

# Quantifying How Natural Grass Sequesters Carbon

‘The Clean Air Calculator (CAC)’

Scott Bills, CSFM  
Sports Field Solutions LLC  
President, Project EverGreen

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# The Clean Air Calculator

By Scott Bills and Cindy Code



— PROJECT —  
**EverGreen**

CREATING A GREENER, HEALTHIER, COOLER EARTH™



— PROJECT —  
**EverGreen**

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*Our Mission*

Bringing people together to make a difference in how our yards, parks and communities create a greener, healthier, cooler Earth.

*Our Vision*

**A GREENER, COOLER EARTH. HEALTHIER, HAPPIER PEOPLE.**



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## *Your Mission*

SFMA advances professionalism in sports field management and safety through education, awareness programs, and industry development.

# Our Shared Mission



# Our Programs

Honoring our commitment to make a difference



**GreenCare for Communities**  
Park and green space revitalization



**GreenCare for Troops**  
Free lawn/landscape services for troops

# Why Project EverGreen

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- Group of like-minded professionals brainstormed
- Preaching to the choir; need to reach outside the industry
  - Bans impacting our business – pesticides, noise, emissions, water, elimination of natural turf
  - Reclaim the word environmentalist.
- Opportunity to tell our story
- 2003 - \$50,000 grant from PLCAA

# Our Approach

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- Is personal, connected and hands on...

We connect people with their **community**, **their parks** and **local business volunteers** in a thoughtful and comprehensive way.

Engaging with the general public to communicate the positives of healthy green spaces.



# Our Story

Making a greener, healthier, cooler Earth



# Collaboration is Essential

No one can do it alone



## SERVICE PROS:

Mobilize professionals to quickly and cost-efficiently renovate and restore urban green spaces

Lawn, landscape, arborists, landscape architects, designers, irrigation contractors, sports turf managers and sod producers

## RESOURCE CHANNELS:

Network provides valuable in-kind material, equipment and supplies

Suppliers, distributors and dealers

## HELPING HANDS:

We encourage neighborhood volunteers to lend a helping hand

Residents, youth sports, churches, donor companies and city workers

**EFFICIENCY IS KEY: OUR EXTENSIVE NETWORK IS HOW WE LEVERAGE EVERY \$1 WE RECEIVED INTO \$3**

# Motivation to Serve

Feeling great about helping matters most



**We engage 1,000s of volunteers to actively help**

Volunteers are assigned a team, team leader, tools and the knowledge they need to contribute and **feel great about it!**



# GreenCare for Communities

Our mission coming to life at a local level



- Reviving parks and public green spaces that support healthy and social communities
- Creating community “hubs” where neighbors – young and old – gather to get to know each other and support one another
- Supporting vibrant, social community interaction serves to strengthen the neighborhood vibe, infrastructure and feelings of safety
- Producing actively growing grass, trees and shrubs that sequester carbon and yields oxygen to reduce heat island effect
- Ensuring healthy, greener parks function as the “lungs of our cities”
- Providing play areas for neighborhood kids to play soccer, baseball, football, dance and run around



# Our Experience

Getting things done takes know-how



Our portfolio includes **more than 100 cities nationwide** resulting in **more than 200 million square feet** of public green spaces including projects in:

Detroit, MI • Cleveland, OH • Durham, NC  
East Harlem, NYC • S. Phoenix • Savannah • Denver •  
Washington D.C. • San Diego  
Houston • Fort Myers



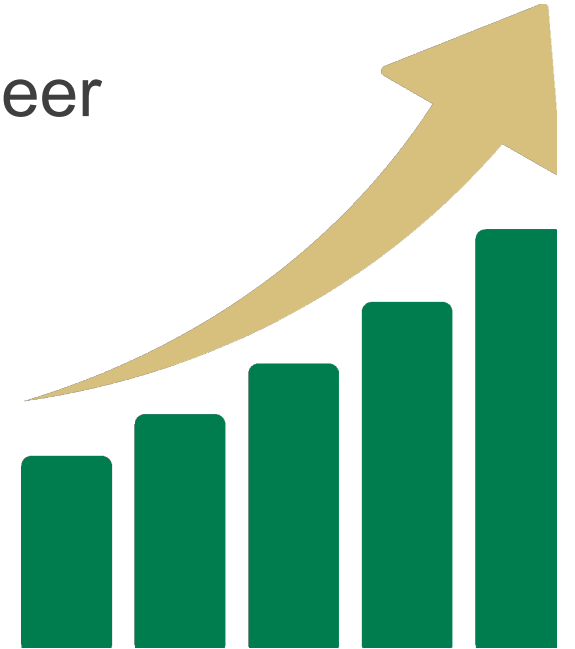
MORE THAN  
**100**  
CITIES

# Measuring Success

Understanding impact means tracking it first



- Before and after each project we quantify the number of people using the parks
- We track community events, sporting events and sheer activity at the parks
- We observe increased home sales, fewer home vacancies, improved property values

