

**Practice: 657 - Wetland Restoration**

**Scenario: #1 - Mineral Flat, Tile Removal**

**Scenario Description:**

A Mineral Flat wetland is to be restored. The wetland size is 40 Acres consists of surface saturated soils interspersed with shallow depressions that are not depressional class HGM wetlands. Resource Concerns are: 4-SOIL QUALITY DEGRADATION - Organic matter depletion, 11- WATER QUALITY DEGRADATION - Excess nutrients in surface and ground waters, 12 - WATER QUALITY DEGRADATION - Pesticides transported to surface and ground waters, 16 - WATER QUALITY DEGRADATION - Excessive sediment in surface waters, 18 - DEGRADED PLANT CONDITION - Undesirable plant productivity and health, 19 - DEGRADED PLANT CONDITION, Inadequate structure and composition, 22- INADEQUATE HABITAT FOR FISH AND WILDLIFE - Habitat degradation.

**Before Situation:**

The site has been drained with a tile drain system. A suitable seed bank exists for natural regeneration to re-establish hydrophytic vegetation. The site is in agricultural production.

**After Situation:**

The drain tiles have been rendered non-functional by excavating 50 foot lengths of tile mains and laterals in 6 separate locations, and backfilling with excavated earth, which is compacted with the excavator bucket. There are no facilitating practices. Restoration of hydrology and plant community functions will improve the WATER QUALITY and DEGRADED PLANT CONDITION concerns listed above. The hydrologic and vegetative practices will address the SOIL QUALITY DEGRADATION and INADEQUATE HABITAT FOR FISH AND WILDLIFE concerns.

**Scenario Feature Measure:** Acres of wetland

**Scenario Unit:** Acre

**Scenario Typical Size:** 40

**Scenario Cost:** \$18,168.16

**Scenario Cost/Unit:** \$454.20

**Cost Details (by category):**

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
<b>Equipment/Installation</b>						
Hydraulic Excavator, .5 CY	930	Track mounted hydraulic excavator with bucket capacity range of 0.3 to 0.8 CY. Equipment and power unit costs. Labor not included.	Hour	\$56.70	8	\$453.60
<b>Foregone Income</b>						
Fl, Corn Dryland	1959	Dryland Corn is Primary Crop	Acre	\$437.76	20	\$8,755.20
Fl, Soybeans Dryland	1961	Dryland Soybeans is Primary Crop	Acre	\$430.43	20	\$8,608.60
<b>Labor</b>						
Equipment Operators, Light	232	Includes: Skid Steer Loaders, Hydraulic Excavators <50 HP, Trenchers <12", Ag Equipment <150 HP, Pickup Trucks, Forklifts, Mulchers	Hour	\$22.08	8	\$176.64
<b>Mobilization</b>						
Mobilization, small equipment	1138	Equipment <70 HP but can't be transported by a pick-up truck or with typical weights between 3,500 to 14,000 pounds.	Each	\$174.12	1	\$174.12

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**Scenario: #2 - Riverine Levee Removal, ditch plugs and floodplain features**

**Scenario Description:**

A Riverine HGM tract on a large floodplain is to be restored. It has been converted to agricultural production by surface ditching and clearing of woody vegetation. The wetland extent is 60 acres. Resource Concerns are: 4-SOIL QUALITY DEGRADATION - Organic matter depletion, 11- WATER QUALITY DEGRADATION - Excess nutrients in surface and ground waters, 12 - WATER QUALITY DEGRADATION - Pesticides transported to surface and ground waters, 16 - WATER QUALITY DEGRADATION - Excessive sediment in surface waters, 18 - DEGRADED PLANT CONDITION - Undesirable plant productivity and health, 19 - DEGRADED PLANT CONDITION, Inadequate structure and composition, 22- INADEQUATE HABITAT FOR FISH AND WILDLIFE - Habitat degradation.

**Before Situation:**

A levee prevents floodwater from entering the tract. The original cover was forest. The site is drained by surface ditches which collect surface water and direct it to the river through a flap gate structure. The site has been completely cleared, and no suitable adjacent seedwall exists for natural regeneration of forest species. The lateral connectivity between the channel and floodplain has been altered by construction of levees along the reach.

