GIS Usage in Institutional Research

Tuesday, February 28th, 2023 3:00 P.M.

Dr. Nicolas A. Valcik
Director, Effectiveness Analytics

History of Mapping - Epidemiology

- John Snow – Apprentice Surgeon
- Mapped down Cholera outbreaks in relation to water supply – London 1854.
- Linked Cholera to the Water Pumps at particular sites.
- Qualitative Collection of Data through interviews
- Mapped down locations given to him in interviews
- Died before his findings were verified.

(Atif, 2013)

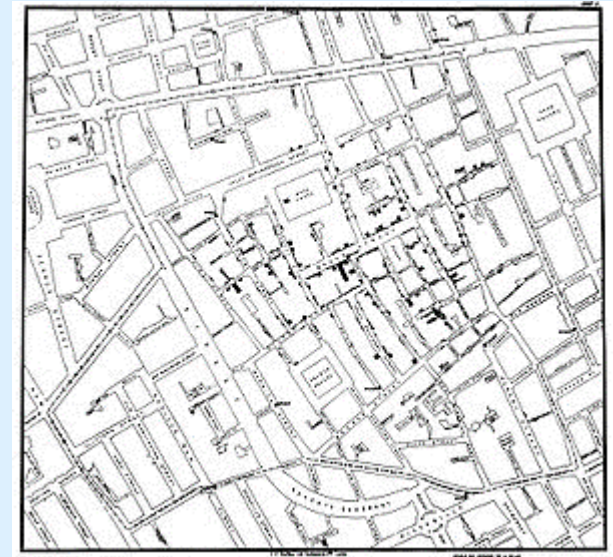
John Snow

Image taken from Atif, 2013

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Spatial Analysis vs. Data Analysis

John Snow's 1854 Map

Example of John Snow's 1854 Data File

- Sick Person #1 – Broad Street
- Sick Person #2 – Poland Street
- Sick Person #3 – Berwick Street
- Sick Person #4 – Little Windmill Street
- Sick Person #5 – Dufours Place

VS.

GIS image taken from Atif, 2013

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Spatial Layering 1854 Data

- Reveals pump on Broadway Street where the individuals are Clustered

- Data file alone cannot show cluster of infections

- Layers can be added to show water pumps within walking distance of sick or deceased individuals

John Snow's 1854 Map

Water Pump

GIS image taken from Atif, 2013
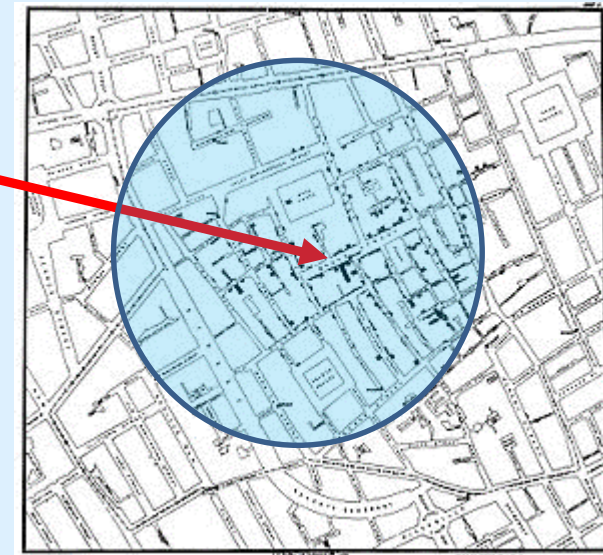
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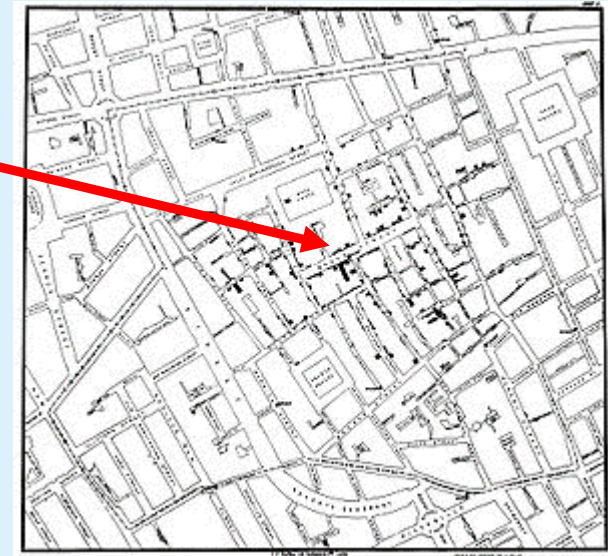
Spatial Layering 1854 Data

- A radius has been superimposed on possible cholera outbreak area around water pumps

- Radius shows individuals within walking distance of water pump from their residences

- Other water pumps outside of radius do not have infected individuals with cholera

John Snow's 1854 Map

Water Pump

VS.

GIS image taken from Atif, 2013

Understanding your Data

- Research Design
- Data collection methodology
- Linking or joining data sets
- Limitations on inputting information into GIS
- Coordinate System – Which one to use (e.g. NAD83)?
- Shapefiles = Layer
- Underlying Tables utilizes Foxpro database
- ArcMap, ArcSDE, ArcIMS
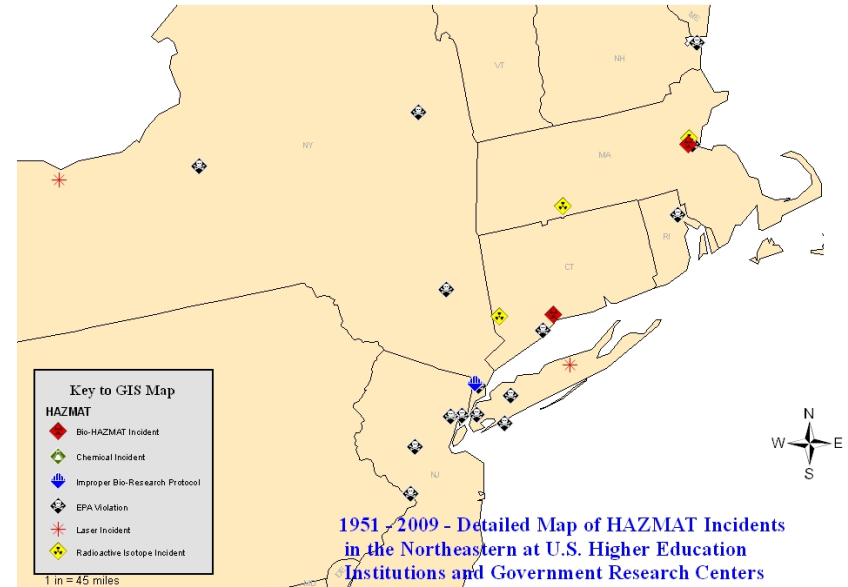- Using SAS with ArcMAP
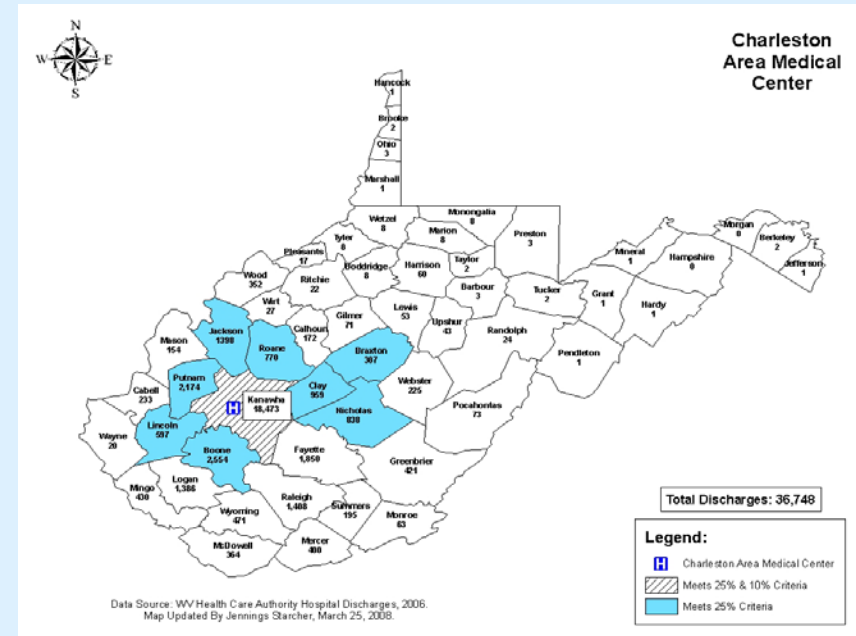
GIS image taken from Starcher, 2008

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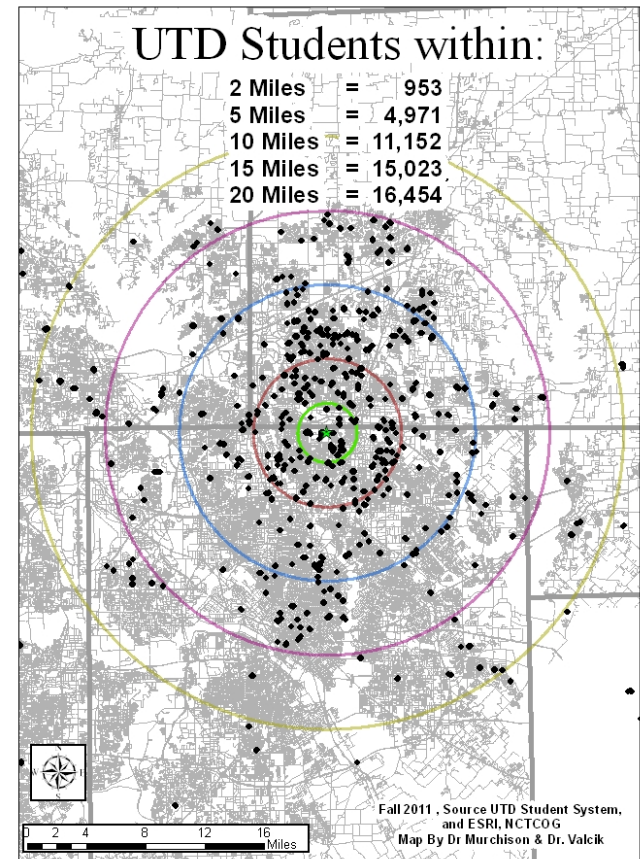# GIS Map in Relation HAZMAT Incidents at Research Universities or Centers
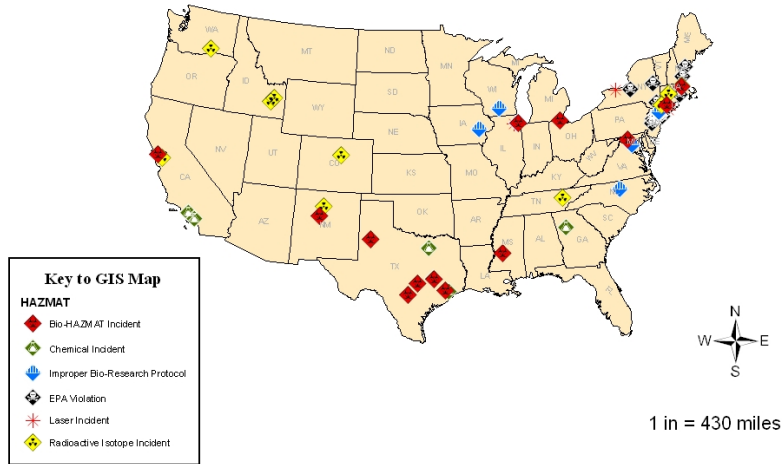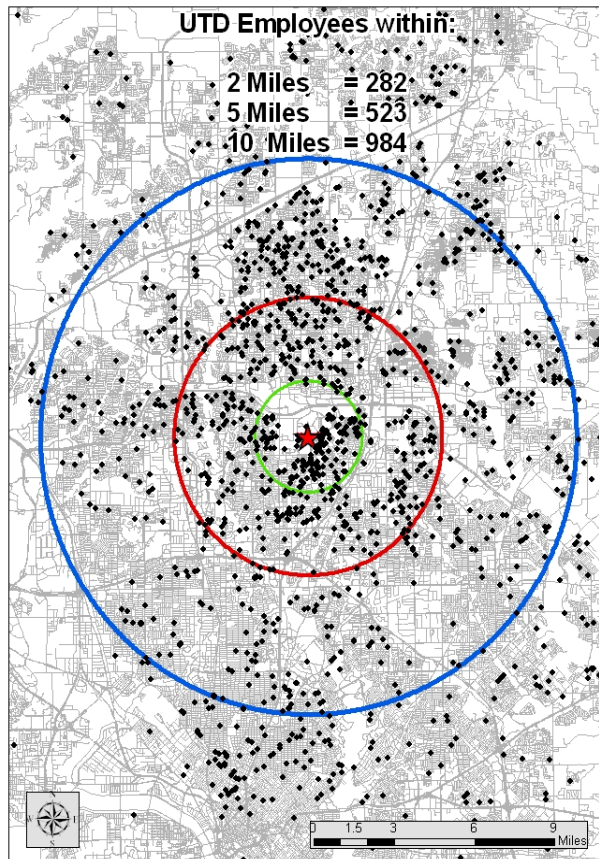

