**“We use nature because it’s valuable,**
**but we lose it because it’s free.”**

***Pavan Sukhdev*** The Economics of Ecosystems and Biodiversity (TEEB)

**France M. Guertin**
**The Dow Chemical Company**
**Midland, Michigan, USA**

- Can we devise a screening level tool from which actionable decisions can be made recognizing the inherent uncertainties associated with quantifying nature?

  - How are decisions that impact nature made today?
  - What is the status of scientific modeling on ecosystem services?
  - How are ecosystem services assessments done?
  - What is achievable for Dow globally?
  - What level of uncertainty is acceptable?

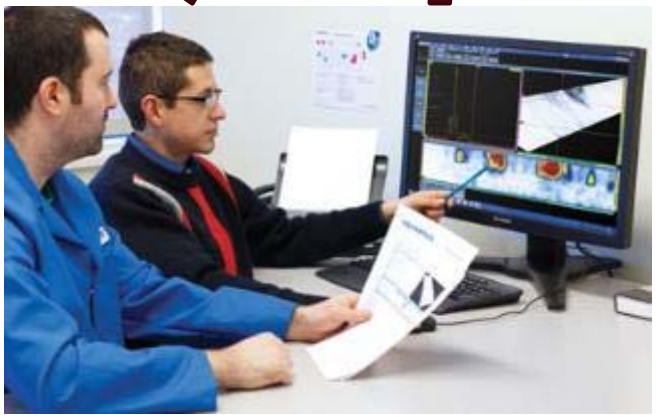
# Ecosystem Services Identification and Inventory (ESII) Tool Definition

- User would be non-ecologists
- Help them measure ecosystem services rapidly and cost effectively
- Measure Ecosystem Services at a site scale, applied globally
- Provide simple gross assessments of ecosystem services at sites
- Provide **scientifically robust** information on ecosystem services—a first step which can guide practitioners on whether more detailed studies would be useful
- Help business decision makers make better informed decision with nature in mind




# Ecosystem Services Identification and Inventory (ESII) Tool

Land attributes captured



ES quantification and valuation

Strategic & Tactical Impact

## *Yes, this can be done!*

But ….If science cannot provide certainty in complex ecosystems, then how should science-based decision making involving nature be approached?

# Identify Sources/Types of Uncertainties

VALUE

SERVICES

FUNCTIONS

LANDSCAPE ATTRIBUTES

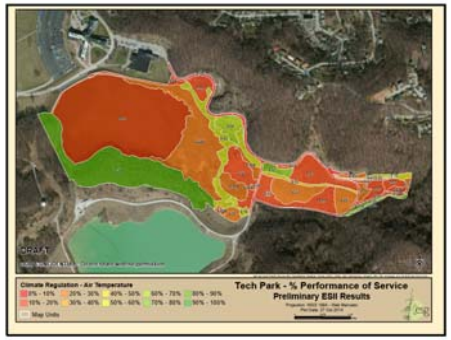
Interpretation

Output Results

Model

Input Data

Informed Business Decision



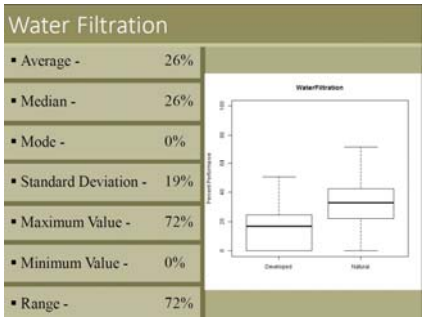

# Strategies for dealing with uncertainty

1. Reduce
2. Recognize
3. Resolve



# Strategy: Reduce

## Informed Business Decision





✓ Consultation with key stakeholders

✓Rigorous QA/QC process
✓Pilot testing / model calibration

✓Peer reviewed models based on the current theoretical state-of-the-art knowledge