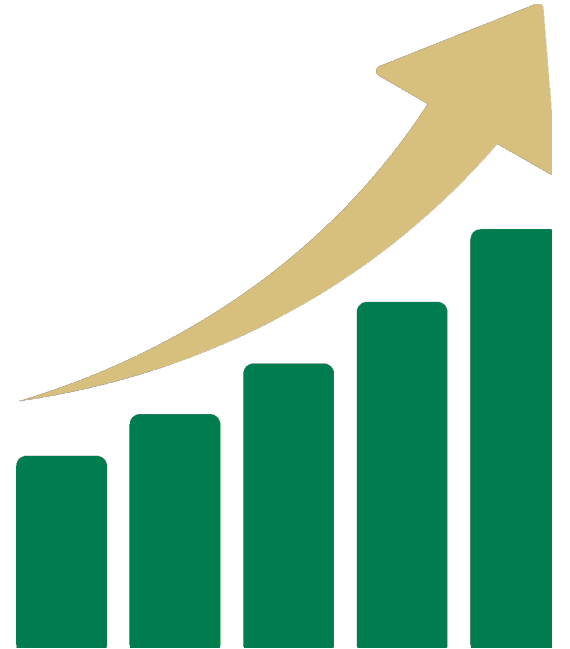


# Clean Air Calculator

A game changer!



- Quantifying the benefits of our work.
- Objectively counter opposing claims.
- Gives the industry a reason to believe.
- Advocacy
- ESG reporting
- Support case for natural turf.



# Clean Air Calculator

A game changer!



— PROJECT —  
EverGreen



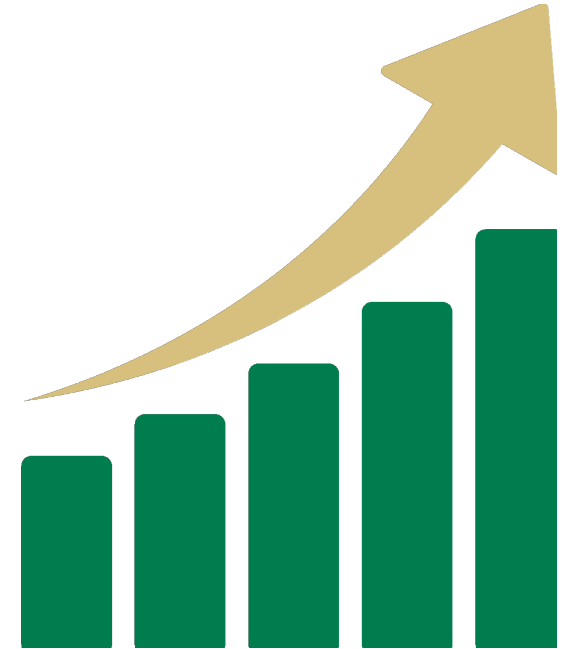


# Clean Air Calculator

## How it was created



- Canadian Nursery & Landscape Association
- Green Cities Foundation
- Research paper published by University of Guelph
- Includes 76 references from across N. America
- Peer reviewed in U.S. by:
  - The Ohio State University
  - Texas A&M
  - Soil Health Institute