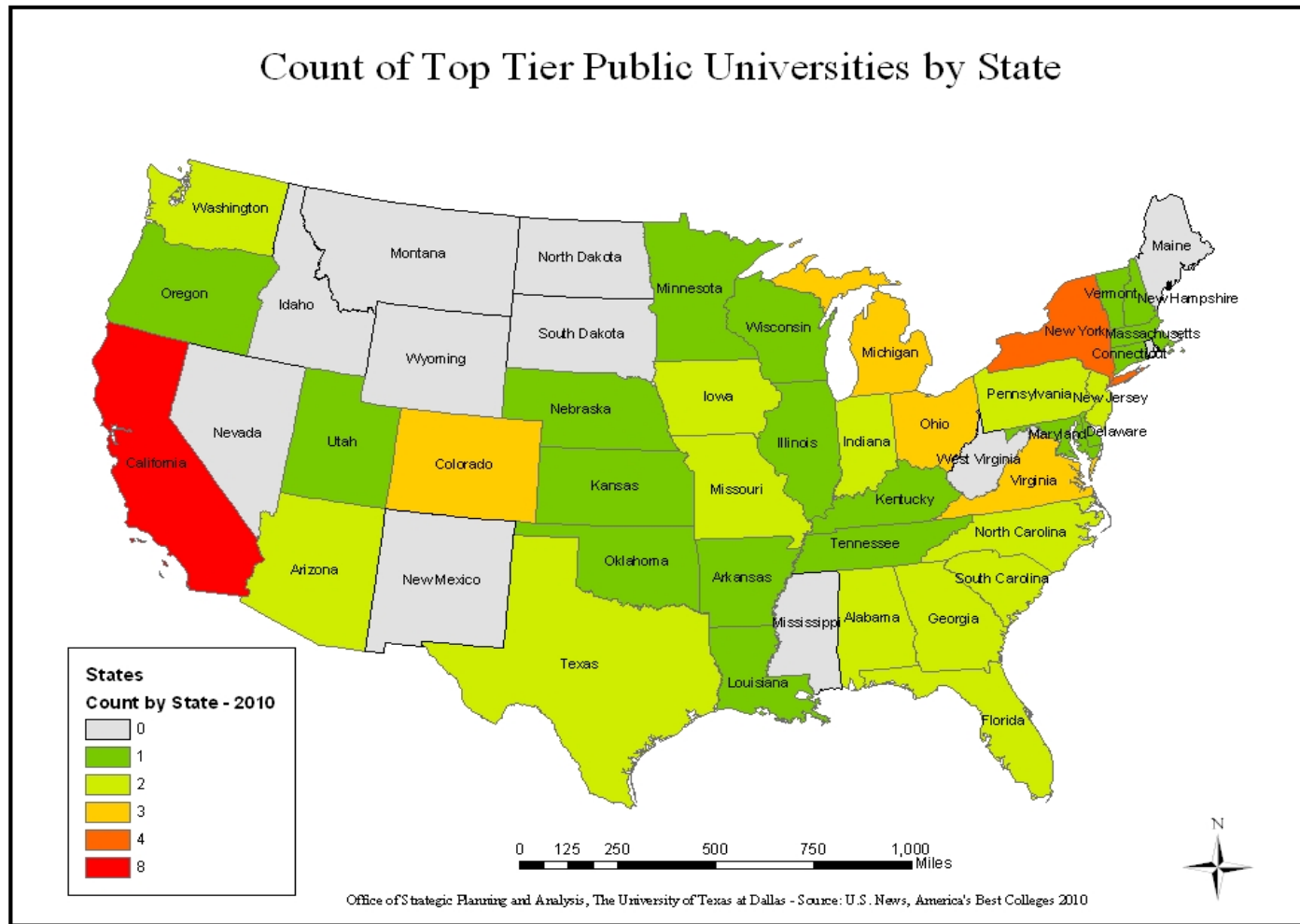GIS image taken from Valcik, 2013
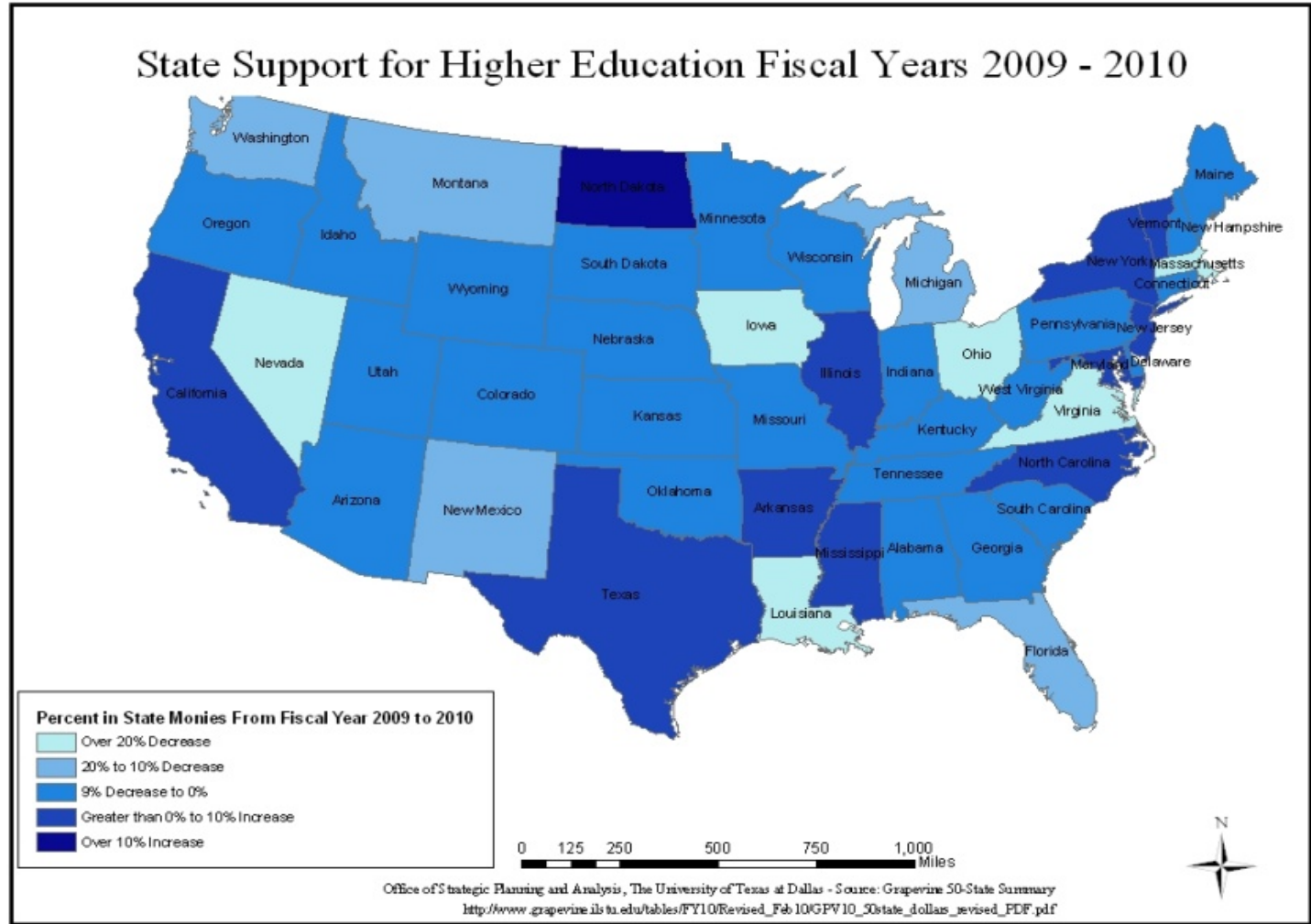

GIS image taken from Valcik, 2013

University of Texas at Dallas - Student and Faculty/Staff Proximity Analysis – 2.0 mile buffer

GIS Used for Benchmarking

Count of Top Tier Public Universities by State

GIS Used for Benchmarking (Continued)

State Support for Higher Education Fiscal Years 2009 - 2010

Percent in State Monies From Fiscal Year 2009 to 2010
- Over 20% Decrease
- 20% to 10% Decrease
- 9% Decrease to 0%
- Greater than 0% to 10% Increase
- Over 10% Increase

Office of Strategic Planning and Analysis, The University of Texas at Dallas - Source: Grapevine 50-State Summary
http://www.grapevine.ils tu.edu/tables/FY10/Revised_Feb10/GPV10_50state_dollars_revised_PDF.pdf

