Integrating the Value of Nature into Business Decisions

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The TNC-Dow Collaboration:
A Breakthrough in Valuing Nature

- Leading NGO and leading global company breaking new ground
- Founded on the belief that business has a key role in valuing and preserving nature while growing
- Science and economics approach – developing new private sector approaches
- Rooted in mutual respect
- Six years and $10 million to deliver breakthrough results
- Transparent process and published results

Collaboration Goal

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Find ways for companies to incorporate the value of nature into business decisions.

Jennifer Molnar

DOW®

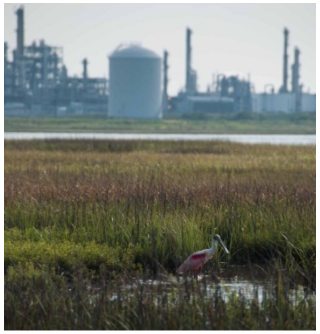
Collaboration Objectives

- Demonstrate how the value of nature can be built into business decision-making
- Serve as a model to other companies
- Develop tools
- Encourage action from policymakers and other leaders
- Increase investment in protecting natural systems and services

Pilot: Dow Texas Operations, Freeport

Air pollution mitigation via reforestation

Coastal natural hazard protection



Freshwater supply

Photos: Jennifer Molnar

Improving Air Quality

Canopy removes O_3 and NO_2 (and PM, SO_2, CO)

But is reforestation cost-competitive?

Can be cost-competitive with conventional control options

Has wide application potential across US

Provides co-benefits for people and nature that conventional controls do not

Peer review paper **published in PNAS** in September, describing science behind concept

PNAS

Reforestation as a novel abatement and compliance measure for ground-level ozone

Timm Kroeger[a,1], Francisco J. Escobedo[b], José L. Hernandez[c,2], Sebastián Varela[b,3], Sonia Delphin[b], Jonathan R. B. Fisher[a], and Janice Waldron[d]

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Edited* by Peter M. Kareiva, Nature Conservancy, Seattle, WA, and approved August 14, 2014 (received for review May 27, 2014)

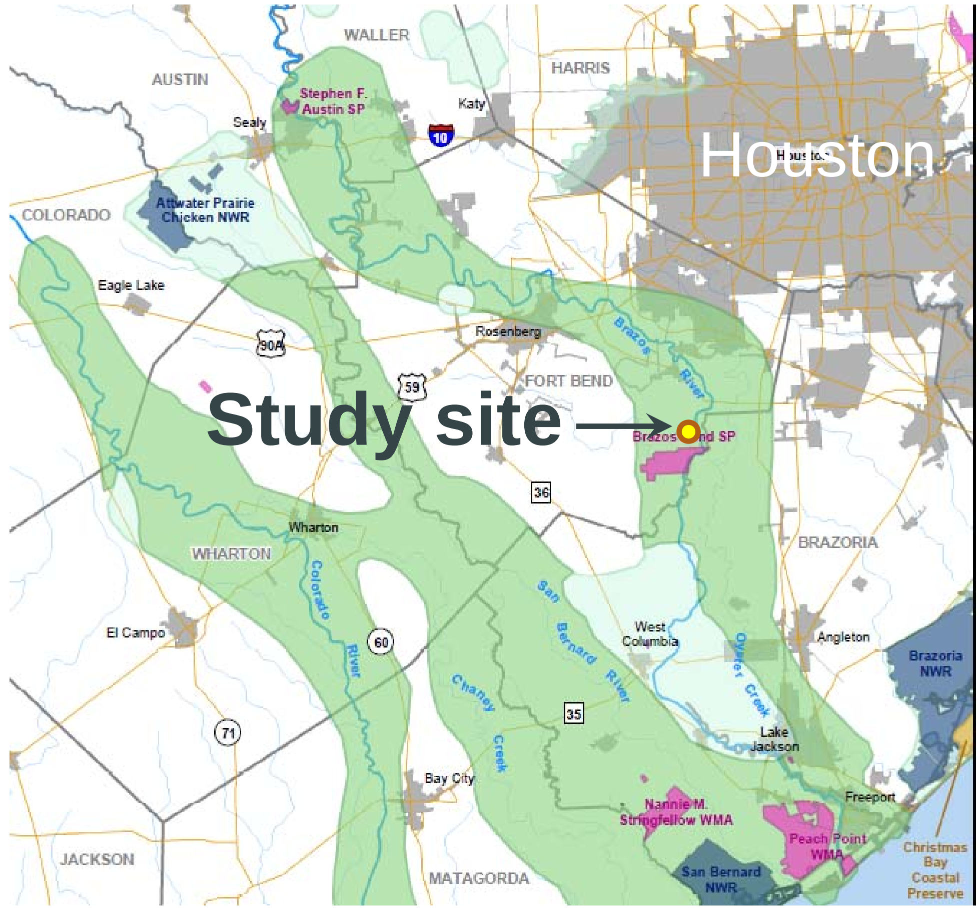
High ambient ozone (O_3) concentrations are a widespread and persistent problem globally. Although studies have documented the role of forests in removing O_3 and one of its precursors, nitro-

