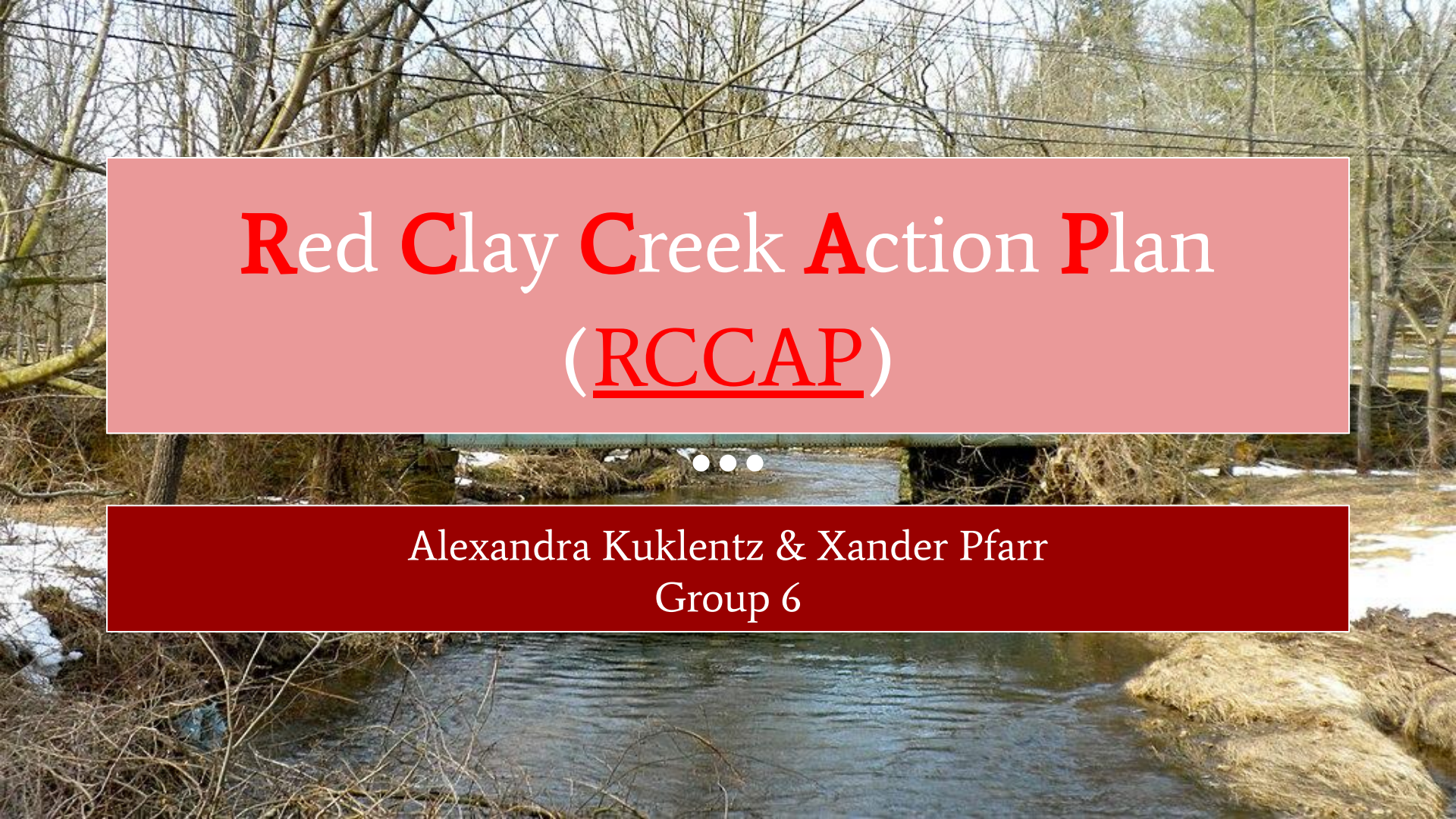

Red **C**lay **C**reek **A**ction **P**lan (RCCAP)

