



# RETURN ON INVESTMENT: Online Tool Calculates The Benefits Of Green Infrastructure

Learn More 

21st Annual Public Works Roundup  
Kate Zielke, North Central Texas Council of Governments  
September 17, 2020

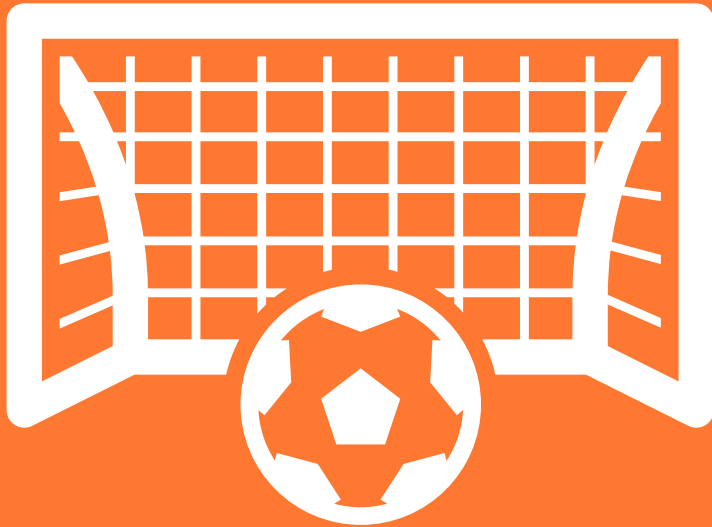
# The challenge

“

We look at environmental programs as the right thing to do, but we look at them as a cost. How do we measure the return on investment of this work?

”

# Goals for developing Economic & Environmental Benefits of Stewardship (EEBS) tool



Create a user-friendly, preliminary tool for decision-making and policy

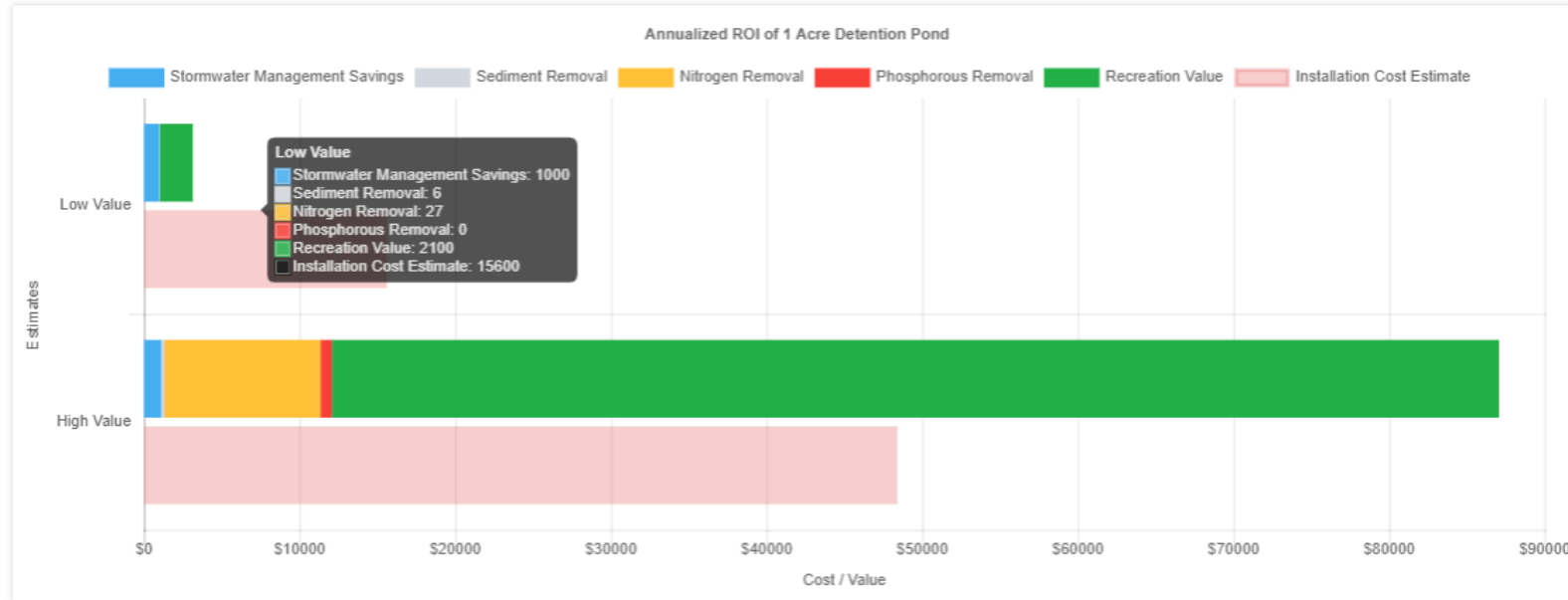
Encourage infrastructure decision-makers to consider the benefits of incorporating environmental stewardship, including qualitative and quantitative benefits