hospital admissions; and 3.7 (90% CI: 1.6–5.9) million school loss days could have been avoided per year on average during 2005–2007 if O_3 concentrations in those years had been reduced

(Kroeger et al. 2014 *PNAS*)

Test Case: Hypothetical Site in the Houston Area

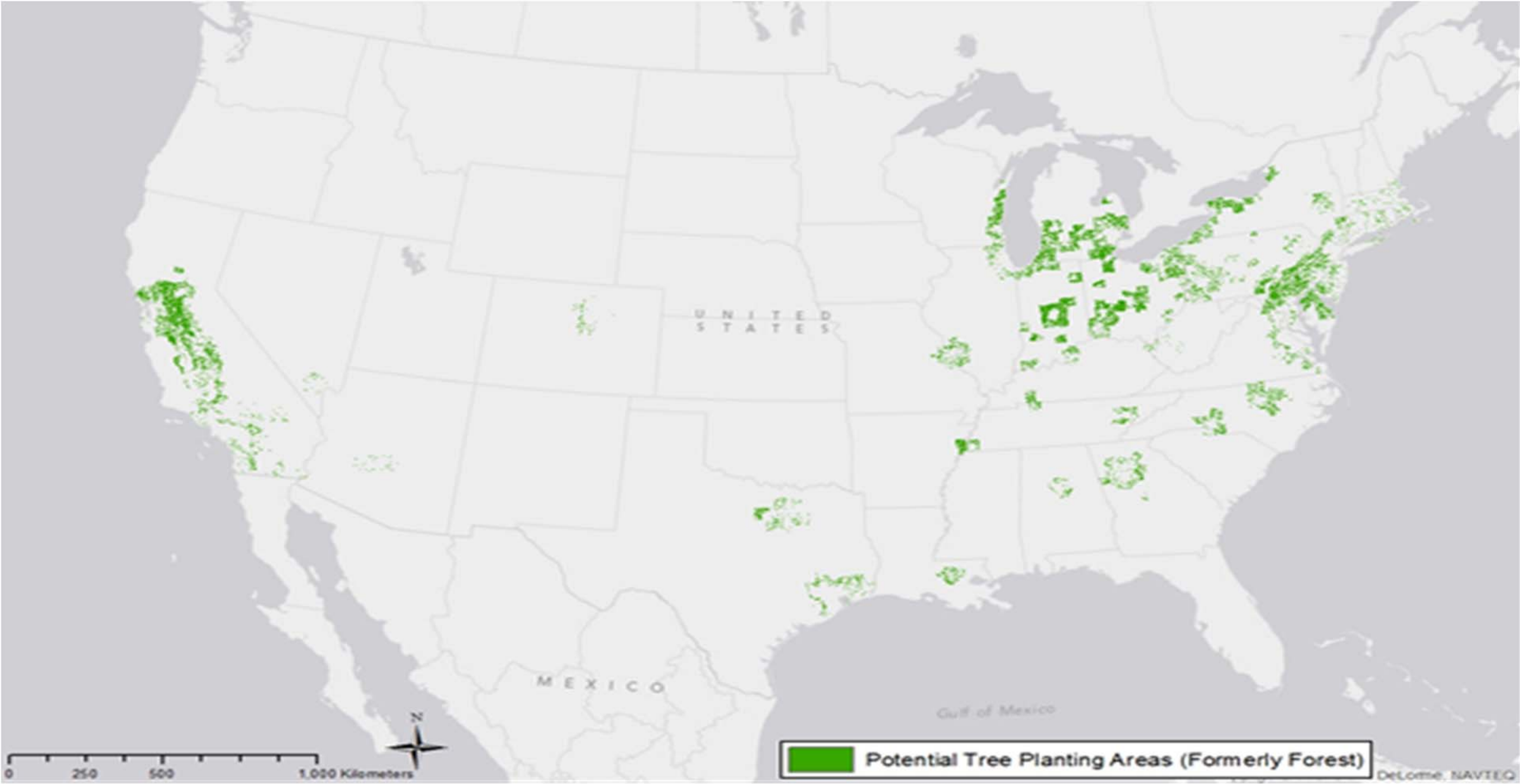
- In 8-county Houston-Galveston-Brazoria ozone non-attainment area
- 1,000-ac bottomland hardwood reforestation
- In Columbia Bottomlands Conservation Area



