Forest Protection as Compensatory Mitigation for Air Pollution Violations

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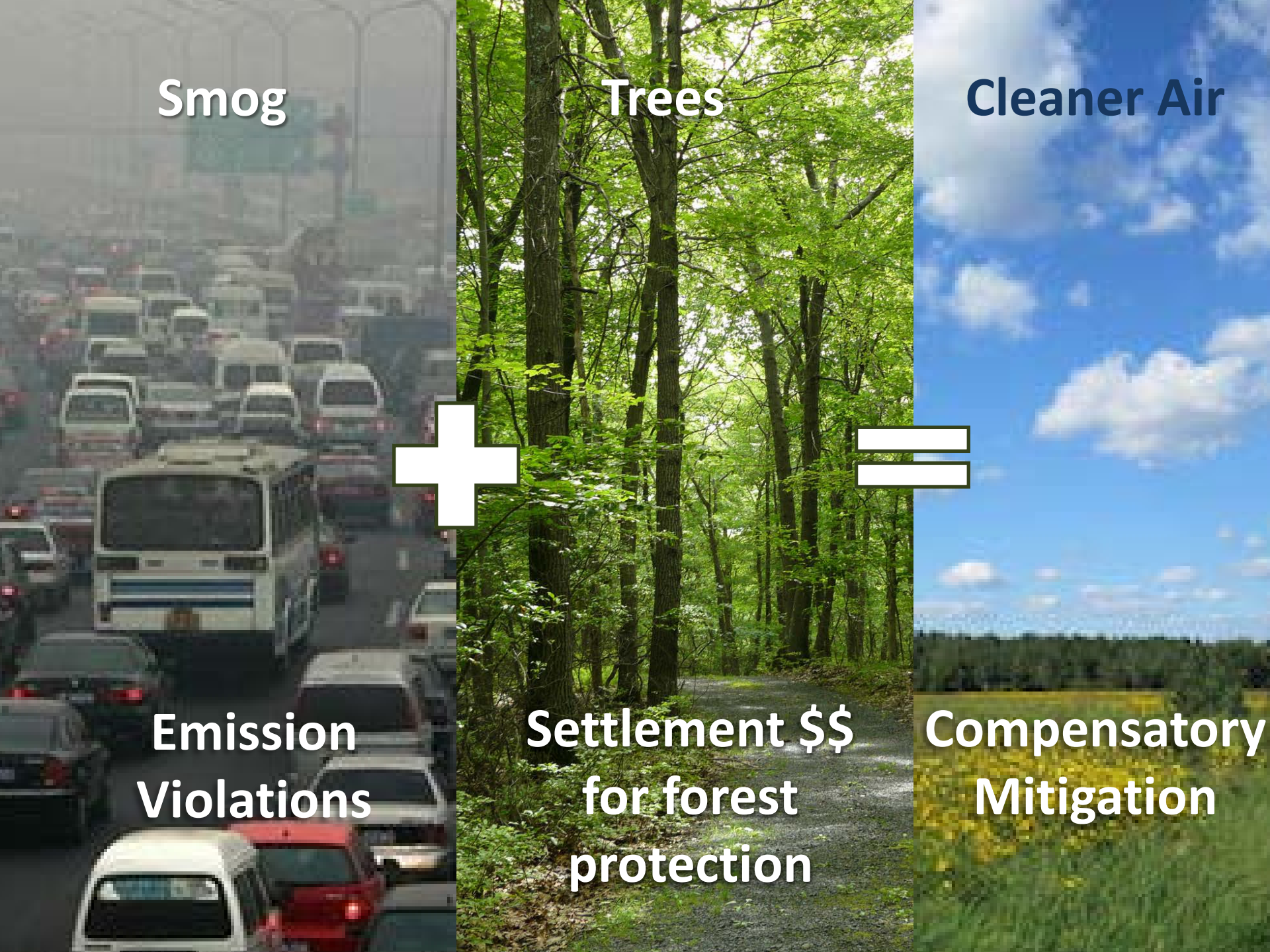
Science Policy Exchange


Smog
Trees
Cleaner Air
Emission Violations
Settlement $$ for forest protection
Compensatory Mitigation

