

Potential Agricultural Control Measures

Table 1. Potential control measure efficiencies in removing *E. coli*.

Control Measure	Bacteria Removal Efficiency
<i>Direct Reduction Efficiency</i>	
Streamside Fencing	100%
Corrected Straight-pipe	100%
Repaired Septic System	100%
Pet Waste Education Program	75%
Pet Waste Composters	100%
<i>Buffer Efficiency*</i>	
Vegetated Buffer	50%
<i>Runoff Treatment Efficiency</i>	
Improved Pasture Management	50%
Loafing Lot Management.	40%
Manure Incorporation	90%
Retention Ponds	80%

*Buffer efficiencies shown here are applied to runoff from twice the buffer area upstream of the buffer. Additional reductions result from the conversion of land from its existing condition to the buffer area.

Table 2. Estimation of streamside fence and number of full exclusion systems required in each impairment.

Impairment	Adjoining Pasture/Hay (Feet)	Grazing Systems (SL-6 or WP-2T)
Judith Creek	17,635	9
Blackwater - Inclusive*	103,239	52
Fishing Creek	0	0
Beaver Creek	64,415	33
James River	146,656	74
Totals	331,945	289

* “Blackwater – Inclusive” includes all upstream tributaries (Burton Creek, Tomahawk Creek, and Ivy Creek).

- Based on 2001 land use map and perennial streams.
- Need to account for existing systems.
- The SL-6 system includes streamside fencing, cross fencing, alternative watering system, and a 35-foot buffer from the stream.
- The WP-2T system includes streamside fencing, hardened crossings, and a 35-foot buffer from the stream. In cases where a watering system already exists, a WP-2T system is a more appropriate choice. **What percentage of systems fall into this category?**

Table 3. Agricultural land-based BMPs.

Control Measure	Unit	Judith Creek	Blackwater - Inclusive*	Fishing Creek	Beaver Creek	James River
Improved Pasture Management	Acres	1,211	18,980	70	6,666	10,173
Loafing Lot Management	System	N/A	??	N/A	??	N/A
Manure Incorporation - Crop	Acre	N/A	210	N/A	40	125
Retention Ponds – Pasture/Crop	Acre - Treated	550 / 0	8,700 / 160	15 / 0	4,500 / 188	3,000 / 0
Vegetated Buffers – Cropland	Acres	N/A	0	N/A	0	0

* “Blackwater – Inclusive” includes all upstream tributaries (Burton Creek, Tomahawk Creek, and Ivy Creek).

- Areas available based on 2001 land use map.
- Need to account for existing systems, and significant changes in livestock numbers.
- If the changes in land use reflect a decrease in livestock numbers in Fishing Creek, then no agricultural BMPs are needed in the Fishing Creek watershed.
- **Do the changes in land use reflect a decrease in the number of livestock?**
- **Are loafing lot systems needed in the Blackwater River or Beaver Creek watershed?**
- **This is one possible implementation strategy. Are there others that should be explored?**

Table 4. Agricultural control measure costs.

Agricultural Control Measure	Unit	Cost per Unit
Grazing Land Protection System (SL-6)	System	\$20,000
Stream Protection System (WP-2T)	System	\$8,000
Streamside Fence Maintenance	Foot	\$3.50
Improved Pasture Management	Acres	\$154
Loafing Lot Management	System	\$10,000
Manure Incorporation	Acres	\$18
Vegetated Buffers - Cropland	Acres	\$360
Retention Ponds – Pasture	Acres – Treated	\$138

Potential Residential Control Measures**Table 5. Estimated residential waste treatment systems in each impaired watershed.**

Impairment	Houses with Standard Septic Systems	Potential Failing Septic Systems	Potential Straight Pipes
Judith Creek	624	73	14
Blackwater – Inclusive*	8,150	1,018	50
Fishing Creek	87	13	0
Beaver Creek	2,158	295	27
James River	5,542	727	14
Total	16,561	2,126	105

* “Blackwater – Inclusive” includes all upstream tributaries (Burton Creek, Tomahawk Creek, and Ivy Creek).

- **For cost estimates, what percentage of septic systems are expected to be repaired vs. replaced? (The Falling River IP used 70% replaced and 30% repaired)**
- **What percentage will need an alternative system? (The Falling River IP used 5%)**
- **Should a septic system pump-out program be included?**

In addition all impaired areas will need a pet waste education program, and pet waste composters for up to 25% of pet owners.

Table 6. Residential control measure costs.

Residential and Urban Control Measure	Unit	Cost per Unit
Septic Systems Pump-outs (RB-1)	System	\$220
Septic System Repair (RB-3)	System	\$3,500
Septic System Installation/Replacement (RB-4)	System	\$4,000
Alternative Waste Treatment System Installation (RB-5)	System	\$15,000
Pet Waste Education Program	System	\$3,750
Pet Waste Composters	Composters	\$50