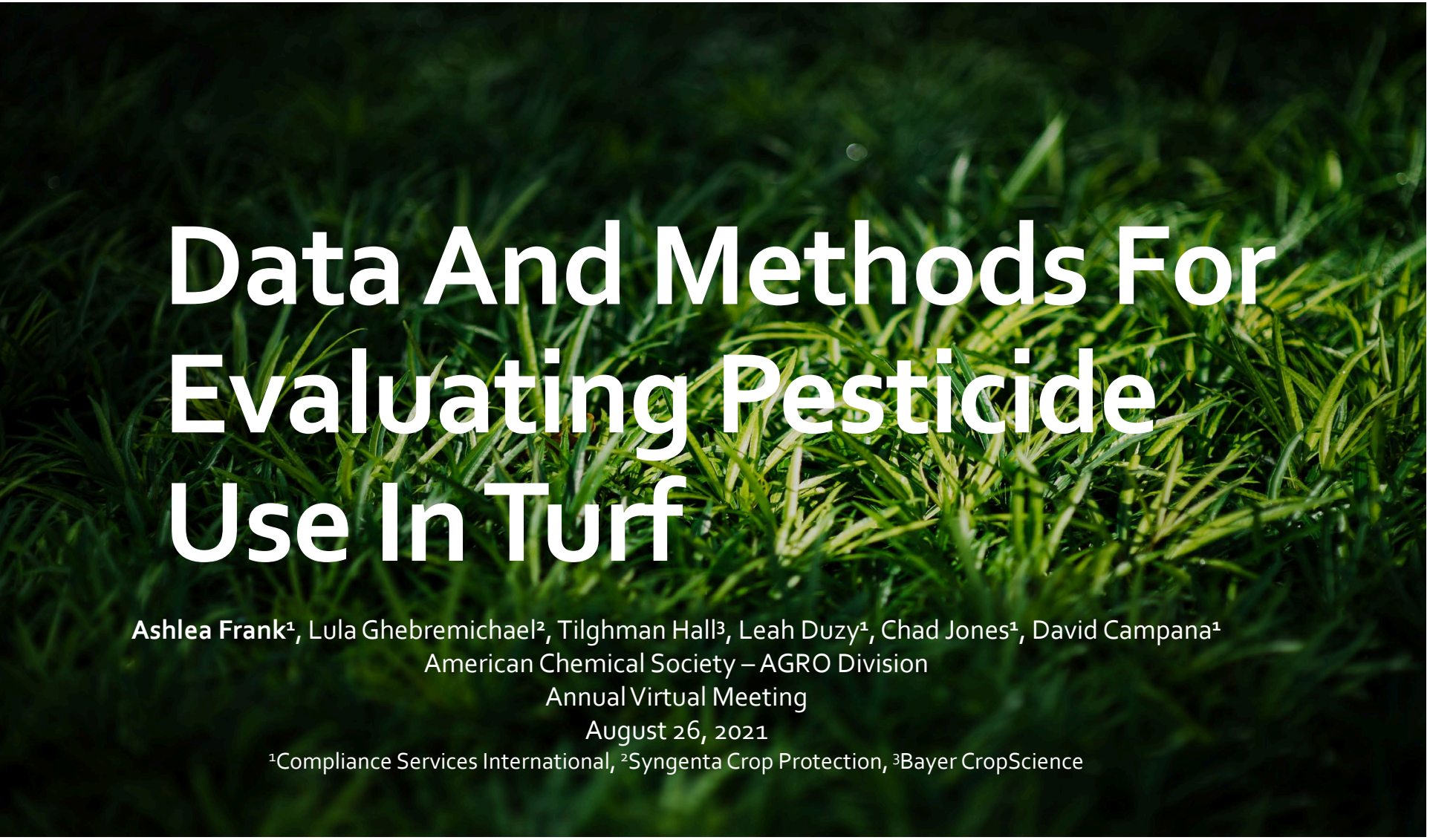


Data And Methods For Evaluating Pesticide Use In Turf

Ashlea Frank[1], Lula Ghebremichael[2], Tilghman Hall[3], Leah Duzy[1], Chad Jones[1], David Campana[1]

American Chemical Society – AGRO Division

Annual Virtual Meeting

August 26, 2021

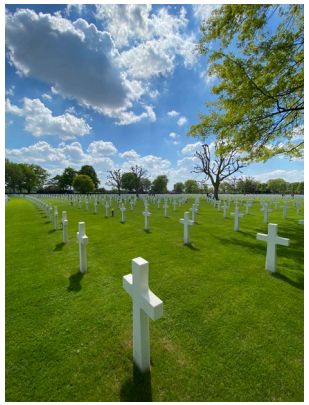
[1]Compliance Services International, [2]Syngenta Crop Protection, [3]Bayer CropScience