Overcome the view that environmental stewardship is only a cost

# EEBS!

## Detention Ponds

Detention ponds capture and store stormwater in a pond year-round, or during/after a storm event. The stormwater is then released at a controlled rate and location. Depending on the type of pond, stormwater pollutants may be filtered, settled, infiltrated, or otherwise reduced before it is released.



Economic & Environmental Benefits of Stewardship

- Evaluate My Project
- Documentation
- User Guide
- Case Studies
- Stewardship
- Data Report
- About

### 3. Your Project Analysis

**14.1**  
Total Acres

**0.2**  
Acres Wetlands

**2.4**  
Acres Terrestrial

**Feet of Streams**

**Acres Flood Zone**

**9.3**  
Acres Aquatic

**0**  
Acres Tree Canopy

**2.3**  
Acres Urban

Some datasets may overlap causing sum total of acres to be greater than actual total of acres.

**IMPACT**  Make Priority

**TERRESTRIAL HABITAT**  Make Priority

**HEAT ISLAND EFFECT**  Make Priority

**VEGETATION REMOVAL**  Make Priority

Your project may affect a resource that may require regulatory compliance. Stewardship options provided may not meet the necessary requirements. Further coordination with regulatory agencies and mitigation may be required.

EEBS was many steps in the making



# Engaging stakeholders and experts

## **Stakeholder interviews**

Tarrant Regional Water District

Cities of Denton, Fort Worth, Cedar Hill

Texas Parks & Wildlife Department

NCTCOG

## **Project review committee**

Texas Parks & Wildlife Department urban biologist

City of Dallas Trinity Watershed Management

NCTCOG National Environmental Policy Act  
practitioner

## **Consultant**

Highland Economics, LLC



# Sample of stakeholder comments

## **Barriers to green infrastructure**

City ordinances

Resistance to change may lead to belief that cost is higher

Lack of experience in implementing green infrastructure

## **Need for financial data**

Metric that will most influence policy makers is money

Cost savings typically are not tracked for existing green infrastructure

Because of budgetary constraints, the bare minimum may be implemented

## **Need for public education**

Education could lead the public to influence policy makers to support green infrastructure

The public likes the look of green infrastructure, and they like the environmental benefit once they are educated about this benefit

## **Need to include green infrastructure in planning phase**

There is a need for a holistic, basin-wide vision in managing stormwater

We need to institutionalize the value of open space at the policy level

Push-back occurs after growth because people realize green space preservation was forgotten

# Input from project review committee

Cleared up terminology discrepancies between city staff, NCTCOG staff, regulatory agencies

Provided feedback on impacts created by infrastructure, relevant green infrastructure to address impacts, and ecosystem services generated by green infrastructure

Discussed ecosystem services that ultimately the data and tool could not address, such as value of animal species, increase in neighboring property value



# Economic data

## Economic and Social Benefits of Mitigating Environmental Impacts of Transportation Projects

September 25, 2018

Prepared For:

North Central Texas Council of Governments  
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Highland Economic  
HIGHLAND ECONOMICS, LLC

Table 1-1: Quantified Costs: To

Type of Environmental Impact	Quant
Stormwater Runoff <sup>1</sup>	929,3
Water Quality <sup>2</sup>	
Sediment	900 - 1,
Nitrogen	8.8 - 10
Phosphorus	1.0 - 2
Recreation <sup>3</sup>	696 - 3,
Urban Heat Island <sup>4</sup>	4,98
Habitat	
Wetland/Riparian	1
Terrestrial Habitat	1
Air Quality <sup>5</sup>	
Particulate Matter	12.5 - 50.9
Nitrogen Dioxide	4.5 - 12.5
Sulfur Dioxide	1.8 - 6.2