Valcik, 2010

West Virginia Need Based Financial Aid in Relation to Abandoned Coal Mines
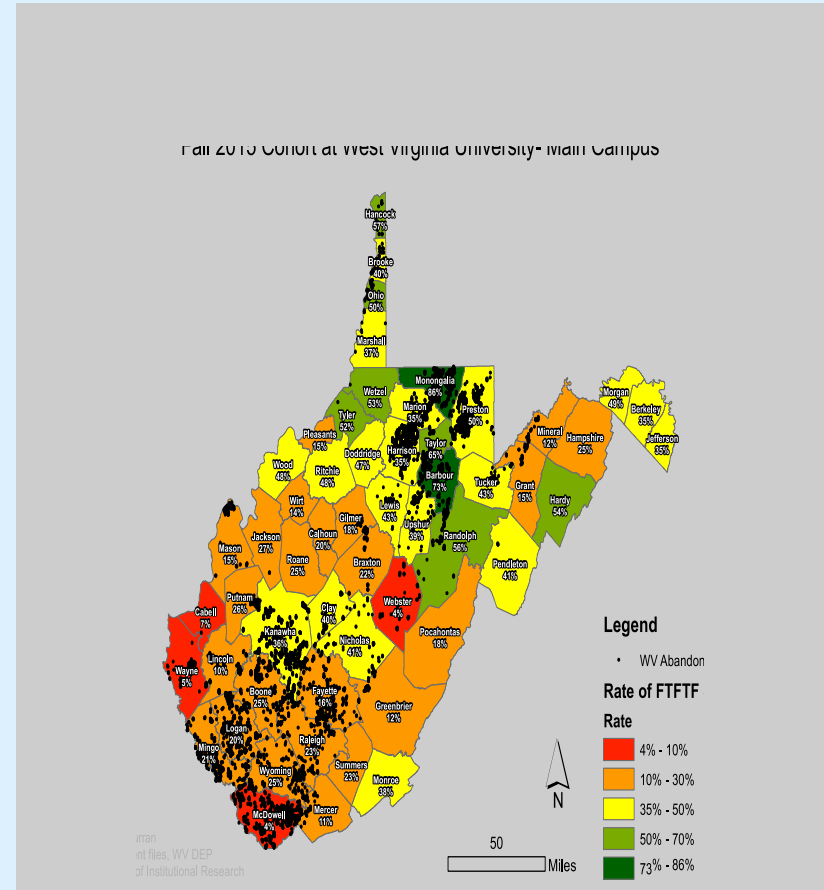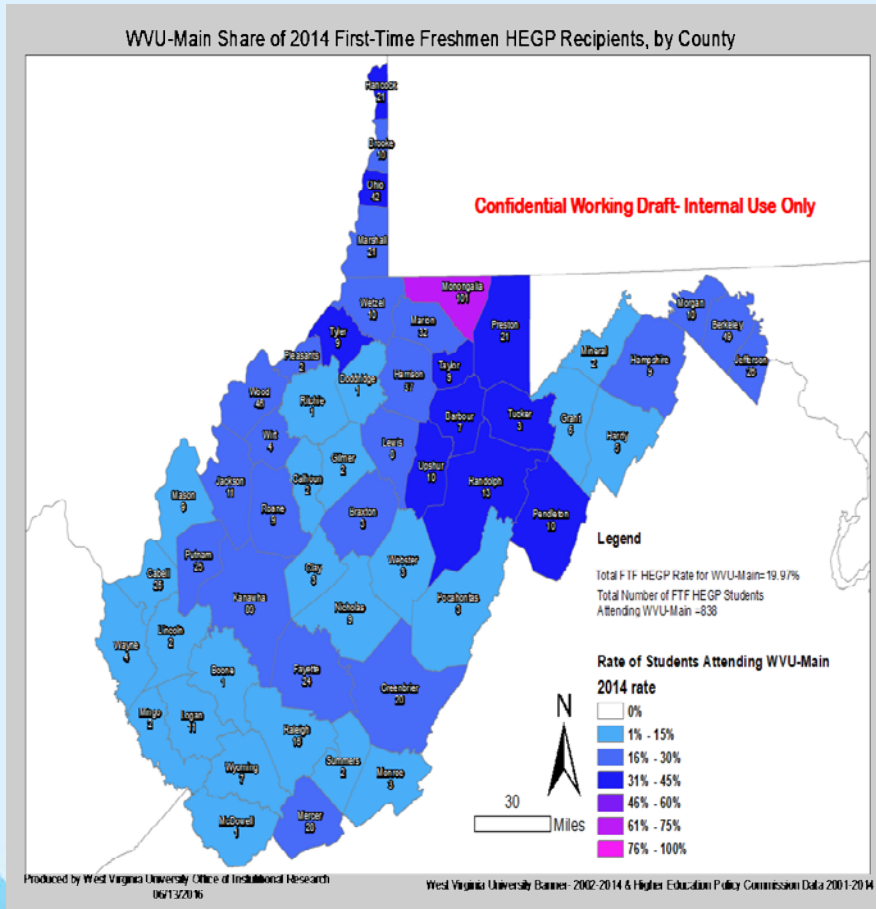
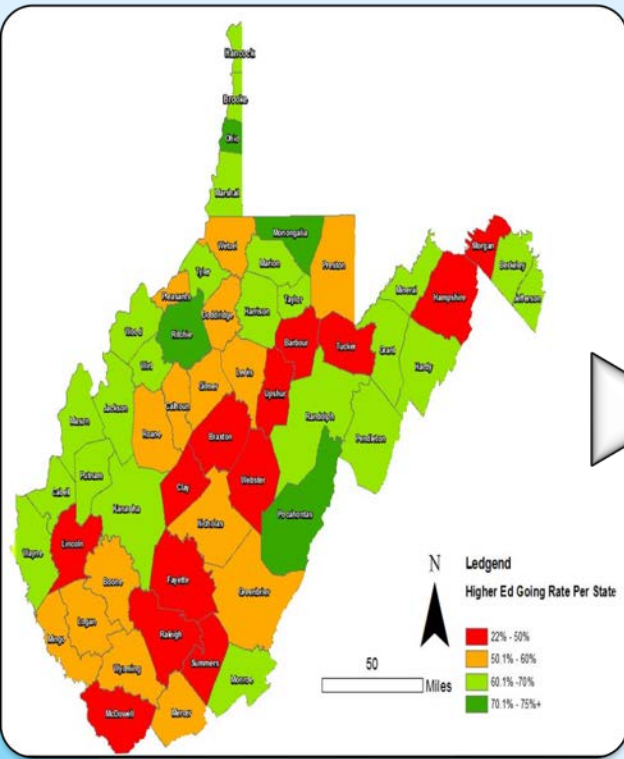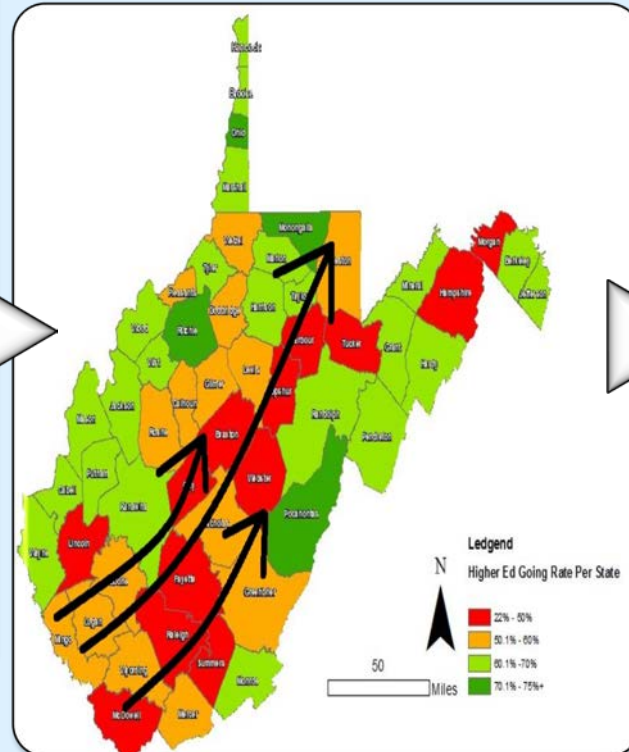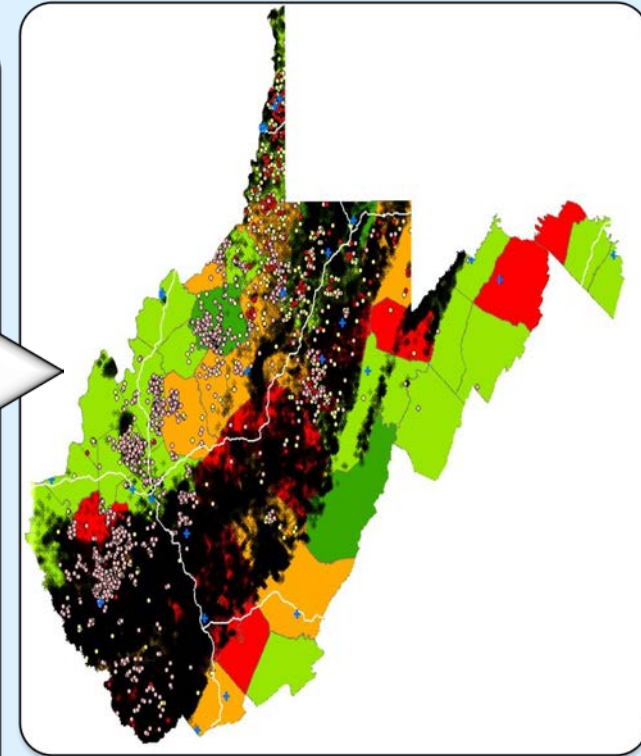# West Virginia Need Based Financial Aid in Relation to Abandoned Coal Mines
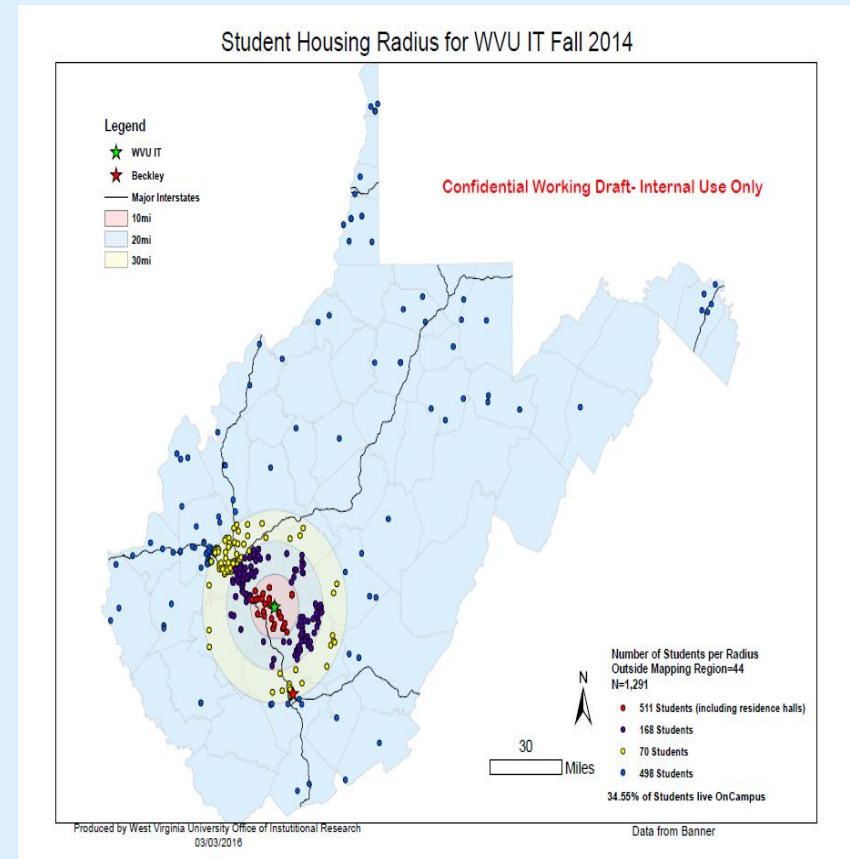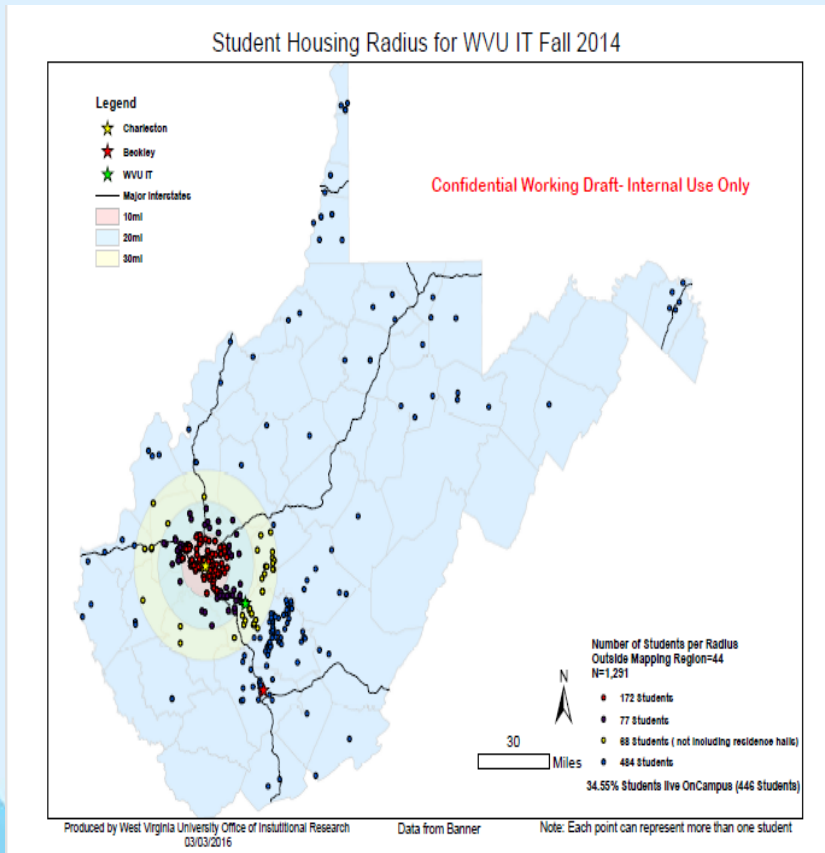

Base Map

Analysis

Overlay

Megan Curran – 2016

(Data from: WV Higher Education Policy Commission)
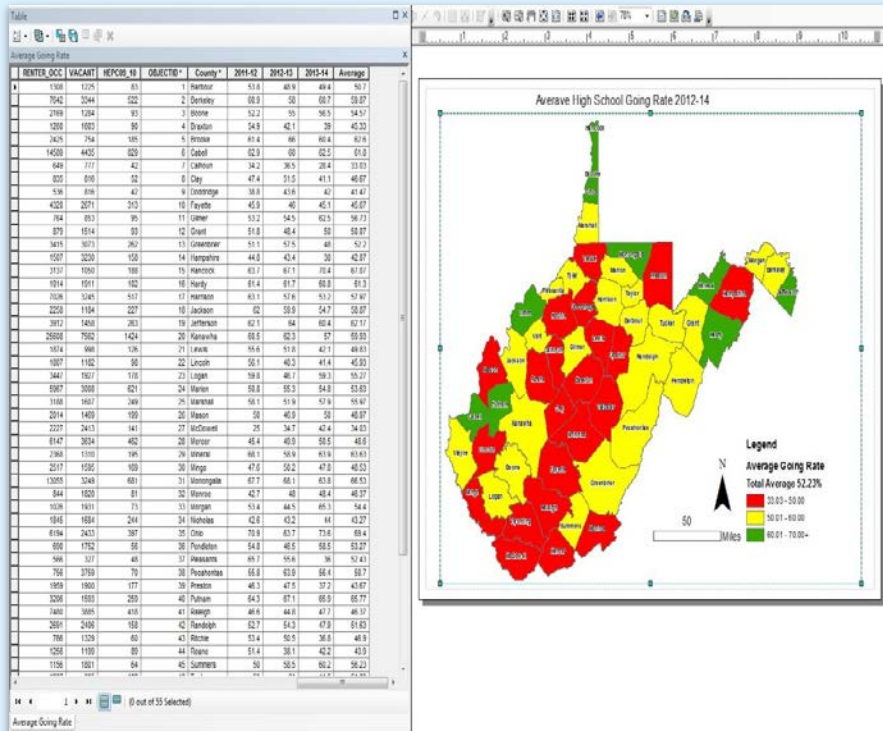
(Data from: WV Higher Education Policy Commission)

West Virginia University -IT Relocation of a Campus – Impact on Resident Students

GIS Support for West Virginia Higher Education Policy Commission
## Data file versus a GIS Shapefile