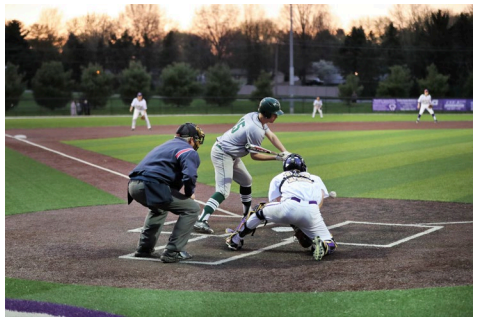
FESTF

Agenda

- Background
- EPA's current approach to assessing potential risk from pesticides used in turf
- Explore turf identification approaches
- Takeaways and next steps

Background





- Turf is found in a variety of locations, facilities, and landscapes, including recreational fields such as baseball diamonds, city parks, golf courses, cemeteries, and residential lawns.
- Pesticides play a role in the management of these areas but quantifying how much and where pesticides are used is a challenge.
  - Many pesticide uses are not tracked or reported
  - Can be applied by many different applicators
    - Homeowners, land managers, certified applicators, etc.
  - Spatial extent of turf is not consistently delineated in a national dataset
  - Different methods will be necessary for different turf uses

Pesticide Evaluation Overview

- As part of the US Environment Protection Agency's (EPA) evaluation of pesticides, each use on a pesticide label is evaluated for potential harm to humans and the environment, including non-target species such as those listed under the Endangered Species Act (ESA).
- For assessing potential risk of pesticides to ESA-listed species, EPA developed a *Revised Method* released in March 2020 (https://www.epa.gov/endangered-species/revised-method-national-level-listed-species-biological-evaluations-conventional). Outlines data and methods for conducting Biological Evaluations (BE) for conventional pesticides.
  - One of the first steps in this process is a spatial overlay of spatial data representing pesticide use sites and ESA-listed species ranges
- The variety and data limitations related to pesticide use in turf leads to challenges when needing to assess potential impacts and identifying where measures to mitigate or minimize adverse impacts are needed.

EPA's Current Approach in Biological Evaluations

In recent final Biological Evaluations, EPA used the following to represent various turf uses:

- "Non-agricultural label uses include a wide range of landcover and land use categories. Each label use was carefully considered and cross-walked with the best available landcover data. Where available, the 2011 National Land Cover Dataset (NLCD) was used to represent many non-agricultural label uses."

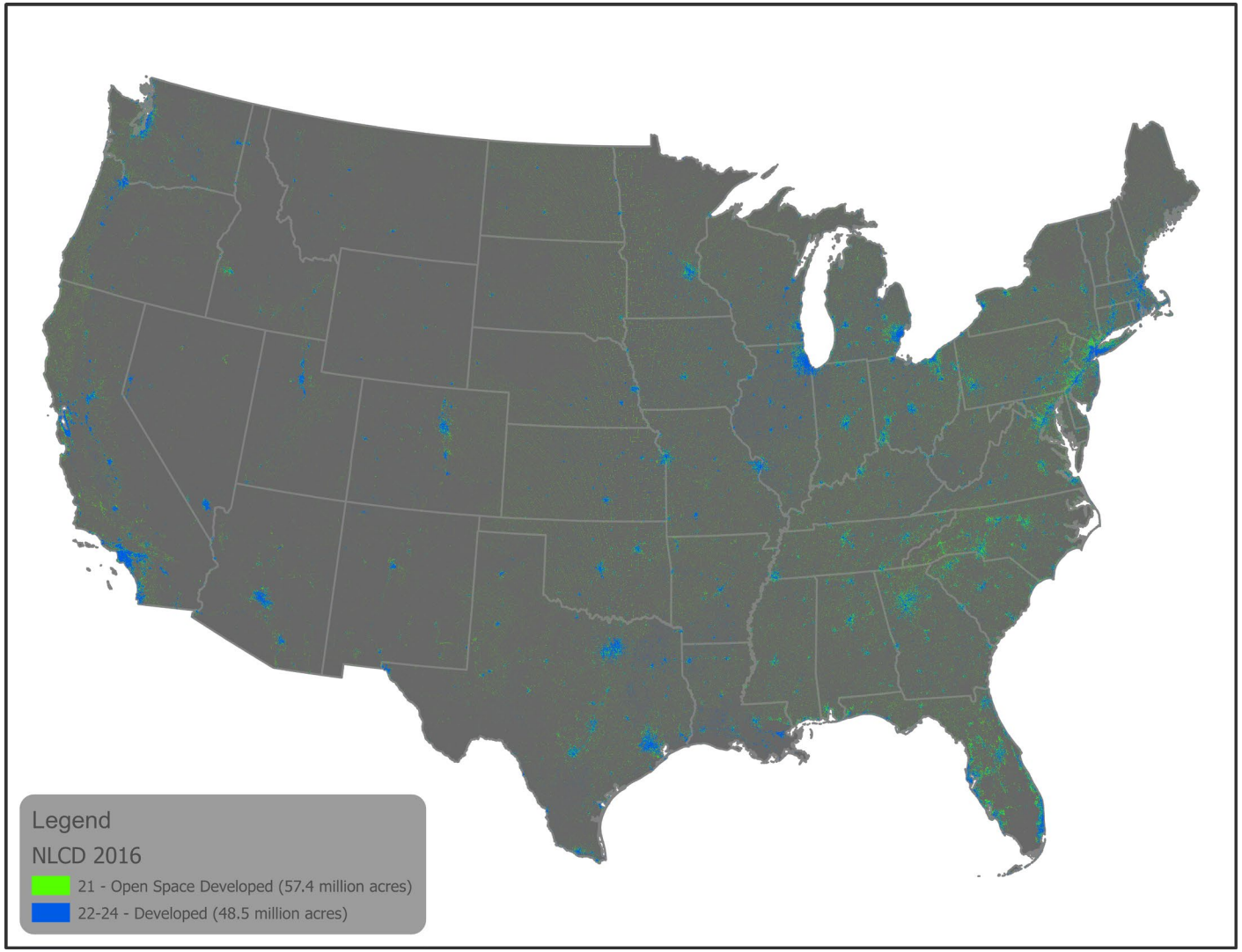
Taken from the Carbaryl Final BE, Appendix 1-6:

