Levisa Fork and Tributaries TMDL Development

Levisa Fork, Slate Creek, Garden Creek

Final Public Meeting

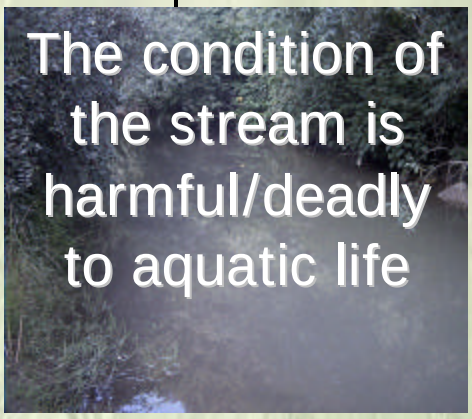
January 14, 2009

Slate Creek: Why Are We Here?

2 Separate Problems!

#1 Bacteria

#2 Aquatic Life

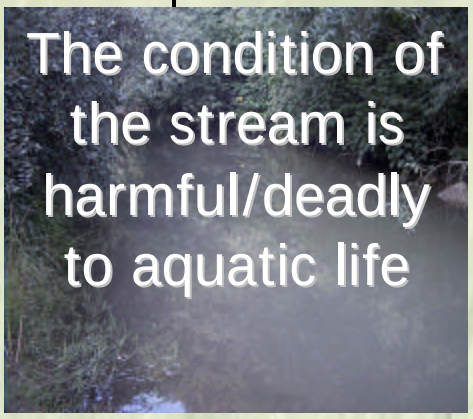


Levisa Fork: Why Are We Here?

3 Separate Problems!

#1 Bacteria

#2 Aquatic Life



#3 Fish Cons.

http://www.nrdc.org/thisgreenlife/images/0609/story02.jpg

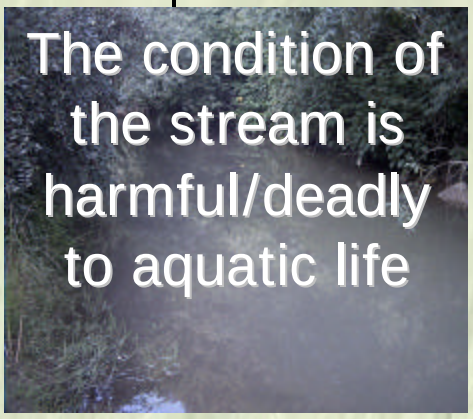
http://www.savannahenvironmentalresearch.org/Greenhouse.jpg

Garden Creek: Why Are We Here?

#1 and #2 Done! PCBs now.