Columbia Bottomlands Conservation Area

(Kroeger et al. 2014 *PNAS*)

National Level Potential



Portions of O_3 non-attainment and maintenance areas where reforestation would reduce ozone, located on **historic forest habitat** and **currently in grass, shrub or agricultural cover**

(Kroeger et al. 2014 *PNAS*)

Coastal Natural Hazard Protection

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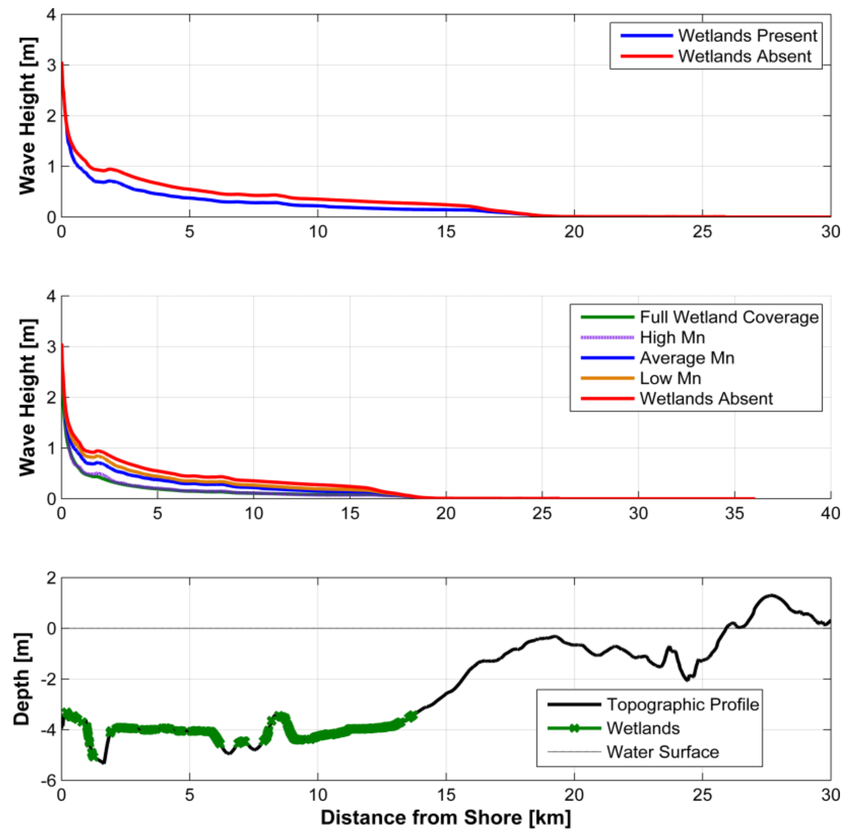
(Molnar, 2012)