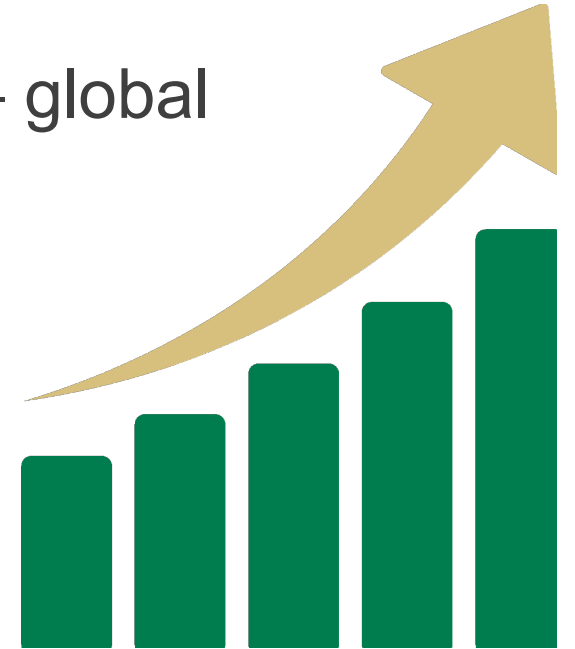


# Clean Air Calculator

## How it was created



- GCF is sole licensee in Canada
- Project EverGreen is sole licensee in US
- Clean Air Calculator data measured through ESRI – global geographic Information system
- Project EverGreen is developing the web-based Tool available through the PE website.
- Professional contractors – key target audience



# Clean Air Calculator

## Research



- 
- Populated the model with reasonable values from the literature
  - Gross C sequestration is defined as the total C that is left over in the soil (for turfgrass) and in wood (for trees) after respiration and decay.
  - Net C sequestration represents the gross C sequestration subtracting the HCC of production and maintenance practices

# Clean Air Calculator

## Research



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- A number of studies have calculated the Hidden Carbon Costs of turfgrasses and provide information on mowing, nitrogen escape (Table 4), fertilizer production and irrigation. This amount of detail in the literature allows for an accurate assessment of the HCC and therefore leads to a robust carbon sequestration calculation for turfgrasses in the urban environment.

# Clean Air Calculator

## Uses



- After service email
  - Professionals can provide customers and constituents with the environmental value of the services provided.
  - Share how more grass, trees and shrubs helps the environment.
  - Engage customers and constituents in participating in health of green spaces and sharing the story.



SPORTS FIELD SOLUTIONS, LLC  
SCOTT BILLS, CSFM  
CERTIFIED SPORTS FIELD CONSULTANT  
908-268-8866

[www.sportfieldsolutionsllc.com](http://www.sportfieldsolutionsllc.com)  
[scott@sportfieldsolutionsllc.com](mailto:scott@sportfieldsolutionsllc.com)

- Nationally Certified Sports Field Manager (CSFM)
- Owned and operated multi-million dollar companies constructing parks, sports complexes and golf courses.
- 40+ years of experience evaluating, designing, building, renovating and maintaining sports fields and golf courses.
- Board of Directors – SFMANJ and Project EverGreen
- Board of Trustees (Past) – SAFE Foundation
- Division 1 Catcher – Rutgers University (1978-1980)
- Up until 2023, played 60+ games/year
- Expert Testimony – Sports Field Injury Cases and Contract Disputes since 2012
  - Over 40 Cases to Date
- Professional Sports Field Consultant since 2012
  - City of West Palm Beach, FL
  - City of Detroit, MI
  - Clark County, Las Vegas, NV
  - City of Farmington, NM
  - City of Salem, MA
  - City of Norwalk, CT
  - Flatirons Academy, Westminster, CO
  - Dozens of New York metropolitan and MidAtlantic area clients
- Instructor – Rutgers University Department of Continuing Professional Education
  - *“Sports Field Safety and Legal Issues”*
  - *“Risk Management in Parks and Recreation”*
  - *“Baseball and Softball Skin Surface Selection Construction and Management”*
- Nationally recognized speaker and presenter

# Why is this important to a Sports Field Manager?

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## Why have 13,000 grass fields been replaced with synthetic turf?

- Less cancellations and rescheduling of games compared to natural grass fields.
- More hours of use (winter, immediately after rainfall) compared to natural grass fields
- Title IX (Athletic Directors)
- Ability to hold events (Concerts, Motocross, Monster Trucks, Car Shows, Carnivals, etc) without damaging or having to replace grass.
- Lack/Shortage of properly trained, educated, interested and hired Sports Field Managers
- Poor job of our industry educating municipal and school administrators the importance of having a Sports Field Manager on staff. (Golf Course example)
- **Bottom Line – We are not doing a good job maintaining natural grass sports fields and infield skin surfaces at the college, high school, parks and recreation levels.**
- All of the above

# How can the Clean Air Calculator (CAC) help me?



- 
- Quantifies the benefits of our work.
  - Objectively counter opposing claims.
  - Gives the industry a reason to believe.
  - Advocacy
  - Environmental, Social and Governance (ESG) reporting
  - Support case for natural turf.



