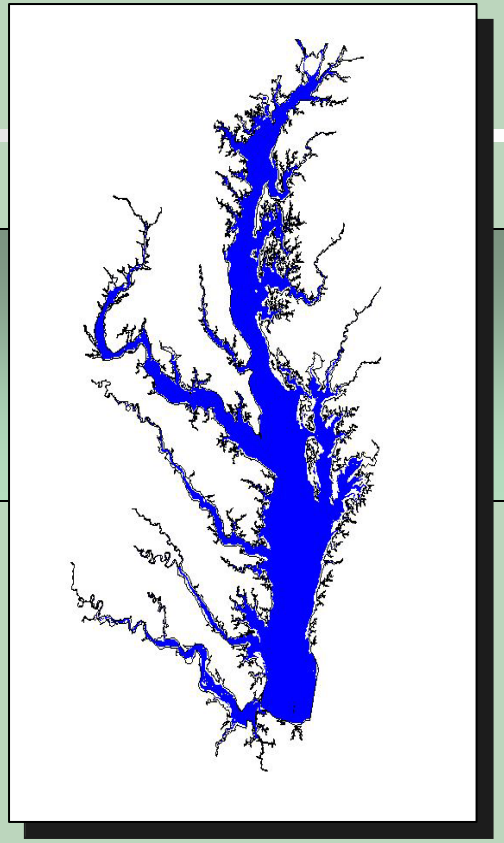
Cost-Effective Strategies

for Reducing Nutrient and Sediment Pollution in Virginia

House Joint Resolution 640
Joint Subcommittee Studying Options to Provide Funding for the Cleanup of Virginia's Polluted Waters



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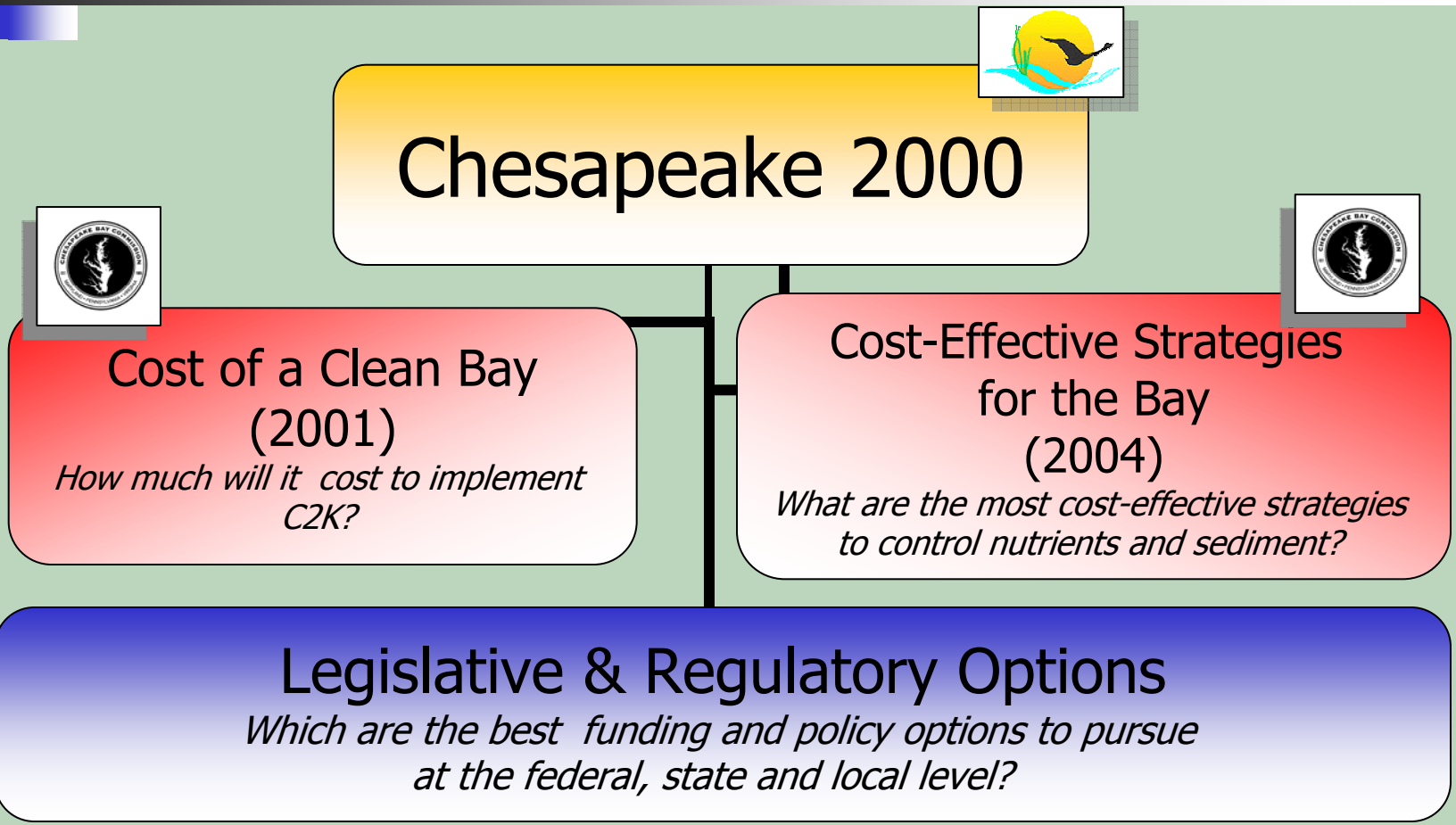
Chesapeake Bay Commission
July 20, 2005