#1 Bacteria Ö

#2 Aquatic Life Ö

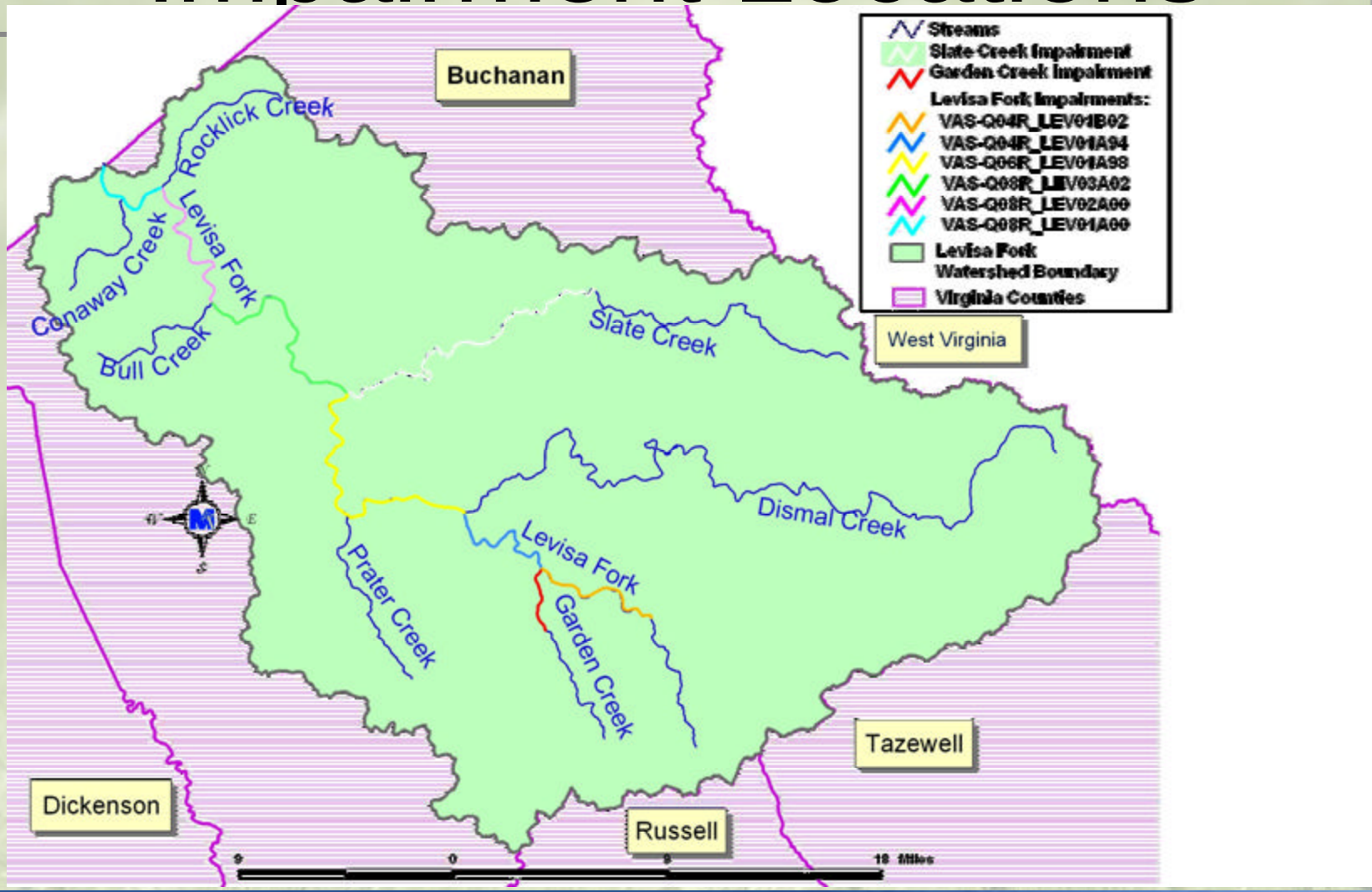


#3 Fish Cons.

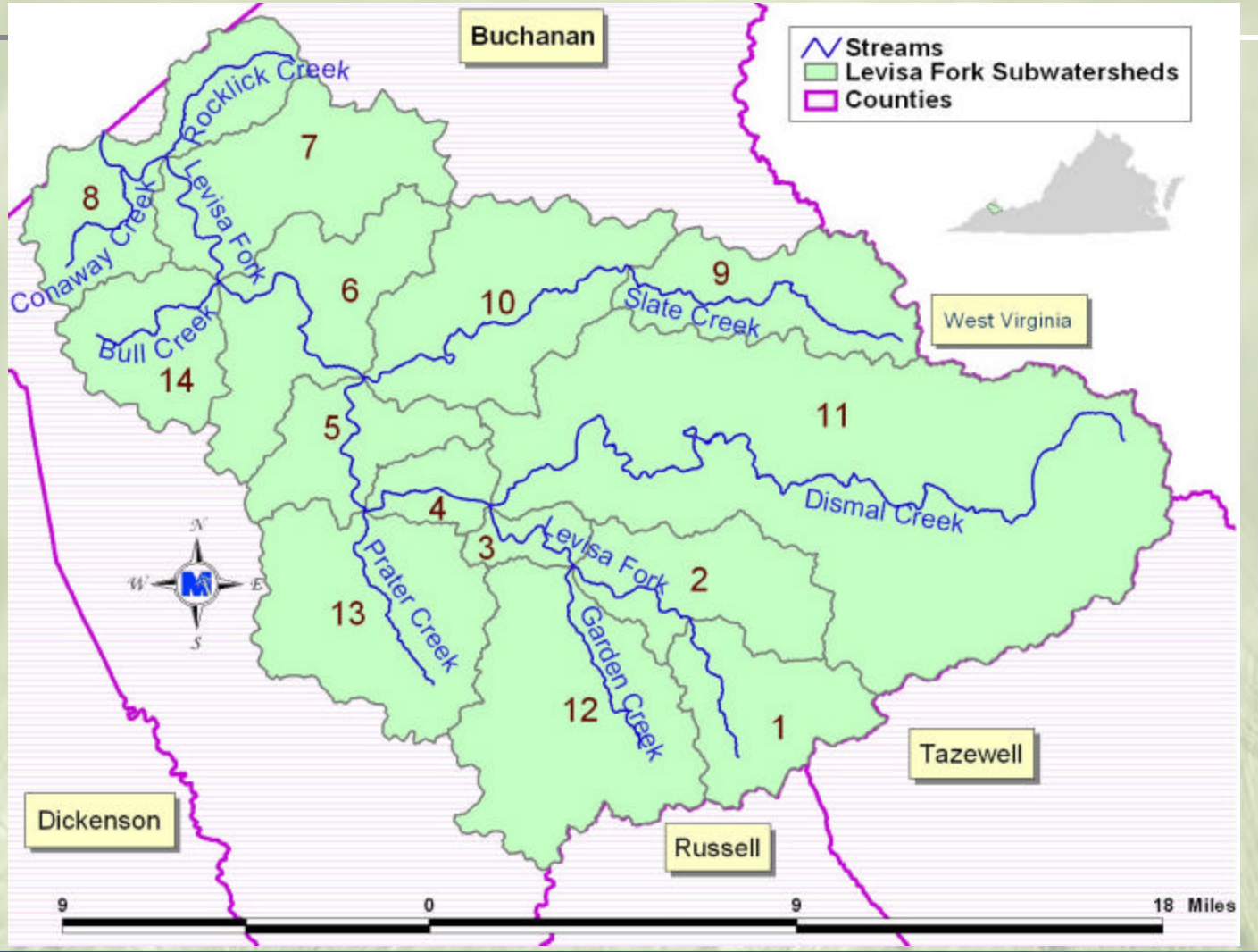
http://www.nrdc.org/thisgreenlife/images/0609/story02.jpg

http://www.savannahenvironmentalresearch.org/greenlounge.jpg

Impairment Locations



Subwatersheds



Water Quality Endpoint Goals

- **#1 Primary Contact Recreational Use**
  - *E. coli* Bacteria Endpoint
    - 126 cfu/100mL monthly geometric mean
- **#2 Aquatic Life Use**
  - Benthics = Bugs on the bottom of the river
    - Stressor = Sediment
    - Acceptable Sediment loads from Reference Watersheds
- **#3 Fish Consumption Use**
  - PCBs = Polychlorinated Biphenyls
    - Endpoint to protect human health = 640 pg/L

How Do We Determine the Bacteria TMDLs?

