

*ELEMENT C: Management Measures
Necessary to Achieve Your Load Reductions,
Along with the Critical Areas for
which to Implement*

*Randall Rush
EPA Region 6
Watersheds/NPS
Grants Coordinator
January 15, 2009*

Element C

- A Description of the nonpoint source management measures that will need to be implemented to achieve load reductions, and a description of the critical areas in which those measures will be needed to implement this plan.

What's it mean?

- The WPP must describe the management measures that are needed to achieve the load reduction goals in element B
- It must also describe any additional pollution prevention goals identified
- Identify critical areas in which those measures will be needed (can be done via map or description)
- Chapters 10 & 11 cover this element

Key Points in evaluating potential management measures

- Are the site features suitable for incorporating the practice?
- How effective is the practice at achieving the goals and loading targets?
- How much does it cost? (compare too)
- Is it acceptable to the stakeholders

Reference Documents for Measures

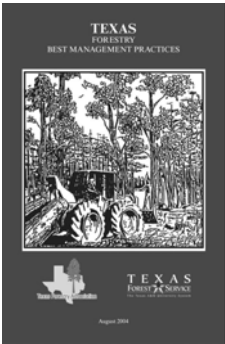
NRCS Handbook on Conservation Practices
[www.nrcs.usda.gov/technical/standards/nhcp.html]
http://efotg.nrcs.usda.gov/efotg_locator.aspx?map=TX

EPA Management Measures Documents
[www.epa.gov/owow/nps/pubs.html]


Texas Forest Service Handbook
[<http://texasforests.tamu.edu/main/article.aspx?id=74>]

OTHERS
Urban Sources [www.bmpdatabase.org]
Center for Watershed Protection [www.cwp.org]

SAMPLES



USDA-NRCS,
Texas Website



Types of Management Measures Structural/Non-Structural Practices

- Agriculture
 - Structural:
 - Buffer strips, mulching, exclusion fencing, riprap, sediment basins, waste treatment lagoons, grassed waterways
 - Non-Structural:
 - Brush control, conservation tillage, nutrient management plans, rotation grazing, pesticide management, residue management

Types of Management Measures Structural/Non-Structural Practices

- Forestry
 - Structural: culverts, cover crops, windrows, road dips
 - Non-Structural: education, erosion sediment control plans, fire management, better road layouts, preharvest planning

Types of Management Measures Structural/Non-Structural Practices

- URBAN
 - Structural: bioretention cells, green roofs, stormwater ponds, sand filters, vegetated gabions,
 - Non-Structural: LID planning, pollution prevention plans, public education, ordinances, pet waste programs, erosion control plans.

Regulatory Tools as Management Measures

- State & Local Stormwater Ordinances
- State and Local Land Use Ordinances
- Regulate NPS, ex. CA requires NOI before irrigation return flow can be discharged
- NPDES Programs: CAFOs, POTWs

Steps to Select Management Practices

- Inventory existing management efforts
- Quantify effectiveness of current measures
- Identify new management opportunities
- Identify critical areas in watershed where additional measures are necessary

Steps to Select Management Practices

- Identify possible management practices
- Establish pollution reduction efficiencies
- Develop screening criteria
- Rank options and develop proposed management opportunities

Quantify Existing MM Efforts

- Urban Runoff
 - Are cities and counties covered under a NPDES Stormwater Permit?
- Agriculture/Silviculture
 - Are land owners operating under a WQMP?
 - Map operations that are contributing loads
- Wetlands
 - Have wetlands been i.d. for flood control and WQ ?
- Wastewater
 - Are there failing OSSS?
 - Are wastewater permits being followed?