Caveat

- This presentation deals ONLY with the tributaries of the Chesapeake Bay and not the Virginia Southern Rivers.
- This presentation gives you our BEST KNOWLEDGE of the costs. These numbers are constantly evolving.
- Our work looked at MAXIMUM FEASIBLE implementation of all practices – not the levels suggested in the Tributary Strategies.

A Sequential Analysis



Fundamental Questions

1. How much pollution must each state control?
2. With limited dollars, what are the best pollution control practices to pursue?
3. How will Virginia address its funding gap?

1. How much pollution must each state control?

Pollution Allocation by Jurisdiction, 2010

	Nitrogen Allocation (million pounds/year)	Phosphorus Allocation (million pounds/year)
PENNSYLVANIA	72	2.3
MARYLAND	37	2.9
VIRGINIA	51	6.0
DISTRICT OF COLUMBIA	2	0.3
NEW YORK	13	0.6
DELAWA	3	0.3
WEST	5	0.4
SUBT	183	12.8
EPA AIR REDUCTION	-8	
BASIN-WIDE TOTAL	175	12.8

Virginia (2003)
75.3 M lbs/yr N
9.7 M lbs/yr P

2. With limited dollars, what are the best pollution control practices to pursue?

Cost-Effective Strategies for the Bay:
Smart Investments for Nutrient and Sediment Reduction

Evaluated 34 practices/controls recognized by Bay Program model to determine which practices will deliver the largest load reductions for the least cost…

- Reviewed Baywide and state-by-state results
- Met with technical experts, conducted literature reviews
- Assumed implementation at "maximum feasible"
- Selected the top 6 practices
- Assessed obstacles and opportunities for large-scale adoption

What this report IS

By selecting the 6 most cost-effective practices, this report is:

- Identifying widely applicable programs that can deliver significant nutrient reduction benefits for the Chesapeake Bay.
- Showing where investments of public funds will result in the greatest water quality improvement for the dollar spent.
- Confirming that many benefits will derive by investing in agricultural management of nutrients and sediments.
- Confirming that the quickest and most reliable improvements come from upgrading sewerage treatment plants.
- Indicating that some practices are near at hand, while others will require research and development of programs that do not now exist.

What this report is NOT

By selecting the 6 most cost effective practices, this report is not:

- claiming they alone can meet our C2K goals.
- assuming they apply to every tributary in the same way.
- implying cost effectiveness should be the only priority for selection of nutrient control strategies.
- implying agriculture should bear the financial burden of the Bay restoration.
- suggesting urban, forest and air controls are unnecessary or unwise.

THE TOP 6 CHOICES

- Wastewater Treatment Plant Upgrades
- Diet and Feed Adjustments
- Traditional Nutrient Management
- Enhanced Nutrient Management
- Conservation Tillage
- Cover Crops

Practices that can be implemented short-term

Current Opportunities

Wastewater Treatment Plant Upgrades - Virginia

Through the use of bacteria, filtration devices and other state of the art changes to facility design, sewage treatment plants can further reduce nitrogen and phosphorus from their waste stream.