Labeled Uses	Crop Descriptions	UDL
Household/domestic dwellings outdoor premises	Household/domestic dwellings outdoor premises, external pest treatments applied by pest management professionals	NLCD Developed
Paths/patios	Household/domestic dwellings outdoor premises, external pest treatments applied by pest management professionals	NLCD Developed
Recreational areas (sports fields, commercial lawns, cemeteries, camp sites, etc.)	Ornamental lawn & turf; applied by lawn care operators, applied by landscape contractors, in institutional turf facilities, golf course and ornamental sod farms (turf))	NLCD Open Space Developed
Residential lawns	Household/domestic dwellings outdoor premises, external pest treatments applied by pest management professionals	NLCD Developed

Taken from the Glyphosate Draft BE, Appendix 1-6:

Labeled Uses	UDL
Golf Courses	NLCD Open Space Developed
Household/domestic dwellings (perimeter outdoor only)	NLCD Developed
Domestic Dwelling Outdoor Premises	NLCD Developed
Recreational areas	NLCD Open Space Developed

NLCD – Developed Land Classes



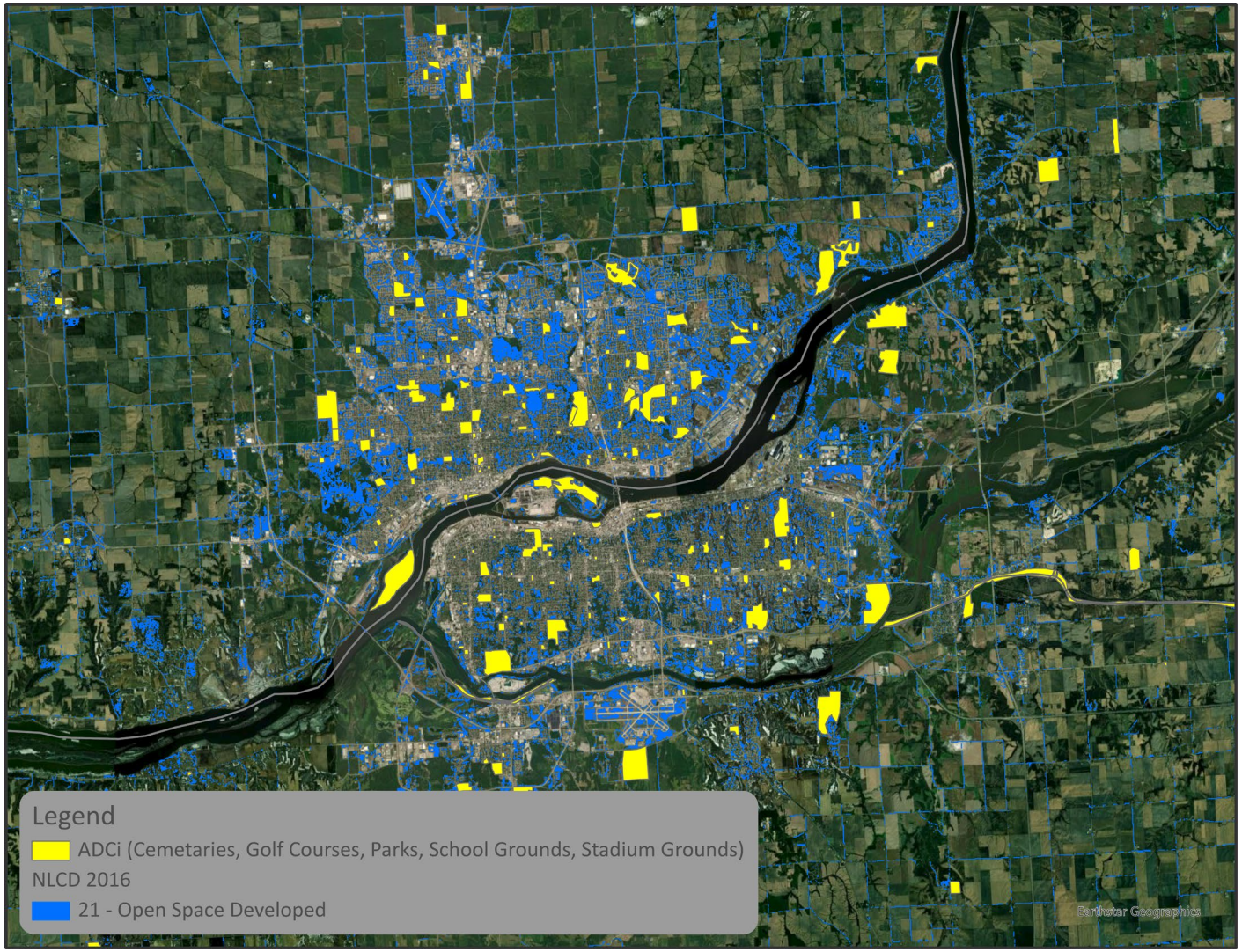
Turf Identification

- FESTF's licensed dataset from American Digital Cartography, inc. (ADCi) includes many feature classes that can be used to represent various turf uses.
  - This dataset is used in navigation systems.
- Depending on how the uses are defined on the label, these can be a 1-to-1 match such as "cemeteries", "golf courses", and "Recreational Areas"
- There are no specific feature classes that represent residential lawns in this dataset.

ADCi Land Cover Features:

Airport Ground
Amusement Park Ground
Building (Area)
Cemetery Ground
Church Ground
Company Ground
Fire Station Ground
Freeport
Golf Course Ground
Hospital Ground
Industrial Area
Industrial Harbour Area
Institution
Island
Library Ground
Military Territory
Park/Garden
Parking Area Ground
Prison Ground
Railway Station Ground
Recreational Area Ground
Rest Area Ground
Runway
School Ground
Shopping Center Ground
Stadium Ground
University or College Ground
Zoo Ground

