

## Off-stream Water Source

**Description:** An off-stream water supply, such as a trough or pond system

**Target NPS Pollutants:** Sediment, Bacteria, Nutrients, Other sediment bound pollutants

**Practice Type:** Structural, Source reduction

### Benefits

#### Benefits to Big Rock Creek Watershed:

- Reduces cattle time in stream, which
- Reduces manure deposition and associated nutrient/bacteria contamination of surface waters
- Reduces streambank destabilization and associated erosion due to trampling and overgrazing of banks

#### Benefits to Farmers:

- Provides clean source of water for livestock (trough source)
- Reduces herd health risks associated with livestock standing in bacteria contaminated water (trough source)
- Decreases herd injuries associated with cattle climbing steep and unstable streambanks (trough or pond source)

### Implementation Considerations

#### General:

- Water source must be available
- Typically combined with Exclusionary Fencing (*Fact Sheet 2*) or Rotational Grazing (*Fact Sheet 6*)
- Does not reduce time spent in stream by cattle for cooling purposes.

#### Barriers:

- Increased financial and maintenance obligation to farmer
- In steep areas the vertical and horizontal distance from water source can impact system requirements and cost

### Financial Considerations

#### Estimated Installation Cost in Marshall County:

\$2,400 per trough system (1)

\$2,000 per pond system (1)

#### Key Cost Factors:

- Pumping system (electrical or solar)
- Number of systems needed to meet herd drinking requirements

#### Applicable Cost-share and Incentive Conservation Programs :

- EQIP (up to 75% cost-share and some behavioral incentives available)
- TDA-NPS (2) (up to 60% cost-share)
- TDA-ARCF (2) (up to 75% cost-share)



Off-stream water sources provide clean water for cattle and reduce stream degradation (*Photo Courtesy of USDA - NRCS*)

Source: (1) Garretson, pers com; (2) Programs have varying requirements, cost-share caps, and contract lengths

Additional Resources: Ritter and Shirmohammadi, 2001; NRCS, 2000; Burns and Buschermohle, 2002; Marsh, 2001

\* Programs are offered to agencies, non-profits and universities but may be implemented on private lands.

# Exclusionary Fencing

**Description:** Fencing to prevent cattle access to the riparian buffer and stream

**Target NPS Pollutants:** Sediment, Bacteria, Nutrients, Other sediment bound pollutants

**Practice Type:** Structural, Source reduction

## Benefits

### Benefits to Big Rock Creek Watershed:

- Reduces direct and local fecal matter and associated nutrients and bacteria transport to streams
- Prevents streambank destabilization due to trampling and overgrazing of banks
- Prevents overgrazing of riparian vegetation

### Benefits to Farmers:

- Reduces herd health risks associated with livestock standing in bacteria contaminated water and climbing streambanks (NRCS, 2000)

## Implementation Considerations

### General:

- Off-stream water source must be provided with complete stream exclusion fencing (*See Fact Sheet 1*)
- Often used in conjunction with Riparian Buffer Management (*See Fact Sheet 5*)

### Barriers:

- Farms with long stream frontage require greater financial and time obligation
- Maintenance in flood plain
- Loss of grazing land

## Financial Considerations

### Estimated Installation Cost in Marshall County:

*\$0.30-\$2.00/foot* (1)

### Sample Fencing Types:

- High tensile woven - \$2.00/foot
- Standard 5 strand barbwire/posts @ 10 ft. - \$1.40
- 5 strand high tensile electric/posts @ 50 ft - \$0.50
- 1 strand high tensile electric/posts @ 50 ft. - \$0.30

### Key Cost Factors:

- Fencing material (i.e. barb wire or high tensile)
- Post material
- # of strands
- Power source for electrical fencing
- Cost of off-stream water source if total exclusion established

### Applicable Cost-share and Incentive Conservation

#### Programs (2):

- EQIP (up to 75% cost-share and some behavioral incentives available)
- Wildlife Buffer Program (\$100/acre incentive)
- TDA-NPS (up to 60% cost-share)
- TDA-ARCF (up to 75% cost-share)



**Fencing Protects Riparian Buffers from Livestock Grazing**

*(Photo Courtesy of USDA- NRCS)*

(1) Source:Garretson, pers com; (2) Programs have varying requirements, cost-share caps, and contract lengths  
Additional Resources: Ritter and Shirmohammadi, 2001; NRCS, 2000; Burns and Buschermohle, 2002; Marsh, 2001

## Heavy Use Area Protection

**Description:** Geotextile material and gravel are installed around areas that receive heavy livestock use

**Target NPS Pollutants:** Sediment

**Practice Type:** Structural, Source reduction

### Benefits

**Benefits to Big Rock Creek Watershed:**

- Decreases soil exposure and sediment runoff

**Benefits to Farmers:**

- Reduces herd health risks associated with livestock standing in muddy areas, such as foot disease and injuries due to unstable footing
- Aesthetically appealing

### Implementation Considerations

**General**

- Target areas include gate openings, feed and exercise areas, water sources, and travel lanes.

