OCTOBER 2014

THE ECONOMIC BENEFITS OF
CLEANING UP THE
CHESAPEAKE

A VALUATION OF THE NATURAL BENEFITS GAINED BY IMPLEMENTING THE CHESAPEAKE CLEAN WATER BLUEPRINT

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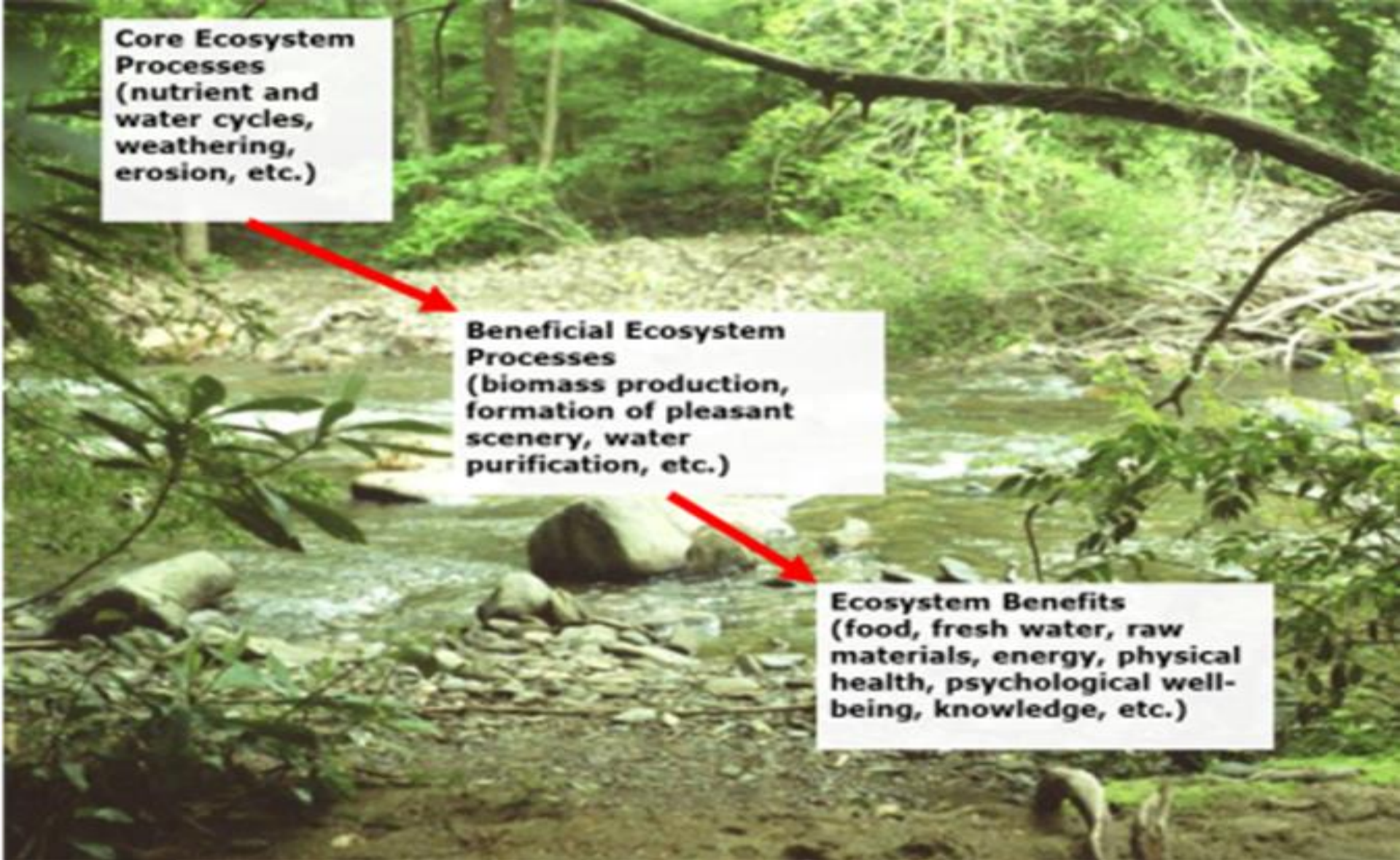*Saving a National Treasure*

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"Ecosystem Services"

Our lands, waters, and associated plants and animals, yield a flow of "ecosystem services" that people depend on to sustain and enhance human life.