- 1/ Source: Derived from rainfall in the Dallas/Fort Worth area from 2008 - 2017 (National Weather Service, 2018).  
 2/ Source: (Li, Barrett, Rammohan, Olivera, & Landphair, 2008). Ranges are similar to the pollutant loads found in other studies of urban runoff in North Central Texas (Banks, 2008; U.S. Geological Survey, 1998). Note that bacteria contamination is also a pollutant of concern in many area waterbodies, but is not related to transportation.  
 3/ Derived from (The Trust for Public Land, 2017; City of Plano, 2017; Dallas Park & Recreation, 2017; Dallas Park & Recreation, 2018)

Table 1-3: Quantified Benefits: Tool Inputs on Economic Benefit

Environmental Benefit	Economic Value	Unit
Stormwater Management <sup>1</sup>	\$1,000 - \$1,100	\$ / Acre impervious / Year
Water Quality (Nitrogen) <sup>2</sup>	\$1 - \$10	\$ / Pound
Water Quality (Phosphorus) <sup>2</sup>	\$1 - \$10	\$ / Pound
Water Quality (TSS) <sup>2</sup>	\$6	\$ / Ton
Recreation <sup>3</sup>	\$3 - \$25	Per Visit Benefit to Recreator
Energy Savings <sup>4</sup>	\$0.1165	\$ / kWh
Aesthetics	\$300 - \$900	\$ / Street Tree / Year
Air Quality (PM <sub>10</sub> ) <sup>5</sup>	\$7.36 - \$19.85	\$ / Pound
Air Quality (NO <sub>2</sub> ) <sup>5</sup>	\$4.59 - \$11.54	\$ / Pound
Air Quality (SO <sub>2</sub> ) <sup>5</sup>	\$3.67 - \$18.40	\$ / Pound
Habitat, Terrestrial	\$100 - \$750	\$ / Acre / Year
Habitat, Wetland/Riparian	\$500 - \$11,400	\$ / Acre / Year
Pavement Maintenance Costs	\$3.50 - \$17	\$ / Tree / Year

Note: Health benefits from air quality are included in the air quality values.

1/ Derived from the residential stormwater fees in Fort Worth and Dallas

2/ (U.S. Environmental Protection Agency, 2015; Natural Resource Conservation Service, US Department of Agriculture, 2010; Shaik, Helmers, & Langemeier, 2002)

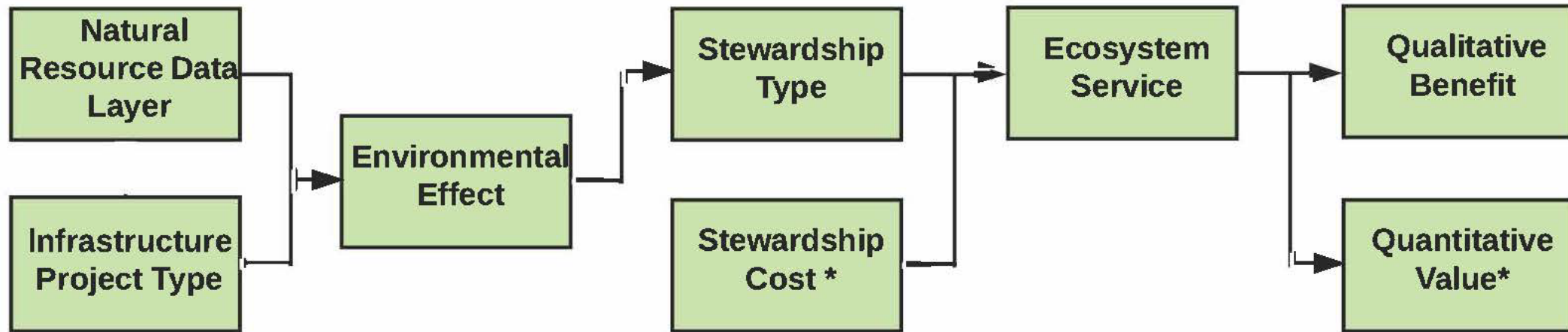
3/ Sources: (Hansen, Mills, Stoll, Freeman, & Hankamer, 1990; Bergstrom & Cordell, 1991; Loomis, 2005). All values were adjusted for inflation to 2018 dollars using the Consumer Price Index.