SHOW ME!!!

# First, some Definitions



- 
- ESG – Environmental, Social and Governance metrics
  - Carbon Dioxide
  - Carbon Budget
  - Carbon Sink
  - Carbon Cost
  - Carbon Sequestration

# ESG – Environmental, Social and Governance Metrics



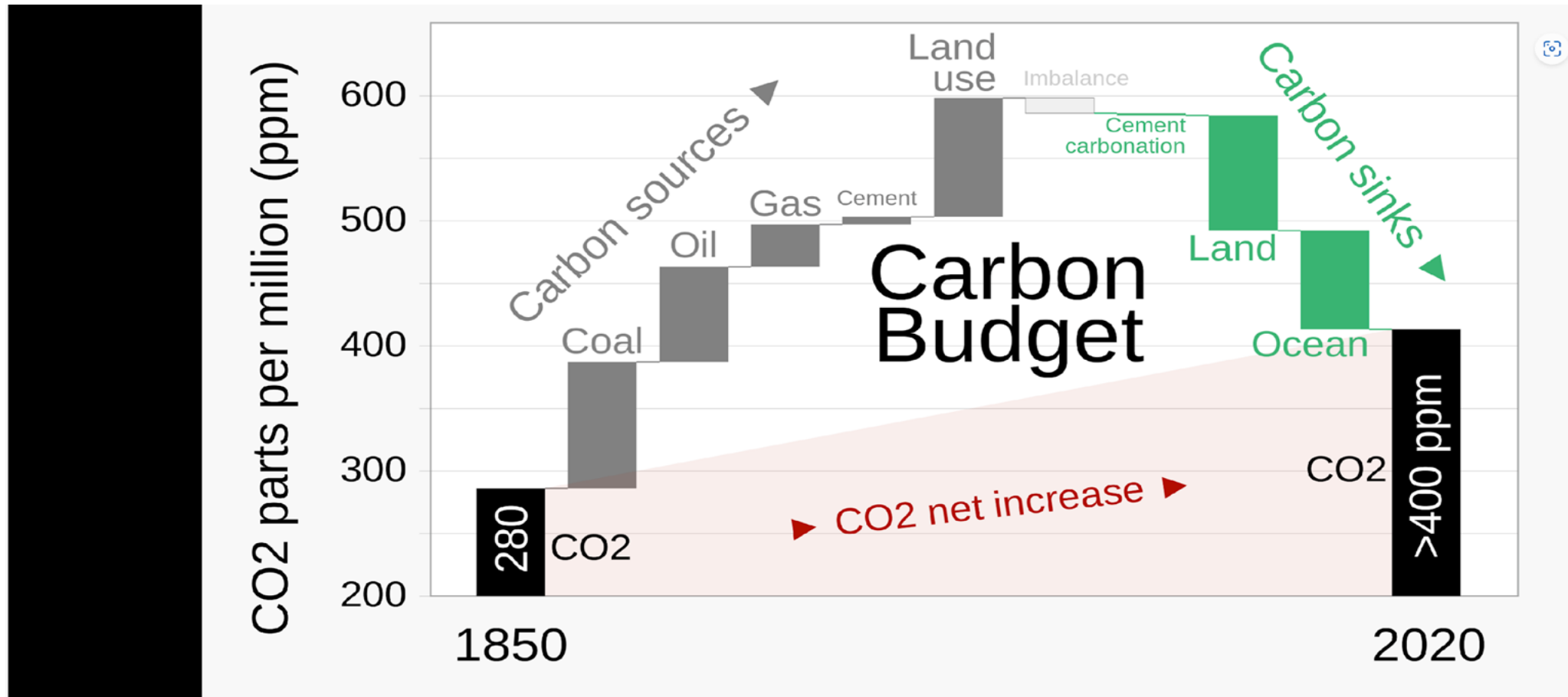
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- 3 pillars that can be considered when investing in a company.
  - Initiative of the United Nations in 2004
  - ESG related investments have grown to over \$30 Trillion in assets
  - Examples of Metrics – Greenhouse gas emissions, Carbon Footprint, Diversity Percentages, Taxes Paid, Wages
  - Qualitative – non-numerical data (commitment to diversity, equity and inclusion)
  - Quantitative – numerical data (emissions, energy usage, deforestation, replacing **natural grass** with synthetic turf)