IDENTIFYING EXISTING PROGRAMS / POLICIES EXAMPLE: MILL CREEK

STAKEHOLDER	EXISTING PROGRAM / POLICY	POLLUTANT ADDRESSED
County Road Commission	Leave Buffers for grading roads	Sediment
	Assess/manage erosion at stream crossings	
	Follow erosion control practices	
Village of Chelsea	Soil erosion controls and stormwater retention requirements- New Development	Sediment
	Detention Ponds	Sediment
	Wastewater Treatment Plant	Nutrients
	Stormwater collectors	Nutrients
	Oil and grease separators	Oil grease
Private Sector: Chrysler	Leave Buffers along creek	Sediment
	Switch product use to no or low phosphorus alternatives	Nutrients
	Monitor Bette Cr. Per NPDES Permit	Nutrients
	Oil-Grease Separators	Oils and grease

Develop Screening Criteria for New Candidate Measures

- Location of management practice within critical area
- Estimated load reductions
- Legal and Regulatory Requirements
- Property Ownership & Site Access
- Added Benefits or Unintended Impacts
- Physical Factors
- Costs
- Social Acceptance

New Management Opportunities

- I.D. New MM
- I.D. Critical Areas
- I.D. Possible MMs
- I.D. Reduction Potential

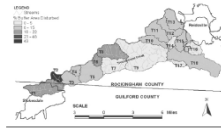


Figure 10-2. Percentage of Buffer Area Distributed and Impaired Stream in the Freshwater Creek Watershed

SAMPLE I.D. EFFICINCIES of MANAGEMENT PRACTCES

AFO	Ag	Industry	Urban	Disturbed Areas	Stream Erosion	Management Practice	Load Reduction (H,M,L)
			☹	☹		Construction Site Mgt	L
	☹					Grazing	M
	☹	☹	☹	☹		Filter Strip	H
	☹		☹	☹		Detention basin	M
	☹					Cover Crop	H
					☹	Gabions	H
			☹			Street Sweeping	L

Arroyo Colorado WPP

- Ag management measures' removal efficiency

Treatment System	Removal Efficiency (%)				
	BOD ₅	TSS	NH ₃ -N	TN	TP
Irrigation Reuse Systems	96	90	80	80	87
Wetland Cell Systems	50	90	80	80	65
Polishing Pond Systems	15	80	40	33	51

Table 17. Estimated Annual Sediment, Total Nitrogen and Total Phosphorus Reductions Resulting from Implementation of the Agricultural Component of the ACW Protection Plan in Tons

Constituent	Est. Reductions	Est. Annual Reductions From Treated Acres		
	Per Treated Acres	50,000 acres	100,000 acres	150,000 acres
Sediment*	200 lbs/acre	50,000 tons	100,000 tons	150,000 tons
Total Nitrogen	0.567 lbs/acre	14.2 tons	28.4 tons	42.5 tons
Total Phosphorus	0.0947 lbs/acre	2.4 tons	4.7 tons	7.1 tons

*Adjusted for comparison to HSPF-generated loading estimate (i.e., SWRT estimate x 1.1)

BMP Options, Associated Efficiencies, Land Usage

BMP Option	TSS Removal Efficiency (%)	TP Removal Efficiency (%)	TN Removal Efficiency (%)	Maximum Land Usage (%)
<i>Urban Land</i>				75
Detention Ponds	95	50	30	20
Retention Ponds	80	50	30	0
Riparian Buffers	50	20	20	10
Treatment Ponds (Wetlands)	80	40	30	10
Vegetated Swales/Strips	80	25	40	10
Infiltration Basins	80	60	60	25
<i>Agricultural Land</i>				40
Grass Planting	48	19	19	5
Grading/Grassed Waterways/Filter Strips	50	20	20	25
Grade Stabilization Structures/Wet Pond	53	21	21	10
<i>Range Land</i>				50
Grass Planting	48	19	19	25

From Handbook TABLE 11-2 Summary of Selected Models for Simulation of Practices

MODEL	Management Practice Evaluation Technique	Water Quality Constituents
Ann AGNPS	Sediment- RUSLE factors Runoff Curve Number Changes Storage Routing Particle Settling	Sediment Nutrients Organic Carbon
STEPL	Sediment – RUSLE factors Runoff Curve Number Changes Simple percent reduction	Sediment Nutrients
HSPF	HSPF infiltration and accumulation factors HSPF erosion factors First order decay Particle Settling	Sediments Nutrients
SWAT	Sediment – MUSLE parameters Infiltration – Curve number parameters Storage routing Particle settling Flow routing	Sediment Nutrients Pesticides