**Barriers:**

- Cost of installation and maintenance

### Financial Considerations

**Estimated Installation Cost in Marshall County:**

\$25,000 per acre (1)

**Key Cost Factors:**

- Level of Grading Required

**Applicable Cost-share and Incentive Conservation Programs (2):**

- EQIP (up to 75% cost-share and some behavioral incentives available)
- TDA-NPS (up to 60% cost-share)
- TDA-ARCF (up to 75% cost-share)



Heavy Use Areas, such, as around this water tank, can be protected using geotextile material and a layer of gravel.

*(Photo Courtesy of USDA NRCS)*

(1) Source: Garretson, pers com; (2) Programs have varying requirements, cost-share caps, and contract lengths  
Additional Resources: NRCS, 2000

## Protected Stream Crossing

**Description:** Geotextile material or concrete pad installed across stream channel at livestock access and ATV crossing points.

**Target NPS Pollutants:** Sediment, Other sediment bound pollutants

**Practice Type:** Structural, Source reduction

### Benefits

#### Benefits to Big Rock Creek Watershed:

- Decreases streambank destabilization and associated erosion, due to trampling of unprotected banks
- Deters wallowing due to gravel bottom

#### Benefits to Farmers:

- Reduces herd health risks associated with livestock standing in bacteria contaminated water
- Reduces herd injuries associated with cattle climbing steep and unstable streambanks
- Improved stability for equipment crossing
- Aesthetically appealing

### Financial Considerations

**Estimated Installation Cost in Marshall County:**  
*\$1,400 per crossing* (1)

#### Key Cost Factors:

- Level of bank grading required
- Cost of associated fencing

#### Applicable Cost-share and Incentive Conservation Programs (2):

- EQIP (up to 75% cost-share and some behavioral incentives available)
- TDA-NPS (up to 60% cost-share)
- TDA-ARCF (up to 75% cost-share)

### Implementation Considerations

#### General:

- Should be used if off-stream water source not feasible
- Should be used in conjunction with exclusionary fencing to keep cattle from moving off protected area (*See Fact Sheet 2*)

#### Barriers:

- Cost of installation
- Since deters wallowing, alternative cooling system may be necessary, especially for dairy cows



**Stream Crossing Protection Can Reduce Erosion and Cattle Time Spent in the Stream**

*(Photo Courtesy of USDA NRCS)*

(1) Source: Garretson, pers com; (2) Programs have varying requirements, cost-share caps, and contract lengths  
Additional Sources: NRCS, 2000; Marsh, 2001

# Riparian Buffer Management

**Description:** A forested or vegetated strip of land between stream and land under active use

**Target NPS Pollutants:** Sediment, Nutrients, Bacteria

**Practice Type:** Structural, Interception

## Benefits

### Benefits to Big Rock Creek Watershed:

- Decreased runoff volume and velocity
- Reduced downstream flooding
- Reduction of water-borne pollutants including sediment, nutrients and fecal matter
- Stabilization of streambanks, reduction of erosion and downstream sedimentation
- Decreased stream temperature
- Increased wildlife habitat

### Benefits to Farmers:

- Stabilization of streambank prevents land loss
- Outer tree buffers can be harvested for long-term income (forested buffers)
- Serves as flood right-of-way, reducing structural damage

## Implementation Considerations

### General:

- Fencing required (*see Fact Sheet 2*)
- Three zone buffer system is ideal (2)
- Must receive low-velocity and volume runoff to be effective
- Establishment of vegetated filter strips is rapid
- Establishment of forested buffers is slow but may provide additional protection during flooding (3)

### Barriers:

- Loss of grazing land
- Establishment and maintenance costs
- May be considered to be aesthetically unappealing
- Limited efficiency in flood zones or areas of steep slopes or heavy soil compaction
- Potential for nuisance animals

## Financial Considerations

### Estimated Installation Cost in Marshall County:

\$140 per acre for vegetated filter strips (1)