4/ Based on the average marginal charge for electricity in Dallas in July 2018 (TexasElectricityRatings.com, 2018)

5/ Derived from (Wang & Santini, 1995). The most recent data available were used for the Dallas metro area population and air pollutant concentrations. Values were adjusted to 2018 dollars using the Consumer Price Index.

Acres Reduced Habitat / Acres Habitat Converted

# Tool concept map

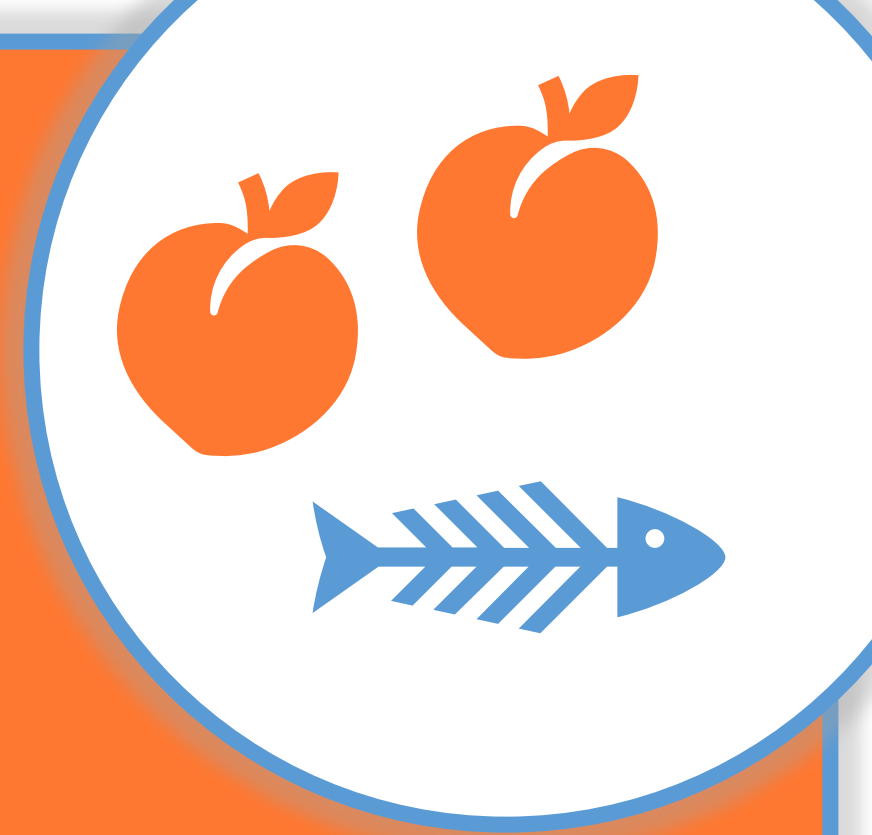


*\* If data was available*

# What are ecosystem services?

The services humans derive from the environment

- Food
  - Flood control
  - Recreation
  - Many more...
- 
- Public goods
  - Value hard to quantify in decision making
  - Protecting ecosystems and their services seen as a cost



Parking lot

Natural Resources Layer

Aquatic Resources/ Habitat	<b>Terrestrial Habitat</b>	Tree Canopy	Streams	Wetlands	Altered Hydrology	Streambank/ Shoreline Erosion
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Environmental Effect

<b>Heat Island Effect</b>	<b>Water Quantity/ Quality</b>	Aquatic Habitat	<b>Terrestrial Habitat</b>	Vehicle Collisions	<b>Vegetation Removal</b>	Altered Hydrology	Streambank/ Shoreline Erosion
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Stewardship Type

<b>Bioretention /Bioswales</b>	<b>Detention Pond</b>	Riparian Plantings/Wetland Restoration	<b>Wildlife Corridor Measures</b>	<b>Preservation of Open Space</b>	<b>Pervious Pavement</b>	<b>Artificial Light Measures</b>	<b>Stream Function Restoration</b>	<b>Native Tree Plantings</b>
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# Case studies