From Handbook TABLE 11-1 Selected Models Representing Capabilities of Practices

MODEL	Types of Practices Considered	Strengths	Limitations
STEPL	Contour farming Filter strips Reduced tillage systems Streambank Stabilization Terracing Forest Road Practices Animal Feedlot Practices Urban / low impact development	Easy to use; good for giving quick estimates. Includes most major types of practices.	Simplified representation of practices using long-term average %. Developed based on literature information that may not rep all conditions.
Ann AGNPS	Feedlot Management Tillage Management Fertilizer Management Pesticide Management Irrigation Management	Strong capabilities for simulating ag. area management. Long-term continuous simulation.	Limited urban and structural practice simulation.
HSPF	Agriculture practices Impoundment Buffer	Can simulate both area and point management practices. Long-term simulation. Land and practice simulation are linked.	Weak representation of structural point practices. Requires moderate to high effort to set up.
SWAT	Street Cleaning Tillage Management Pesticide/ Fertilizer Management Grazing & Irrigation Management Filter Strips & Impoundment	Strong capabilities for simulating ag area practices. Ability to consider crop rotation. Long-term simulation.	Limited urban and structural practice simulation.

Sample Calculating to Select Management Practices and Costs

Texas		County: ANGELINA							
1. Input watershed land use area (ac) and precipitation (in)								0.908	
Watershed	Urban	Cropland	Pasture land	Forest	Feedlots	Total	Annual Rainfall	Avg. Rain/Event	
W1	2400	1000	3000	10000	5	16405	45.56	0.832	
W2	1500	2500	3000	12000	3	19003	45.56	0.832	

Sample Calculating to Select Management Practices and Costs

2. Input agricultural animals									
Watershed	Beef Cattle	Dairy Cattle	Swine (Hog)	Sheep	Horse	Chicken	Turkey	Duck	# of months manure applied
W1	500	2000	3000	100	0	30000	10000	0	8
W2	300	1500	2500	0	20	35000	12000	300	8
Total	800	3500	5500	100	20	65000	22000	300	

3. Input septic system and illegal direct wastewater discharge data					
Watershed	No. of Septic Systems	Population per Septic System	Septic Failure Rate, %	Wastewater Direct Discharge, # of People	Direct Discharge Reduction, %
W1	500	2.43	2	15	0
W2	350	2.43	2	0	0

1. BMPs and efficiencies for different pollutants on CROPLAND.

Watershed	Cropland					
	N	P	BOD	Sediment	BMPs	% Area BMP Applied
W1	0.0825	0.0675	ND	0.1125	Grass Swales	15
W2	0.1	0.35	34	0.425	Terrace	50

