

Case Study 15: Creel Ditch Two-Stage Project, Steuben County, IN

Location: Creel Ditch is part of the St. Joseph River – Fish Creek: Creel Ditch in Steuben County, Indiana.

Fish Creek HUC: 0410000304

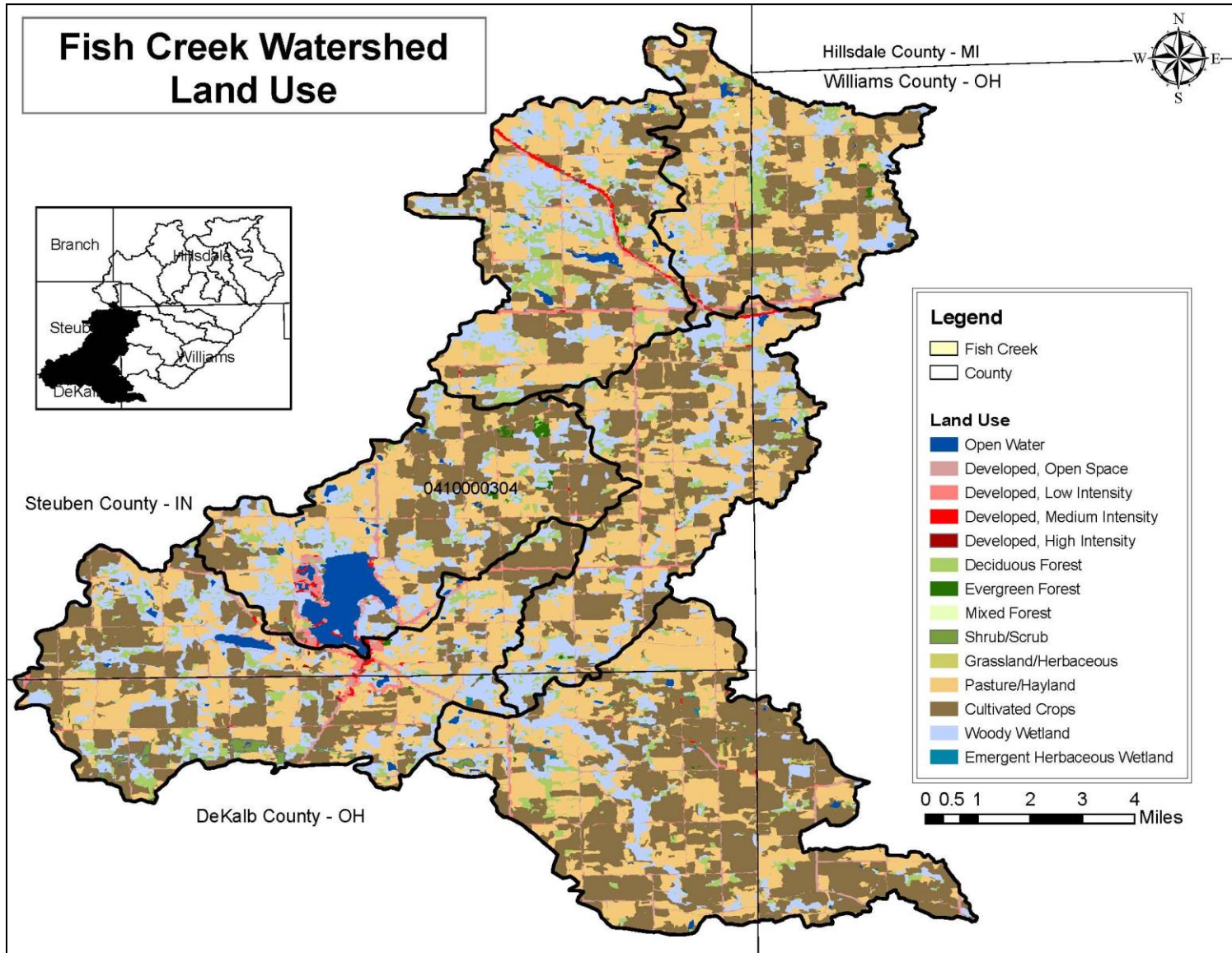
Watershed Descriptionⁱ: The St. Joseph River, a major tributary to the Maumee River which feeds into Lake Erie, is over 86 miles long and is the drinking water source for more than 250,000 residents of the Fort Wayne, Indiana area. Within the St. Joseph River is Fish Creek. Fish Creek Watershed is the third largest of the four watersheds that comprise the Upper St. Joseph River Watershed at over 78,710.50 acres. The primary influence on water quality in the Fish Creek Watershed is agriculture, as can be seen in Table 3.4.21 and Figure 3.22. According to the National Land Cover Data from the USGS, approximately 70% of the Fish Creek watershed is agriculture, which is almost evenly split between row crops and pasture or hay land. Developed areas in the watershed make up just fewer than 6% of the land use, but note that 4.05% of that is “open land” which is comprised of parks or lawn grasses and generally has less than 20% impervious cover. Hamilton, Indiana (P=1,527) is located within Fish Creek Watershed and may contribute to water pollution from lawn fertilizers and discharge from the waste water treatment plant (WWTP).

The Fish Creek Watershed has a few undeveloped areas including over 5000 acres of deciduous or evergreen forest, mostly in northeastern portion of the watershed, just north of Montpelier. Woody wetlands are scattered throughout the watershed, though are mostly along the Fish Creek riparian area, and making up nearly 15% of the watershed land use.