Hypothesis

Understanding the role of coastal habitats in storm protection will improve levee design and reduce costs, especially in the face of sea level rise



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(Reddy, Guannel, et al. In Review)

Coastal Protection with Habitats and Levees

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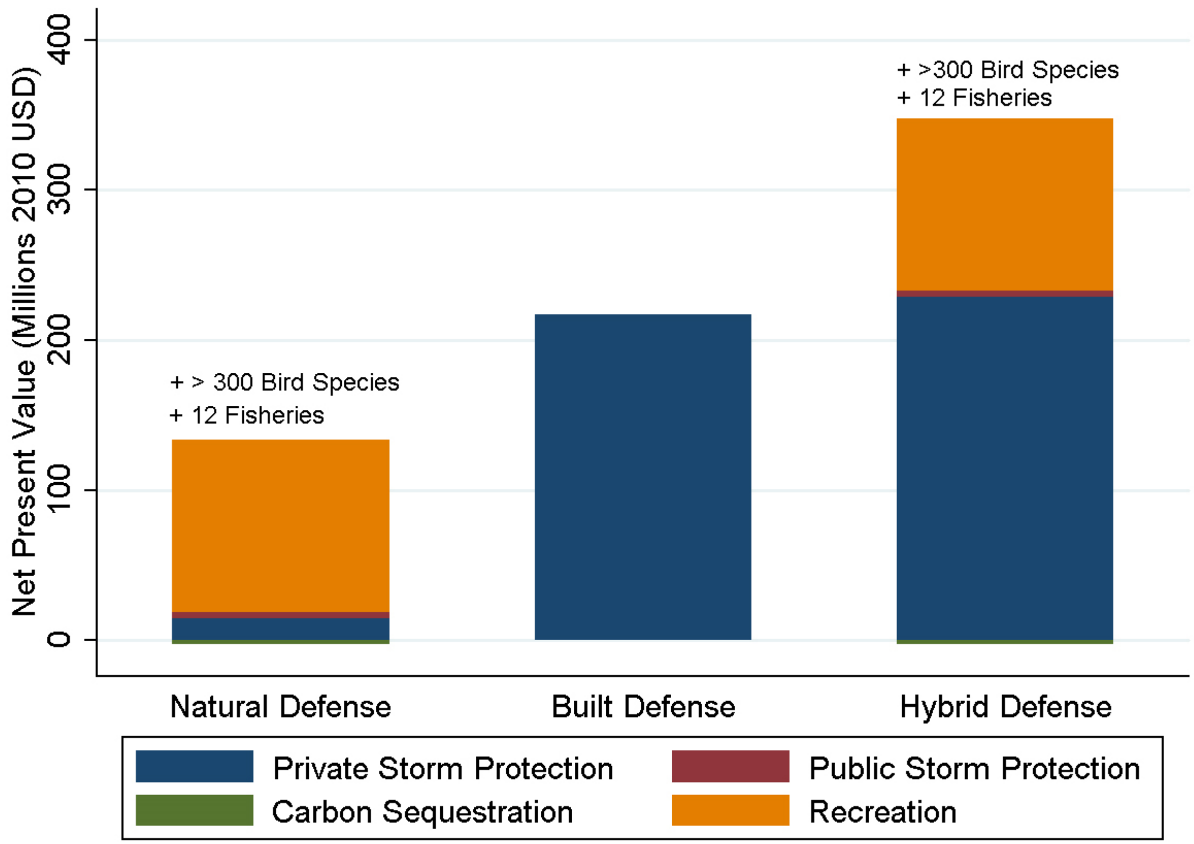
Natural Defense

Built Defense



(Reddy, Guannel, et al. In Review)

(Note: property damage estimates use county tax assessment data for industrial properties and do not use Dow property values)

Freshwater Asset Valuation and Management

(Photo: Automania 2005)