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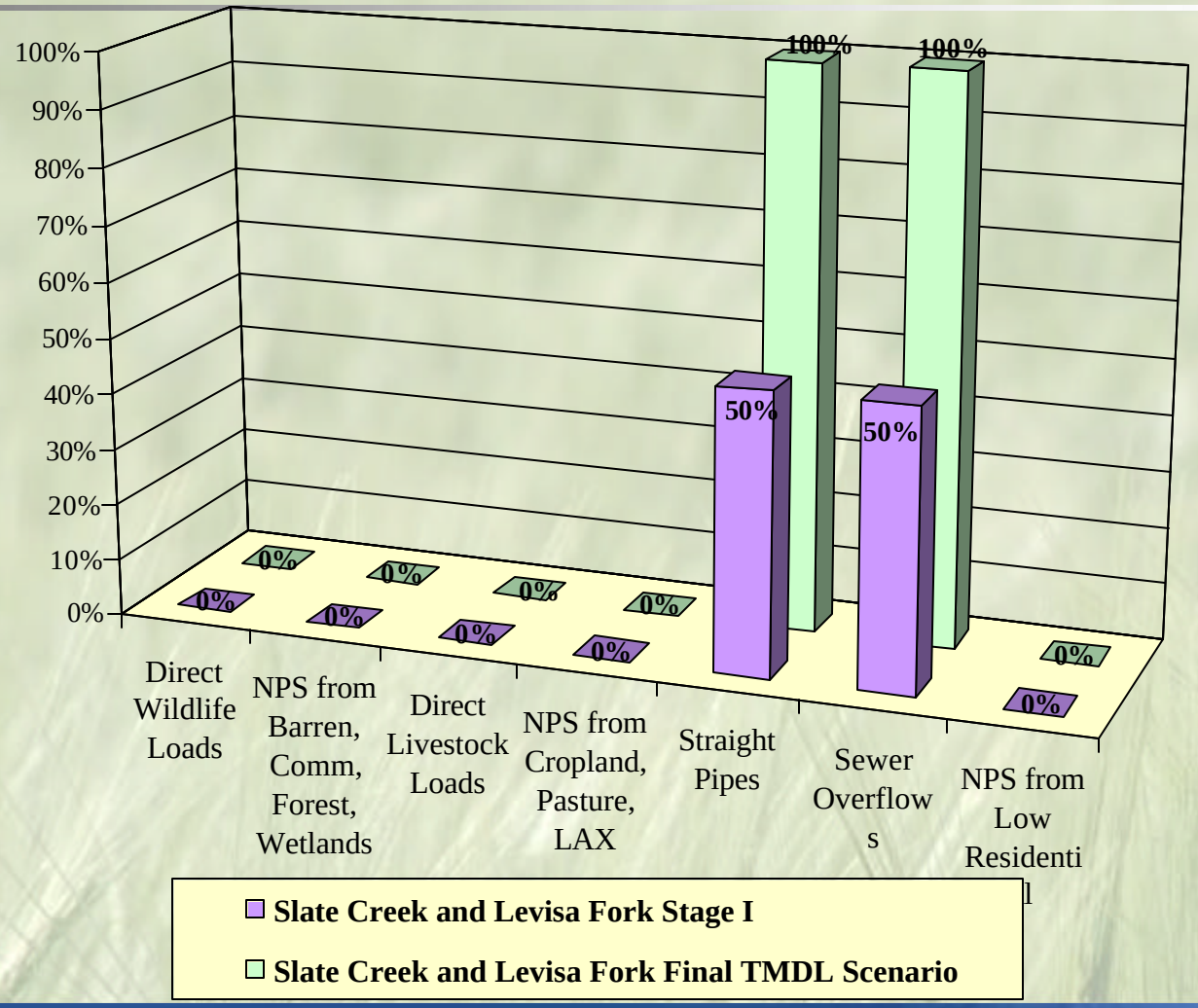
Watershed data

TMDL

Slate Creek and Levisa Fork: *E. coli* Load Reductions



Slate Creek Final *E. coli* TMDL Table

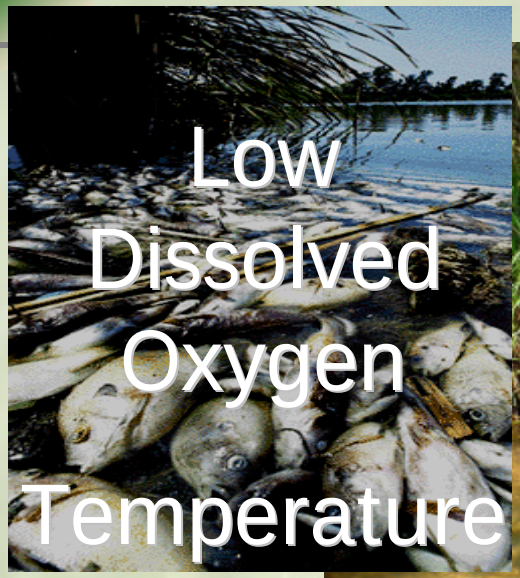
Impairment	WLA	LA	MOS	TMDL
Slate Creek	5.29E+11	5.03E+13		5.08E+13
VAG400096	*1.74E+09*			
VAG400064	*1.74E+09*			
VAG400465	*1.74E+09*			
VAG400557	*1.74E+09*			
VAG400558	*1.74E+09*			
VAG400643	*1.74E+09*		Implicit	
VAG400668	*1.74E+09*			
VAG400664	*1.74E+09*			
VAG400634	*1.74E+09*			
VAG400731	*1.74E+09*			
VAG400735	*1.74E+09*			
VAG400812	*1.74E+09*			
Future Load	*5.08E+11*			