\$225 per acre forested riparian buffers (1)

### Key Cost Factors:

- Type of vegetation planted
- Associated fencing costs

### Applicable Cost-share and Incentive Conservation Programs (4) :

- EQIP (up to 75% cost-share and some behavioral incentives available)
- CRP (up to 50% cost-share)
- TRIP (up to 50% cost-share and \$8/acre incentive)
- Private Stewardship Program (up to 90%)
- Wildlife Buffer Program (\$100/acre incentive)
- TDA-NPS (up to 60% cost-share)
- TDA-ARCF (up to 75% cost-share)
- Property Tax Benefits (if in easement)



**Riparian Buffers Improve Water Quality and Habitat**

(Photo Courtesy of USDA NRCS)

(1) Source: Garretson, pers com, (2) Description of three zone buffer system in Ritter and Shirmohammadi, 2001, (3) Source: Klapproth and Johnson, 2000; (4) Programs have varying requirements, cost-share caps, and contract lengths  
Additional Resources: NRCS, 2000; VCE, 2000; UGA, 2002

# Rotational Grazing

**Description:** Practice of rotating livestock between several small paddocks instead of permitting to continuously graze one large pasture

**Target NPS Pollutants:** Sediment, Other sediment bound pollutants

**Practice Type:** Managerial/ Structural, Source reduction

## Benefits

## Financial Considerations

### Benefits to Big Rock Creek Watershed:

- Decreased runoff due to overgrazing

### Benefits to Farmers:

- Improves forage quality and utilization
- Decreases feed cost
- Increases stocking rate
- Extends grazing season
- Improved uniformity of pastures
- Increased soil fertility
- Reduced production costs
- Increased herd health

### Estimated Installation Cost in Marshall County:

**\$20 per acre** (1)

### Key Cost Factors:

- Associated fencing
- Installation of off-stream water source
- Time to rotate herd

### Applicable Cost-share and Incentive Conservation Programs (2) :

- EQIP (up to 75% cost-share and some behavioral incentives available)
- TDA-NPS (up to 60% cost-share)
- TDA-ARCF (up to 75% cost-share)

## Implementation Considerations

### General:

- Fencing required (*See Fact Sheet 2*)
- Site specific management plan required
- Typically off-stream water source must be provided (*See Fact Sheet 1*)

### Barriers:

- Increased cost of installation and maintenance of temporary fencing
- Increased time to rotate livestock



**Rotational grazing has many benefits to the farmer and environment**

(Photo Courtesy of USDA NRCS)

(1) Source: Garretson, pers com; (2) Programs have varying requirements, cost-share caps, and contract lengths  
 Additional Resources: Ritter and Shirmohammadi, 2001, NRCS, 2000; White and Wolf, 1996; Chorney, 1999; Beetz, 2002

Big Rock Creek Pastureland Conservation Practice Fact Sheet # 7  
**Sinkhole Protection: Vegetative Buffer**

**Description:** Use of vegetative buffering to reduce runoff from entering sinkholes

**Target NPS Pollutants:** Sediment, Nutrient, Bacteria

**Practice Type:** Structural, Interception

**Benefits**

**Benefits to Big Rock Creek Watershed:**

- Reduces runoff pollutant contamination of groundwater
- Decreased runoff volume and velocity
- Reduces groundwater contamination

**Benefits to Farmers:**

- Reduces groundwater contamination
- Reduces potential for cattle health risk of falling into sink hole

**Financial Considerations**

**Estimated Installation Cost in Marshall County:**

*\$140 per acre for vegetated filter strips (1)*  
*\$225 per acre forested buffers (1)*

**Key Cost Factors:**

- Plus associate fencing costs
- Type of vegetation planted

**Applicable Cost-share and Incentive Conservation Programs (3) :**

- EQIP (up to 75% cost-share and some behavioral incentives available)
- TDA-NPS (up to 60% cost-share)
- TDA-ARCF (up to 75% cost-share)

**Implementation Considerations**

**General:**

- 50-100 ft. buffer recommended (2)
- Fencing required (*see Fact Sheet 2*)
- Must receive low-velocity and volume runoff to be effective (buffer)
- Establishment of forested buffers is slow
- Establishment of vegetated filter strips is rapid

**Barriers:**

- Land taken out of production
- Long-term maintenance required
- Extent of sinkhole presence may make financially unfeasible to buffer all sinkholes, at this point consider easements