Valuable

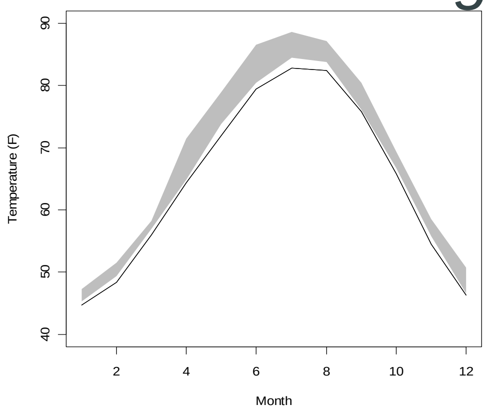
but

Costs and risk assessments do not reflect value

Future Water Risk, Prices, and Economic Losses

Trends | Water Availability & Use | Economic Impact

Climate Change



Water Stress

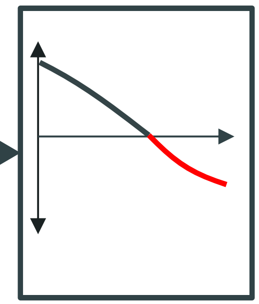
Demand Growth

Demand Stress

Prices

$$$

Losses



With & Without Market

Nine Climate-Demand Scenarios

Climate- Low, Medium, High Flow

Demand- 1999, 2040, Full Permit

(Reddy, McDonald et al. In Press *Ecosystem Services*)

Preventing Freshwater Supply Disruption

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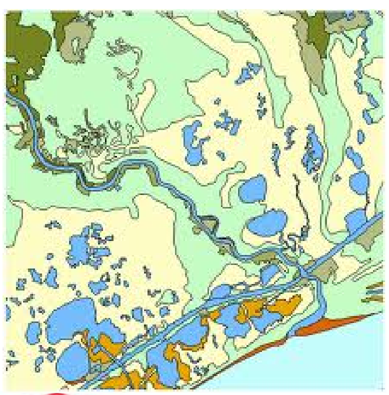
Floodplain Restoration-Reservoir Reallocation

(Photo: Sentra Woods 2009) (Photo: Dlanor Smada 2012)

Municipal Rebate Program

(Photo: Dan Hwoang Nguyen 2007)

Land Cover Management



Coastal Marsh Water Treatment

(Photo: Docent Joyce 2013)

Irrigation Efficiency Program

(Photo: CIMMT 2010)

(Reddy, McDonald, et al. In Press *Ecosystem Services*)

Pilot: Santa Vitória, Brazil

- Cerrado: Global biodiversity hotspot, with less than 20% natural habitat & < 2 % protected (Klink & Machado 2005)
- Land use: cattle ranching and increasingly sugarcane production (Lapola et al. 2010)
- Nature conservation on agriculture (private) lands is vital and regulated by the Brazilian Forest Code (FC) (Soares-Filho et al. 2014)
- Brazil pilot: Guide business decisions about land use to meet the FC and to optimize agricultural production *and* benefits of habitat restoration, biodiversity & ecosystem services

Cerrado

Cattle ranching

Sugarcane

Economic and Environmental Modeling

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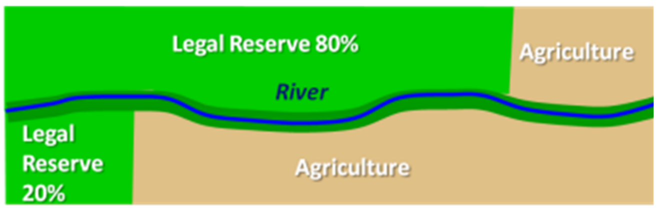
Agriculture
Cattle ranching
Sugar cane

- Economic return ($)



Forest Code

- Amount of habitat required (LRs + PPAs)
- Cost of Forest Code compliance ($)