Table 3.4.21: Land Use in the Fish Creek Watershed

Landuse	Open Water	Open Space	Dev. Low Intensity	Dev. Medium Intensity	Dev. High Intensity	Deciduous Forest	Evergreen Forest	Mixed Forest
Acres	1333.79 1.69%	3185.03 4.05%	1048.37 1.33%	324.82 <1%	49.87 <1%	4939.81 6.28%	229.5 <1%	48.3 <1%
Landuse	Shrub/ Scrub	Grassland/ Herbaceous	Hay/ Pasture	Cultivated Crops	Woody Wetlands	Emergent Herbaceous Forest	Barren Land	TOTAL
Acres	262.37 <1%	309.34 <1%	26416.36 33.56%	28976.03 36.81%	11499.12 14.61%	87.79 <1%	0 0	78710.50 100%

Figure 3.22: Land Use in the Fish Creek Watershed



Fish Creek Targets: Overall, significant contributors to nonpoint source pollution in the Fish Creek Watershed are livestock, row crops with conventional tillage practices and a lack of riparian buffer and urban areas, specifically Hamilton.

Table 4.4: Nitrate+Nitrite Pollution Load Reductions Necessary to Meet Target Loads

			2012 Load	Target Load	Reduction Needed
Subwatershed	Site Number	Mean CF/S	Nitrate+Nitrite (Tons/yr)	Nitrate+Nitrite (Tons/yr)	Nitrite+ Nitrite (Tons/yr)
Headwaters Fish Creek	171	6.08	1.91	9.57	0.00
West Branch-Fish Creek	170	5.23	0.37	8.24	0.00
Cornell Ditch - Fish Creek	124	9.38	8.09	14.77	0.00

Table 4.5: Total Phosphorus Pollution Load Reductions Necessary to Meet Target Loads

			2012 Load	Target Load	Reduction Needed
Subwatershed	Site Number	Mean CF/S	Total Phosphorus (Tons/yr)	Total Phosphorus (Tons/yr)	Total Phosphorus (Tons/yr)
Headwaters Fish Creek	171	6.08	0.34	0.48	0.00
West Branch-Fish Creek	170	5.23	0.30	0.41	0.00
Cornell Ditch - Fish Creek	124	9.38	0.99	0.74	0.25

Table 4.6: Total Dissolved Solid Pollution Load Reductions Necessary to Meet Target Loads

			2013 Load	Target Load	Reduction Needed
Subwatershed	Site Number	Mean CF/S	TDS (Tons/yr)	TDS (Tons/yr)	TDS (Tons/yr)
Headwaters Fish Creek	171	6.08	2.33	4488.22	0.00
West Branch-Fish Creek	170	5.23	2769.45	3860.76	0.00
Cornell Ditch - Fish Creek	124	9.38	3259.02	6924.26	0.00

Table 4.7: Dissolved Reactive Phosphorus Pollution Load Reductions Necessary to Meet Target

			SWAT Load	Target Load	Reduction Needed
Subwatershed	Site Number	Mean CF/S	Dissolved Reactive Phosphorus (Tons/yr)	Dissolved Reactive Phosphorus (Tons/yr)	Dissolved Reactive Phosphorus (Tons/yr)
Headwaters Fish Creek	171	21.3	0.81	1.05	0.00
West Branch-Fish Creek	170	14.3	0.37	0.70	0.00
Cornell Ditch - Fish Creek	124	147.4	5.78	7.25	0.00

Creel Ditchⁱⁱ: Creel Ditch was an incised drainage channel draining a 4.7 square mile watershed covered by row crops and pasture (69%), water and wetlands (16%) and low and high density development (6%). In 2006, TNC’s Upper St. Joseph Project Office (now WLEB AG Project Office) received a grant from The Joyce Foundation to implement conservation practices in the Creel Ditch Watershed to reduce sedimentation to the downstream receiving system, Fish Creek.

Construction Details:

- Constructed in 2008
- Drainage Area: 4.7 square miles
- Channel Slope: .3%
- Project length: 5,200’
- Reach 1 = 1,200’ & Reach 2 = 4,000’

REACH 1:

Earthwork cost: \$14,546 (\$12.12 per linear foot)

- Mobilization - \$0
- Site Prep - \$0
- Soil Excavation, Hauling and Disposal: \$14,546
 - 4,156 cubic yards @ 3.50 per cubic yard
 - 3.5 cubic yards per linear foot of channel

Outlet Protection and Erosion Control: \$0

Seed and Seeding: \$0

Repairs: \$0

Engineering, survey, and inspection: \$0 (design completed in-kind by OSU)

Total Cost: \$14,546

Cost per linear foot: \$12.12

REACH 2:

Earthwork cost: \$87,686 (\$21.92 per linear foot)

- Mobilization - \$0
- Site Prep - \$0
- Soil Excavation, Hauling and Disposal: \$87,686

- 25,052 cubic yards @ 3.50 per cubic yard
- 6.3 cubic yards per linear foot of channel

Outlet Protection and Erosion Control: \$0

Seed and Seeding: \$0

Repairs: \$0

Engineering, survey, and inspection: \$0 (design completed in-kind by OSU)

Total Cost: \$87,686

Cost per linear foot: \$21.92

Post-construction Monitoring: Post-construction monitoring suggested that after two years nitrate-nitrogen, total phosphorus, and total suspended sediments loads were reduced and fish and macro-invertebrate communities improved. Ammonia concentrations and substrate composition were not significantly different after two years.

Federally Endangered Species: In Fish Creek, it is the only known location for the white cat's paw pearly mussel (*Epioblasma obliquata perobliqua*) is currently found. In general, Fish creek systems harbor 31 species of mussels and 42 species of fish.

ⁱ Upper St. Joseph River Watershed Management Plan

ⁱⁱ Great Lakes Regional Water Program: Two-Stage Case Study: Creel Ditch, <http://greatlakeswater.uwex.edu/>