County	2011-12	2012-13	2013-14	Average	County	2011-12	2012-13	2013-14	Average
Barbour	53.8	48.9	49.4	50.70	Mineral	68.1	58.9	63.9	63.63
Berkeley	60.9	58	60.7	59.87	Mingo	47.6	50.2	47.8	48.53
Boone	52.2	55	56.5	54.57	Monongalia	67.7	68.1	63.8	66.53
Braxton	54.9	42.1	39	45.33	Monroe	42.7	48	48.4	46.37
Brooke	61.4	66	60.4	62.60	Morgan	53.4	44.5	65.3	54.40
Cabell	62.9	60	62.5	61.80	Nicholas	42.6	43.2	44	43.27
Calhoun	34.2	36.5	28.4	33.03	Ohio	70.9	63.7	73.6	69.40
Clay	47.4	51.5	41.1	46.67	Pendleton	54.8	46.5	58.5	53.27
Doddridge	38.8	43.6	42	41.47	Pleasants	65.7	55.6	36	52.43
Fayette	45.9	46	45.1	45.67	Pocahonta	55.8	63.9	56.4	58.70
Gilmer	53.2	54.5	62.5	56.73	Preston	46.3	47.5	37.2	43.67
Grant	51.8	48.4	50	50.07	Putnam	64.3	67.1	65.9	65.77
Greenbrier	51.1	57.5	48	52.20	Raleigh	46.6	44.8	47.7	46.37
Hampshire	44.8	43.4	38	42.07	Randolph	52.7	54.3	47.9	51.63
Hancock	63.7	67.1	70.4	67.07	Ritchie	53.4	50.5	36.8	46.90
Hardy	61.4	61.7	60.8	61.30	Roane	51.4	38.1	42.2	43.90
Harrison	63.1	57.6	53.2	57.97	Summers	50	58.5	60.2	56.23
Jackson	62	59.9	54.7	58.87	Taylor	53	61	41.5	51.83
Jefferson	62.1	64	60.4	62.17	Tucker	51.1	56.8	48.8	52.23
Kanawha	60.5	62.3	57	59.93	Tyler	53.8	61.8	52.5	56.03
Lewis	55.6	51.8	42.1	49.83	Upshur	47.2	44.6	36.9	42.90
Lincoln	56.1	40.3	41.4	45.93	Wayne	57.4	62	51.8	57.07
Logan	59.8	46.7	59.3	55.27	Webster	50	41.5	52.6	48.03
Marion	50.8	55.3	54.8	53.63	Wetzel	46.5	52	45	47.83
Marshall	58.1	51.9	57.9	55.97	Wirt	66.7	56.2	50	57.63
Mason	50	46.9	50	48.97	Wood	64.7	66.4	61.7	64.27
McDowell	25	34.7	42.4	34.03	Wyoming	39	46.7	43.7	43.13
Mercer	45.4	49.9	50.5	48.60	Total	53.1036	52.1964	51.375	52.23
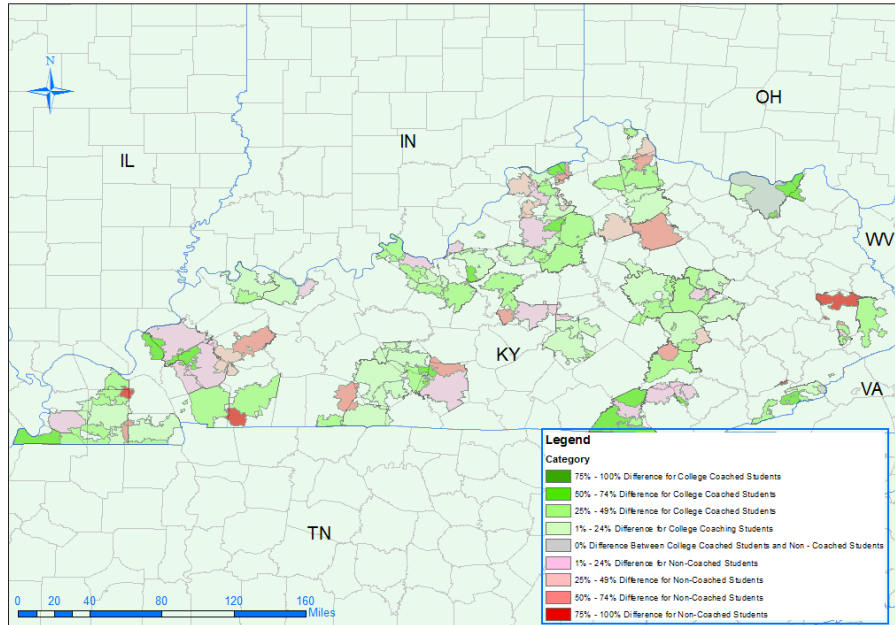
Megan Curran – 2016
(Data from: WV Higher Education Policy Commission)

GIS Map for the Kentucky Campus Compact 2014 Assessment

Kentucky High School Seniors -
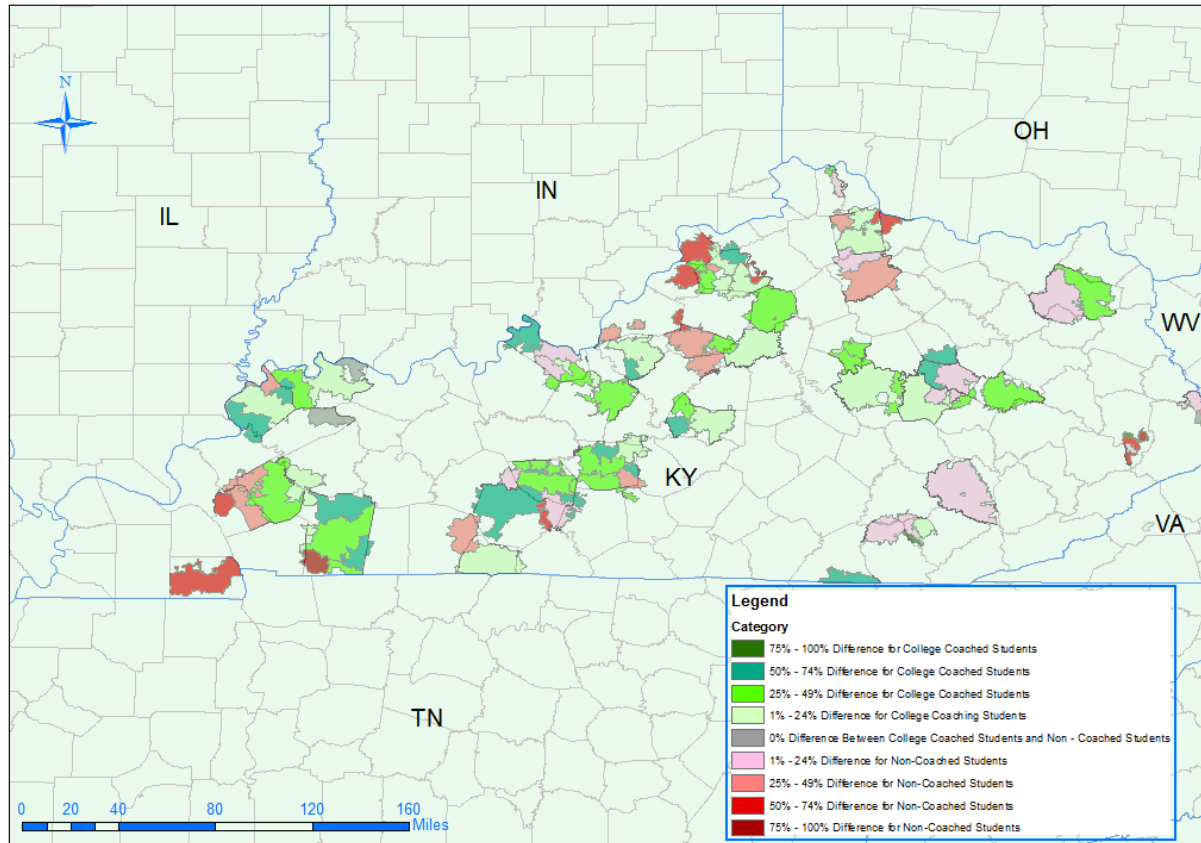Percent Difference by Zip Code of College Coached and Non-Coached Students Going to College in 2012
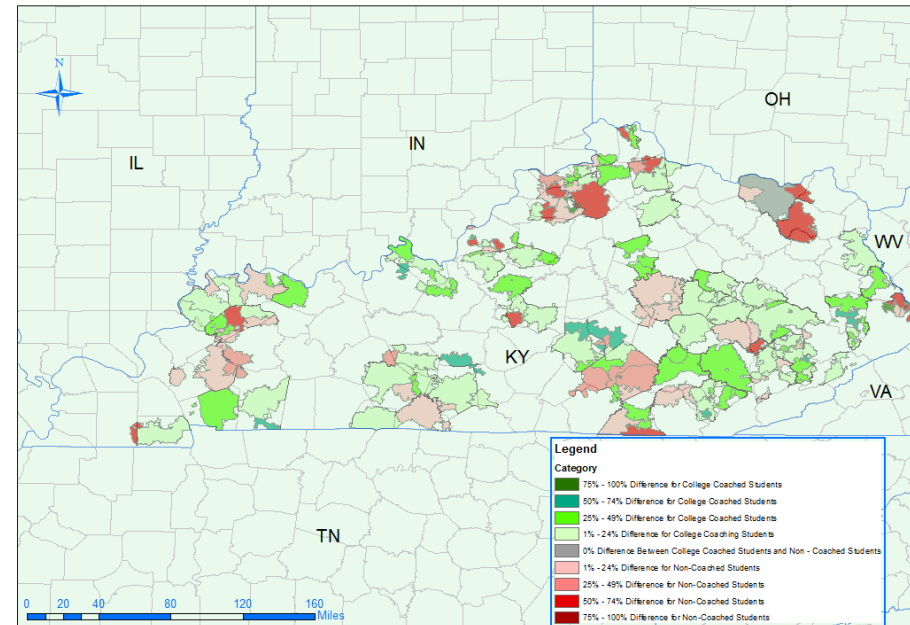
Kentucky High School Seniors -
Percent Difference by Zip Code of College Coached and Non-Coached Students Going to College in 2013

GIS image taken from Valcik, 2015

GIS image taken from Valcik, 2015

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GIS Map for the Kentucky Campus Compact 2014 Assessment

Kentucky High School Seniors -
Percent Difference by Zip Code of College Coached and Non-Coached Students Going to College in 2014

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GIS image taken from Valcik, 2015

Geospatial Information System Use in Public Organizations

Edited by Nicolas A. Valcik – Routledge 2019
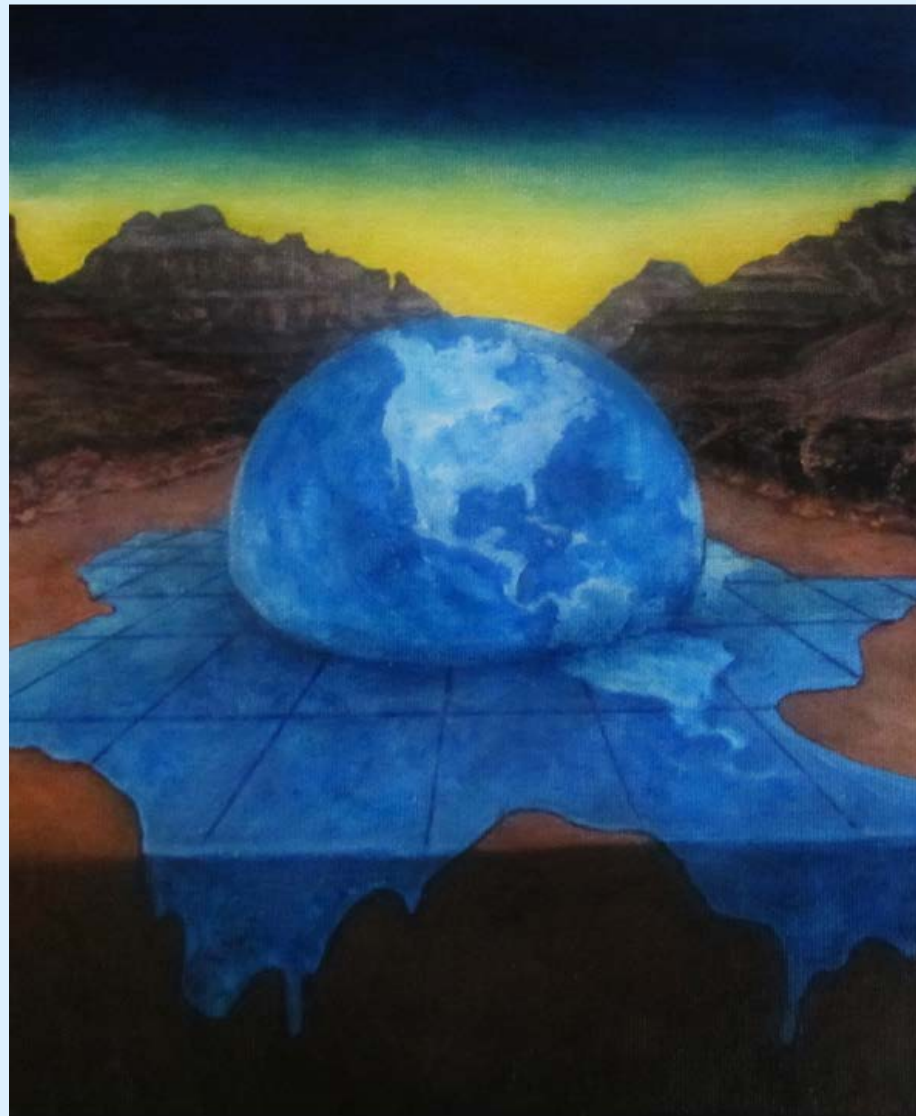
West Virginia University Student Proximity Project 2013 - 2017