Policy

1. National Ambient Air Quality Standards for 6 “criteria pollutants”
2. Enforceable air emission standards exist for all major sources
3. Negotiated settlements can include mitigation funds and environmental projects to compensate the public for damages

Science

1. Smog harms health
2. Ground-level ozone causes smog
3. NOx emissions form ozone
4. Trees remove ozone and NOx
5. Pollution removal by forests has been measured and mapped

Contents lists available at ScienceDirect

Environmental Pollution

journal homepage: www.elsevier.com/locate/envpol

Tree and forest effects on air quality and human health in the United States

David J. Nowak [a, *], Satoshi Hirabayashi [b], Allison Bodine [b], Eric Greenfield [a]

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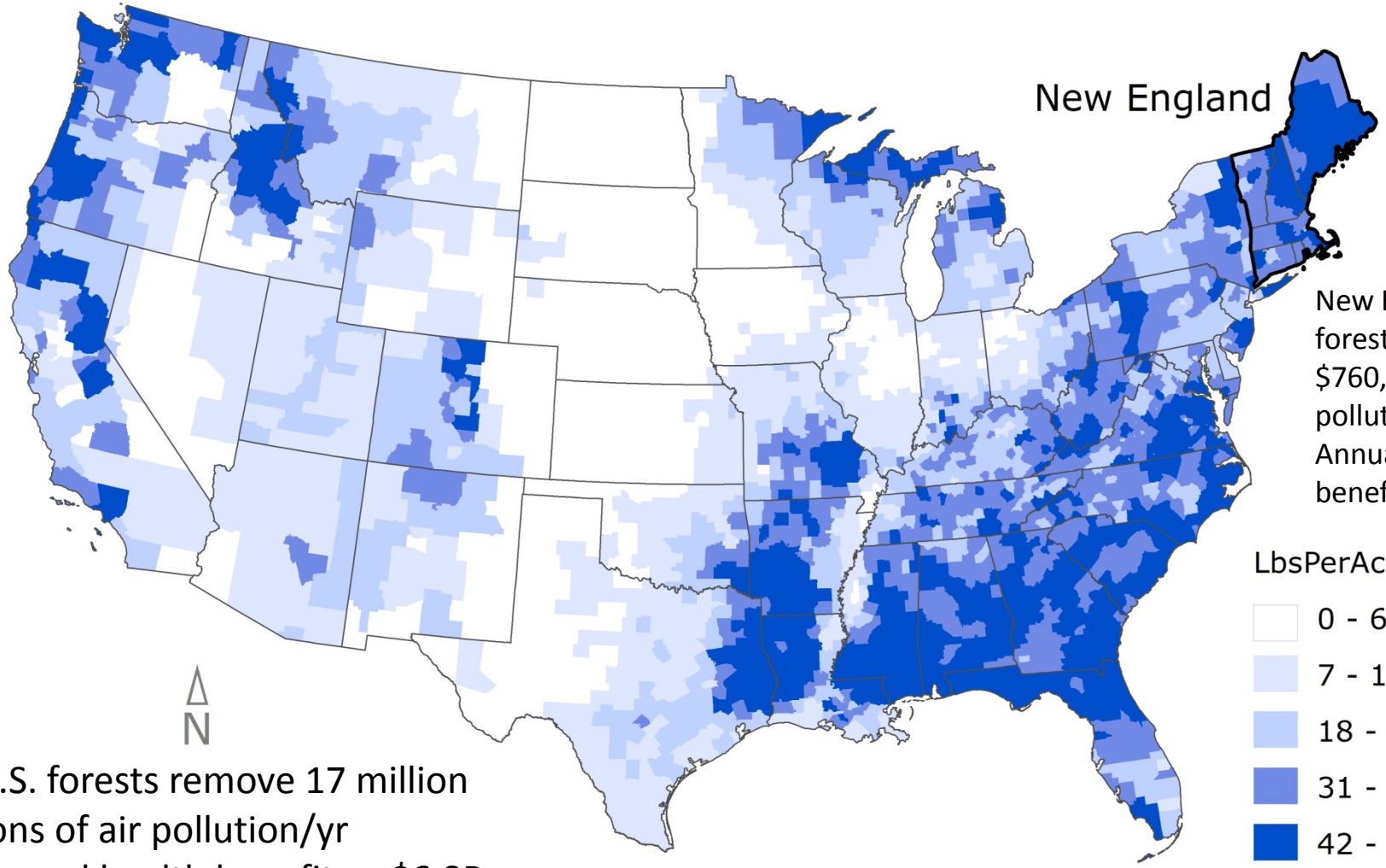
Pollution Removal by Forests



