

# UNEQUAL CARTOGRAPHIES: MAPPING CLIMATE CHANGE IN APPALACHIA

Miranda Shugars / Virginia Tech

## COURSE DESCRIPTION

*Unequal Cartographies* will investigate relationships between historically-rooted inequalities and climate change impacts today using free, open-source mapping tools. Students will visualize complex urban issues using GIS (geographic information systems; i.e., digital mapping). The class will discuss how discriminatory government practices have relegated people to ecologically vulnerable areas, how health impacts of heat and pollution disproportionately impact historically-marginalized people, and how the ecological crises we now collectively face stem partly from deeply-rooted social ills.

While the lectures and readings will cover a broad range of mapping theory and history, the tutorials, lecture examples, and final projects will focus on three nearby Appalachian cities: Richmond, Roanoke, and Charleston. Unlike larger US cities, these Appalachian areas have not received much cartographic attention. Each city has distinctive histories of redlining and urban renewal which are clear in their physical footprints and social-ecological inequalities today. Lectures will incorporate examples of how each city's discriminatory practices shaped its development, and how this relates to unique environmental vulnerabilities: water and air pollution from heavy industries like mining, quarrying, factories, and railroads; distance from parks and locations of sidewalk and bike networks; big box footprints dividing communities and forcing car-reliance; and climate change-related heat waves and flooding, with their unequal health and economic outcomes. Tutorials will leverage verified parcel, building, historical, and census data for these cities.

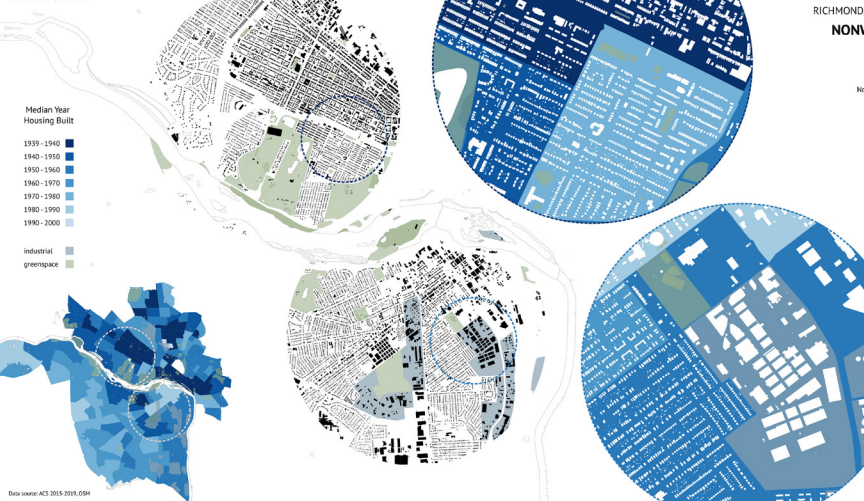
**Technical Skills:** This course will cover the basics of finding and evaluating data, representing data sets in GIS, using GIS tools to evaluate data, and crafting visual arguments with data maps. In the spirit of democratizing cartography, all softwares and data used will be free and publicly-available: QGIS and Mapbox, OpenStreetMap, US census data, and municipal/county GIS data. The final project will be an interactive scrollymap that presents student research on a chosen socio-environmental topic in one of the three focus cities. This format will demonstrate the two major learning goals of this class: technical skills and constructing a visual argument through maps.

**Relevance:** Virginia Tech's architecture program embraces traditional skills of making, craft, and attention to place. Students develop deeply personal relationships with the field through careful, physical exploration of material and site. The campus in Blacksburg, Virginia occupies a folded edge of the Appalachian mountain range near the West Virginia and North Carolina borders, not far from historical coal mines and some of the country's best hiking. Blacksburg sits on the Eastern Continental Divide which separates the Mississippi /Gulf and Atlantic watersheds, and the world's oldest river, the New River, flows just south. The school's culture is meaningfully rooted in regional geography, and impacted by ecological shifts like increased flooding and landslides in former mining towns, decreasing firefly populations and increasing deer populations, and summer heat waves which disrupt the Appalachian Trail season. Tech is impacted by geographical social changes as well, like the economic decline in nearby West Virginia which seeps across the border and sucks vitality out of historical mill towns, or the increase in outdoor tourism exemplified most recently by the New River Gorge's National Park designation.