- Locate students and employees that live around West Virginia University

- Shows patterns for infrastructure concern (i.e. utilities and streets)

- Real Estate utilizing proximity analysis for marketing university housing

- Locks student and employee addresses to map in relation to public transportation and traffic count

- Analyzing data on where students live and compares their class locations for campuses

- Allows for a retention study on students by class level

- Allows for analysis of distribution of where students and employees live in Morgantown

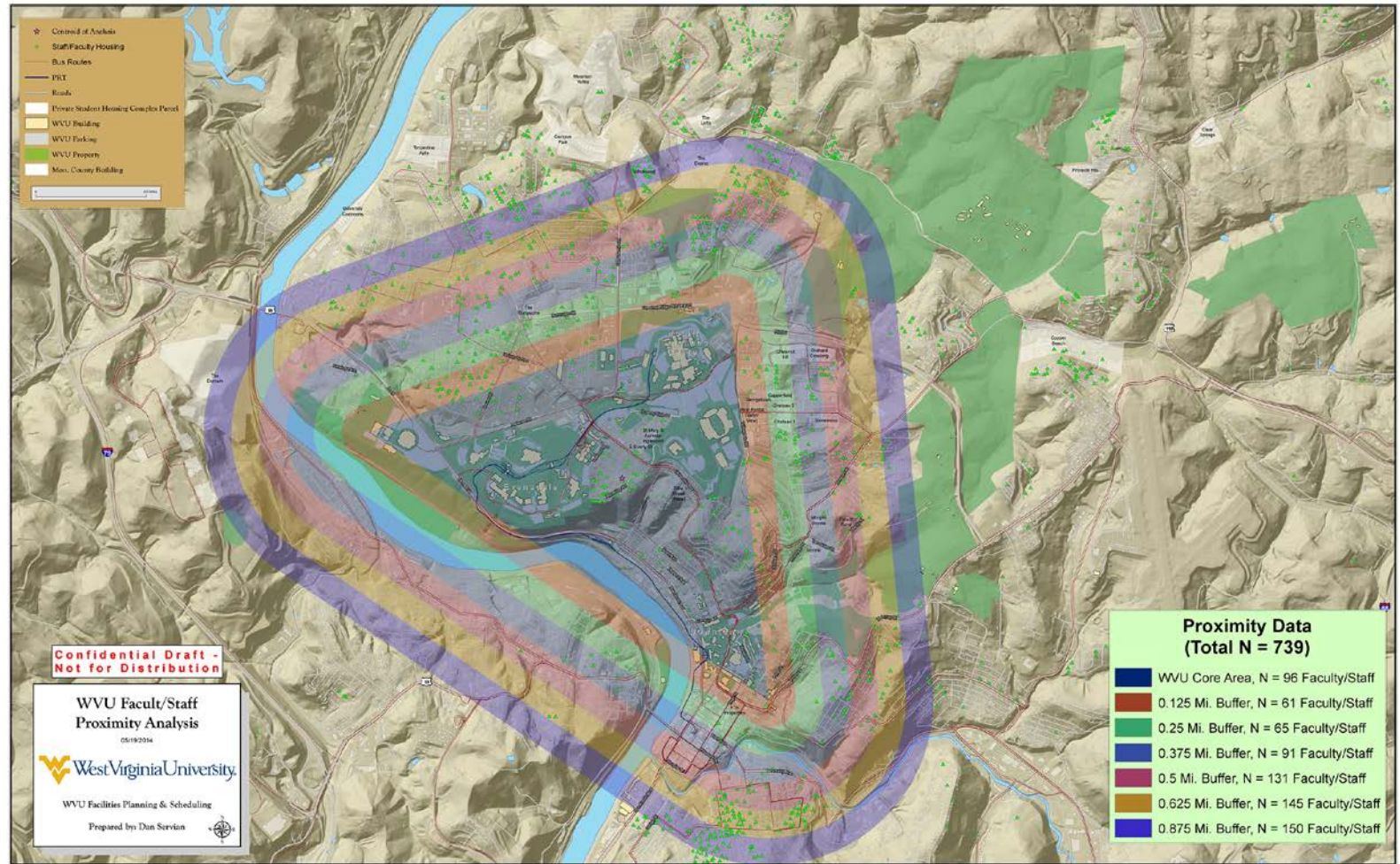- Can be superimposed on Central Appraisal District Information