Levisa Fork Final *E. coli* TMDL Table

Impairment	WLA	LA	MOS	TMDL
Levisa Fork	**7.69E+12**	**1.93E+14**		**2.00E+14**
*VAG****** (33)*	*1.74E+09*			
VA0090531	*5.39E+12*			
VA0026999	*1.62E+10*			
VA0065536	*5.39E+10*		***Implicit***	
VA0068438	*1.94E+10*			
VA0089907	*2.02E+10*			
VA0066907	*5.39E+10*			
VA0065625	*6.74E+10*			
VA0090239	*8.63E+09*			
Future Load	*2.00E+12*			

#2

What is harming the Aquatic Life?



#2

Endpoint Determination

- Reference Watershed Approach
- Levisa Fork
  - Dry Creek, Tazewell County, VA; McDowell County, WV
    - Similar soil characteristics and land use
    - Majority in same Ecoregion
- Slate Creek
  - Lick Creek, Bland, Smyth, and Tazewell Counties, VA
    - Similar soil characteristics and land use
    - Similar erodibility and slopes

#2

Slate Creek Sediment Reductions Needed

#2

Slate Creek Sediment Final Allocation Scenario

- Existing Load = **8,321.71**
- Final Allocated Target Load = **1,769.60**
- Overall **78.74%** sediment reduction
  - No reductions required to VPDES permitted loads

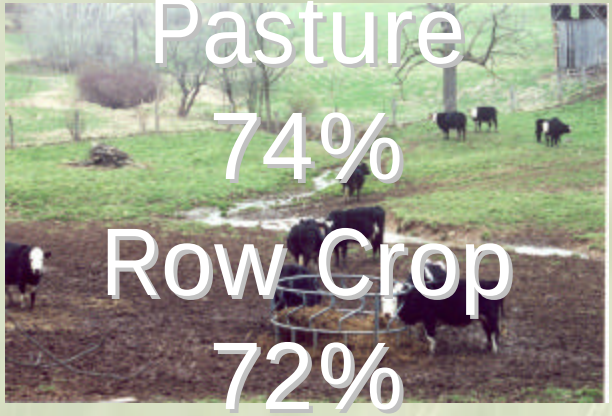
#2

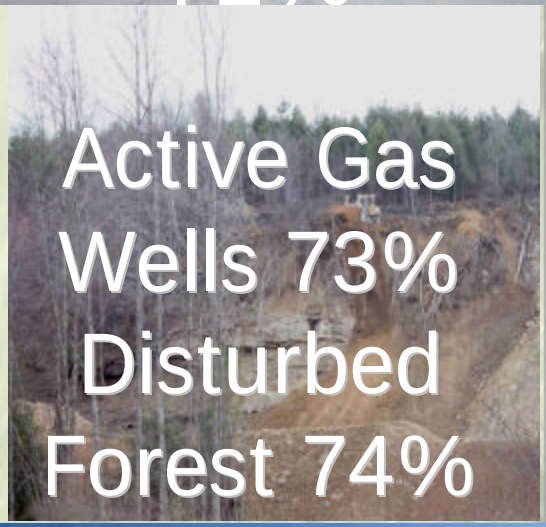
Slate Creek Sediment TMDL

Impairment	WLA t/yr	LA t/yr	MOS t/yr	TMDL t/yr
Slate Creek	**31.46**	**1,738.14**	**197.77**	**1,967.37**
VAG750149	*0.41*			
VAG400096	*0.04*			
VAG400064	*0.04*			
VAG400465	*0.04*			
VAG400557	*0.04*			
VAG400558	*0.04*			
VAG400643	*0.04*			
VAG400668	*0.04*			
VAG400664	*0.04*			
VAG400634	*0.04*			
VAG400731	*0.04*			
VAG400735	*0.04*			
VA0026999	*0.25*			
VAG400812	*0.04*			
Surface Coal Mining Transient Permits:	*10.63*			
Future Growth	*19.67*			

#2

Levisa Fork Sediment Reductions Needed





#2

Levisa Fork Sediment Final Allocation Scenario

- Existing Load = **53,272.75**
- Final Allocated Target Load = **17,547.44**
- Overall **70.15%** sediment reduction
  - No reductions required to VPDES permitted loads

#2

Levisa Fork Sediment TMDL

Impairment	WLA t/yr	LA t/yr	MOS t/yr	TMDL t/yr
Levisa Fork	**729.66**	**16,817.78**	**1,949.76**	**19,497.20**
VAR101038	*4.70*			
VAR104503	*0.86*			
VAR102495	*0.16*			
VAR104799	*0.19*			
VAR050018	*4.50*			
VAR050059	*0.54*			
VAR050102	*0.62*			
VAR051686	*1.73*			
VAG110243	*0.49*			
VAG750020	*0.41*			
*VAG****** (33)*	*0.04*			
VA0050351	*13.83*			
VA0052639	*0.04*			
VA0065536	*0.83*			
VA0065625	*1.04*			
VA0066907	*0.83*			
VA0068438	*0.30*			
VA0089907	*0.31*			
VA0090239	*0.13*			
VA0090531	*82.96*			
Future Growth	*194.97*			
Surface Mining Transient Permits:	*418.86*			

How Do We Determine the PCB TMDLs?

