally restricted corridor.

Meandering channel allowed for the creation of wetland habitat on both sides of the channel.

Had to be careful – adding meanders added length to channel and could have potential off-site hydraulic impacts.

The background is a solid blue color with a gradient. At the top, there are several wavy, horizontal lines in shades of blue and cyan, creating a layered, water-like effect. The lines are smooth and flow across the width of the image.

Construction

Fall 2010 – Spring 2011

Dewatering/SESC



Riffle-Pool Unit Construction and Channel Meandering



Seeding/Planting



Returning Flow to the Channel



Returning Flow to the Channel



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Monitoring

Is vegetation becoming established?
Are the riffle-pool units functioning?

Vegetation



Vegetation



Riffle-Pool Units

HEC-RAS predicted velocity (V) vs. actual measured velocity (V)

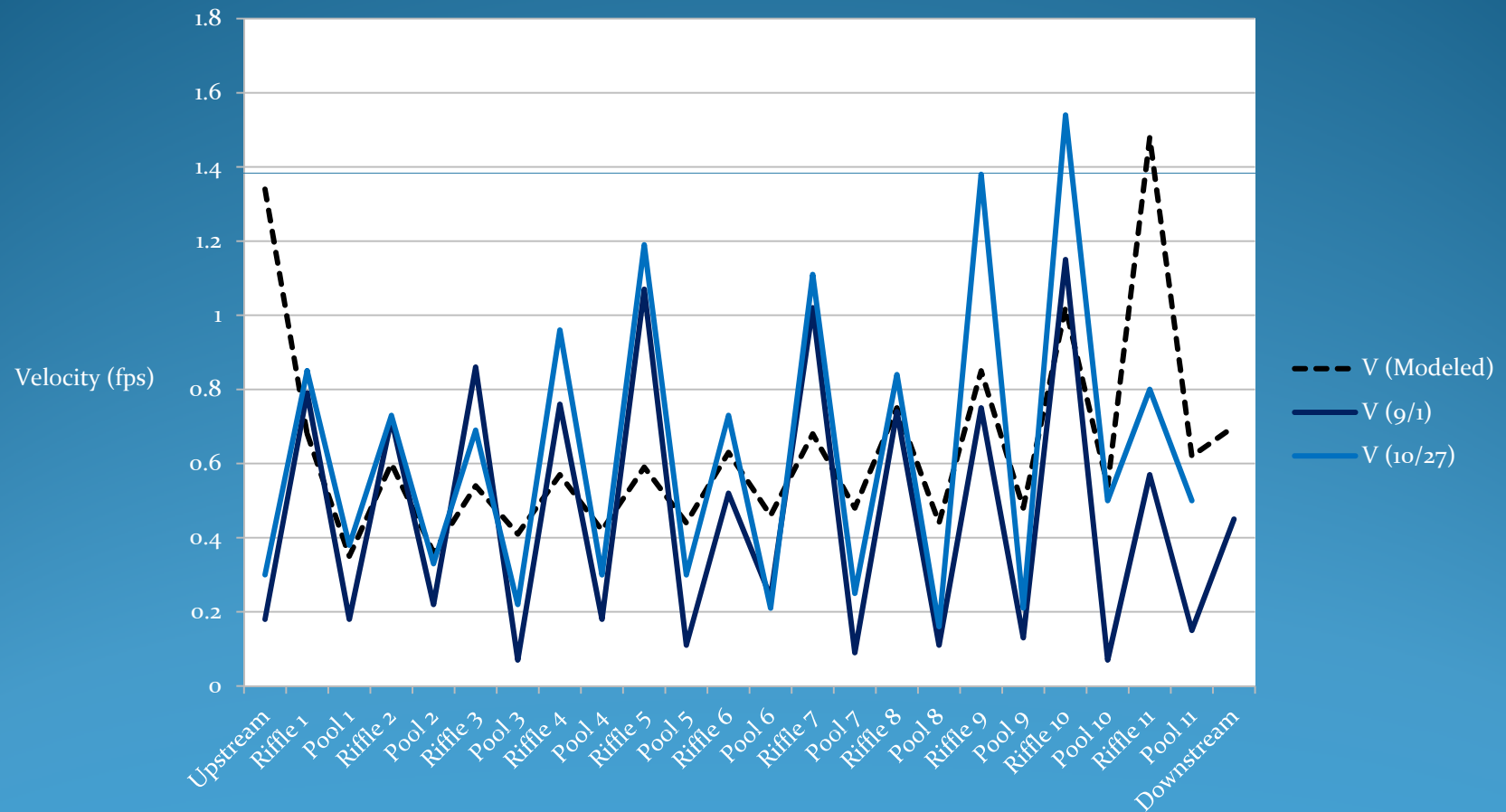
Location	V (Modeled) *	V (9/1)	V (10/27)
Riffle 1	0.68	0.79	0.85
Pool 1	0.35	0.18	0.38
Riffle 2	0.60	0.72	0.73
Pool 2	0.36	0.22	0.33
Riffle 3	0.54	0.86	0.69
Pool 3	0.41	0.07	0.22
Riffle 4	0.57	0.76	0.96
Pool 4	0.42	0.18	0.30
Riffle 5	0.59	1.07	1.19
Pool 5	0.44	0.11	0.3
Riffle 6	0.63	0.52	0.73
Pool 6	0.46	0.24	0.21
Riffle 7	0.68	1.02	1.11
Pool 7	0.48	0.09	0.25
Riffle 8	0.75	0.74	0.84
Pool 8	0.44	0.11	0.16
Riffle 9	0.85	0.75	1.38
Pool 9	0.48	0.13	0.21
Riffle 10	1.02	1.15	1.54
Pool 10	0.54	0.07	0.50
Riffle 11	1.48	0.57	0.80
Pool 11	0.62	0.15	0.50

Parameter	Modeled	Obs. (9/1)	Obs. (10/27)
Q (cfs)	40	45 *	73 *
Mean V-riffle (fps)	0.76	0.81	0.98
Mean V-pool (fps)	0.45	0.14	0.31
Dif. (fps)	0.31	0.67	0.67
Dif. (percent)	41%	83%	68%

* USGS gage data

* Six flows modeled during project design ranging from mean spring flow based upon stream gage records (40 cfs) to 100-year (1305 cfs).

Riffle-Pool Units



References

Leopold, L. 2003. A View of the River. Harvard University Press.

Simon, A., M. Doyle, M. Kondolf, F. Shields, B. Rhoads, and M. McPhillips. 2007. Critical Evaluation of How the Rosgen Classification and Associated “Natural Channel Design” Methods Fail to Integrate and Quantify Fluvial Processes and Response. Journal of the American Water Resources Association. Vol. 43, No. 5.

Wade, R., B. Rhoads, J. Rodriguez, M. Daniels, D. Wilson, E. Herricks, F. Bombardelli, M. Garcia, and J. Schwartz. 2002. Integrating Science and Technology to Support Stream Naturalization Near Chicago, Illinois. Journal of the American Water Resources Association. Vol. 38, No. 4.

Schwartz, J. and E. Herricks. 2005. Fish Use of Stage-Specific Fluvial Habitats as Refuge Patches During a Flood in a Low-Gradient Illinois Stream. Canadian Journal of Fisheries and Aquatic Sciences. Vol. 62, No. 7.



Questions?

Thank you!

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