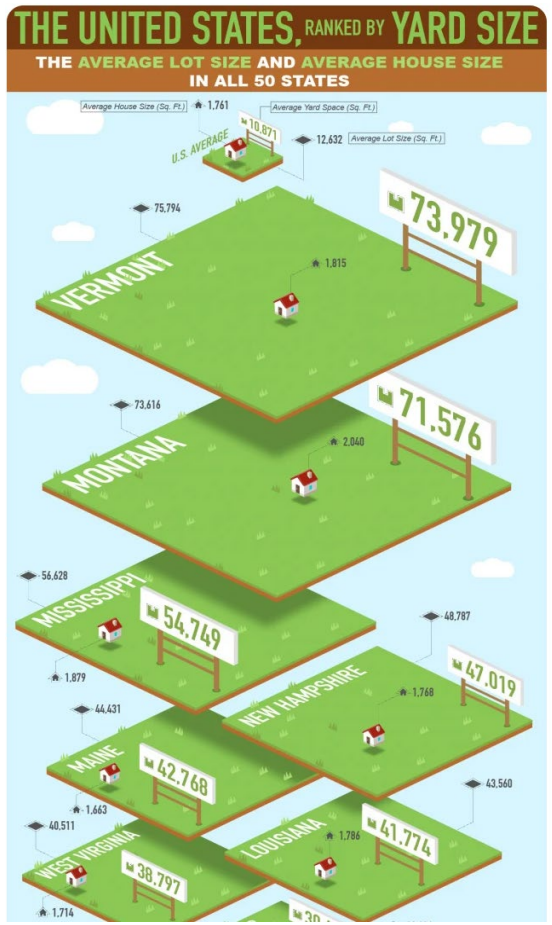
NLCD and ADCi Comparison

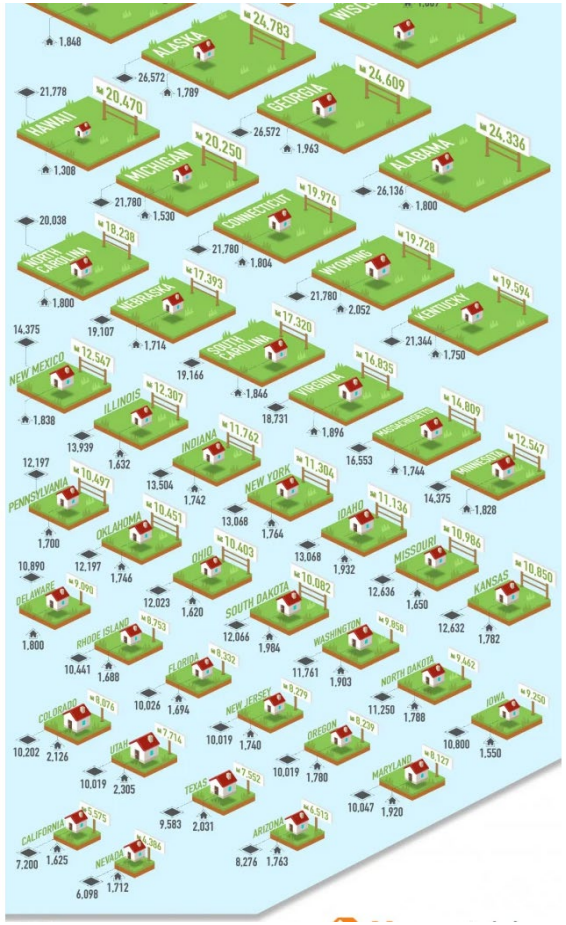


Residential Land Parcel Assumptions

The entire parcel is only partly comprised of turf

- Realtor.com (2011): Average U.S. lawn covers 10,871 sqft
  - Calculated by subtracting mean home size from mean lot size
  - Breakdown by state ranges from 4,386 sqft (NV) to 73,979 sqft (VT)
- But not every lawn is turf!



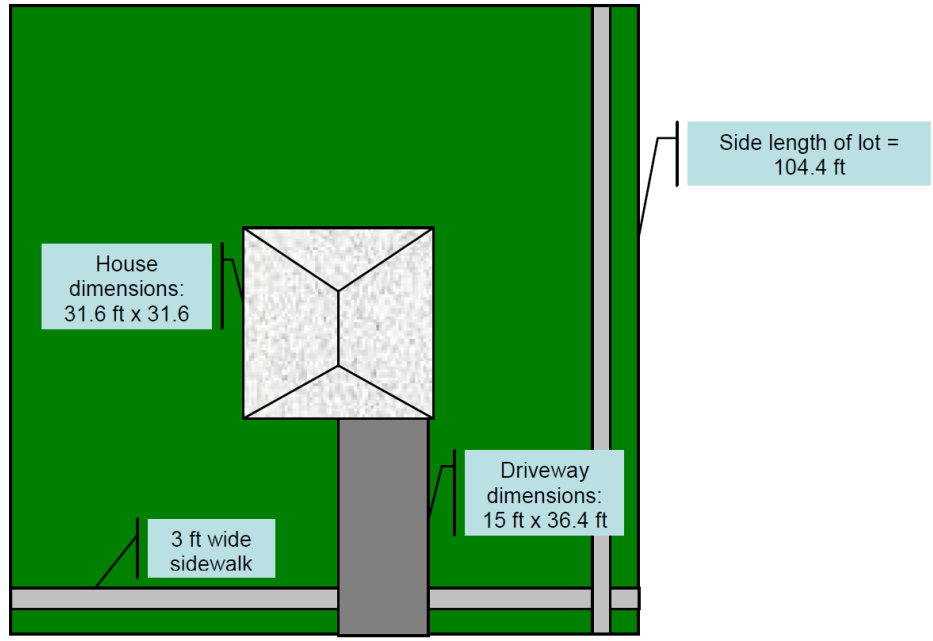


Residential Land Parcel Assumptions by EPA

The entire parcel is only partly comprised of turf

- For aquatic pesticide concentration modeling of residential turf applications, EPA's Pesticide in Water Calculator (PWC) Residential Scenario assumes that lawn/turf comprises 8,672 – 9,075 sqft (80-83% of ¼-acre lot size, depending on lot location).

8672 - lawn
1000 - house
572 - sidewalk
+ 546- driveway
10,890 sq ft = ¼ acre



- Source: https://www3.epa.gov/pesticides/endanger/litstatus/effects/redleg-frog/alachlor/appendix-g.pdf

- However, EPA's California Red-Legged Frog (CRLF) residential turf scenario states that the ¼-acre lot is 38% "impervious" … which can be considered contradictory (source: CRLF residential turf scenario metadata)

Goal

- The FIFRA Endangered Species Task Force (FESTF), a pesticide registrant task force aimed at providing ESA and pesticide data to the EPA, is exploring ways to improve the analysis of potential impacts to species listed under the federal Endangered Species Act by evaluating various data sources and how they can be used to spatially delineate pesticide use in residential turf.