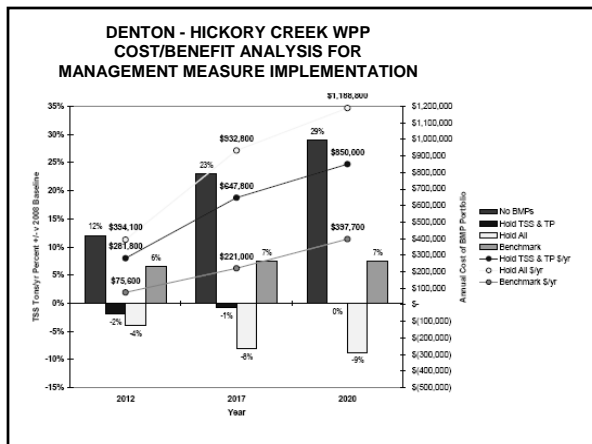
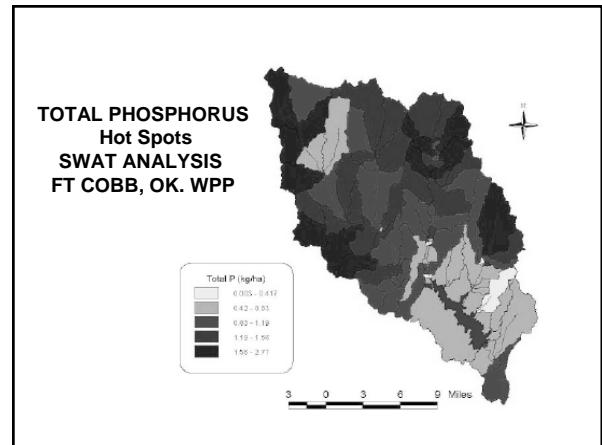
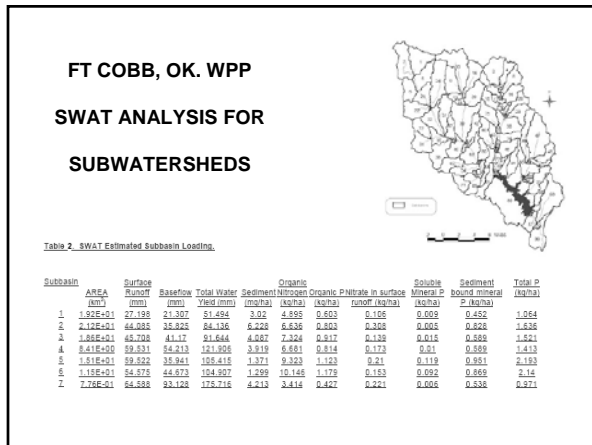
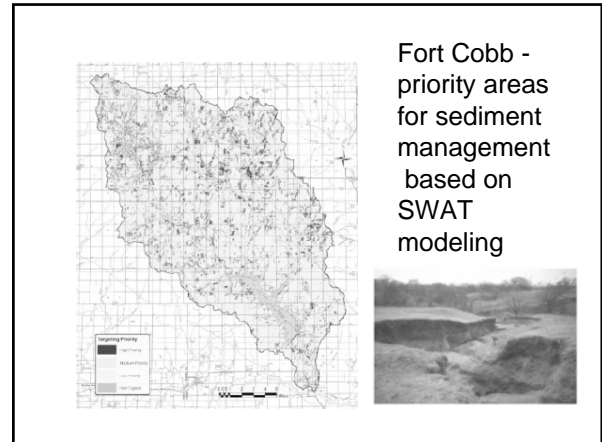
2. BMPs and efficiencies for different pollutants on PASTURELAND.

Watershed	Pastureland					
	N	P	BOD	Sediment	BMPs	% Area BMP Applied
W1	0	0	0	0		100
W2	0	0	0	0	Combined BMPs-	100

3. BMPs and efficiencies for different pollutants on FOREST.

Watershed	Forest					
	N	P	BOD	Sediment	BMPs	% Area BMP Applied
W1	ND	ND	ND	0.1775	Grass seeding roads	25
W2	ND	ND	ND	0.258	Streamside buffer	30

Water shed	LOADS: NO BMPs				WITH BMPs			
	N LOAD (no BMP)	P Load (no BMP)	BOD Load (no BMP)	Sed. Load (no BMP)	N Reduct	P Reduct	BOD Reduced	Sed. Reduct.
	lb/year	lb/year	lb/year	t/year	lb/year	lb/year	lb/year	t/year
W1	108603	20351.2	247397	2351.0	3326.0	2251.4	963.0	150.5
W2	98424.3	20873.0	224130	3702.1	15679	6096.7	2051748	1154.8
Total	207027.4	41224.2	471527	6053.2	19005	8348.0	2052711.9	1305.3