✓ User friendly data collection protocols
✓ Repeatability testing

# Strategy: Recognize

Recognize- Know what you don’t know

- ✓ tracking using Bayesian Belief Network makes it possible to reveal the weakest elements of an assessment (probabilistic vs deterministic)
- ✓ user can input level of certainty
- ✓ benchmarking/ scenario building



# Strategy: Resolve

✓ Acknowledge uncertainty connected to complex ecosystem interactions and dynamics within guidelines

✓ Screening level tool! Describe what the tool can and can not do

✓

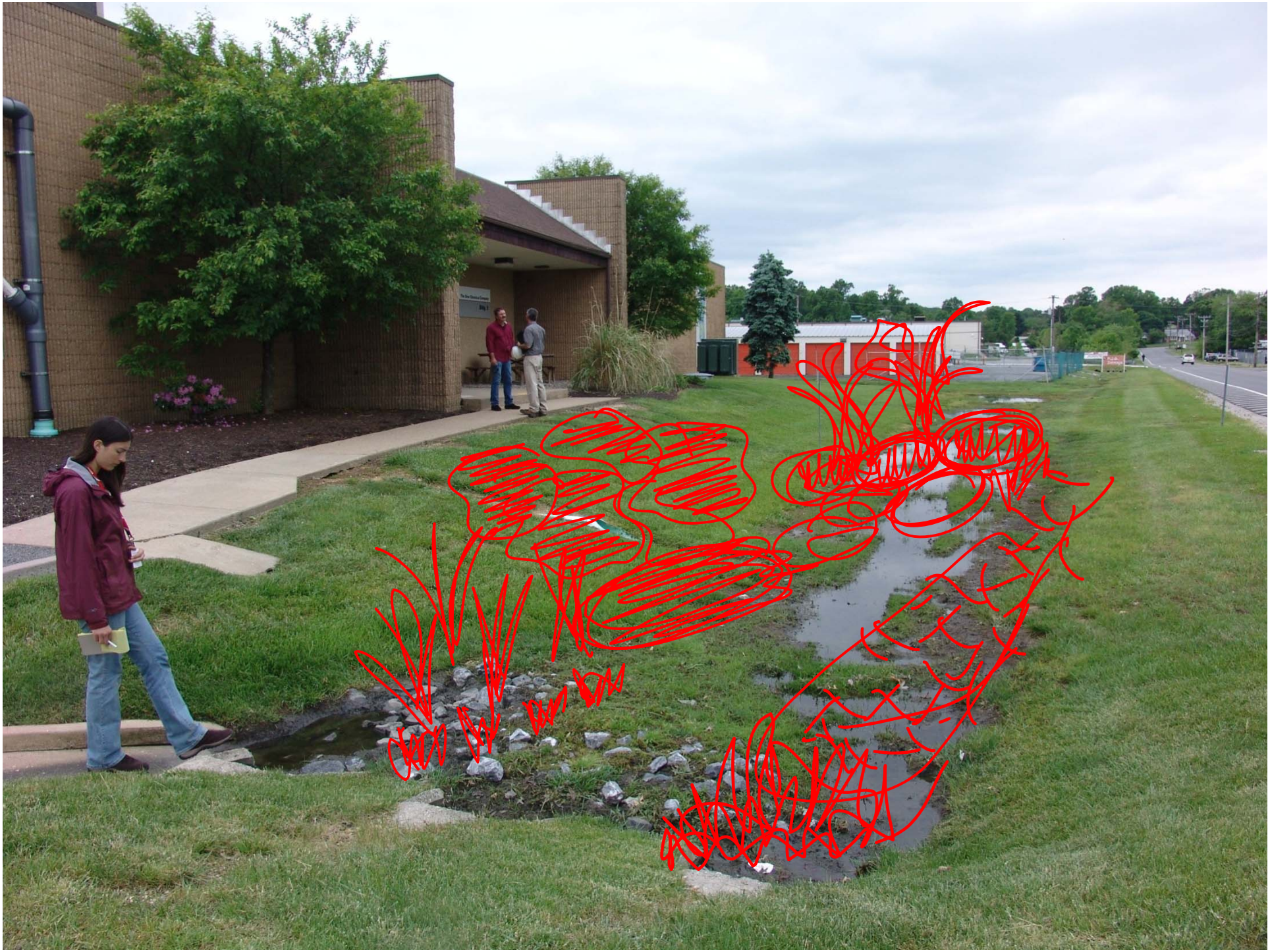
✓ Apply precautionary /conservative principle