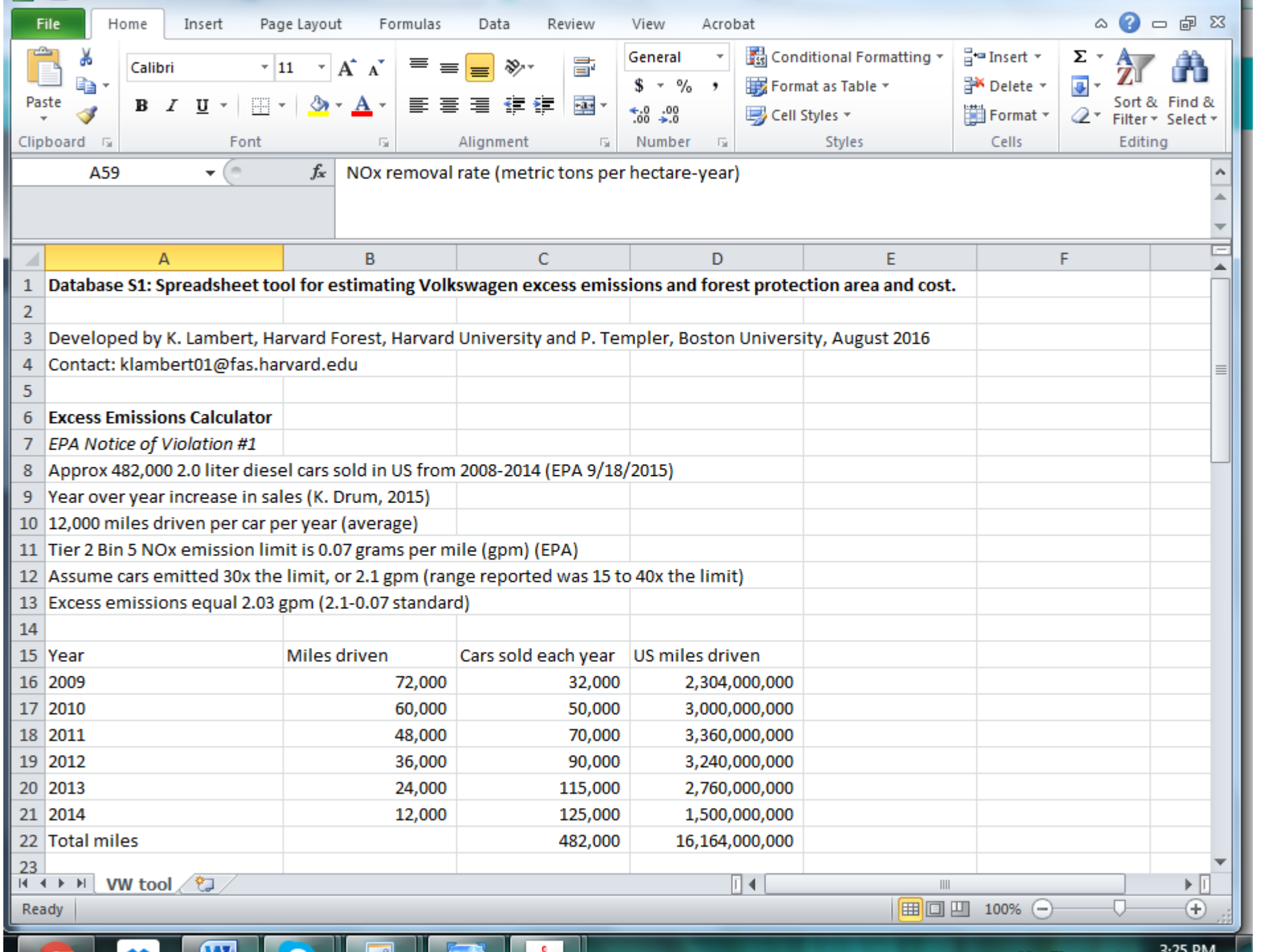
New England forests remove $760,000 tons of air pollution/yr
Annual health benefits ~ $550M