# Carbon Dioxide (CO<sub>2</sub>)



- **Carbon Dioxide(CO<sub>2</sub>)** is a [chemical compound](#) with the [chemical formula](#) CO<sub>2</sub>. It is found in the gas state at room temperature, and as the source of available carbon in the [carbon cycle](#), atmospheric CO<sub>2</sub> is the primary [carbon](#) source for [life](#) on Earth. In the air, carbon dioxide is transparent to visible light but absorbs [infrared radiation](#), acting as a [greenhouse gas](#). Carbon dioxide is soluble in [water](#) and is found in [groundwater](#), [lakes](#), [ice caps](#), and [seawater](#). When carbon dioxide dissolves in water, it forms [carbonate](#) and mainly [bicarbonate](#) (HCO<sub>3</sub><sup>-</sup>), which causes [ocean acidification](#) as [atmospheric CO<sub>2</sub>](#) levels increase.<sup>[9]</sup>
- It is a [trace gas in Earth's atmosphere](#) at 421 [parts per million](#) (ppm)<sup>[note 1]</sup>, or about 0.04% (as of May 2022) having risen from pre-industrial levels (1850) of 280 ppm or about 0.025%.<sup>[11][12]</sup> Burning [fossil fuels](#) is the primary cause of these increased CO<sub>2</sub> concentrations and also the primary cause of [climate change](#).<sup>[13]</sup>

# Carbon Budget



Carbon sinks (green bars on the right) remove carbon from the atmosphere, whereas carbon sources (greenhouse gas emissions) (grey bars on the left) add them. Together, they are part of the carbon budget which is no longer in balance since the 1850s, causing a nearly 50% rise in atmospheric carbon dioxide concentration.<sup>[1]</sup>

# Carbon Cost



The **Carbon Cost** of maintaining turfgrass is a topic of interest in the context of climate change. Lawns can function as **Carbon Sinks**, soaking up **Carbon Dioxide** from the atmosphere, but these benefits can also be offset by **Carbon Costs** associated with maintaining a lawn, such as mowing, trimming and blowing with gas-powered equipment, the use of synthetic fertilizers and irrigation.

It is generally agreed, well-maintained turf does a better job sequestering carbon than turf under stress conditions when respiration exceeds photosynthesis, thus releasing CO<sub>2</sub>

# Carbon Sink



A **Carbon Sink** is anything, natural or otherwise, that accumulates and stores some carbon-containing chemical compound for an indefinite period and thereby removes Carbon Dioxide (CO<sub>2</sub>) from the atmosphere.<sup>[2]</sup> These sinks form an important part of the natural carbon cycle.

A **Carbon Pool**, is all the places where carbon can be (the atmosphere, oceans, soil, plants, and so forth).

A **Carbon Sink** is a type of carbon pool that has the capability to take up more carbon from the atmosphere than it releases (Forests, Native Grasslands, Turf).

# Carbon Sequestration



**Carbon Sequestration** is the process of capturing, securing and storing carbon dioxide (CO<sub>2</sub>) in a [carbon pool](#). Carbon sequestration is a naturally occurring process but it can also be enhanced or achieved with technology, for example within [carbon capture and storage](#) projects. There are two main types of carbon sequestration: geologic and biologic.

For the purpose of this presentation we will look at 'maintained turfgrass' and its ability to sequester carbon.



# CASE STUDIES



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## **1. Town of Westfield/Westfield Board of Education, NJ**

Controversial cooperative plan to convert approximately 420,000 SF (9.6 Acres) of natural grass to synthetic turf behind an Elementary School.

## **2. Town of Long Branch, NJ**

Approximately 317,900 SF (7.3 Acres) of synthetic turf originally constructed for over \$4 Million at less than 10' above sea level, then was reconstructed for nearly \$5 Million after Hurricane Sandy in 2013.

## **3. City of New York Parks Department**

The city has approximately 276 synthetic athletic fields accounting for 10,958,321 SF of area covered by a synthetic surface.