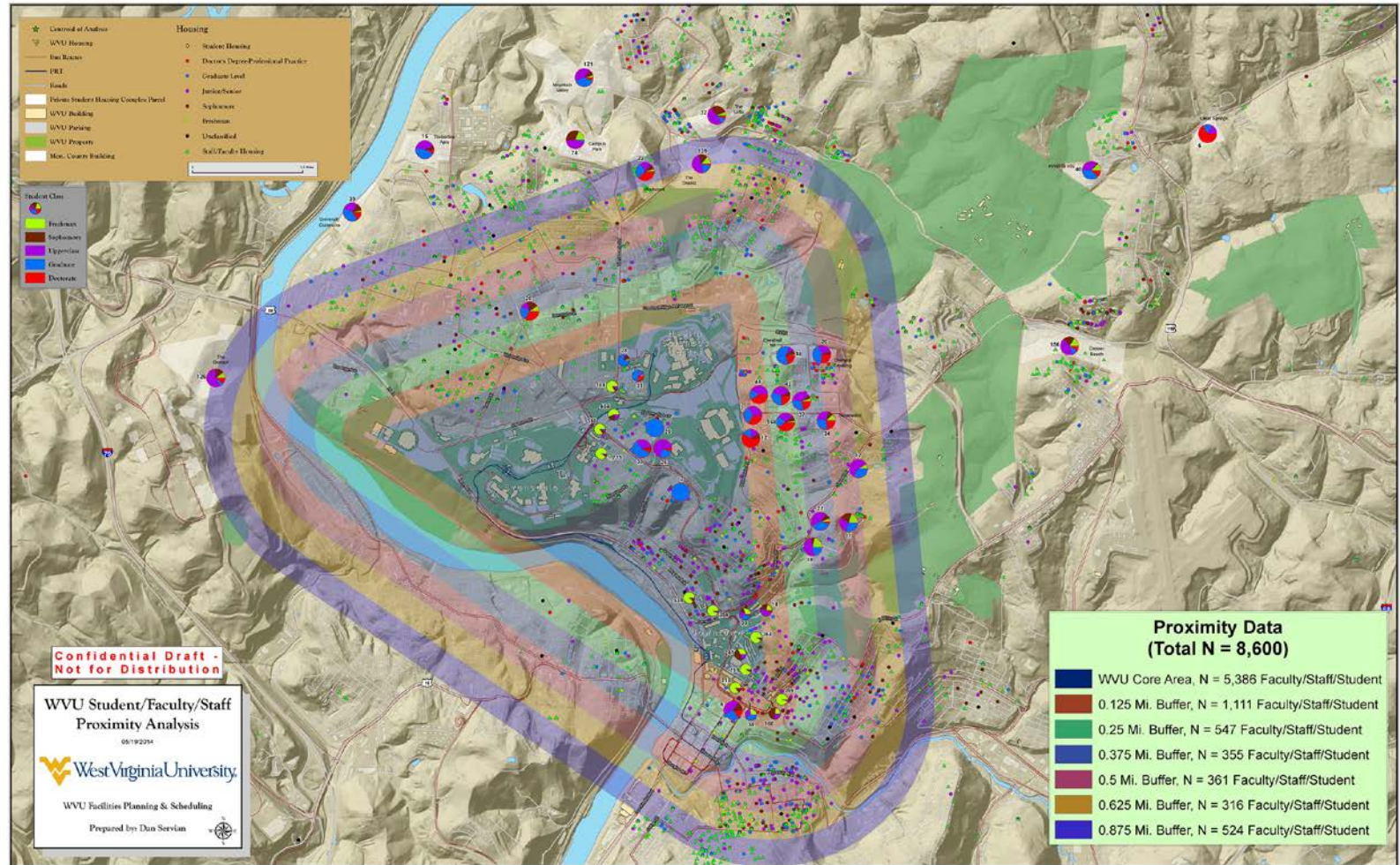# West Virginia University - Student Proximity Analysis – 0.5 mile buffer
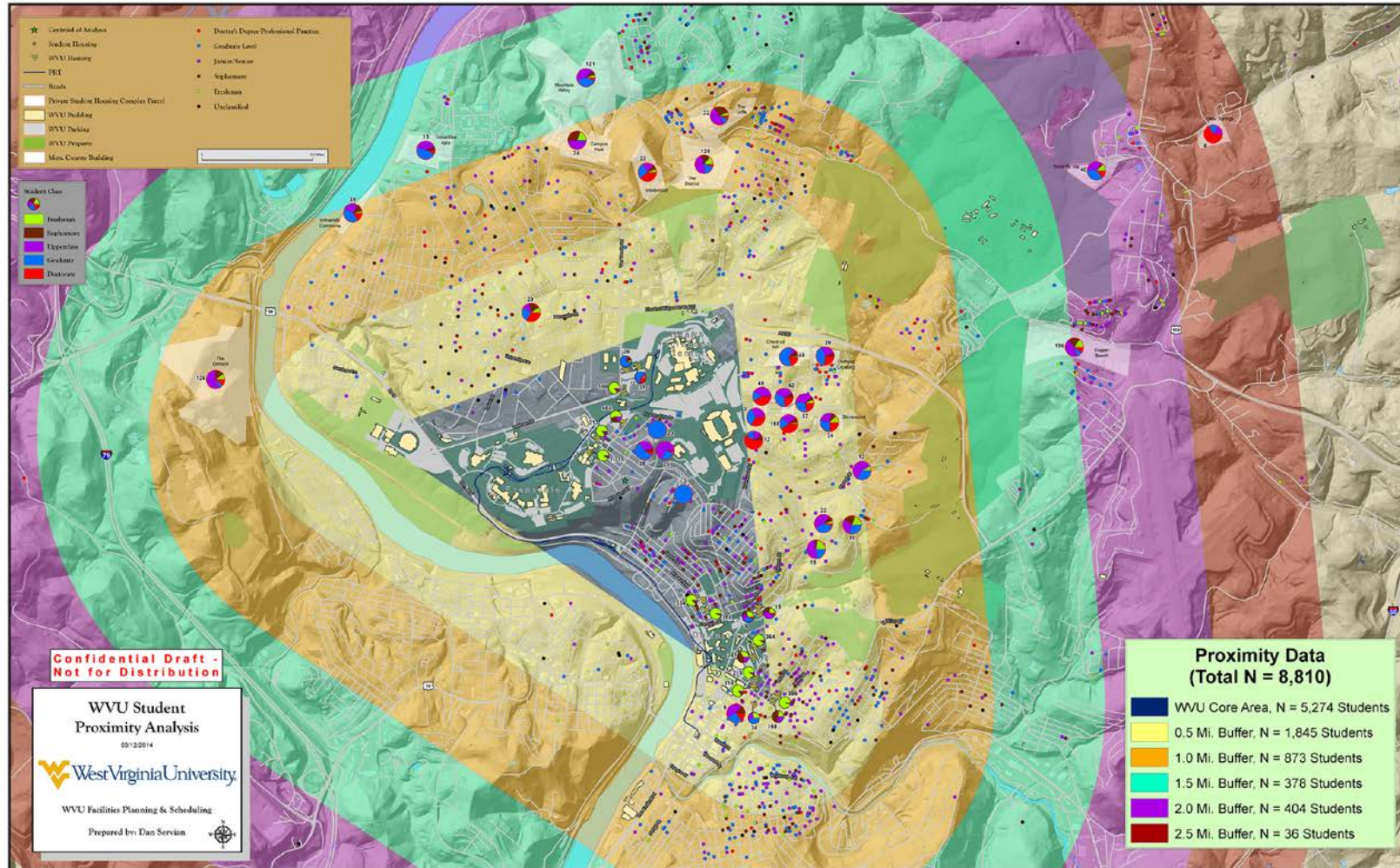
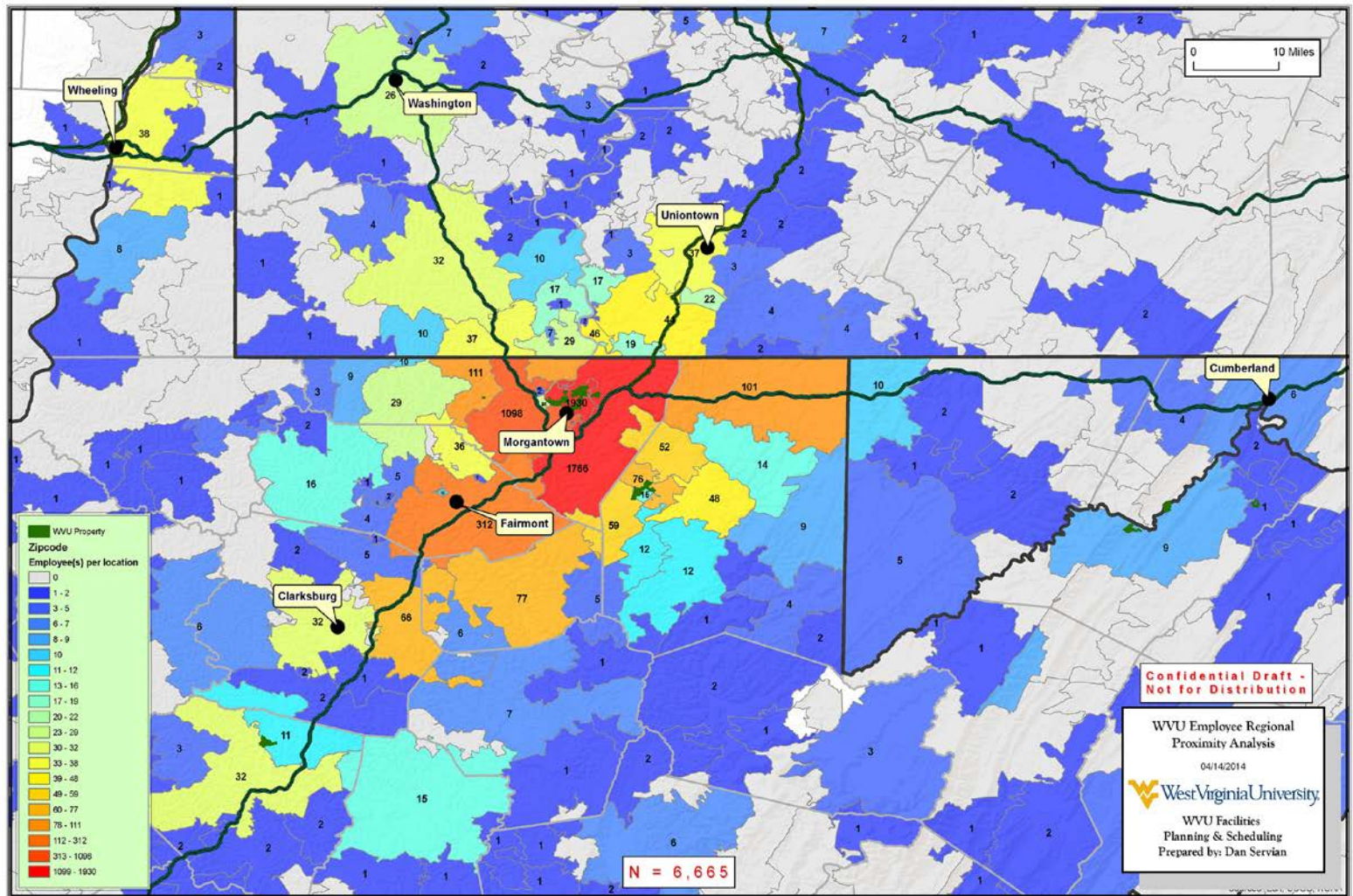# West Virginia University - Student Proximity Analysis – 0.125 mile buffer
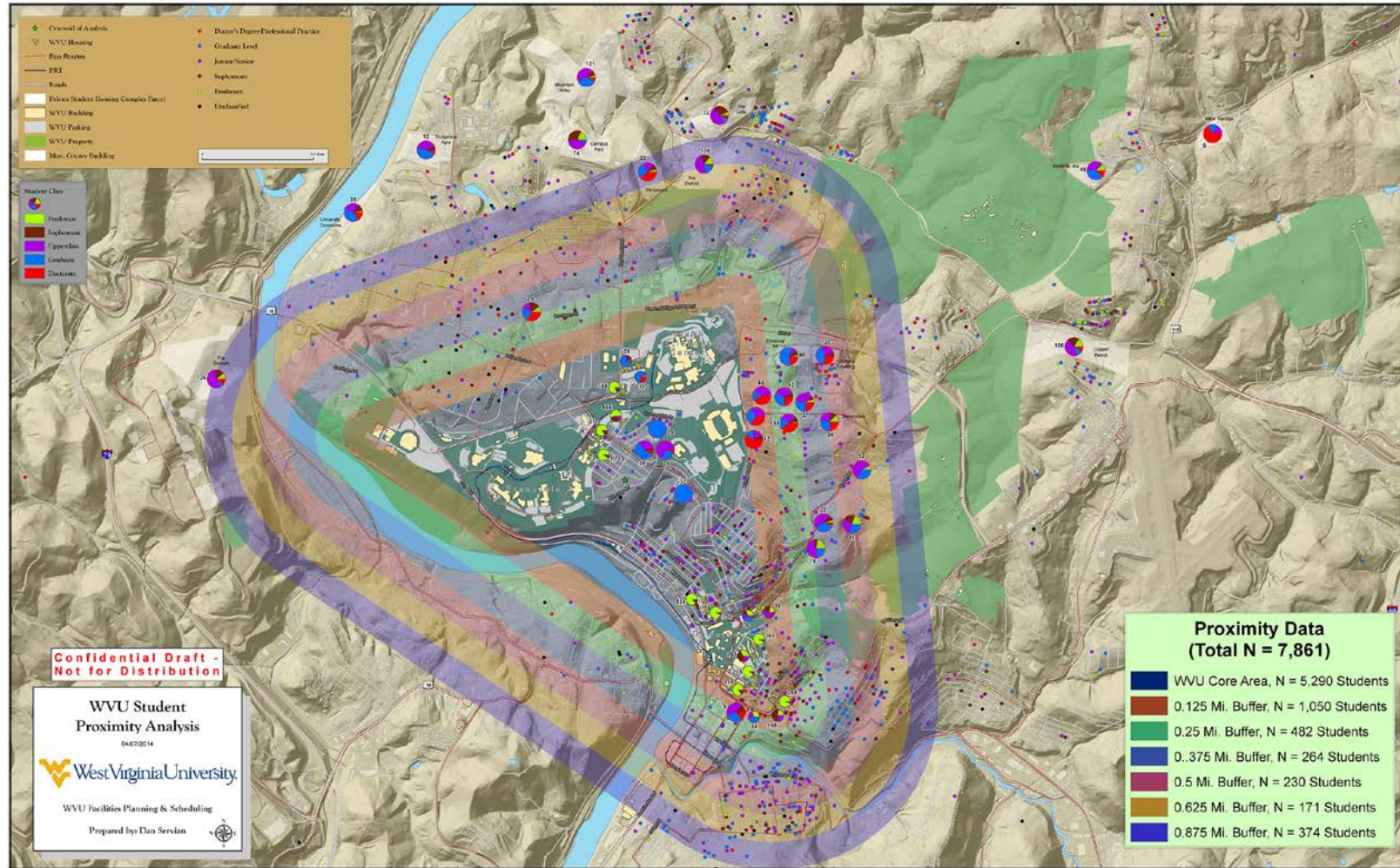
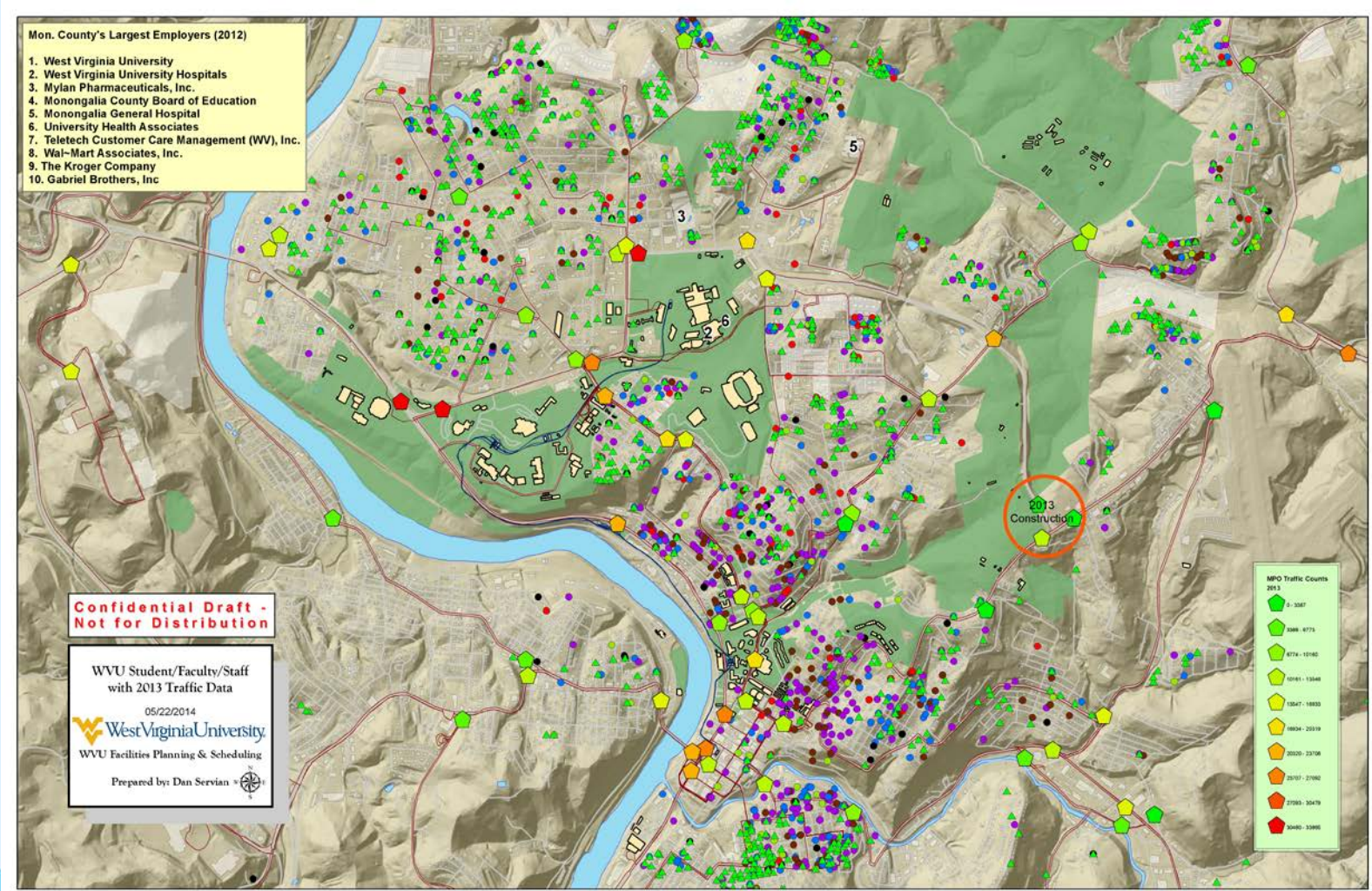# West Virginia University - Faculty/Staff Proximity Analysis – 0.125 mile buffer

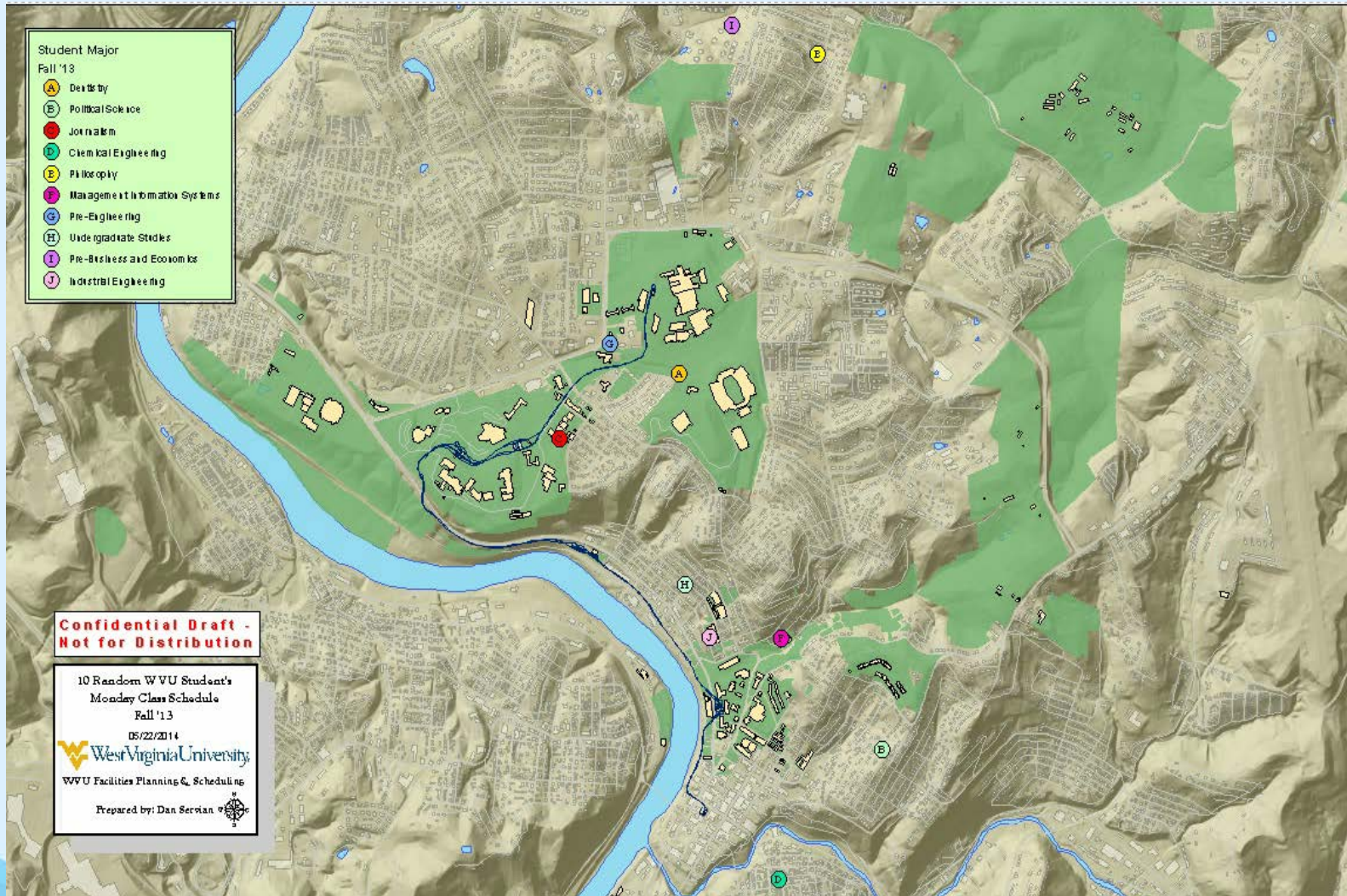# West Virginia University - Student/Faculty/Staff Proximity Analysis – 0.125 mile buffer