U.S. forests remove 17 million tons of air pollution/yr
Annual health benefits ~ $6.8B
Annual additional benefits ~ $86B

Adapted from Nowak et al. 2014

Compensatory Mitigation

Case Study: Volkswagen NOx Emission Violations



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A59 NOx removal rate (metric tons per hectare-year)

	A	B	C	D	E	F
1	**Database S1: Spreadsheet tool for estimating Volkswagen excess emissions and forest protection area and cost.**					
2						
3	Developed by K. Lambert, Harvard Forest, Harvard University and P. Templer, Boston University, August 2016					
4	Contact: klambert01@fas.harvard.edu					
5						
6	**Excess Emissions Calculator**					
7	*EPA Notice of Violation #1*					
8	Approx 482,000 2.0 liter diesel cars sold in US from 2008-2014 (EPA 9/18/2015)					
9	Year over year increase in sales (K. Drum, 2015)					
10	12,000 miles driven per car per year (average)					
11	Tier 2 Bin 5 NOx emission limit is 0.07 grams per mile (gpm) (EPA)					
12	Assume cars emitted 30x the limit, or 2.1 gpm (range reported was 15 to 40x the limit)					
13	Excess emissions equal 2.03 gpm (2.1-0.07 standard)					
14						
15	Year	Miles driven	Cars sold each year	US miles driven		
16	2009	72,000	32,000	2,304,000,000		
17	2010	60,000	50,000	3,000,000,000		
18	2011	48,000	70,000	3,360,000,000		
19	2012	36,000	90,000	3,240,000,000		
20	2013	24,000	115,000	2,760,000,000		
21	2014	12,000	125,000	1,500,000,000		
22	Total miles		482,000	16,164,000,000		
23						

VW tool

Ready 100%

Calculator

FORESTS FOR CLEAN AIR

567,000 cars
18 billion miles

34 tons
excess NOx

316,000 acres in 10 yrs
105,000 acres in 30 yrs

$350M - $700M
$115M - $230M

TruStar Energy CNG

$2.7 Billion Up For Grabs!

The VW Volkswagen Settlement means municipalities and private companies can obtain 100% of the cost for new CNG vehicles!

LEARN MORE RIGHT NOW!

Implementation

I. Regulatory/Settlement Approach

- Eligible use for *Environmental Mitigation Trust* funds
- Fund for *Supplemental Environmental Projects*
- State adopt in *Beneficiary Mitigation Plans*

II. Corporate Sustainability Approach

- Work with VW to establish voluntary fund

Protecting Nature and Species Diversity

At Volkswagen, responsibility for the environment goes well beyond the automobile and its use. Accordingly, we support a range of concrete projects involving the protection of nature and species diversity, for example projects involving the renaturation of river and moor landscapes in cooperation with such organisations as Germany's nature conservation organisation

Naturschutzbund Deutschland e.V. (NABU).

All activities are implemented within the scope of our Think Blue. approach. With this approach we motivate people to act sustainably and demonstrate how satisfying it can be to achieve change – and of course we make sure we set a good example.

Think Blue.

Trees are the Answer

Society of American Foresters

www.eforester.org

Extra slide: Analysis Assumptions

- Forest protection occurs in regions where O3 production is NOx (not VOC) limited
- Vehicles sold = 567,000
- Year over year sales = 32k to 115k sold/yr
- Average mileage = 12,000/yr
- The Tier 2 Bin 5 NOx emission limit for light-duty vehicles = 0.07 grams per mile
- Excess emissions per mile = 2.03 gpm
- NOx removal rate = 0.55 g NO2/m2
- NOx precursor removal to ozone removal = 1 mol NOx: 5 mol O3
- Fee acquisition = $2000/acre
- Easement = $1000/acre