+

Watershed data

TMDL

Garden Creek PCB TMDL

Impairment	WLA (pg/yr)	LA (pg/yr)	MOS	TMDL (pg/yr)
Garden Creek	**2.10E+10**	**9.81E+11**		**1.00E+12**
1201698	*1.97E+07*			
1400047	*7.78E+09*			
1400492	*3.70E+07*			
1400493	*1.44E+08*		***Implicit***	
1401489	*1.66E+07*			
1401531	*1.43E+09*			
1500384	*7.97E+08*			
1700864	*8.05E+08*			
Future Load	*1.00E+10*			

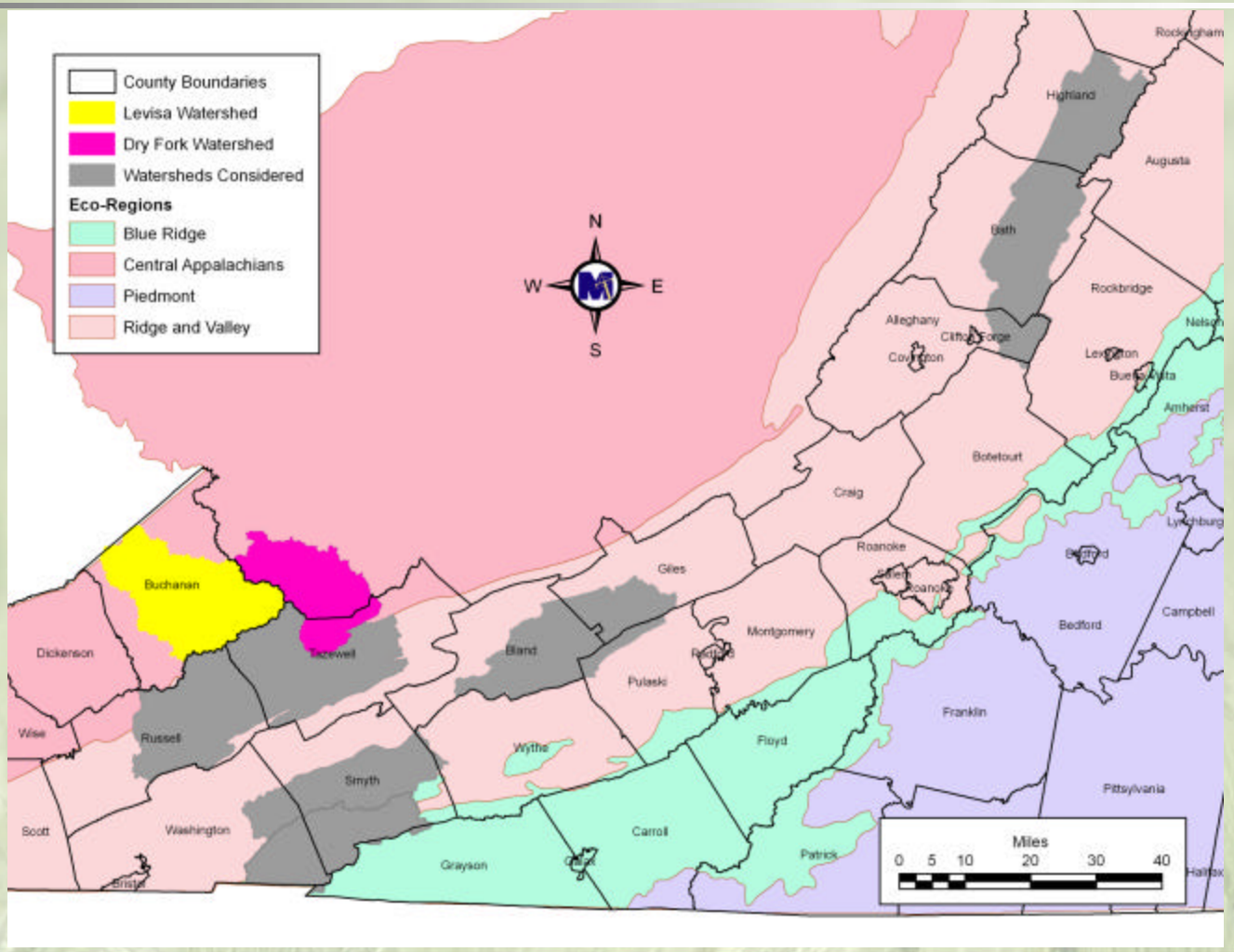
Levisa Fork PCB TMDL

Impairment	WLA (pg/yr)	WLA (pg/yr)	WLA (pg/yr)	WLA (pg/yr)	WLA (pg/yr)	WLA (pg/yr)	WLA (pg/yr)	WLA (pg/yr)	WLA (pg/yr)	LA (pg/yr)	MOS	TMDL (pg/yr)
Levisa Fork	**1.98E+12**									**6.90E+12**	**Implicit**	**8.87E+12**
Permit	***pg/yr***	***Permit***	***pg/yr***	***Permit***	***pg/yr***	***Permit***	***pg/yr***	***Permit***	***pg/yr***			
1100470	*2.84E+08*	*1200342*	*2.31E+07*	*1201523*	*2.31E+07*	*1300404*	*8.46E+07*	*1401489*	*7.15E+08*			
1101381	*1.39E+09*	*1200343*	*2.33E+07*	*1201532*	*1.06E+07*	*1300417*	*9.15E+07*	*1401493*	*1.06E+08*			
1101553	*8.21E+08*	*1200354*	*1.84E+08*	*1201539*	*2.14E+07*	*1300425*	*8.33E+08*	*1401531*	*7.73E+08*			
1101701	*2.06E+08*	*1200881*	*2.09E+07*	*1201540*	*4.44E+07*	*1300426*	*1.33E+09*	*1401598*	*3.44E+08*			
1101736	*5.27E+08*	*1201015*	*5.57E+07*	*1201574*	*7.27E+07*	*1300451*	*1.32E+08*	*1401635*	*2.71E+08*			
1101752	*1.84E+09*	*1201050*	*5.27E+07*	*1201678*	*1.14E+07*	*1300453*	*1.07E+09*	*1401645*	*1.38E+07*			
1101792	*7.13E+08*	*1201053*	*1.26E+07*	*1201698*	*1.06E+07*	*1300454*	*1.87E+08*	*1500384*	*4.31E+08*			
1101823	*1.56E+09*	*1201091*	*1.58E+08*	*1201716*	*7.13E+07*	*1300945*	*1.88E+07*	*1601787*	*1.43E+09*			