Core Ecosystem
Processes
(nutrient and
water cycles,
weathering,
erosion, etc.)

Beneficial Ecosystem
Processes
(biomass production,
formation of pleasant
scenery, water
purification, etc.)

Ecosystem Benefits
(food, fresh water, raw
materials, energy, physical
health, psychological well-
being, knowledge, etc.)

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A New View of the Puget Sound Economy
The Economic Value of Nature's Services in the Puget Sound Basin

Earth Economics

David Batker
Paula Swedeen
Robert Costanza
Isabel de la Torre
Roelof Boumans
Kenneth Bagstad

Initial estimates for the cleanup say the price tag could be as much as $27 billion by 2020. **That's a lot less than the estimated long-term value of the ecosystems in and around the sound,** *said study author David Batker, an economist…*

Economists Measure Value of Puget Sound

Posted July 26, 2008 at 5:46 p.m.

Discuss   Print   A A A

SEATTLE (AP) — Is it possible to put a price tag on the economic value of the Puget Sound, including the mountains, forests and wetlands surrounding it? A group of economists have come up with a range: at least $7 billion to $62 billion a year.

In a report issued this week by Earth Economics, a Seattle-based nonprofit, the authors used computerized maps to calculate how many acres of different kinds of land surround the sound, then used existing studies to put price tags on things such as the flood-controlling benefits of an acre of wetland.

The study puts an estimate on all the "natural capital" — both goods and services — of the region.

It quantifies the air filtering impact of urban forests, the value of fresh water from wetlands and snowmelt, and both wild and cultivated food from fish to berries. It also considers the more obvious economic effect of Puget Sound, including the money tourists spend in the region and the sale of food from local farms and fisheries.

The economists emphasize the numbers are just a "rough cut, first step" at putting a value on nature. The broad range comes from the variety of existing studies they used when calculating prices. The aim of the report is to raise awareness and contribute to the community discussion.

[Senate Hearing 112-16]
[From the U.S. Government Printing Office]

DROUGHT AND CLIMATE CHANGE ON WATER RESOURCES

S. Hrg. 112-16

HEARING

before the

COMMITTEE ON ENERGY AND NATURAL RESOURCES UNITED STATES SENATE

ONE HUNDRED TWELFTH CONGRESS

FIRST SESSION

TO

RECENT DROUGHT CONDITIONS AFFECTING NEW RULES TO BE ISSUED PURSUANT TO SECTIONS 9503 REGARDING A REVIEW OF THE CURRENT IMPACTS OF CLIMATE CHANGE ON WATER RISKS ASSOCIATED WITH CLIMATE CHANGE CERTAIN RIVER BASINS

APRIL 27, 2011

Committee on Energy and Natural Resources

We chose 8 "ecosystem services" that are most likely to be improved by the Blueprint:

- Aesthetic value

- Air pollution treatment

- Climate stability

- Food production

- Recreation

- Waste treatment

- Water supply

- Water regulation

Three Scenarios

- The present-day dollar value of natural benefits for the watershed (based on 2009 pre-TMDL)

- The dollar value of the same services post-Blueprint

- Estimate of what we lose if we don't implement the Blueprint ("Business as usual")

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Approach

Worked with CBP staff to acquire fine scale land use information for entire watershed both pre- (2010) and post-Blueprint (2025).

Land Cover
Chesapeake Bay Watershed

Land Cover Classes
- Low/Medium intensity developed
- High intensity developed
- Wetlands
- Forest
- Agriculture
- Barren
- Chesapeake Bay Watershed
- Chesapeake Bay
- State Boundary

Data Sources: Chesapeake Bay Program, National Land Cover Data 2001

For more information, visit www.chesapeakebay.net

Created by EA, 1/23/08

UTM Zone 18N, NAD 83

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Habitats

- Forests (including buffers)
- Wetlands
- Agricultural land
- Open Water
- Urban Open space
- Urban
- Other

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Establish current value for each of these habitats, using literature based values of the applicable ES services.

- Habitats like wetlands and forests have higher ES value than ag and urban lands

- Adjust values of current condition (Baseline) based on a measure of human impact and degradation.