Residential Turf Scoping

Exploring ways to use land parcel data, satellite imagery, and image classification

- One of the most difficult turf categories to define is residential lawns and regional differences in land cover require different approaches in different areas of the country
- Explored two methods for delineating lawns from residential parcel spatial data and satellite imagery:
  - Parcel Classification and Remote Sensing
  - NLCD Developed Refined Using Land Parcel Data

Residential Turf Scoping Method 1: Parcel Classification and Remote Sensing

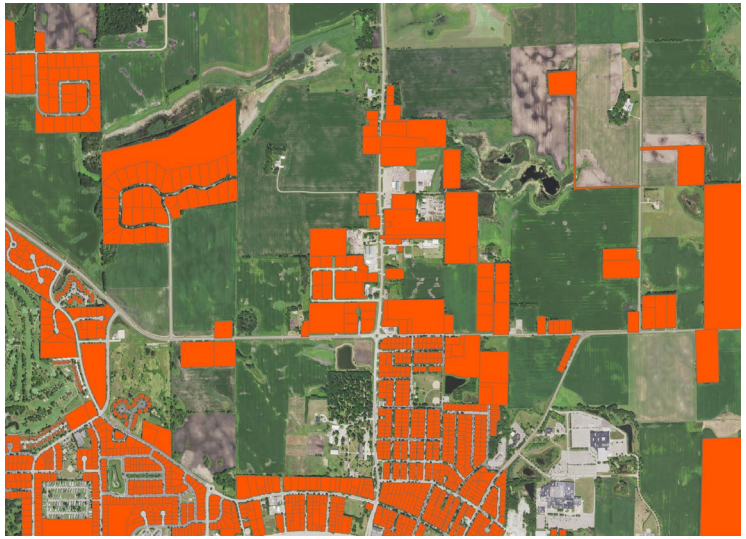
Parcel Classification and Remote Sensing

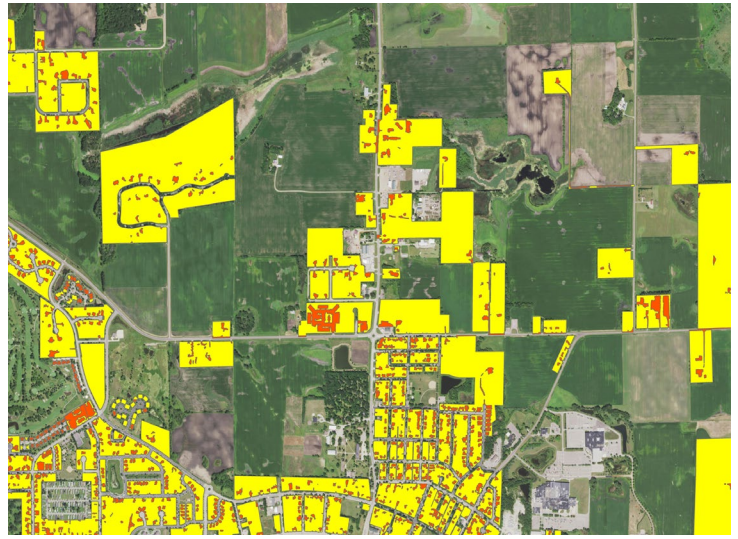
- GIS-based approach to residential land parcel refinement
- Acquire publicly available parcel spatial data from municipalities
- Use the National Agriculture Imagery Program (NAIP) imagery to identify turf and remove artificial structures from land parcels using image classification
  - A process of assigning classes or defining land cover to all the pixels in a remotely sensed image by producing a training sample
  - The areas of the classified image identified as artificial structures or natural land cover are then used to refine the parcel data; either to identify structures to be removed from analysis or, in the case of our Arizona case study, used to identify the natural land cover
- Observations from three case studies (MN, ID, AZ) in different landscapes

Parcel Classification and Remote Sensing (1)

McCleod, MN

Scope Area: 3,400 Acres





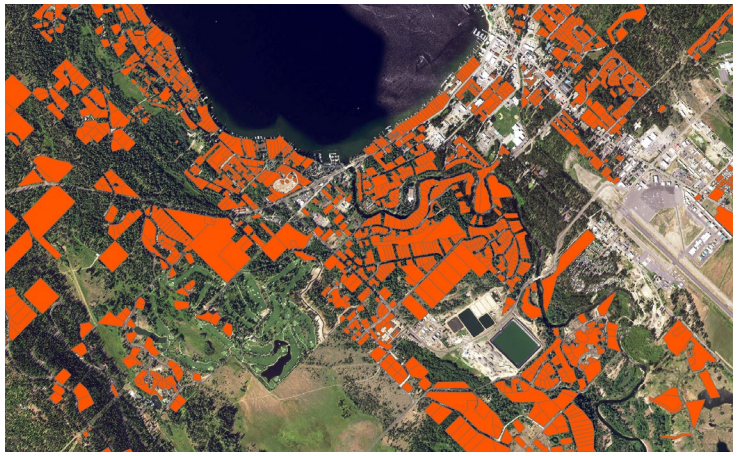
Publicly available parcel spatial data	Refined Parcel data with artificial structures removed (NAIP)