West Virginia University - Faculty/Staff Regional Proximity Analysis

West Virginia University - Student/Faculty/Staff Proximity Analysis with 2013 Traffic Data

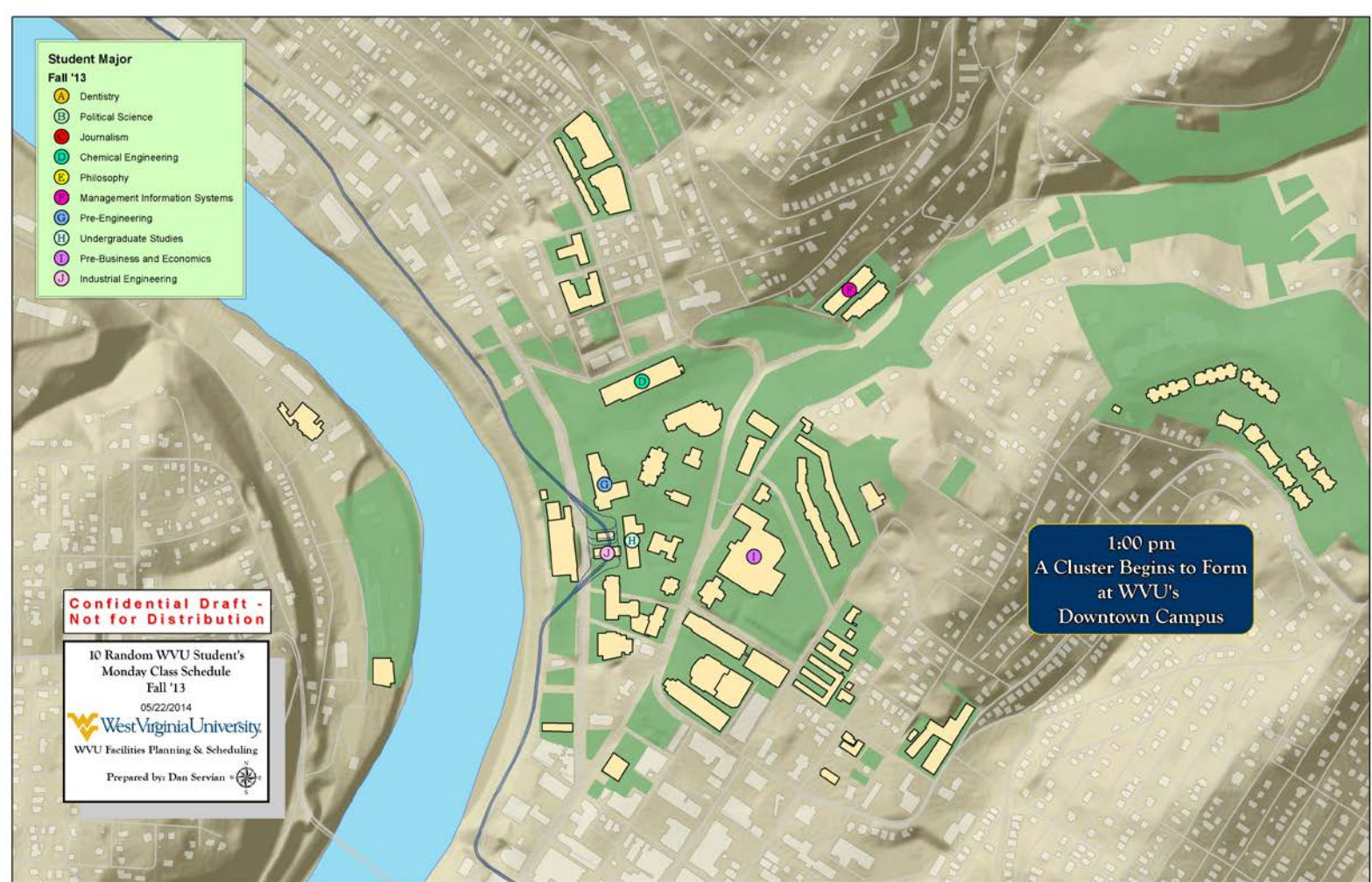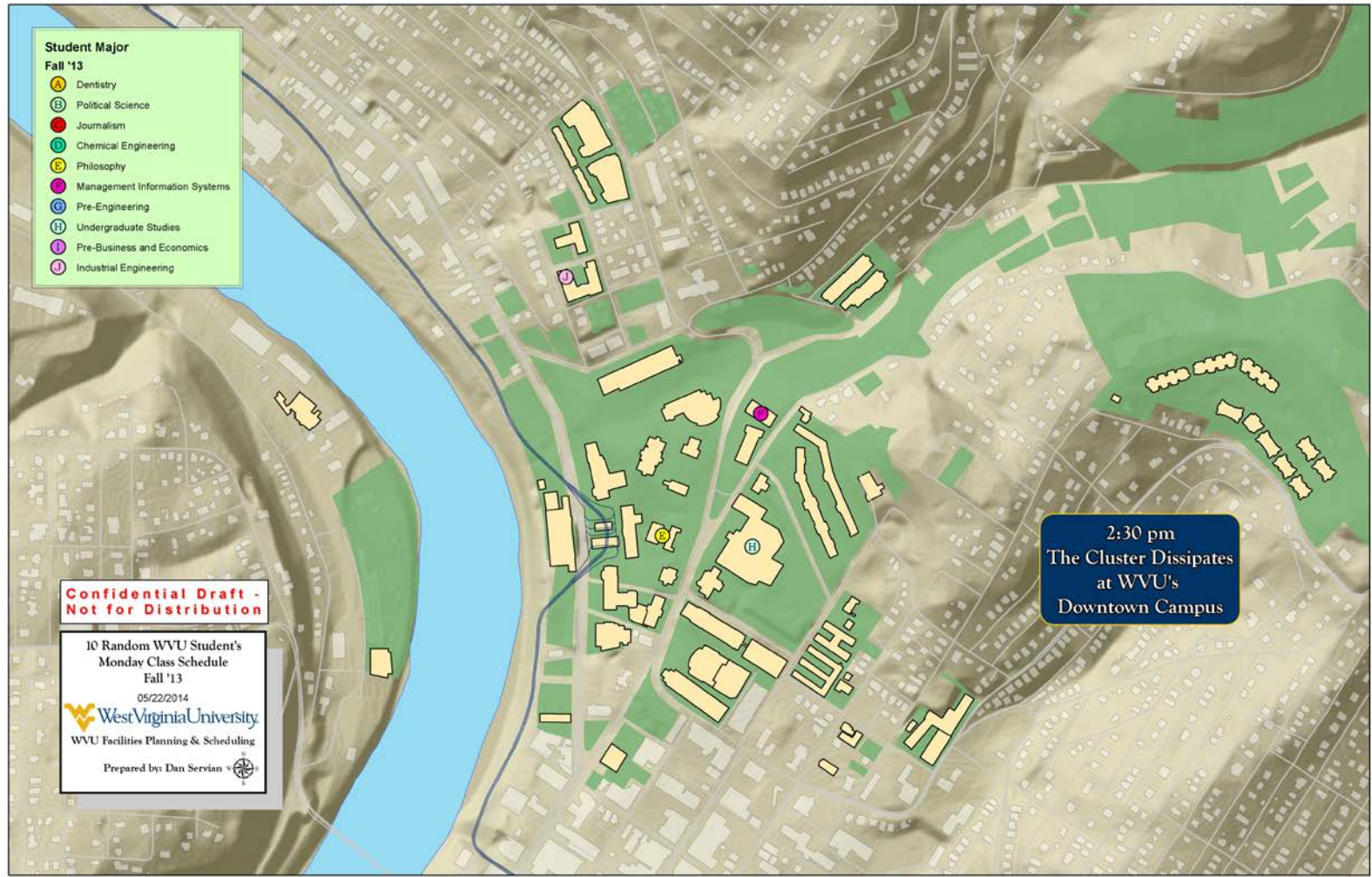# 10 Random West Virginia University Student Class Schedule (Fall '13, Monday)

10 Random West Virginia University Student Class Schedule (Fall '13, Monday) Cluster 12:30 p.m.
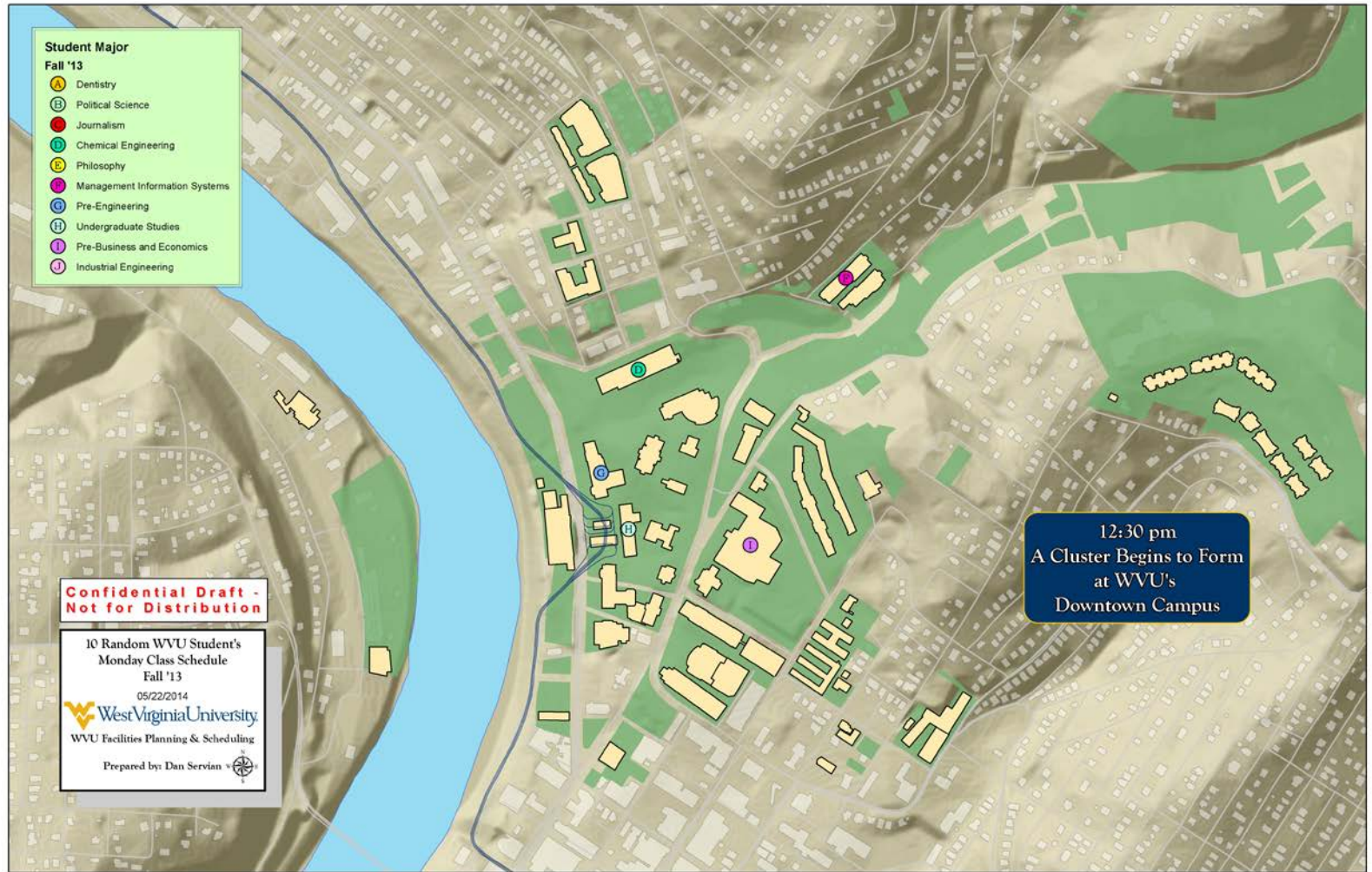
10 Random West Virginia University Student Class Schedule (Fall '13, Monday) Cluster 1:00 p.m.