Green  
infrastructure

Open space

Pervious  
pavement

## Green Infrastructure in Grand Rapids, MI



**North Central Texas  
Council of Governments**



### *Green Infrastructure Net Economic Benefits in Grand Rapids, Michigan*

#### Cities in North Central Texas

#### Grand Rapids, Michigan Study

It is expected that there would be net benefits in Grand Rapids of implementing a variety of green infrastructure (GI) practices, including conserved natural areas, street tree planters, rain gardens, permeable asphalt, infiltration, and bioretention basins. A study by local researchers showed that each GI practice would provide a positive economic return when compared to conventional "gray" stormwater management infrastructure.<sup>1</sup>

Net benefits were estimated to be positive over the life of the GI measure (measured as net present

#### Key Program Benefits

- Green infrastructure mitigation measures are estimated to provide a higher net economic benefit than gray infrastructure. Specifically, the additional net benefits are:
  - Conserved natural areas: \$3.10/ft<sup>3</sup>
  - Street Trees: \$1.48/ft<sup>3</sup>
  - Rain gardens: \$1.12/ft<sup>3</sup>
  - Permeable asphalt: \$0.68/ft<sup>3</sup>

# User guide

Video or PDF versions

## Evaluate My Project

### 1. Draw Your Project Boundaries



Navigate to the location of your project by typing in an address, clicking and dragging on the map, and/or using the + and - tools.



# Tool demo

The screenshot shows a web application interface. At the top left is a blue header with a tree icon and the text "Economic & Environmental Benefits of Stewardship". Below this is a navigation menu with items: "Evaluate My Project", "Documentation" (with a dropdown arrow), "User Guide", "Case Studies", "Stewardship Information", "Data Report", and "About". The main content area features a large banner image of purple lupines with a circular logo of a tree. The banner text reads "Economic & Environmental Benefits of Stewardship". Below the banner are three white boxes with blue borders. The first box is titled "User Guide" and contains the text "Step by step guide for how to use the project evaluation tool." and a blue button with a book icon labeled "Read User Guide". The second box is titled "Project Evaluation Tool" and contains the text "The Economic & Environmental Benefits of Stewardship tool can estimate the return on investment of implementing environmental stewardship to reduce the environmental effects of transportation projects. The tool can educate decision-makers about the value of environmental stewardship." and a green button with a gear icon labeled "Evaluate My Project". The third box is titled "Stewardship Information" and contains the text "Browse our library of stewardship options and download or print informational fliers." and a blue button with a document icon labeled "Stewardship Information".

**Economic & Environmental Benefits of Stewardship**

Evaluate My Project

Documentation

User Guide

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### User Guide

Step by step guide for how to use the project evaluation tool.

Read User Guide

### Project Evaluation Tool

The Economic & Environmental Benefits of Stewardship tool can estimate the return on investment of implementing environmental stewardship to reduce the environmental effects of transportation projects. The tool can educate decision-makers about the value of environmental stewardship.

Evaluate My Project


### Stewardship Information

Browse our library of stewardship options and download or print informational fliers.

Stewardship Information


# Really excited about EEBS?


If you would like to promote EEBS, NCTCOG staff would be happy to speak at your event. We also can provide flyers to distribute or email.





## Economic & Environmental Benefits of Stewardship Tool

The Economic & Environmental Benefits of Stewardship tool estimates the potential return on investment of implementing environmental stewardship to reduce the environmental effects created by transportation projects. The tool can educate decision makers about the financial value of environmental stewardship. Use the tool at [eeps.nctcog.org](http://eeps.nctcog.org).

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**Draw and describe project boundaries**
- 

**Prioritize environmental effects**
- 

**Select stewardship options**
- 

**Compile report on benefits and costs**



# **Environmental Matchmaking Tools**

**Webinar**

**September 30  
1:30 p.m.**

**Learn about free tools  
to help identify your  
best stewardship options and  
mitigation locations  
for your transportation  
or development projects.**



*Regional  
Ecosystem  
Framework*

*Environmental &  
Economic  
Benefits of  
Stewardship*

*Permittee  
Responsible  
Mitigation  
Database*

**[www.nctcog.org/envir/events](http://www.nctcog.org/envir/events)**

# Contacts

## **EEBS content questions**

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## **EEBS technical questions**

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