**Sinkhole Protection is Important to Prevent Groundwater Contamination**

*(Photo Courtesy of USDA NRCS)*

(1) Source: Garretson, pers com; (2) Source: UT, 1991; (3) Programs have varying requirements, cost-share caps, and contract lengths

Additional Resources: NRCS, 2000; Watson *et al.* 1997

Big Rock Creek Pastureland Conservation Practice Fact Sheet # 8  
**Steep Slope Management: Reforestation**

**Description:** Planting or permitting natural regrowth of forest on steep slopes previously used as pasture  
**Target NPS Pollutants:** Sediment, Nutrient, Bacteria  
**Practice Type:** Structural, Interception

**Benefits**

**Benefits to Big Rock Creek Watershed:**

- Decreased runoff volume and velocity, and related flooding
- Reduction of water-borne pollutants including sediment, nutrients and fecal matter
- Increased wildlife habitat

**Benefits to Farmers:**

- Potential for selective harvesting for long-term economic benefits
- Reduction of runoff and erosion

**Financial Considerations**

**Estimated Installation Cost in Marshall County:**

*\$225 per acre hardwood tree/shrubs* (1)  
*\$220 per acres pine tree/shrubs* (1)

**Key Cost Factors:**

- Type of vegetation planted
- Associated fencing costs

**Applicable Cost-share and Incentive Conservation Programs (2) :**

- CRP (up to 50% cost-share)
- TRIP (up to 50% cost-share and \$8/acre incentive)
- Property Tax Benefits (if in easement)

**Implementation Considerations**

**General:**

- Exclusionary fencing required (*see Fact Sheet 2*)
- Establishment is slow
- Can influence downstream hydrology

**Barriers:**

- Loss of pasture land
- Long-term maintenance if fencing is required



**Reforestation of Steep Slopes Can Reduce Runoff and Increase Infiltration**

(1) Source: Garretson, pers com; (2) Programs have varying requirements, cost-share caps, and contract lengths  
 Additional Sources: Omernick *et al.*, 1981



# Streambank Restoration and Stabilization

**Description:** Vegetating streambanks, bioengineering or rip rap used to prevent further severe bank destabilization and erosion

**Target NPS Pollutants:** Sediment

**Practice Type:** Structural/ Managerial, Source

## Benefits

### Benefits to Big Rock Creek Watershed:

- Decreased channel erosion and sedimentation

### Benefits to Farmers:

- Stabilization of streambank prevents land loss
- Reduced mowing if permit passive revegetation

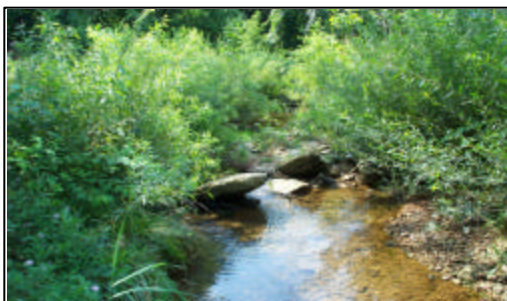
## Implementation Considerations

### General:

- Site must be accessible for large machinery
- Additional practices to reduce source of erosion may be necessary

### Barriers:

- Cost of design and construction
- Machinery access to site location
- Long-term maintenance



**Vegetative Plantings – A nonstructural technique used where erosion potential is not severe**

## Financial Considerations

### Estimated Establishment Cost in Marshall County:

*Free- Passive revegetation*

*\$5-25 per linear foot - Streambank Plantings<sup>(2)</sup>*

*\$7.00 per linear foot - Bioengineering <sup>(1)</sup>*

*\$50.00 per linear foot – Riprap rock <sup>(1)</sup>*

### Key Cost Factors:

- Extent of existing erosion problem
- Plant material chosen
- Installation method
- Implementation of additional practices necessary to support project successes (i.e. establishment of buffer)

### Applicable Cost-share and Incentive Conservation Programs <sup>(3)</sup> :

- EQIP (up to 75% cost-share and some behavioral incentives available)
- TDA-NPS (up to 60% cost-share)
- TDA-ARCF (up to 75% cost-share)
- Property Tax Benefits (if in easement)



**Imbricated Rip-Rap - A highly structural stabilization technique used where erosion potential is high and vegetative techniques are not likely to be effective.**

(1) Source: Garretson, pers com (2) Source: Brown, pers com. (3) Programs have varying requirements, cost-share caps, and contract length ; Additional Resources: Ritter and Shirmohammadi, 2001