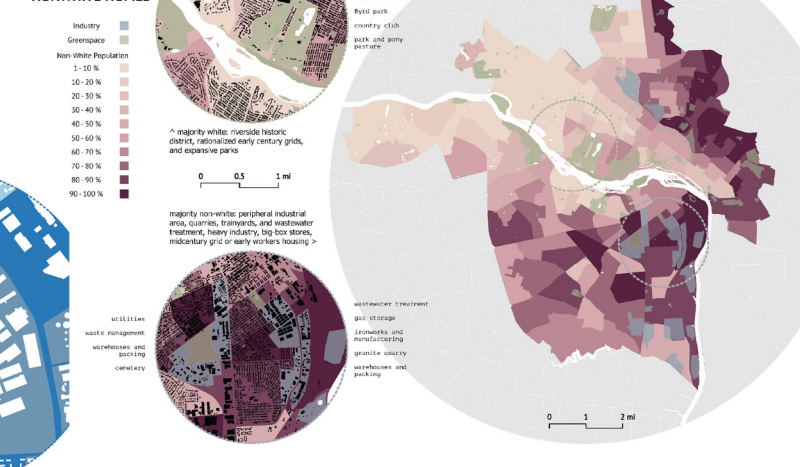
Students are intimately connected to the Appalachian environment. This class will allow them to explore connections between their landscape and social history through mapping. Guest lecturers will connect the class with community leaders from Appalachian cities, informing final project topic choice. The online, interactive final projects enable students to communicate with community audiences, which might yield collaborations in future years. The class's regional focus also aligns with Virginia Tech's Appalachian studies investment and the school's interest in local and community engagement, laying the foundation for long-term course development.

maps of Richmond inequality prepared for GIS lectures and tutorials >

NOLIS: FOOTPRINTS OVER TIME.  
DEVELOPMENT AGE COMPARED TO  
GREEN AND INDUSTRIAL SPACE  
IN RICHMOND, VIRGINIA



PARK vs INDUSTRY  
2015-2019  
PROXIMITY TO  
RICHMOND, VA  
NONWHITE HOMES



## SCHEDULE: LECTURES, READINGS, TUTORIALS

Structure: This will be a 3-credit lecture and lab class, divided between 1 hour for lecture and 1.5 hours for tutorials each class. Each week students will complete a reading response discussion assignment through Canvas. Tutorial submissions will be due at the end of each week, and the final project will be divided into a topic proposal, midterm presentation, and final presentation and submission.

### Part 1: What are maps? (5 weeks)

Introduces core mapping theories and applications using examples from Appalachia.

#### **Lecture 1: Introduction**

Summary: Introduction to history of data visualization and cartography for social activism (example: D.E.B. Du Bois); counter-example of cartography for social oppression (redlining); class structure and syllabus.

Tutorial 1: QGIS 1 city map (working with OSM data)

#### **Lecture 2: Maps as Power**

Summary: Maps are not objective instruments, but instead projections of their creators, inherently biased and often hegemonic (power-reinforcing); examples of colonial boundaries, the Jeffersonian grid.

Tutorial 2: QGIS 2 city topo (working with USGS DEMs)

#### **Lecture 3: Maps, Society, and Ecology**

Summary: Cartography can obscure and reveal social / ecological relationships; example of MS river levee building and agriculture; Dust Bowl; warfare and ecological invasion (mosquitos); Ukraine invasion. Thinking geographically helps us understand events as patterns.

Tutorial 3: QGIS 3 municipal parcel data

#### **Lecture 4: What is GIS (and why should I care)?**

Summary: A brief history of GIS through the lineage of data visualization and cartography; Canada and the US in 1960s (Roger Tomilson); invented as tool of material and human resource management by governments.

Tutorial 4: QGIS 4 NOAA (working with raster data)

#### **Lecture 5: GIS Industry Today**

Summary: Several examples of how GIS is used today in private and public spheres; including satellite imagery and logistics companies, government/state mapping, NGO disaster mapping, and academic social justice labs.

Tutorial 5: QGIS 5 census data part 1: comparing two variables

### Part 2: Image-Making (4 weeks)

Refines rhetorical and aesthetic mapping skills.