- Single most beneficial nutrient reduction practice, delivering greater N & P reductions than the 5 ag practices combined!
- $146M/yr cost (2003-2010) includes annualized capital and annual O&M; Can be spread over large user base
- Assumes 4 mg/l where feasible; some flexibility for nutrient trading (based upon design flows)
- Reliable, long term nutrient reductions

Traditional Nutrient Management - Virginia

Nutrient management plans prescribe the use and timing of nutrients in manure and commercial fertilizer to reduce excess application while assuring no loss of yield.

- Applying Nutrient Management Plans to all available acreage would reduce N by 2.8 M lbs
- At $7 per acre, high cost effectiveness for N: $2.07 per lb reduced
- Effectiveness dependent upon full implementation and available technical assistance
- Accelerates need for alternative uses of excess manure

Conservation Tillage - Virginia

To reduce erosion and nutrient runoff, crops are planted with minimal cultivation of the soil while retaining cover crops and crop residue that covers a minimum of 30 percent of the field.

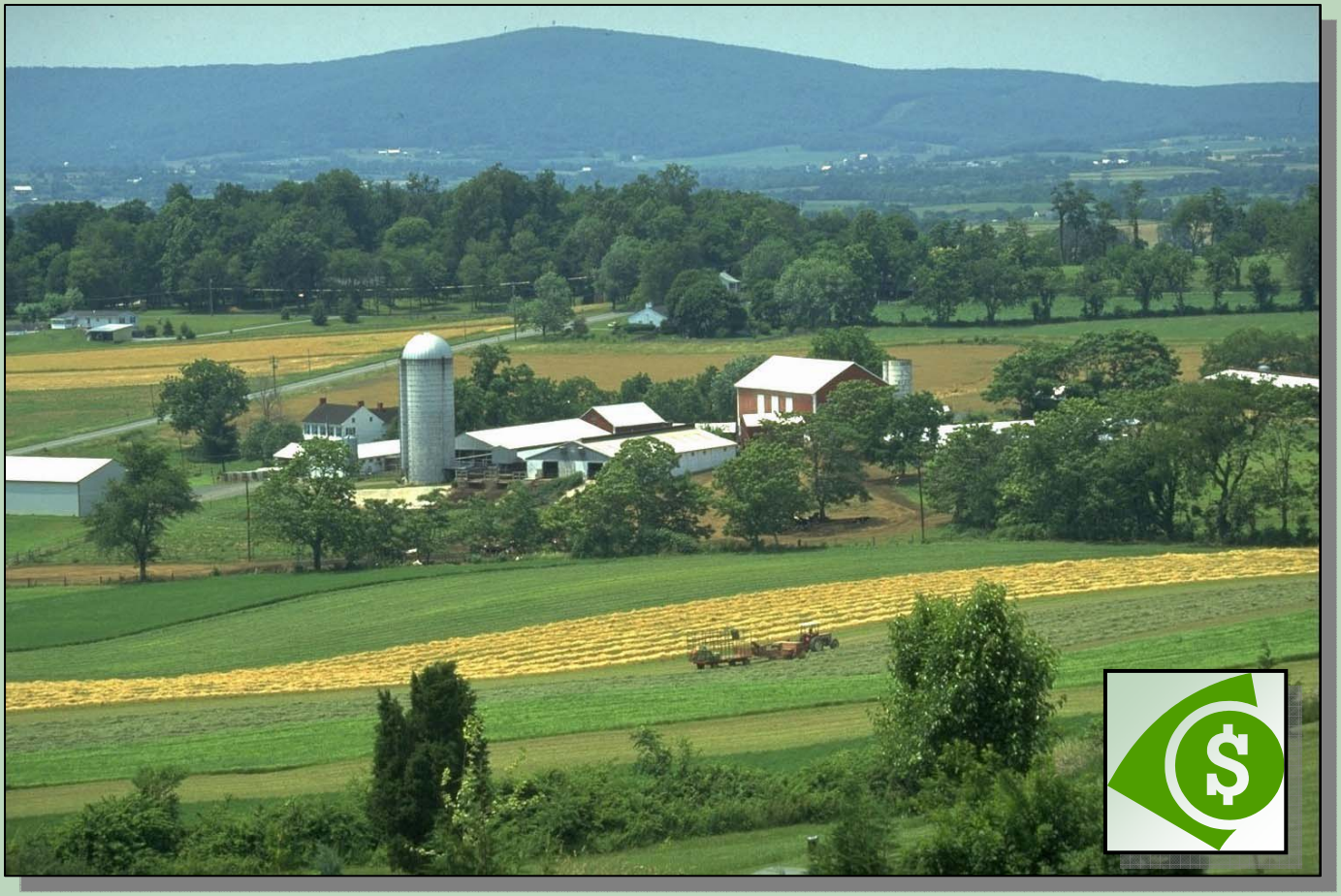
- Among agricultural practices, single most beneficial practice for P and sediment, delivering 40% of Virginia's sediment goal
- Proven, widely adopted practice, available technology
- Limits incorporation of manure; may aggravate ammonia emissions
- Increased need for manure transport and alternative use