**After Situation:**

The hydrology of the site is restored with the installation of ditch plugs, and the excavation of macrotopographic features with an average depth of 6" over 30% of the wetland area. Excavated spoil is placed adjacent to the features on the wetland and adjacent non-wetland area with a maximum depth of 24 inches. The levee has been breached at the upstream and downstream ends of the tract reach, restoring dynamic stream flooding. The breach length is 150 feet long at both locations. Both the wetland and non-wetland areas are planted with a Bottomland Hardwood species mix. The levee breaches are armored with rock riprap. Facilitating practices include Grade Stabilization Structure and Tree and Shrub Planting. Restoration of hydrology and plant community functions will improve the WATER QUALITY and DEGRADED PLANT CONDITION concerns listed above. The hydrologic and vegetative practices will address the SOIL QUALITY DEGRADATION and INADEQUATE HABITAT FOR FISH AND WILDLIFE concerns.

**Scenario Feature Measure:** Acres of wetland

**Scenario Unit:** Acre

**Scenario Typical Size:** 60

**Scenario Cost:** \$79,611.82

**Scenario Cost/Unit:** \$1,326.86

**Cost Details (by category):**

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
<b>Equipment/Installation</b>						
Dozer, 200 HP	928	Track mounted Dozer with horsepower range of 160 to 250. Equipment and power unit costs. Labor not included.	Hour	\$188.76	36	\$6,795.36
Scraper, self propelled, 21 CY	1208	Self propelled earthmoving scraper with 21 CY capacity. Does not include labor.	Hour	\$369.59	113	\$41,763.67
<b>Foregone Income</b>						
FI, Soybeans Dryland	1961	Dryland Soybeans is Primary Crop	Acre	\$430.43	30	\$12,912.90
FI, Corn Dryland	1959	Dryland Corn is Primary Crop	Acre	\$437.76	30	\$13,132.80
<b>Labor</b>						
Equipment Operators, Heavy	233	Includes: Cranes, Hydraulic Excavators >=50 HP, Dozers, Paving Machines, Rock Trenchers, Trenchers >=12", Dump Trucks, Ag Equipment >=150 HP, Scrapers, Water Wagons.	Hour	\$26.97	149	\$4,018.53
<b>Mobilization</b>						
Mobilization, large equipment	1140	Equipment >150HP or typical weights greater than 30,000 pounds or loads requiring over width or over length permits.	Each	\$494.28	2	\$988.56

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**Scenario: #3 - Depression Sediment Removal and Ditch Plug**

**Scenario Description:**

A Depressional HGM class wetland is to be restored. The wetland size is 10 acres. The site is a recharge depression, fed only from surface runoff. Resource Concerns are: 4-SOIL QUALITY DEGRADATION - Organic matter depletion, 11- WATER QUALITY DEGRADATION - Excess nutrients in surface and ground waters, 12 - WATER QUALITY DEGRADATION - Pesticides transported to surface and ground waters, 16 - WATER QUALITY DEGRADATION - Excessive sediment in surface waters, 18 - DEGRADED PLANT CONDITION - Undesirable plant productivity and health, 19 - DEGRADED PLANT CONDITION, Inadequate structure and composition, 22- INADEQUATE HABITAT FOR FISH AND WILDLIFE - Habitat degradation.

**Before Situation:**

The wetland has been converted to agricultural production, and the tract drained with a surface ditch. The ditch is 4' average depth, and 12 feet average width. The wetland receives surface runoff from an adjacent upland watershed, and ponds water on a shallow perched layer. The watershed has been converted from native to agricultural landuse, and the resultant soil erosion has deposited 6" of sediment in the bottom of the depression.

**After Situation:**

The ditch has been plugged by the installation of a 50' long section of compacted clay fill, and the deposition has been removed down to the original topsoil layer. A herbaceous plant community has been seeded. Facilitative practices include Conservation Cover. Restoration of hydrology and plant community functions will improve the WATER QUALITY and DEGRADED PLANT CONDITION concerns listed above. The hydrologic and vegetative practices will address the SOIL QUALITY DEGRADATION and INADEQUATE HABITAT FOR FISH AND WILDLIFE concerns.