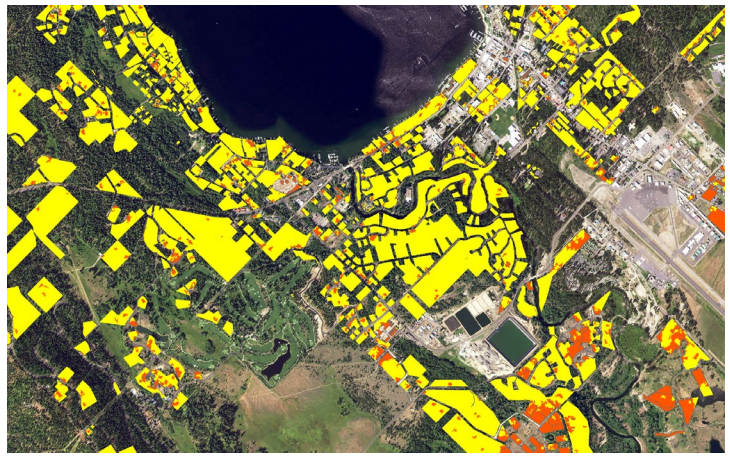
Fairly easy to identify artificial structures in this landscape; could be valuable tool for localized refinement in this area of the country

Parcel Classification and Remote Sensing (2)

McCall, ID

Scope Area: 5,300 Acres





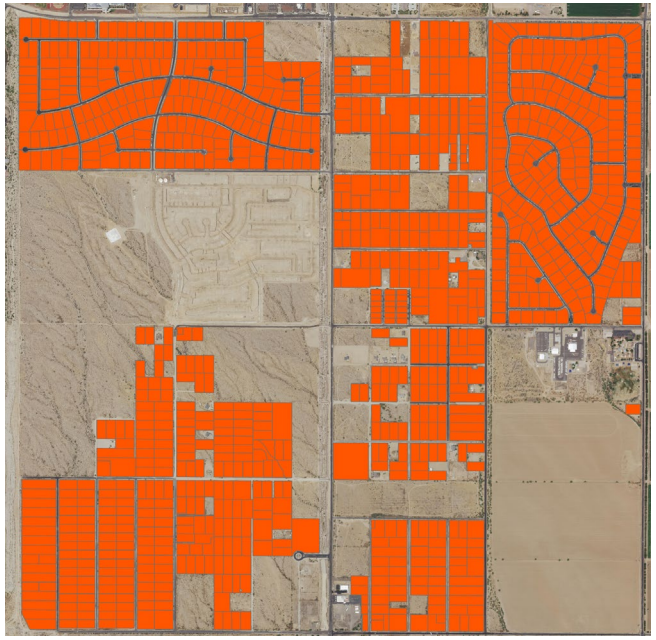
Publicly available parcel spatial data	Refined Parcel data with artificial structures removed (NAIP)

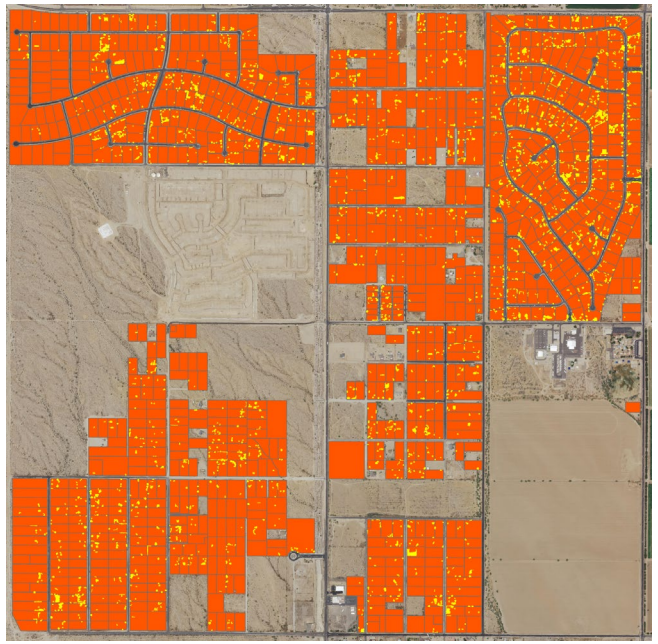
Very difficult to identify artificial structures in this area with abundant tree canopy; perhaps incorporating Lidar could improve classification.

Parcel Classification and Remote Sensing (3)

Maricopa County outside of Phoenix, AZ

Scope Area: 2,800 Acres





Publicly available parcel spatial data	Refined Parcel data with lawns identified (NAIP)

Due to the nature of the desert ecosystem in Maricopa Co. it was more appropriate to identify the natural land cover than to identify and remove artificial structures as in the previous examples.