1101846	*5.77E+08*	*1201097*	*8.97E+06*	*1201749*	*4.36E+07*	*1301156*	*8.85E+07*	*1601788*	*1.38E+09*			
1101881	*2.60E+07*	*1201131*	*7.60E+06*	*1201753*	*4.14E+08*	*1301226*	*9.94E+08*	*1601816*	*9.37E+08*			
1101903	*1.49E+09*	*1201182*	*1.14E+08*	*1201902*	*5.82E+07*	*1301640*	*2.49E+08*	*1700864*	*4.35E+08*			
1101979	*2.77E+08*	*1201230*	*2.65E+07*	*1201906*	*5.85E+06*	*1400047*	*5.86E+09*	*1701300*	*4.46E+08*			
1101987	*4.25E+08*	*1201273*	*7.14E+07*	*1201907*	*1.49E+07*	*1400345*	*3.24E+08*	*1801821*	*1.20E+05*			
1101999	*1.05E+08*	*1201276*	*1.28E+07*	*1201922*	*3.98E+07*	*1400419*	*7.01E+07*	*VA0090531*	*1.77E+12*			
1102001	*1.30E+09*	*1201310*	*1.42E+07*	*1201940*	*2.46E+07*	*1400492*	*1.21E+09*	*VA0026999*	*5.31E+09*			
1102030	*7.02E+08*	*1201345*	*1.80E+08*	*1201988*	*1.84E+07*	*1400493*	*6.11E+08*	*VA0065536*	*1.77E+10*			
1200194	*1.24E+08*	*1201348*	*2.37E+08*	*1202036*	*3.19E+07*	*1400496*	*6.68E+08*	*VA0068438*	*6.37E+09*			
1200235	*7.63E+07*	*1201373*	*8.19E+06*	*1300120*	*9.34E+07*	*1400498*	*4.04E+08*	*VA0089907*	*6.64E+09*			
1200281	*2.61E+07*	*1201442*	*1.56E+07*	*1300359*	*4.35E+08*	*1401039*	*1.01E+08*	*VA0066907*	*1.77E+10*			
1200282	*1.78E+07*	*1201484*	*1.35E+08*	*1300378*	*5.64E+07*	*1401167*	*1.93E+08*	*VA0065625*	*2.21E+10*			
1200308	*1.92E+08*	*1201495*	*3.31E+07*	*1300379*	*2.54E+08*	*1401181*	*5.13E+07*	*VA0090239*	*2.83E+09*			
1200335	*4.88E+07*	*1201508*	*4.01E+07*	*1300398*	*1.12E+08*	*1401232*	*3.77E+08*	*Future Load*	*8.87E+10*			

Questions?