Cover Crops - Virginia

Small grain crops planted in the fall to consume excess nutrients remaining in the field after harvest. Cover crops are not fertilized and are killed or plowed under in the spring.

- Potential to deliver 2.5m lb N reduction along with some P reductions (0.05m lbs)
- Even at $27 per acre, cost effective: $3.90 per lb. N reduced
- Needs consistent annual funding source; level of incentive payment required for large scale adoption uncertain
- Timing of planting crucial to achieving full nutrient reduction potential

Emerging Opportunities



Diet and Feed Adjustments

Feed formulas can be adjusted to increase digestion and absorption of nutrients by the animals, resulting in less nutrients excreted in manure.

- **Research indicates potential N reductions of 30-50% and P reductions of 40-60% for poultry, dairy, cattle, swine manures Baywide; State-by-state benefits have not been calculated.**
- **On a typical dairy farm, 70-80% of the nitrogen contained in feed is excreted in manure. Lack of consolidation and integration in the dairy industry pose challenges to implementing/quantifying diet and feed changes on a large scale.**
- **Continued research and outreach is essential to enable large scale implementation beyond poultry**

Enhanced Nutrient Management - Virginia

- Enhanced nutrient management provides a 15% further reduction in nutrients applied to cropland beyond traditional nutrient management.

- ENM on all row crops and hay acreage would significantly reduce N runoff beyond that achieved from traditional NMPs.
- Assumes $40 per acre to provide "safety net" for risk of reduced yield
- Pilot studies may be needed before large-scale adoption
- This practice will exacerbate excess manure issues

Annual Cost & Benefit of the 6 Cost-Effective Practices, in Virginia (2003-2010)

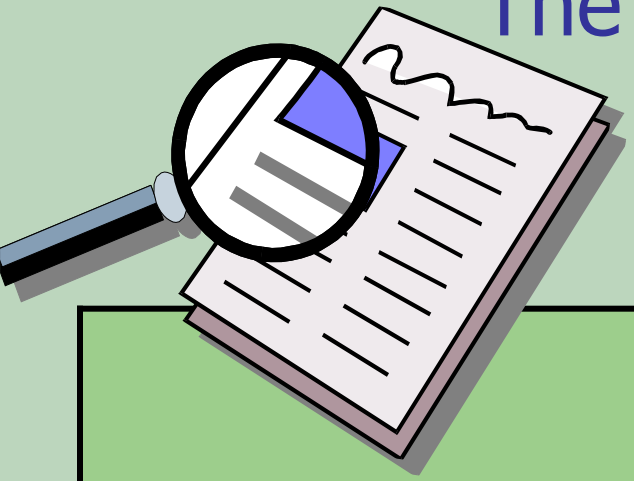
Source	% of total Tributary Goal			Total Cost $M/yr	% of Total Tributary Strategy Cost
	N	P	Sed		
Waste Treatment Upgrades	50	42	N/A	145.7	8
Agricultural Practices	38	18	47	78.5	9
Total	88	60	47	224.2	17

Annual Cost for the 6 Cost-Effective Measures in Virginia (2003-2010)