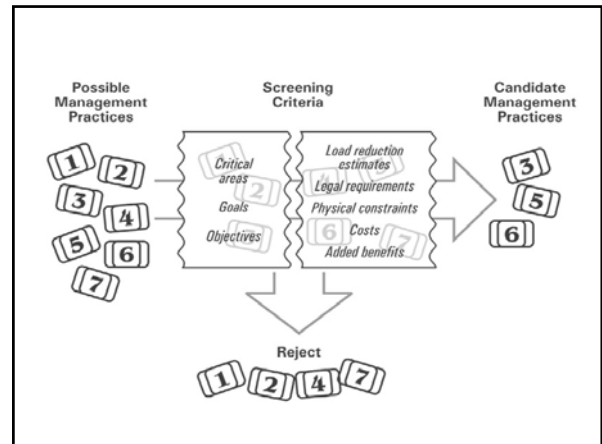


Hickory Creek – MM \$/Benefit

LAND USE: BMP	TSS-LBS			Phosphorus-LBS			Nitrogen-LBS		
	BMP Pounds per Acre Land Controlled	\$/Credit Found by Land Use by BMP	Relative \$/Acre Rank	BMP Pounds per Acre Land Controlled	\$/Credit Found by Land Use by BMP	Relative \$/Acre Rank	BMP Pounds per Acre Land Controlled	\$/Credit Found by Land Use by BMP	Relative \$/Acre Rank
Urban Land									
Detention ponds	104.96	\$6.79	10	0.67	\$1,064	8	1.10	\$649	10
Retention Ponds	129.19	\$13.59	11	0.67	\$2,624	10	1.10	\$1,600	12
Riparian Buffers	80.74	\$0.28	3	0.27	\$84	5	0.73	\$31	4
Treatment Ponds (wetlands)	129.19	\$0.15	2	0.54	\$36	2	1.10	\$18	2
Vegetated Swales/Strips	129.19	\$0.04	1	0.33	\$16	1	1.46	\$4	1
Infiltration basins									
Agricultural Land									
Grass Planting	58.48	\$2.65	8	0.37	\$415	6	0.71	\$217	8
Grading/Grassed Waterways/Filter Strips	61.56	\$0.43	4	0.39	\$67	3	0.75	\$35	5
Grass Stabilization/Wet Pond	64.64	\$27.19	13	0.41	\$4,264	12	0.79	\$2,234	13
Range Land									
Grass Planting	26.27	\$5.89	9	0.05	\$3,043	11	0.36	\$435	9

The Final Selections

- Develop Decision Criteria
 - Impacts to local government
 - Regulatory feasibility
 - Compatibility with other planning efforts
 - Political Support
- Summarize Results Present to Stakeholders
- Stakeholder Feedback
- Rank Preferences and make Final Selections



Element C: NPS Management Measures

- Maryland – Corsica River Watershed

TABLE 5

Summary of Implementation Project Costs and Reductions			
Best Management Practice (BMP)	Goal	Cost	Nutrient Reduction Lbs.
1. Nutrient Uptake	3,000 acres	\$90,000.00	21,000 N, 370 P
2. AG Nutrient and Sediment Reducing Buffers	100 acres	(\$170/ac + staff) \$67,000.00	9,188 N, 792 P
3. Whole Farm Nutrient Management and Horse Pasture Management	5 projects	(\$25,000.00/site) \$125,000.00	15,977 N, 1,944 P
4. Household Pollution Reduction	400 acres	\$3,696.00	634 N, 118P
5. Main Stem of the Corsica River: Water Quality Monitoring		\$345,434.00	
6. Submerged Aquatic Vegetation (SAV) Reestablishment		\$48,000.00	
7. Low Impact Development Technique in Ordinance Form		Ordinance \$37,000.00/Regional BMPs \$272,385.00	2,668 N, 236 P
8. Native Conservation Landscaping Demonstration Project		\$78,410.00	Est. 70% Reduction
9. Easements Incentive Program	1,710 acres	(\$2,437.00/ac) \$4,167,270.00	
10. Creation of Non-Agricultural Wetlands		\$22,000.00	
11. Septic System Retrofits		\$141,000.00	38,905 N
12. EcoTeams		\$93,500.00	
13. Turbidity Reduction		(cost for first 10 ac.) \$145,000.00	
Total with All Programs, Complete		\$9,423,320.00	
Total without Easements (9) and Total Septic Conversion (11)		\$1,378,550.00	

Vegetated Buffers

- 100 acres
- \$170/acre for 15 years
- 9,188.46 lbs/acre of N
- 792.40 lbs/acre of P

Conservation Easements

Oyster Bed Re-Population

Nutrient Management 50 Acres Volun. Demonstration

- 5 Farmette Conversion Projects
- \$25,000 each
- 14% Nutrient Reduction