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Approach

Implementation of Blueprint will have 2 primary effects:

1. Changes in acres of the various habitats e.g., increases in land in forests and wetlands

2. Improved condition of existing habitats and their services (e.g., increased Bay DO results in more food production, reduced nitrogen pollution means healthier wetlands that can better reduce flooding)

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Approach

Blueprint Scenario

- "Upstream" improvement in habitat based on expected pollution reductions in sediment, nitrogen, and phosphorus

- Tidal water improvement based on expected improvements in dissolved oxygen

BAU Scenario

- "Upstream" degradation in habitat based on expected pollution increases in sediment, nitrogen, and phosphorus in 2025 according to CBP projections

- Tidal water dissolved oxygen assumed to be the same as 2009

	Baseline (2009)	Blueprint	Business as Usual
Tidal Segments (Health Indicator, 0-1 scale)	0.709	1.000	0.709
Open Water (Acres)	2,902,290	2,902,290	2,902,290
Non-Tidal Segments (Health Indicator, 0-1 scale)	0.533	0.606	0.494
Agriculture (Acres)	9,115,604	8,508,590	8,937,770
Forest (Acres)	26,087,310	26,146,565	25,599,783
Open Water (Acres)	418,638	418,638	418,638
Urban Open (Acres)	1,827,581	2,138,186	2,157,705
Urban Other (Acres)	3,272,272	3,519,108	3,627,798
Wetland (Acres)	245,895	238,374	232,321
Other (Acres)	130,960	128,794	124,252

$$
\begin{aligned}
\text{ESV} \\
= \sum_{i,j,k} \big[(Acres_{j,k}) \times (\text{Baseline Health}_k) \\
\times (Health\ Adjustment_k) \times (\$/acre/year)_{i,j}
\end{aligned}
$$

$Acres_{j,k}$ *the number of acres land use (j) in river segment (k)* (From Chesapeake Bay model output are remotely sensed data)

Baseline health$_k$ is the initial health proxy for river segment (k) (from DO attainment for tidal segments, and from the modified wildness index for non-tidal segments)

Health Adjustment$_k$ is an adjustment to take into account changes to pollutant loading for non-tidal segments between the baseline and 2025 scenarios (i.e., Blueprint and Business-as-Usual), applied for each river segment (k).

($/acre/year)$_{i,j}$ is the minimum of the dollar value of each ecosystem service (i) provided from each land use (j) each year. These values are drawn from the Ecosystem Valuation Toolkit and other sources listed in the Appendix.*

The Economic Benefits of Cleaning Up The Chesapeake

Baseline 2009: **$107.2 Billion** per year

Restored 2025: **$129.7 Billion** per year

Gain: **$22.5 Billion** per year

Land Use	Baseline ESV (millions of 2013$)	Blueprint ESV (millions of 2013$)	Blueprint Change from Baseline (%)	Blueprint Difference from BAU (%)	Business-as-Usual ESV (millions of 2013$)	Business-as-Usual Change from Baseline (%)
Agriculture	12,258	13,434	10%	23%	10,949	-11%
Forest	73,960	86,406	17%	24%	69,639	-6%
Open Water	16,721	24,301	45%	47%	16,549	-1%
Urban Open	3,403	4,706	38%	26%	3,727	10%
Urban Other	11	14	26%	18%	12	7%
Wetland	356	364	2%	34%	270	-24%
Other	467	508	9%	32%	386	-17%
Total	$107,176	$129,732	21%	28%	$101,531	-5%

Jurisdiction	Baseline	Blueprint			Business-as-Usual	
	ESV (millions of 2013$)	ESV (millions of 2013$)	Change from Baseline (%)	Difference from BAU (%)	ESV (millions of 2013$)	Change from Baseline (%)
Virginia	41,195	49,540	20%	30%	38,006	-8%
Pennsylvania	32,637	38,828	19%	26%	30,810	-6%
Maryland	15,892	20,449	29%	34%	15,209	-4%
New York	10,361	12,276	18%	18%	10,363	0%
West Virginia	6,330	7,668	21%	19%	6,458	2%
Delaware	735	941	28%	43%	659	-10%
District of Columbia	25	29	15%	10%	27	5%
Total	$107,176	$129,732	21%	28%	$101,531	-5%

Takeaways

- Watershed-wide benefits

- Benefits 4x the cost