# Town of Westfield/Westfield BOE, Westfield, NJ



- 
- Hired in 2013 to provide a comprehensive report on the condition of the sports fields and recommendations for a turf management plan. None of the recommendations were put into affect.
  - Received calls annually from user groups, parents and newly hired grounds personnel about the poor condition of the sports fields and that nothing has been done since my report.
  - Contacted by a citizens group in 2022 to educate them about the Pro's and Con's of natural grass vs. synthetic turf and due to the proposed project behind Edison Intermediate School.
  - The town and BOE has spent tens of thousands of dollars on consultants, engineers and architects to justify the construction of the synthetic turf complex (budgeted at over \$8 Million).
  - Report by one consultant noted *'high-quality, high-capacity grass fields are achievable with proper maintenance.'*

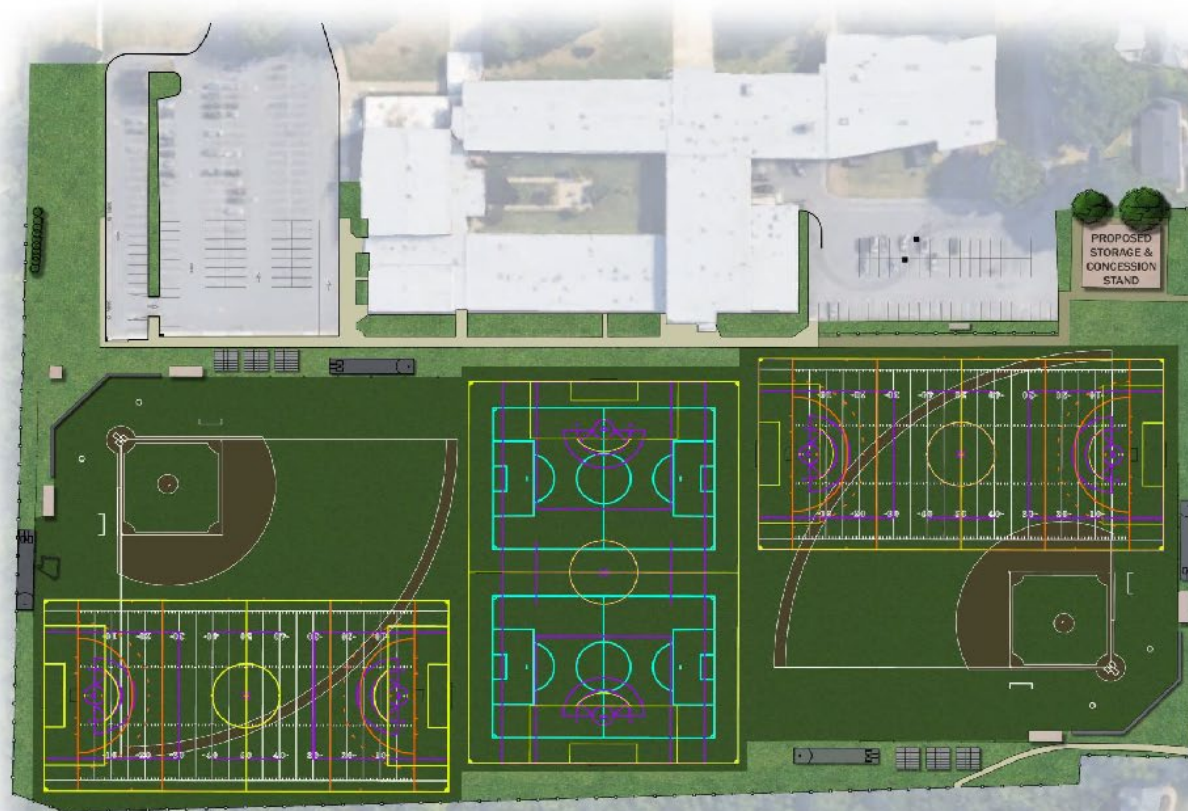
# Town of Westfield/Westfield BOE, Westfield, NJ



# Town of Westfield/Westfield BOE, Westfield, NJ



# Town of Westfield, Westfield BOE, Westfield, NJ



#### **PROPOSED FIELDS:**

- BASEBALL
- SOCCER
- FIELD HOCKEY
- LACROSSE
- FOOTBALL/BAND
- YOUTH SOCCER

#### **SITE IMPROVEMENTS:**

- STORAGE & CONCESSION STAND with RESTROOMS
- NEW SIDEWALK CONNECTION
- NEW PERIMETER FENCE
- LIGHTING
- NEW GOALS/EQUIPMENT FOR FIELDS