**Scenario Feature Measure:** Acres of Wetland

**Scenario Unit:** Acre

**Scenario Typical Size:** 10

**Scenario Cost:** \$30,744.25

**Scenario Cost/Unit:** \$3,074.43

**Cost Details (by category):**

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
<b>Equipment/Installation</b>						
Scraper, self propelled, 21 CY	1208	Self propelled earthmoving scraper with 21 CY capacity. Does not include labor.	Hour	\$369.59	63	\$23,284.17
Dozer, 200 HP	928	Track mounted Dozer with horsepower range of 160 to 250. Equipment and power unit costs. Labor not included.	Hour	\$188.76	2	\$377.52
<b>Foregone Income</b>						
FI, Corn Dryland	1959	Dryland Corn is Primary Crop	Acre	\$437.76	5	\$2,188.80
FI, Soybeans Dryland	1961	Dryland Soybeans is Primary Crop	Acre	\$430.43	5	\$2,152.15
<b>Labor</b>						
Equipment Operators, Heavy	233	Includes: Cranes, Hydraulic Excavators >=50 HP, Dozers, Paving Machines, Rock Trenchers, Trenchers >=12", Dump Trucks, Ag Equipment >=150 HP, Scrapers, Water Wagons.	Hour	\$26.97	65	\$1,753.05
<b>Mobilization</b>						
Mobilization, large equipment	1140	Equipment >150HP or typical weights greater than 30,000 pounds or loads requiring over width or over length permits.	Each	\$494.28	2	\$988.56

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**Scenario: #4 - Riverine Channel and Floodplain Restoration**

**Scenario Description:**

A Riverine HGM landscape on a small stream on a low stream order riparian landscape has been partially converted to agricultural production on 10 acres of the 15 acre wetland tract. The stream channel has degraded. The reach is 1500 feet in length. Resource Concerns are: 4-SOIL QUALITY DEGRADATION - Organic matter depletion, 11- WATER QUALITY DEGRADATION - Excess nutrients in surface and ground waters, 12 - WATER QUALITY DEGRADATION - Pesticides transported to surface and ground waters, 16 - WATER QUALITY DEGRADATION - Excessive sediment in surface waters, 18 - DEGRADED PLANT CONDITION - Undesirable plant productivity and health, 19 - DEGRADED PLANT CONDITION, Inadequate structure and composition, 22- INADEQUATE HABITAT FOR FISH AND WILDLIFE - Habitat degradation.

**Before Situation:**

Channel incision has broken the lateral connectivity between the stream and floodplain. The conversion to cropland was accompanied by filling and leveling of backswamp, side channel, and oxbow features which formerly ponded water or exposed the floodplain groundwater table. The site no longer has access to floodwater or water surface profile supported groundwater. No suitable seed bank exists for natural regeneration of the original hydrophytic plant community, either in the channel, or on the floodplain.

**After Situation:**

The hydrology of the site is restored by the installation of a series of rock check structures to raise the stream water surface profile. Floodplain macrotopographic features replicating the original side channels, oxbows, and backswamps are constructed by excavation. Spoil is placed adjacent to the excavations to replicate natural depositional features. The average depth of the excavated features is 0.5 feet, and the surface area of the excavations is 25% of the tract size. The eroding stream bank is stabilized with soil bio-engineering features, and fish habitat improvement measures are installed in the channel. The tract is seeded to appropriate hydrophytic and upland vegetation, both woody and herbaceous. Facilitating practices are Streambank and Shoreline protection, Structure for Water Control, Conservation Cover, Tree/Shrub Establishment, and Stream Habitat Improvement and Management. Restoration of hydrology and plant community functions will improve the WATER QUALITY and DEGRADED PLANT CONDITION concerns listed above. The hydrologic and vegetative practices will address the SOIL QUALITY DEGRADATION and INADEQUATE HABITAT FOR FISH AND WILDLIFE concerns.

**Scenario Feature Measure:** Acres of wetland

**Scenario Unit:** Acre

**Scenario Typical Size:** 15

**Scenario Cost:** \$22,181.77

**Scenario Cost/Unit:** \$1,478.78

**Cost Details (by category):**

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
<b>Equipment/Installation</b>						
Dozer, 200 HP	928	Track mounted Dozer with horsepower range of 160 to 250. Equipment and power unit costs. Labor not included.	Hour	\$188.76	34	\$6,417.84
Scraper, self propelled, 21 CY	1208	Self propelled earthmoving scraper with 21 CY capacity. Does not include labor.	Hour	\$369.59	24	\$8,870.16
<b>Foregone Income</b>						
FI, Soybeans Dryland	1961	Dryland Soybeans is Primary Crop	Acre	\$430.43	5	\$2,152.15
FI, Corn Dryland	1959	Dryland Corn is Primary Crop	Acre	\$437.76	5	\$2,188.80
<b>Labor</b>						
Equipment Operators, Heavy	233	Includes: Cranes, Hydraulic Excavators >=50 HP, Dozers, Paving Machines, Rock Trenchers, Trenchers >=12", Dump Trucks, Ag Equipment >=150 HP, Scrapers, Water Wagons.	Hour	\$26.97	58	\$1,564.26
<b>Mobilization</b>						
Mobilization, large equipment	1140	Equipment >150HP or typical weights greater than 30,000 pounds or loads requiring over width or over length permits.	Each	\$494.28	2	\$988.56

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**Scenario: #5 - Vernal Pool**

**Scenario Description:**

Restoration of vernal pools on suitable sites within areas of hardwood forest. This involves restoration of hydrology to a vernal pool site that provides season shallow surface water. Resource concerns include INADEQUATE HABITAT FOR FISH AND WILDLIFE - Habitat degradation.