#### **Lecture 6: Beautiful maps and charts**

Summary: Review of characteristics of attractive and communicative maps; Tufte's six principles of analytic design, examples of the Mississippi meander belt maps and other historical maps.

Tutorial 6: QGIS 6 census data part 2: overlaying geographical features

#### **Guest lecture 1 (community development organization or GIS researcher)**

#### **Midterm Presentations**

#### **Lecture 7: Truth and data fidelity**

Summary: Covers basic data fallacies (errors) like cherry-picking and causation vs. correlation; review of previous examples with more skepticism. The necessity of bias in storytelling.

Tutorial 7: Intro to Mapbox (static map layers)

### Part 3: Storytelling (5 weeks)

On mapping communication and adapting static to interactive maps.

#### **Lecture 8: Climate justice and (informal) urban forms**

Summary: urban segregation and pollution; what a noli map reveals; examples of New Orleans-area industry pollution, Richmond's clear legacy of redlining in urban fabric, practices of mapping informal settlements.

Tutorial 8: Intro to Mapbox Interactive

#### **Lecture 9: Storytelling with maps (psychogeography, community mapping)**

Summary: community mapping, non-literal mapping practices, maps as a storytelling tool which should be widely accessible; COVID-experience maps.

Tutorial 9: Scrollytelling Template pt 1

#### **Guest lecture 2 (GIS researcher)**

#### **Guest lecture 3 (GIS researcher)**

#### **Final Presentations**

Tutorial 10: Scrollytelling Template pt 2



POTENTIAL READINGS

“Maps, Knowledge, and Power” (Harley, 1988)  
Ecologies of Fear (Davis, 1995)  
“Can the Mosquito Speak?” (Mitchell, 2002)  
“Cartography and Decolonization” Decolonizing the Map (Craib, 2017)  
“Human-Scaled Visualizations and Society”, The Sage Handbook of GIS and Society (Ballas and Dorling, 2011)  
“Geography’s Nature and Perspectives”, Geography: Why It Matters (Murphy, 2018)  
W. E. B. Du Bois’s Data Portraits (Wilson et.al., 2018)  
“Reveal Submits Testimony to Congress” (Reveal and Glantz, 2020)  
“The Economics of Maps” (Nagaraj and Stern, 2020)  
“Mapping the digital empire: Google Earth and postmodern cartography” (Farman, 2010)  
“How to Do Things with Space: Expanded Architecture and Nongovernmental Politics: An Interview with Laura Kurgan” (McKee, 2012)

Raw Data is an Oxymoron (Rosenberg et al. ,2013)  
Beautiful Evidence (Tufte, 2006)  
“A Place for Stories” (Cronon, 1992)  
“Viral Visualizations: How Coronavirus Skeptics Use Orthodox Data Practices to Promote Unorthodox Science Online” (Lee et al., 2021)  
“Digital Territories: Google maps as a political technique in re-making urban informality” (Luque-Ayala and Maia, 2019)  
Extrastatecraft (Easterling, 2016)  
The Image of the City (Lynch, 1960)  
The Agency of Mapping: Speculation, Critique, and Invention (Corner, 1999)  
Introduction to a Critique of Urban Geography (Debord, 1955)  
Close Up at a Distance (Kurgan, 2013)  
Rethinking the Power of Maps (Wood, 2010)  
Mapping Society (Vaughan, 2018)  
Rethinking Maps: New Frontiers in Cartographic Theory (ed. Dodge et. al., 2009)

**Background:** This will be an update and ecological pivot of an existing course called “GIS for Designers”. This course introduces students to QGIS and the basics of demographic and geographic analysis, primarily with OpenStreetMap and public census, county, and municipal data. During its first three semesters, the course has focused on racial issues in major cities such as Chicago, D.C., Atlanta, and Richmond. Both undergraduate and graduate students at the Blacksburg and Alexandria campuses and from many departments outside of architecture have enrolled in “GIS for Designers”, demonstrating an interest among Tech students in understanding place through social mapping. The pivot to socio-ecological concerns will play uniquely in a rural Appalachian context, where many students identify with the natural landscape. Though the class will focus on the urban scale, students will leave with a general idea of how mapping climate issues can re-frame landscapes.

examples of student work from pilot course “GIS for Designers”  
(more at [mshug.github.com](https://mshug.github.com)) >