Extra Slides Do Not Print

Dry Fork


County Boundaries
Levisa Watershed
Dry Fork Watershed
Watersheds Considered
Eco-Regions
Blue Ridge
Central Appalachians
Piedmont
Ridge and Valley
N
W
E
S
Rockingham
Highland
Augusta
Bath
Rockbridge
Nelson
Alleghany
Clifton Forge
Covington
Lexington
Buena Vista
Amherst
Botetourt
Craig
Lynchburg
Roanoke
Salem
Roanoke
Bedford
Giles
Buchanan
Campbell
Bedford
Montgomery
Dickenson
Tazewell
Bland
Radford
Pulaski
Franklin
Wise
Russell
Wytheville
Floyd
Smyth
Pittsylvania
Scott
Washington
Carroll
Grayson
Galax
Patrick
Bristol
Halifax
Miles
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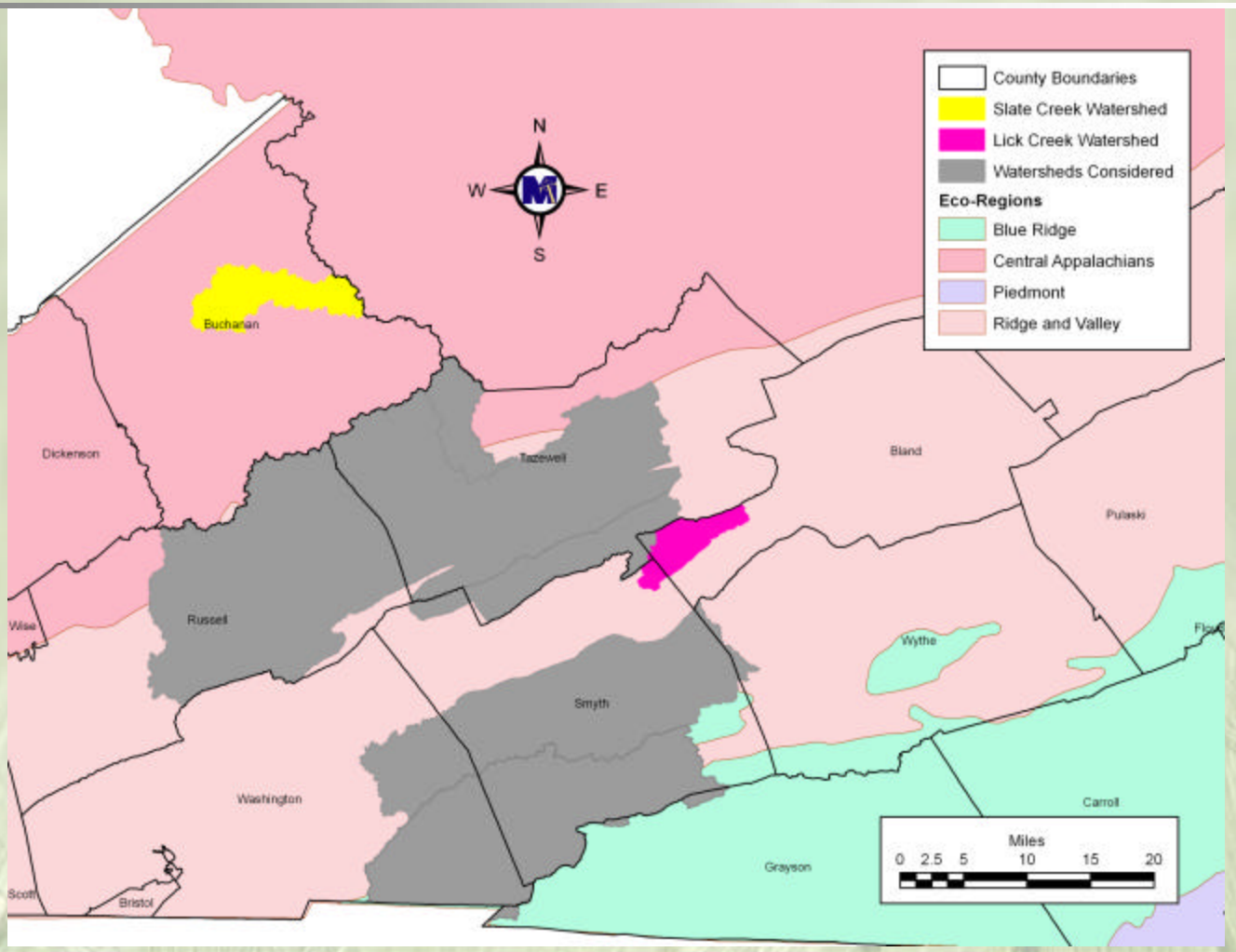
Lick Creek