	Total Cost (million $)	Nitrogen Cost per Pound Reduced ($/lb)	Phosphorus Cost per Pound Reduced ($/lb)	Sediment Cost per Ton Reduced ($/ton)
Waste Treatment Upgrades	$145.7	$8.40	$32.98	N/A
Enhanced Nutrient Management	$60.4	$17.99	$338.84	N/A
Nutrient Management	$5.7	$2.07	N/A	N/A
Cover Crops	$9.8	$3.91	$225.79	$403.23
Conservation Tillage	$2.6	$7.41	$7.55	$15.23
Diet and Feed Changes	$0.0	N/A	$0.0	N/A
All 6 BMPs	$224.2			

The CBC Cost Effectiveness Report vs. the VA Tributary Strategy

A comparison of assumptions

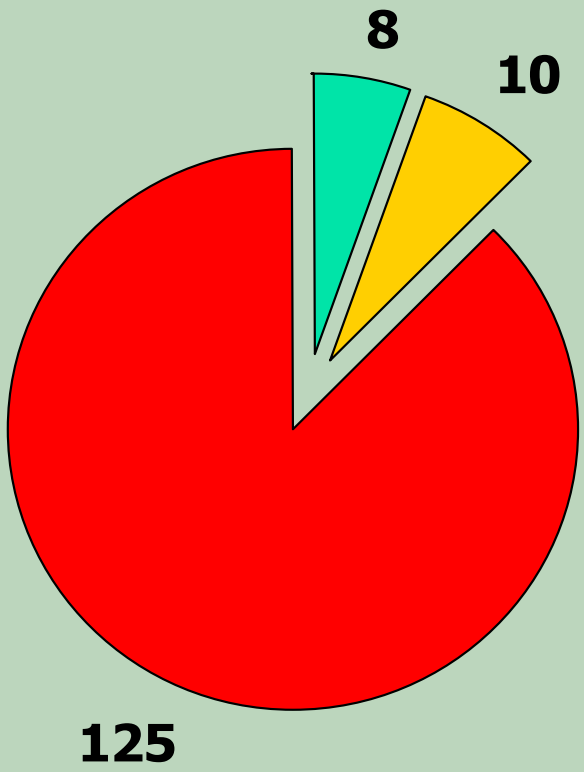


	Chesapeake Bay Commission **2003-2010, Assumed New Implementation**	**VA Tributary Strategy** **By 2010, Existing and Planned Implementation**
Waste Treatment Upgrades	Effluent Concentrations= 4mg TN/L & 0.3 mg TP/L	Effluent Concentrations= 3-8mg TN/L & 0.3-1.0 mg TP/L
Enhanced Nutrient Management	1,509,241 Acres	10,410 Acres
Ag Nutrient Management	819,887 Acres	1,009,595 Acres
Cover Crops	363,929 Acres	413,282 Acres
Conservation Tillage & Continuous No-Till	289,630 Acres	501,304 Acres
Diet and Feed Changes	16% reduction in manure TP applications to cropland	0% reduction in manure TP application to cropland

Some closing thoughts…

- The Federal government cannot be relied upon to pay our bill
- Point source pollution control presents Virginia's greatest opportunity
- The costs will be ongoing, with needs extending far beyond 2010
- Spreading the burden out offers the greatest gain
- The longer that we wait, the more expensive… or impossible it will get.