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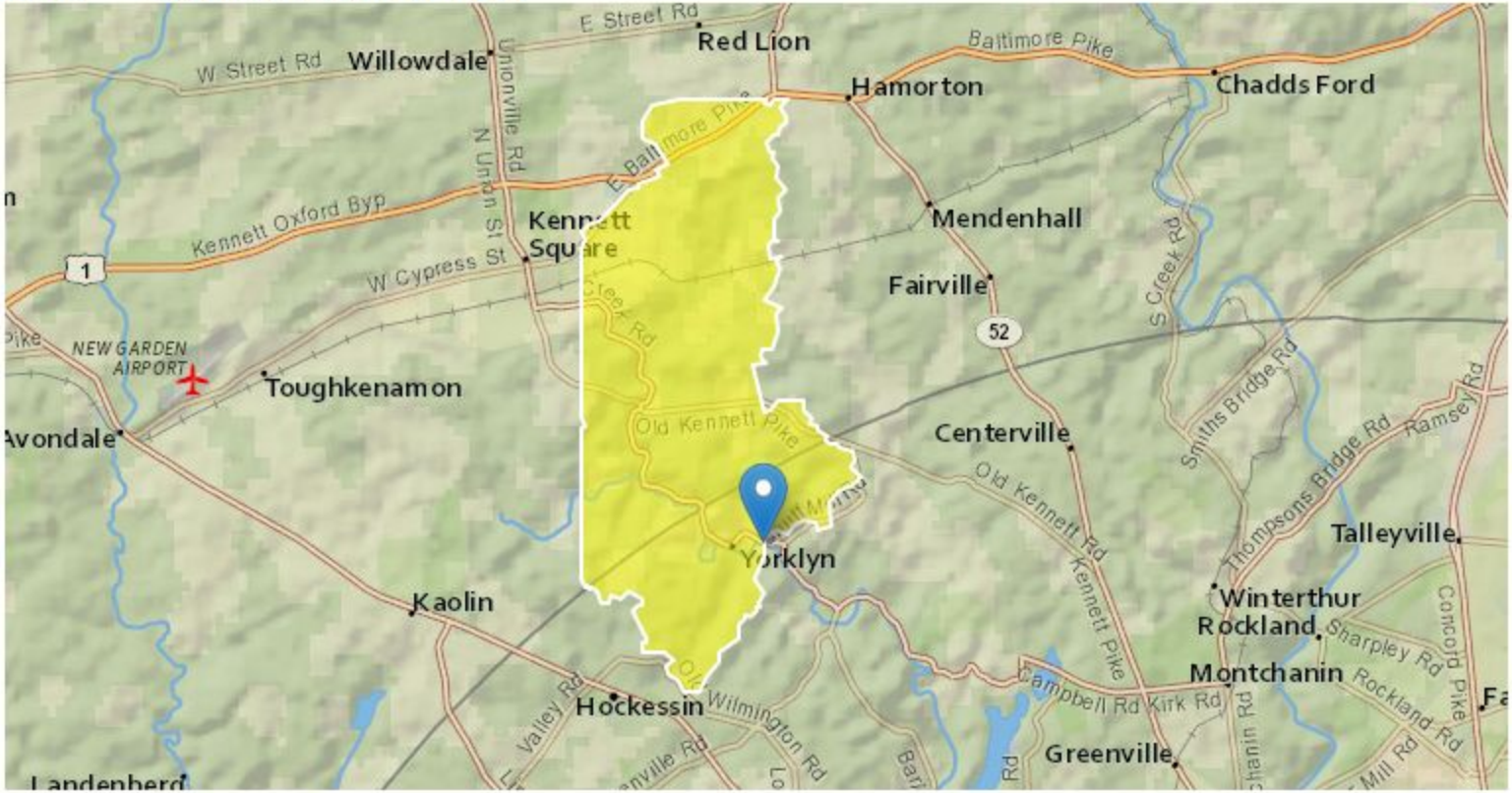
Group 6

Mission Statement

RRCAP's mission is to identify various pollutants affecting the Red Clay Creek Watershed in both DE and PA and provide recommendations for reducing these pollutants by at least 30% by 2040 in order to maintain a safe, healthy watershed with suitable drinking water for its 50,000+ inhabitants.