✓ Elicit expert advice/judgment from a broad base community

✓ Foster learning from each application

✓ Seek /recommend further analysis where necessary

✓ Understand the context and what level of uncertainty is acceptable by stakeholder engagement



# ESII Score Card

| | Bioswale 0.11 Acres | | | | | |
|---|---|---|---|---|---|---|
| | Past Condition | | Present Condition | | Amount of Change | |
| | Drainage Ditch (Intermittent or Ephemeral) | | Managed Wetland in Maintained Lawn or Green Space | | | |
| | Average % Performance | Functional Acres | Average % Performance | Functional Acres | Change in % Performance | Functional Acres |
| Carbon Sequestration | NA | NA | 49% | 0.05 | 100% | 0.05 |
| Channel Diversity | 10% | 0.01 | NA | NA | -100% | -0.01 |
| Channel Equilibrium | 33% | 0.04 | NA | NA | -100% | -0.03 |
| Evaporation | 13% | 0.01 | 39% | 0.04 | 26% | 0.03 |
| Filtration | 0% | 0.00 | 27% | 0.03 | 100% | 0.03 |
| Infiltration | NA | NA | 23% | 0.02 | 100% | 0.02 |
| Interception | NA | NA | 56% | 0.06 | 100% | 0.06 |
| Nitrogen | 0% | 0.00 | 23% | 0.03 | 100% | 0.03 |
| Noise Attenuation | 12% | 0.01 | 12% | 0.01 | 0% | 0.00 |
| Organic Matter Production | 0% | 0.00 | 38% | 0.04 | 100% | 0.04 |
| Phosphorus | 0% | 0.00 | 13% | 0.01 | 100% | 0.01 |
| Sediment Transport | 33% | 0.04 | 33% | 0.04 | 0% | 0.00 |
| Soil Quality | NA | NA | 70% | 0.08 | 100% | 0.08 |
| Soil Retention | NA | NA | 38% | 0.04 | 100% | 0.04 |
| Soil Stability | NA | NA | 100% | 0.11 | 100% | 0.11 |
| Temperature (albedo) | 0% | 0.00 | 14% | 0.02 | 100% | 0.02 |
| Temperature (water quality) | 0% | 0.00 | 5% | 0.01 | 100% | 0.01 |
| Transpiration | 0% | 0.00 | 42% | 0.05 | 100% | 0.05 |
| Visual Screening | 5% | 0.01 | 5% | 0.01 | 0% | 0.00 |

*Some functions are not relevant in all map units. Therefore, functional acre scores reflect the sum of the map unit acreages where the functions are capable of being performed.

## *GI Opportunity Newark, DE*

| | |
|---|---|
| Grey traditional solution: | $50,000 min. |
| Green Alternative: | $25,000 |
| NPV30 Bioswale project: | $40,000 |

***Before***

***After***

# Using ESII while recognizing inherent uncertainties associated with quantifying nature






# Conclusion

**Despite uncertainties inherent in quantifying nature, ESII is a breakthrough tool for making better informed business decisions related to nature.**

# Recommended Reading

ENVIRONMENTAL SCIENCE & POLICY 29 (2013) 12–23

Available online at www.sciencedirect.com

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## Coping with uncertainties in science-based advice informing environmental management of the Baltic Sea

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