**Before Situation:**

The site has mature trees and vegetation typical to vernal pools but the hydrology of the site has been altered such that the site no longer is inundated seasonally which is required for wildlife that are dependent on vernal pools for part of their life cycle. The existing native vegetation precludes the use of standard wetland restoration construction methods.

**After Situation:**

Seasonal inundation of the site has been restored to the site without significant disturbance to the native vegetation. Wildlife habitat for species that utilize vernal pools has been restored to the site.

**Scenario Feature Measure:** Area of pool

**Scenario Unit:** Acre

**Scenario Typical Size:** 0

**Scenario Cost:** \$2,629.52

**Scenario Cost/Unit:** #Div/0!

**Cost Details (by category):**

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
<b>Equipment/Installation</b>						
Backhoe, 80 HP	926	Wheel mounted backhoe excavator with horsepower range of 60 to 90. Equipment and power unit costs. Labor not included.	Hour	\$56.70	16	\$907.20
Skidsteer, 80 HP	933	Skidsteer loader with horsepower range of 60 to 90. Equipment and power unit costs. Labor not included.	Hour	\$43.69	8	\$349.52
<b>Labor</b>						
General Labor	231	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$20.32	16	\$325.12
Equipment Operators, Light	232	Includes: Skid Steer Loaders, Hydraulic Excavators <50 HP, Trenchers <12", Ag Equipment <150 HP, Pickup Trucks, Forklifts, Mulchers	Hour	\$22.08	24	\$529.92
<b>Mobilization</b>						
Mobilization, medium equipment	1139	Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds.	Each	\$258.88	2	\$517.76

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**Scenario: #6 - Riverine, oxbow wetland**

**Scenario Description:**

Restoration of a 0.40 acre oxbow wetland to create off-channel habitat for species such as Topeka Shiner. Includes removal of post settlement alluvium down to the original soil surface, slope, and contour. Reconnection of the oxbow to the stream channel using original, natural inflow and outflow channels will include excavation of post settlement alluvium to the original soil surface, slope, and contour. Resource concerns include habitat degradation and excessive sedimentation.

**Before Situation:**

Backwater lakes and oxbows have become filled with sediment eliminating or degrading habitat for fish and other aquatic organisms. Substrates are not compact enough to support emergent vegetation. The stream is no longer connected to this off-channel habitat necessary for parts of the life cycle of fish and aquatic organisms that live in the main channel.

**After Situation:**

A 0.4 acre off-channel oxbow (35' bottom width, 56' topwidth, 3.5' depth, 310 feet long) is excavated to remove the post settlement alluvium down to original soil surface, slope and contour. Oxbow is reconnected to the stream channel by excavating the original inflow and outflow channels to post settlement grade, slope and contour.

**Scenario Feature Measure:** area of excavation

**Scenario Unit:** Acre

**Scenario Typical Size:** 0

**Scenario Cost:** \$11,660.04

**Scenario Cost/Unit:** #Div/0!

**Cost Details (by category):**

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
<b>Equipment/Installation</b>						
Hydraulic Excavator, 2 CY	932	Track mounted hydraulic excavator with bucket capacity range of 1.5 to 2.5 CY. Equipment and power unit costs. Labor not included.	Hour	\$193.04	36	\$6,949.44
Dozer, 140 HP	927	Track mounted Dozer with horsepower range of 125 to 160. Equipment and power unit costs. Labor not included.	Hour	\$125.87	18	\$2,265.66
<b>Labor</b>						
Equipment Operators, Heavy	233	Includes: Cranes, Hydraulic Excavators >=50 HP, Dozers, Paving Machines, Rock Trenchers, Trenchers >=12", Dump Trucks, Ag Equipment >=150 HP, Scrapers, Water Wagons.	Hour	\$26.97	54	\$1,456.38
<b>Mobilization</b>						
Mobilization, large equipment	1140	Equipment >150HP or typical weights greater than 30,000 pounds or loads requiring over width or over length permits.	Each	\$494.28	2	\$988.56