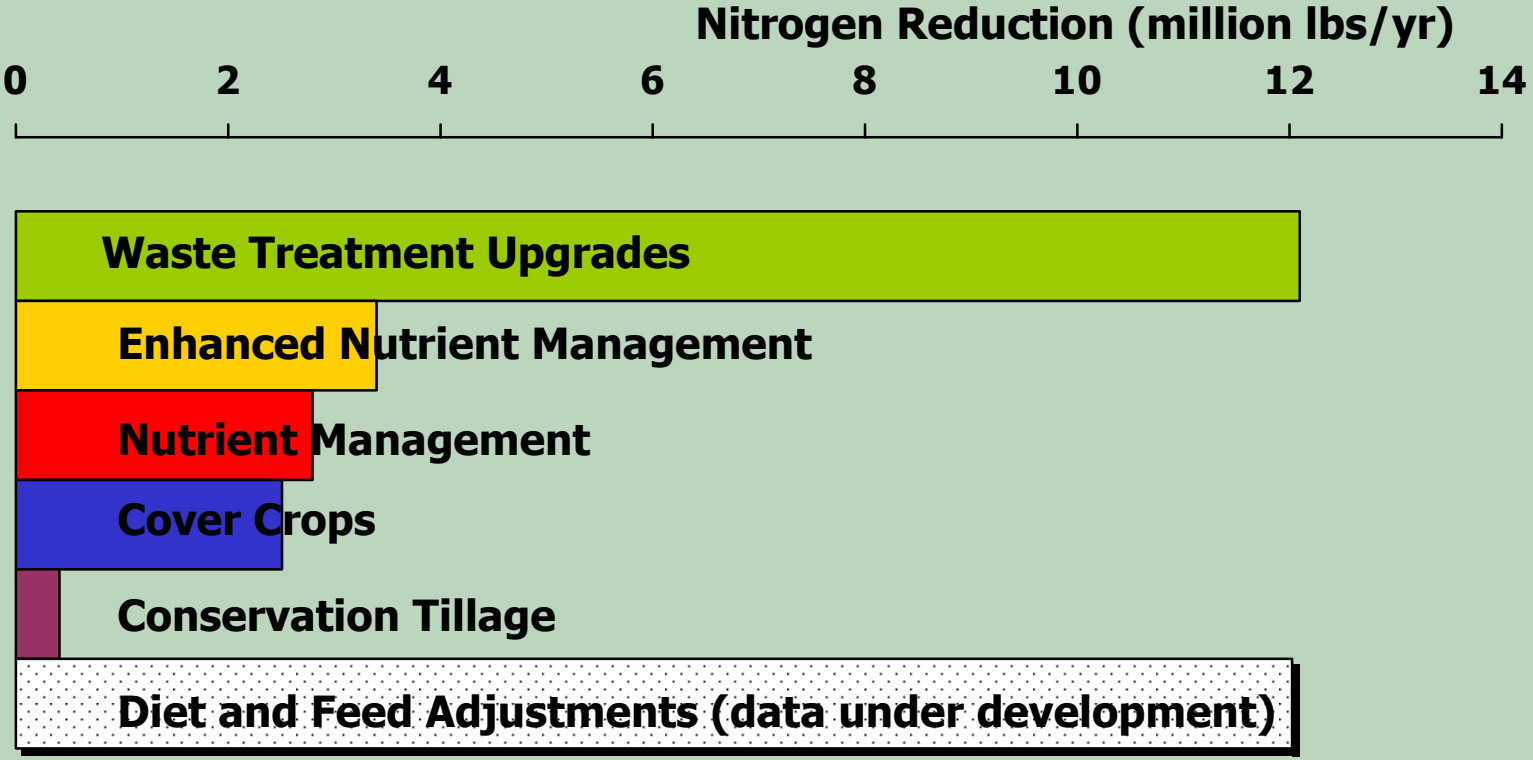
The Federal government cannot be relied upon to pay our bill…



Annual Agriculture Conservation Spending
2005-2010
Millions $

- **Projected State Funds**
- **Projected Federal Funds**
- **Projected Deficit**

Point source upgrades present Virginia's greatest opportunity…



Maximum Feasible Nitrogen Reduction Virginia
For individual best management practices (2002 baseline)

Spreading the burden out offers the greatest gain…

The **average annual cost** for each of the projected 2.8 M households in Virginia by 2010 is **$125** assuming that the state share is $1.75 billion*. This would be further reduced by the financial support already provided by other state cost-share programs.

Other Average Household Expenditures

Entertainment $1,863

Alcoholic Beverages $372

Source: National Census, 2002

* Virginia state-share Tributary Strategy estimate

The costs will be ongoing, with needs extending far beyond 2010…

FOR EXAMPLE:

- Sewage Treatment Plants have a 20-year design life
- Cover crops must be purchased every year
- Most agricultural practices have a 15 year life or less
- Stormwater management will be hugely expensive
- Maintaining the cap in the face of growth will require more practices to be installed

SIMPLY PUT…

establishing a significant, long-term DEDICATED FUNDING SOURCE is the only way to remove Virginia's waters from the Federal Dirty Waters List and restore the Bay.

Chesapeake Bay Commission

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