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Carbon Sequestration  
**420,000 SF (9.6 Acres) of Synthetic Turf**  
**The Existing Natural Grass Fields:**

- Sequester 243,236.014 lbs of Carbon Dioxide (CO<sub>2</sub>)
- Benefit 261 people with clean air (Accounts for Carbon Cost)
- Offset a driving distance of 372,606.96 miles.  
(Avg annual driving distance in 2021 was 13,489 miles)
  - Equivalent to taking 27.6 vehicles off the road

# Long Branch, NJ (Manahasset Creek Park)



- Synthetic athletic field complex originally constructed in 2008.
- Park is less than 10 feet above sea level.
- 320,000 Square Feet (7.3 Acres)
- Original Cost – over \$4 Million
- Synthetic athletic fields had to be reconstructed in 2013 after Hurricane Sandy completely destroyed the complex.
- Ocean/storm surge came up through the drainage, lifted and displaced the turf, drainage and stone base.
- Replacement cost over \$5 Million, due to disposal of the existing turf.
- FEMA paid 90%, Long Branch paid 10%.

# Long Branch, NJ (Manahasset Creek Park)





# Long Branch, NJ (Manahasset Creek Park)



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## Carbon Sequestration **317,900 SF (7.3 Acres) of Synthetic Turf Natural Grass Could:**

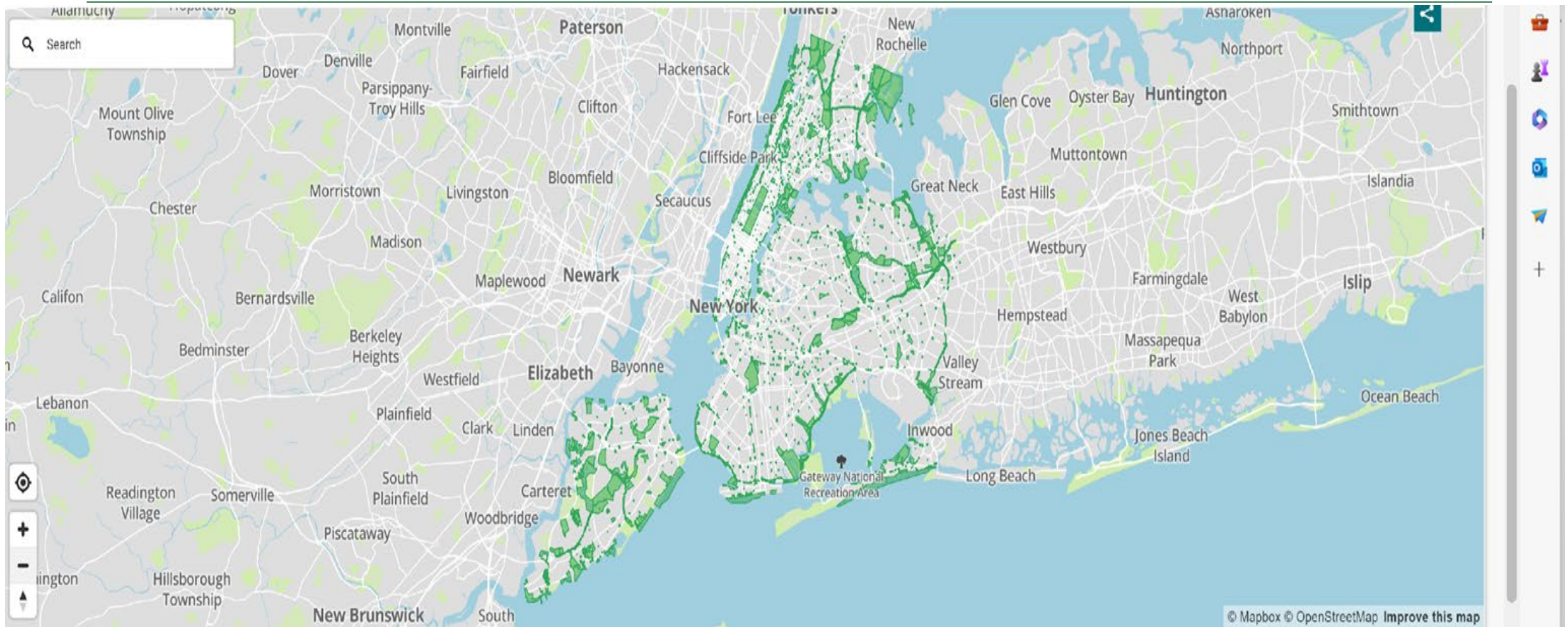
- Sequester 184,108.04 lbs of Carbon Dioxide (CO<sub>2</sub>)
- Benefit 198 people with clean air (Accounts for Carbon Cost)
- Offset a driving distance of 282,027.96 miles  
(Avg annual driving distance in 2021 was 13,489 miles)
  - Equivalent to taking 21 vehicles off the road