Biodiversity

- # of Birds & Mammals in landscape


Terrestrial Surface Water Quality & Carbon Sequestration

- Nutrients & sediments in waterways
- Carbon sequestration from habitats

Landscape-level Planning: Better for Business & Nature

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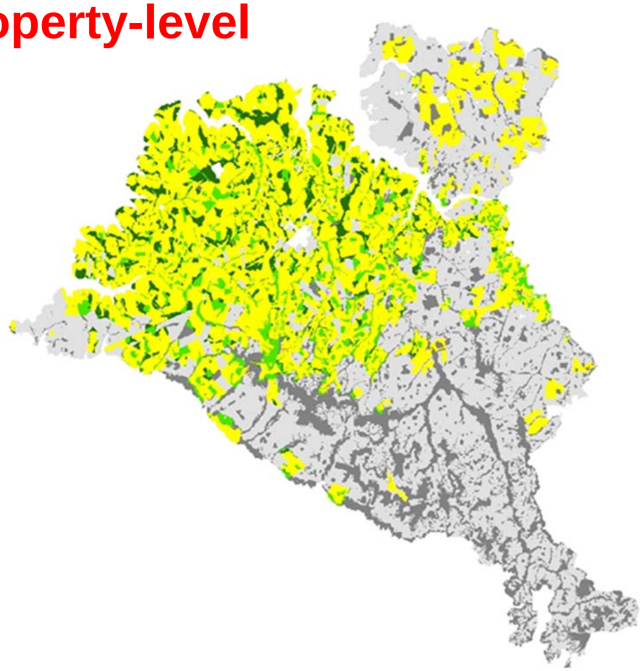
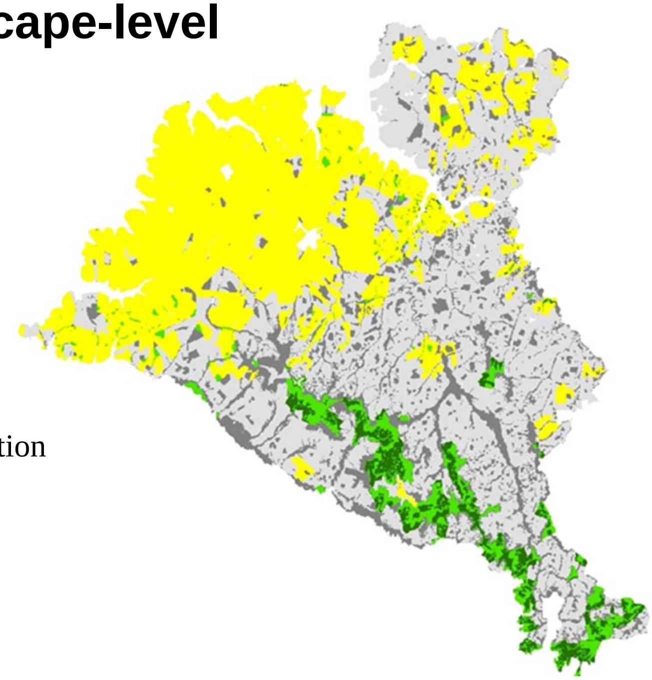
Property-level



Landscape-level



- Profitable land set-aside for FC compliance
- Additional 30-69 farms needed to meet production
- More habitat required for compliance: 11,500 (±2600) ha
- Habitat is more fragmented

- Cost savings: $19-$35 million
- Reduced transportation, leasing, and restoration costs
- Supports up to 74 more species
- Stores 151,000 additional tons carbon (with restoration)
- Similar water quality

(Kennedy, Miteva et al. in prep)

The Ecosystem Identification & Inventory Tool (ESII)

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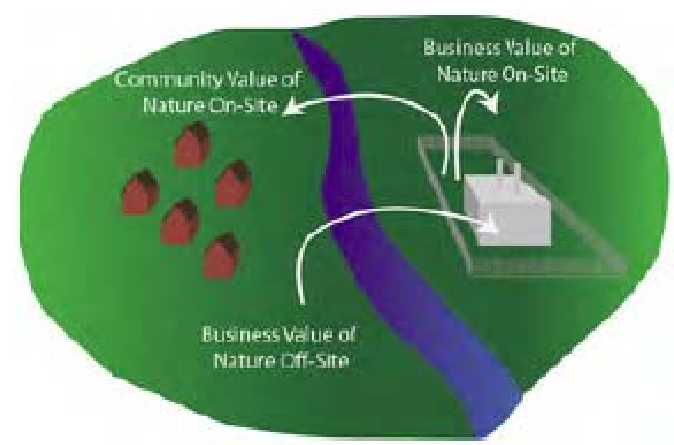
The ESII Tool:

- uses ecological attributes to identify and quantify ecosystem services at a site.
- Supports translation of these services into **economic benefits** to the business by providing data in units of measure that engineers and finance staff can put into their own valuation models.



Eight Initial Ecosystem Services

- air quality
- climate control
- erosion control
- flood hazard mitigation
- water quality control
- water quantity control
- water provisioning
- aesthetics

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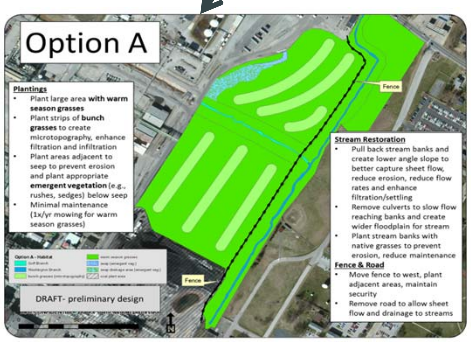
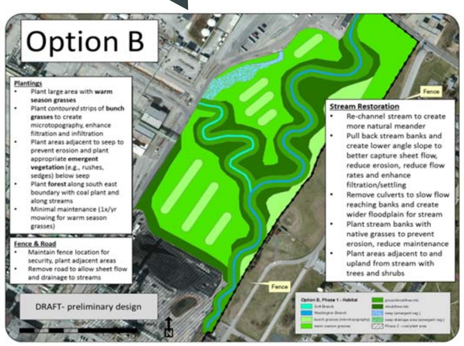
esg

ESII Tool Case Study: Tank Farm Re-development

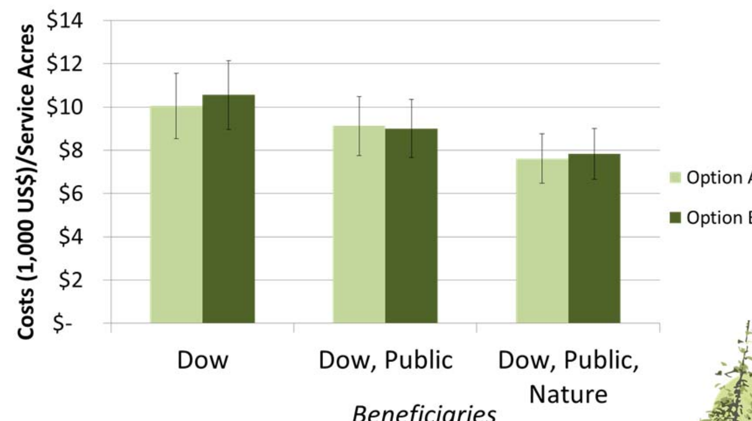




Production of Ecosystem Services

Ecosystem Service Production	Baseline	Option A	Option B
Air NOx Removal (lbs/year)	1	1	30
Air PM Removal (lbs/year)	2	2	80
BTU Reduction (Shade) (BTU/hr)	8,258,000	8,248,000	20,572,000
Erosion Regulation (acres)⁺	6	0	0
Water Provisioning (gallons)*	2,014,000	614,000	2,864,000
Water Quality TSS Removal (mg/l)	10	32	34
Water Quality NOx Removal (mg/l)	0.1	0.26	0.29
Water Quantity Control (Runoff) (gallons)**	4,281,000	3,657,000	3,512,000

Cost-effectiveness of Service Provision



More information on our natural capital work

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http://www.nature.org/dow

Acknowledgements

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The Natural Capital Project
TNC- Texas State Chapter
TNC-Brazil Country Program
TNC-Central Science
TNC-Corporate Practices
TNC-Development by Design