County Boundaries
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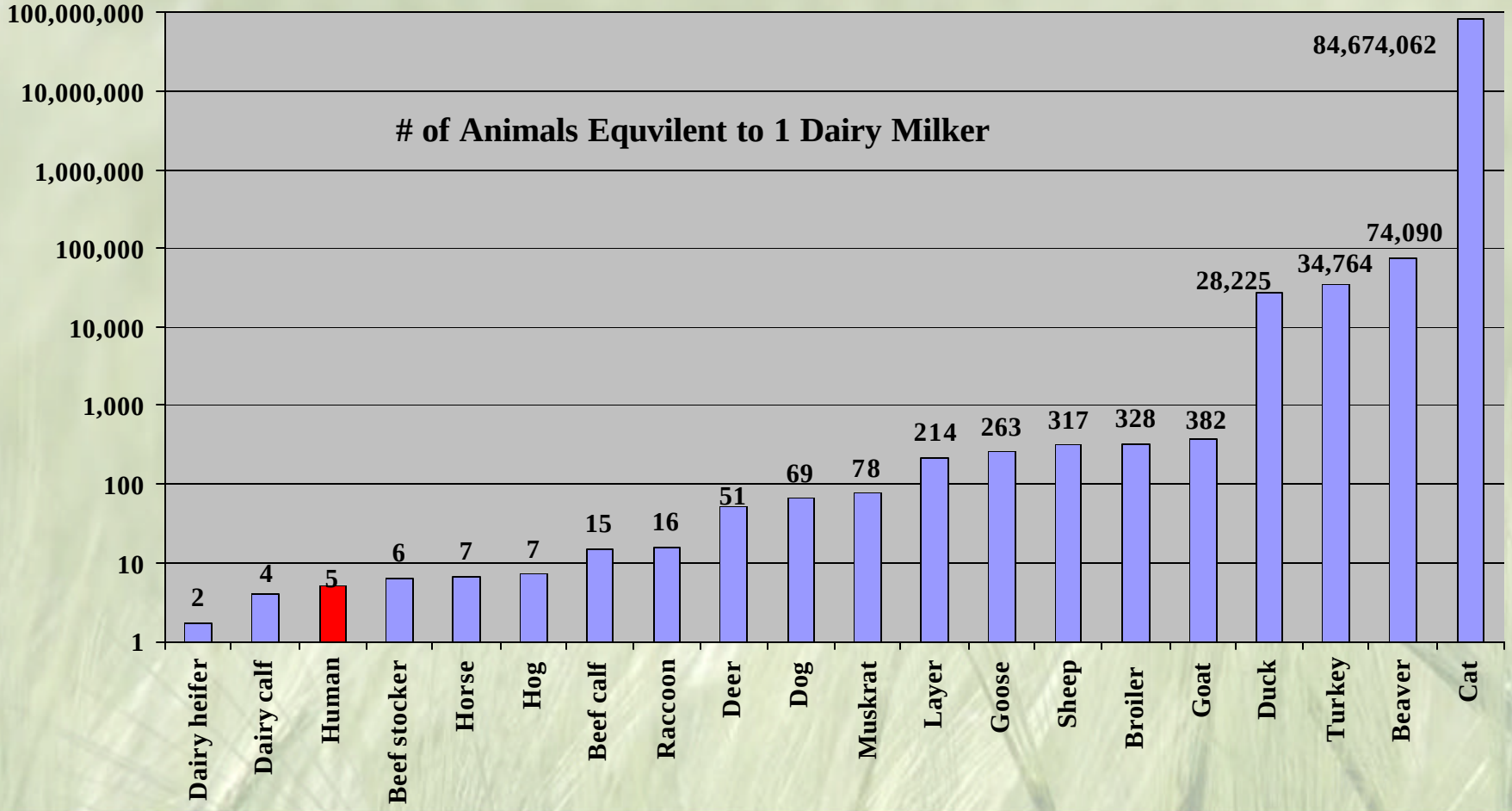
Dickenson
Tazewell
Bland
Pulaski
Russell
Wise
Wythe
Smyth
Washington
Carroll
Grayson
Scott
Bristol
Miles
0 2.5 5 10 15 20

Fecal Production Graph



#2 Slate Creek Sediment TMDL

Impairment	WLA t/yr	LA t/yr	MOS t/yr	TMDL t/yr
Slate Creek	**31.46**	**1,738.14**	**197.77**	**1,967.37**
VAG750149	*0.41*			
VAG400096	*0.04*			
VAG400064	*0.04*			
VAG400465	*0.04*			
VAG400557	*0.04*			
VAG400558	*0.04*			
VAG400643	*0.04*			
VAG400668	*0.04*			
VAG400664	*0.04*			
VAG400634	*0.04*			
VAG400731	*0.04*			
VAG400735	*0.04*			
VA0026999	*0.25*			
VAG400812	*0.04*			
Surface Coal Mining Transient Permits:	*10.63*			
Future Growth	*19.67*			

Surface Coal Mining Transient Permits:	t/yr
1100470	*0.40*
1101823	*5.80*
1200335	*0.16*
1200342	*0.09*
1200354	*0.05*
1201050	*0.09*
1201097	*0.03*
1201276	*0.05*
1201345	*0.51*
1201484	*0.29*
1201508	*0.01*
1201539	*0.08*
1201540	*0.17*
1201988	*0.07*
1301640	*0.92*
1400492	*0.05*
1401645	*0.05*
1601816	*1.81*

#2

Levisa Fork Sediment TMDL

Surface Mining Transient Permits:	t/yr	Permit	t/yr	Permit	t/yr	Permit	t/yr
1100470	2.36	1201230	0.36	1300379	3.44	1401493	1.44
1101381	18.85	1201273	0.97	1300398	1.52	1401531	10.45
1101553	11.1	1201310	0.19	1300404	1.14	1401598	4.65
1101752	24.92	1201345	0.56	1300417	1.24	1401635	3.67
1101792	9.64	1201348	3.2	1300425	11.26	1500384	5.82
1101846	7.8	1201373	0.11	1300426	18	1601787	19.31
1101881	0.35	1201442	0.21	1300451	1.79	1601816	6.08
1101903	1.47	1201484	0.78	1300453	14.53	1700864	5.87
1101987	5.74	1201495	0.45	1300454	2.52	1701300	6.02
1102001	17.57	1201508	0.52	1300945	0.25	1801821	0.02
1102030	3.76	1201523	0.31	1301156	1.2		
1200194	1.68	1201532	0.14	1301226	13.44		
1200235	1.03	1201574	0.98	1400047	79.2		
1200282	0.24	1201698	0.14	1400345	4.38		
1200308	2.59	1201716	0.96	1400419	0.95		
1200335	0.09	1201749	0.59	1400492	16.14		
1200354	2.32	1201753	5.59	1400493	8.26		
1200881	0.28	1201902	0.79	1400496	9.03		
1201015	0.75	1201906	0.09	1400498	5.46		
1201050	0.4	1201907	0.2	1401039	1.37		
1201053	0.17	1202036	0.43	1401167	2.61		
1201091	2.13	1300120	1.26	1401181	0.69		
1201131	0.1	1300359	5.88	1401232	5.1		
1201182	1.54	1300378	0.76	1401489	9.66		