# NYC Department of Parks and Recreation



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- 1,700 Parks (1,306,800,000SF - 30,000+ Acres)
  - 5,000+ Individual Properties
  - 14 percent of New York City
  - Largest is Pelham Bay Park in the Bronx (2,765 Acres)
  - Central Park is 843 acres
  - 800 Athletic Fields
  - 276 Synthetic Athletic Fields (10,958,321SF - 251 Acres)

# NYC Department of Parks and Recreation



## Carbon Sequestration

**10,958,321 SF (251 Acres) of Synthetic Turf  
Natural Grass Could:**

- Sequester 6,311,692.58 lbs of Carbon Dioxide (CO<sub>2</sub>)
- Benefit 6,777 people with clean air (Accounts for Carbon Cost)
- Offset a driving distance of 9,668,174.65 miles  
(Avg annual driving distance in 2021 was 13,489 miles)
  - Equivalent to taking 717 vehicles off the road

# Now the Big One



- As per the NRPA in 2020 there were approximately 13,000 synthetic athletic fields in the United States.
- At an average size of 65,000 SF that equates to approximately 845,000,000 SF or 19,398 Acres of Synthetic turf.
- Does not include playgrounds, dog parks, putting greens, resort lawns or residential yards (California, Arizona)
- California Governor Gavin Newsom signed a law in October 2023 allowing cities and counties to ban synthetic turf overheat and chemical exposure concerns.

# Now the Big One



## Carbon Sequestration

**13,000 Synthetic Fields in the United States**

**845,000,000 SF (19,398 Acres) of Synthetic Turf**

### **Equivalent Area of Natural Grass could:**

- Sequester 490,100,000 lbs of Carbon Dioxide (CO<sub>2</sub>)
- Benefit 525,194 people with clean air (Accounts for Carbon Cost)
- Offset a driving distance of 749,649,717 miles  
(Avg annual driving distance in 2021 was 13,489 miles)
  - Equivalent to taking 55,575 vehicles off the road

# Why are so many synthetic fields being built?



- Less cancellations and rescheduling of games
- More hours of use (winter, immediately after rainfall)
- Title IX
- Lack/Shortage of properly trained, educated, interested and hired Sports Field Managers
- Poor job of our industry educating municipal and school administrators of the importance of having a Sports Field Manager on staff.
- Bottom Line – We are not doing a good job maintaining natural grass sports fields and infield skin surfaces.
- All of the above



# 10-year Life Cycle Cost Comparison

*Example for a Soccer Field 180' x 360' = ~65,000 sf  
Center and Goal Areas 1/3 = ~20,000 sf*

## Natural Grass

	cost/sf	cost/1 year	cost/10 years
Evaluation & Training		\$1,000	\$10,000
Resodding 20,000 SF of wear areas every year.	\$2.5	\$50,000	\$500,000
Maintenance program (Aeration, overseeding, fertilizer, topdressing, mowing, irrigation)		\$20,000	\$200,000
<b>TOTAL</b>			<b>\$710,000</b>

## Synthetic Turf

	cost/sf	cost/1 year	cost/10 years
Construction	\$20		\$1,300,000
Resurfacing in 10 years			\$500,000
Maintenance program (Gmax, inspections, grooming, repairs)		\$5,000	\$50,000
<b>TOTAL</b>			<b>\$1,850,000</b>



# TAKE HOMES!!!



- 
- Colleges, High Schools, Corporations and Municipalities do not meet their ESG goals by replacing natural grass with synthetic turf.
  - With the Clean Air Calculator (CAC) we can now quantify to administrators and citizen groups how natural grass benefits the environment.
  - We can use the tool to advocate for the proper management of natural grass and all public/private green spaces.
  - As we turn the tide of replacing natural grass fields with synthetic turf, we need to be prepared to provide educated and dedicated sports field managers to colleges, school districts and municipalities.

QUESTIONS?