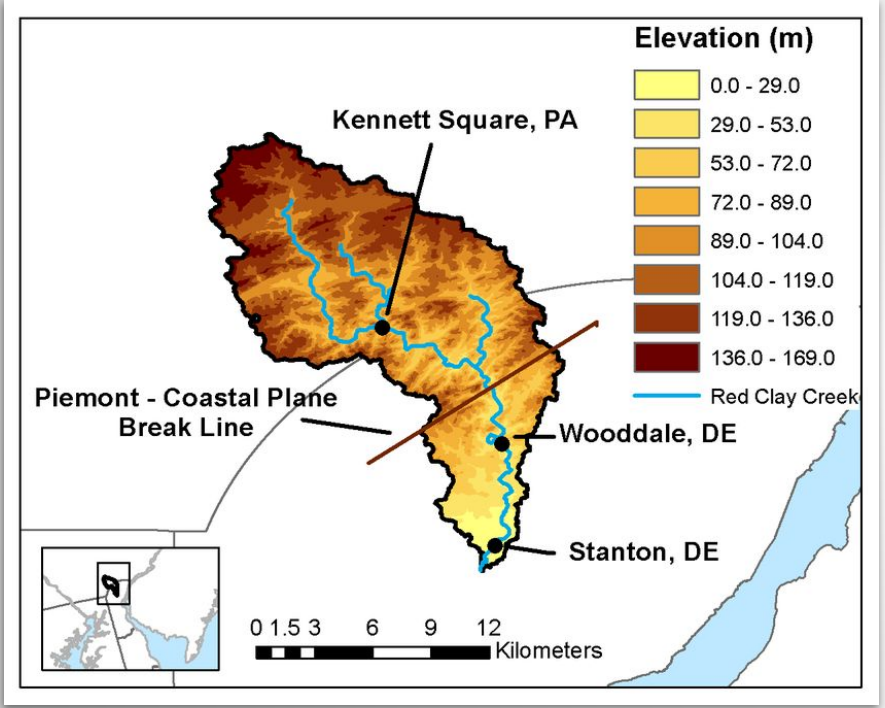
Red Clay Creek Delineated

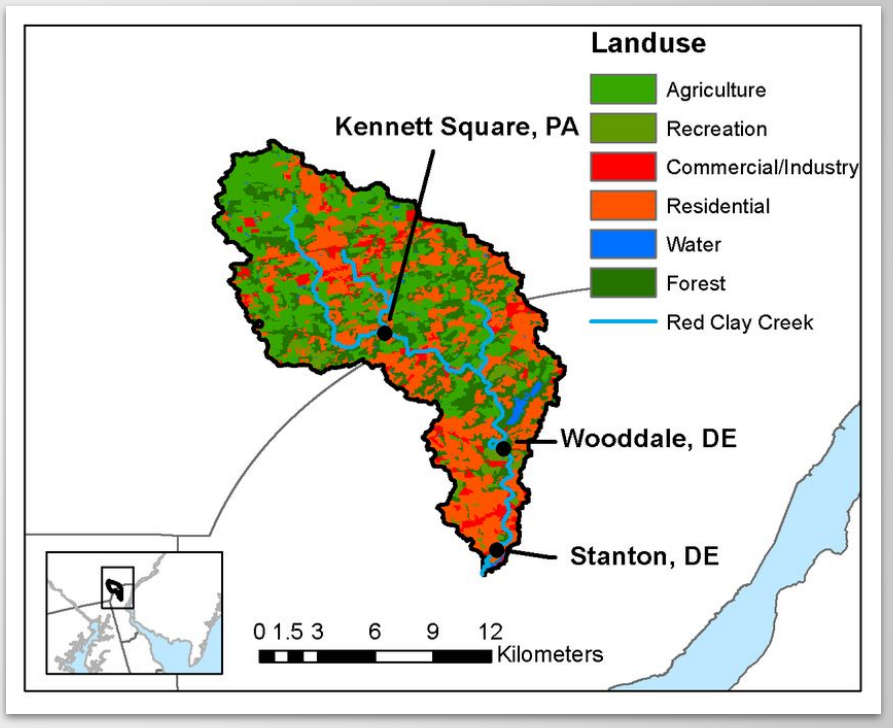
Region ID: DE
Workspace ID: DE20220302180634406000
Clicked Point (Latitude, Longitude): 39.80851, -75.67038
Time: 2022-03-02 13:07:03 -0500



Background: Red Clay Creek Watershed

- Small sub-watershed; 54 sq. miles
- 1 of 4 in the Christiana River Basin
  - Part of the Delaware River Basin
- Chester County, PA to New Castle County, DE
  - General governance at the state and federal government level (TMDLs)
    - A few specific policies enacted by counties and townships
- Land uses (2015 data):
  - Agriculture = 39%
  - Forest/wetland = 33%
  - Urban/suburban development = 27%
- Economy:
  - $9.8 to $19.7 billion to the economies in both PA and DE
  - 11,000 jobs and over $30.4 million in wages


Elevation (m)
0.0 - 29.0
29.0 - 53.0
53.0 - 72.0
72.0 - 89.0
89.0 - 104.0
104.0 - 119.0
119.0 - 136.0
136.0 - 169.0
Red Clay Creek
Kennett Square, PA
Piemont - Coastal Plane
Break Line
Wooddale, DE
Stanton, DE
0 1.5 3 6 9 12
Kilometers


Landuse
Agriculture
Recreation
Commercial/Industry
Residential
Water
Forest
Red Clay Creek
Kennett Square, PA
Wooddale, DE
Stanton, DE
0 1.5 3 6 9 12
Kilometers