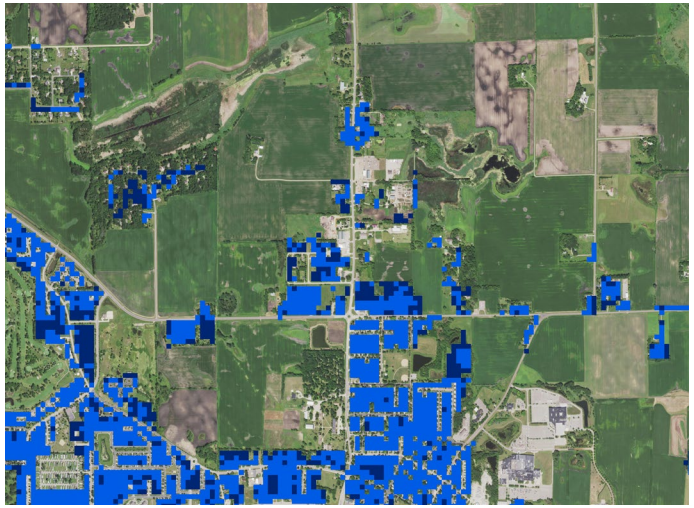
Residential Turf Scoping Method 2: NLCD Developed Refined Using Land Parcel Data

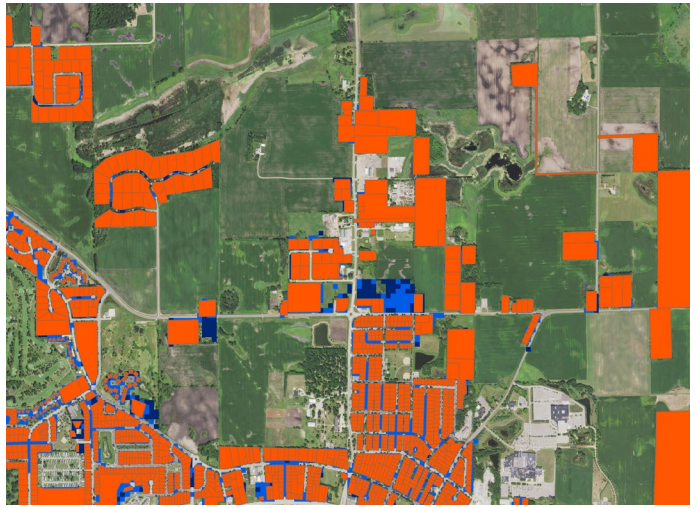
- Refine the NLCD developed classes by incorporating parcel data
  - GIS-based approach to NLCD refinement
  - Use of residential land parcel data as a mask to remove areas of the NLCD developed layer that are non-residential
  - Differentiate residential from commercial development in the NLCD

NLCD Developed Refined Using Land Parcel Data

McCleod, MN

Scope Area: 3,400 Acres





NLCD Developed & NLCD Open Space Developed	NLCD pixels that could potentially be removed by parcel refinement

Essentially removed commercial developed land

Takeaways

- How turf uses are defined on pesticides labels are important.
- The ADCi dataset is the 'best available data' to represent where pesticides may be used in many non-residential turf sites.
- For residential turf, the methods explored showed mixed results
  - Minnesota example showed promise because the land cover was relatively homogeneous, and the topography was uniform.
  - The varied topography and abundant forest/woodland areas in Idaho proved much more difficult to classify.
  - The Arizona case study was a great example of how you must adapt these techniques to different ecosystems:
    - Use of false color (near infrared) imagery in areas with minimal green growth
- Considerations
  - Publicly available parcel data may have inconsistent zoning classifications across different municipalities
  - Aggregated national level data are available but may be cost prohibitive
  - Rural vs urban; large acreage of forested or non-maintained grassland property
    - Residential lawns are easier to identify in a suburban neighborhood

What's Next

- While the methods explored may not be applicable to all locations in the US, there is value in refinement at smaller, localized scales.
  - Refined data generated at localized scales could then be aggregated and housed in FESTF's Information Management System, Gopher, to inform future assessments for pesticides.
- Future efforts:
  - Explore how land parcel assumptions (from EPA's PWC residential scenario modeling and other sources) can be used to define/refine residential turf
    - Data are simpler and reasonable to incorporate into risk assessment
    - Geographical variability is more easily handled at coarse scales
    - Can be integrated spatially
  - Explore regional differences in landscapes to develop regionally-appropriate scenarios and approaches

Acknowledgements

- Work presented on behalf of the FIFRA Endangered Species Task Force, Spatial Data Subgroup
  - Spatial analysts: David Campana and Chad Jones

Thank you for this opportunity and please contact me with any questions!

Ashlea Frank

Principal Consultant, Compliance Services International

Technical Consultant, FIFRA Endangered Species Task Force

7501 Bridgeport Way West – Lakewood, WA 98499

253-473-9007

AFrank@ComplianceServices.com

COMPLIANCE SERVICES INTERNATIONAL

FESTF FIFRA Endangered Species Task Force