History

- Rich industrial history
  - Several different mill sites: flour, iron, wool, vulcanized fiber, and more
- Site of Wilmington and Western Railroad
- Since moved to agriculture
  - Mushroom farms
    - Largest concentration of growers in the US
    - Think Kennett Square
- Several parts protected
  - Part of White Clay Creek Wild and Scenic River System (1968)
  - Auburn Valley State Park

Problem	Description	Cause
Problem 1: Industrial Pollutants	A long and careless industrial history has left the RCCW with long-standing industrial contaminant issues, notably a large amount of zinc chloride, lead, PCBs, dioxins, and chlorinated pesticides	Historically, many industrial by-products were incorrectly disposed of and typically have a long half-life, leading to prolonged pollution
Problem 2: Fertilizer Runoff and Eutrophication	The gradual transition from industry to agriculture has increased the amount of nutrients and fertilizer runoff entering streams in the RCCW, causing concern for DO levels	Significant levels of agricultural activity or fertilizer use leads to more nitrogen and phosphorus in waterways, oftentimes resulting in eutrophication
Problem 3: Impervious cover/Stormwater runoff/Flooding	A rapidly growing population in the RCCW (approx. 50,000) has increased the amount of impervious cover (~14%)	As the amount of impervious cover in a watershed grows, stream water flow is impeded, water quality decreases, and flooding increases

Problem 1: Industrial Contaminants

- By-products of industrial activities were not disposed of properly
- EX: Zinc chloride from vulcanized fiber production
  - Others include lead, PCBs, dioxins, and chlorinated pesticides
- Removal has been largely successful but has not completely resolved these issues
  - DNREC headed zinc removal
    - 75,000 pounds of zinc chloride from the groundwater
    - 277,000 pounds of contaminated soil
- Affect drinking water quality for 50,000 residents
  - Ripple effect into Delaware River Basin
- Harmful to organisms living in watershed, including humans
- Removal may also cause habitat degradation

Problem 2: Fertilizer Runoff and Eutrophication

- Increase in agricultural activity
  - More fertilizer, manure, etc.
- Other sources including lawns, golf courses, etc.
- Target level for nitrogen levels falls between 1.0-3.0 mg/L
  - Only 20-29% of collection sites in 2007 fell below 3.0 mg/L
- Phosphorus levels in 2007 were in expected range (0.3-0.6 mg/L)
- Likely worse 15+ years later
- Concerns about DO levels, particularly pre-dawn minimums
  - Potentially deadly to aquatic organisms

Problem 3: Impervious cover/Stormwater Runoff/Flooding

- Population of 50,000 and growing
  - Lots of development & impervious cover
- Approximately 13% impervious cover in 2015
  - Likely even more now--estimated 14% in 2020
- Ground cannot absorb waters from surface
  - Decreased streamflow
  - Decreased water quality
  - Increased flooding

Goals

1. Ensure that lingering industrial pollutants such as zinc chloride are monitored and continue to be successfully removed without lasting harm to the ecosystem
2. Identify sources of fertilizer runoff; reduce nutrient load by offering strategies tailored to each pollution source
3. Reduce amount of current and future impervious cover and renovate stormwater drainage systems

Recommendations for Management Strategies #1

- More data collection necessary
  - Working with outdated data
- Review established TMDLs in both PA and DE
  - Provide recommendations for revisions if necessary
- Continue removal of industrial contaminants
  - Monitor effects on ecosystem as many removal processes disturb stream habitats

Recommendations for Management Strategies #2

- Data collection!
- Identify major sources of pollution
- Increase stream corridor protection through riparian buffers and stream fencing
  - Artificial wetlands provide natural filtration
- Encourage mushroom farmers to file a Mushroom Farm Environmental Management Plan
- Provide further education about potential impacts of agricultural practices
  - Certifications
  - PA: mandatory Nutrient Management Plans
- Establish manure management facilities

Recommendations for Management Strategies #3

- Data collection!!
- Increase stream corridor protection through riparian buffers and stream fencing
  - Artificial wetlands can absorb excess water
- Renovate stormwater systems
  - Include infiltration systems and water quality treatment
- Periodic cleaning of drainage systems
  - Eliminate worst of debris
    - Prevent clogs
- Impervious cover alternatives
  - Mulch, gravel, pervious concrete

Conclusion

- RCCW may be small, but it's important
  - Population is growing
  - Ripple effects to Delaware River Basin
- Management may be somewhat difficult across state borders
  - Environmental groups that span both states
    - Brandywine Red Clay Alliance
    - Stroud Water Research Center
- Further data collection is absolutely essential in moving forward
  - Most publicly accessible data at least several years out of date
- Aim to reduce all three categories of pollution by 30% by 2040