10 Random West Virginia University Student Class Schedule (Fall '13, Monday) Cluster 2:30 p.m.

West Virginia University – Evansdale Redevelopment

- Future campus map projected

- Project was utilized for town meetings as well as planning and zoning commission

- Internal usage, by WVU, for redevelopment of parking and transportation requirements and needs for the campus and community

- Used for an environmental impact study for Evansdale campus redevelopment project

- Collegiate stakeholders used the maps to locate species of trees as well as to determine the impact of the arboretum and Evansdale campus

- Roadway map was used to show infrastructure changes that will be beneficial to the community.

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West Virginia University – Evansdale Redevelopment

- Method
  - Georeferenced the schematics for all of the new construction and roadway change
    - Art Museum
    - Evansdale Crossing
    - Advanced Engineering Research Building
    - Health & Education Building
    - Agricultural Sciences Building
    - Roadways & Intersections

  - Digitized new buildings and roadway designs

  - Removed the building and roadway shapefiles to be replaced

  - Via Photoshop, erased the buildings and roadways to be replaced
    - Exported tiff of image
    - Altered image in Photoshop
    - Georeferenced altered image

West Virginia University's Evansdale Projected Redevelopment (Potential C.A.C. Parking Changes)
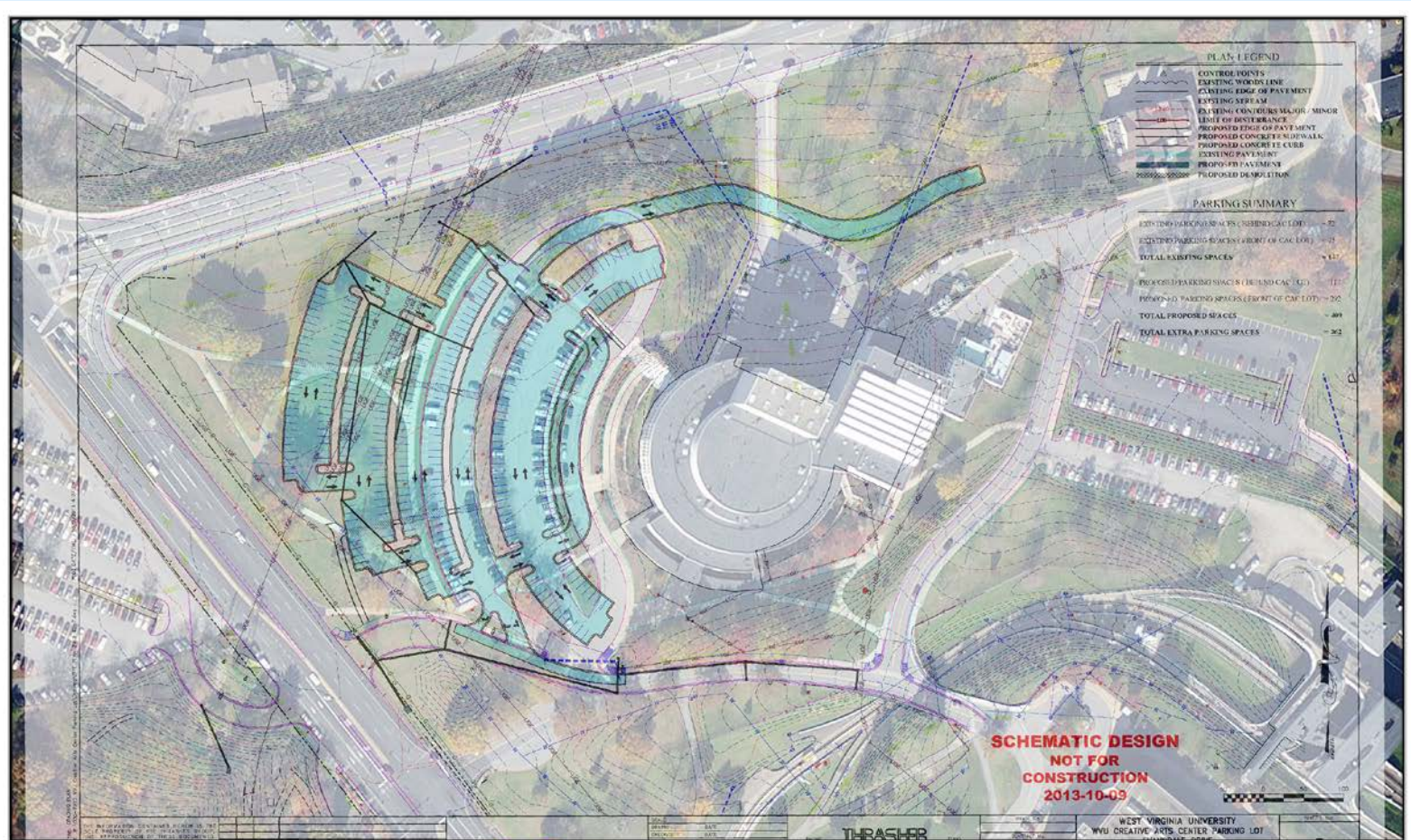
West Virginia University's Evansdale Projected Redevelopment (Intersection of Evansdale Dr. & Monongahela. Blvd.)
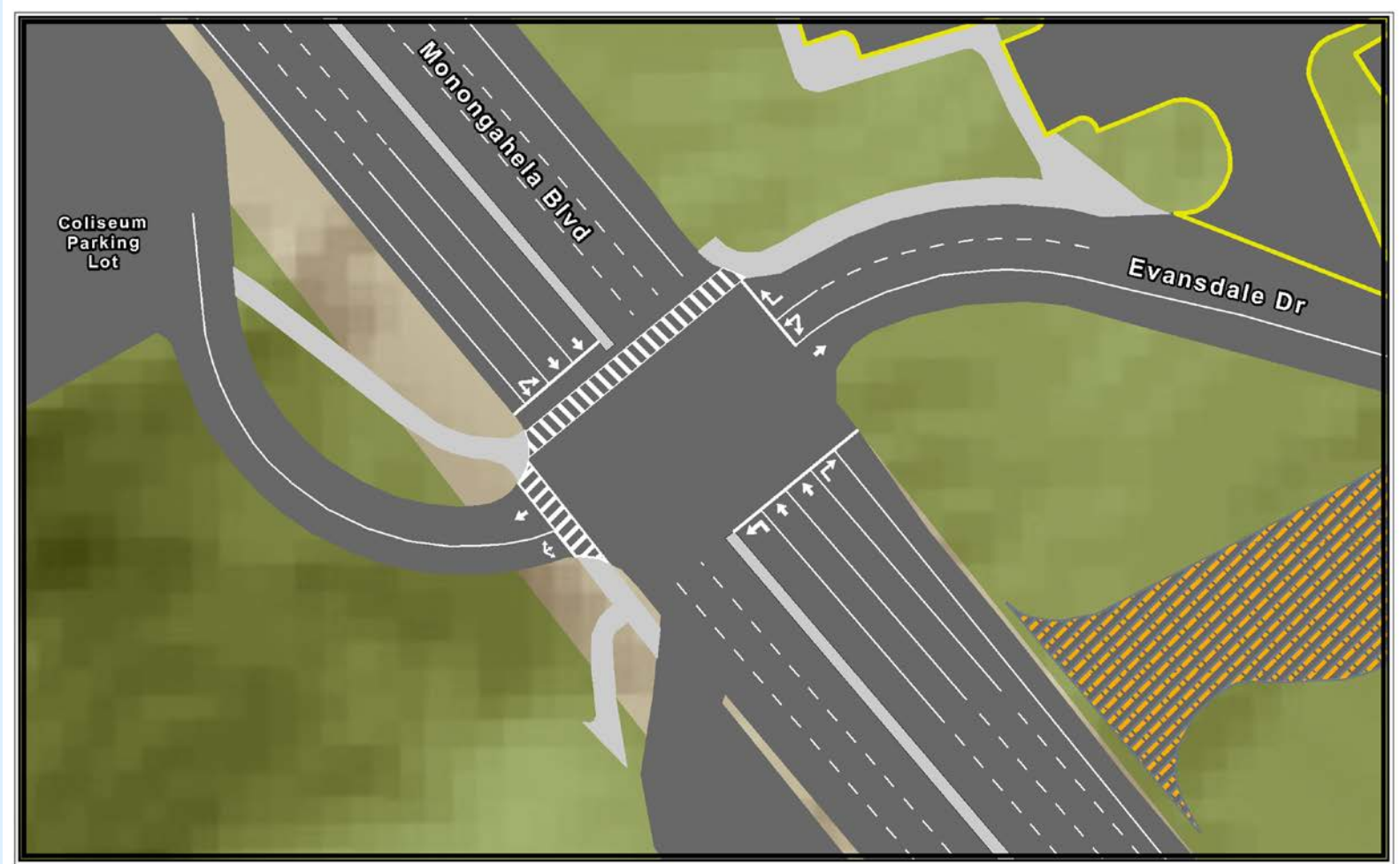
West Virginia University's Evansdale Projected Redevelopment
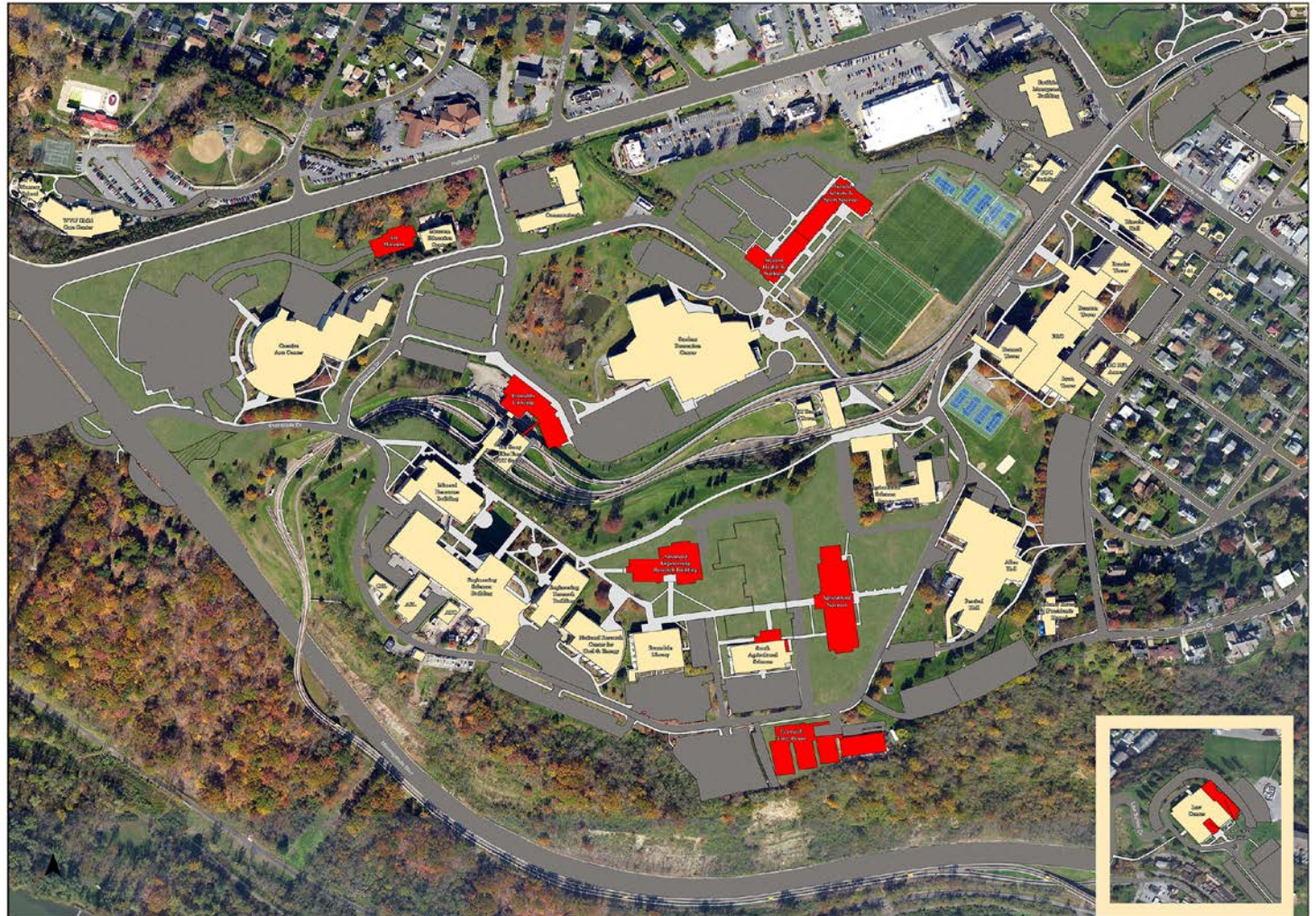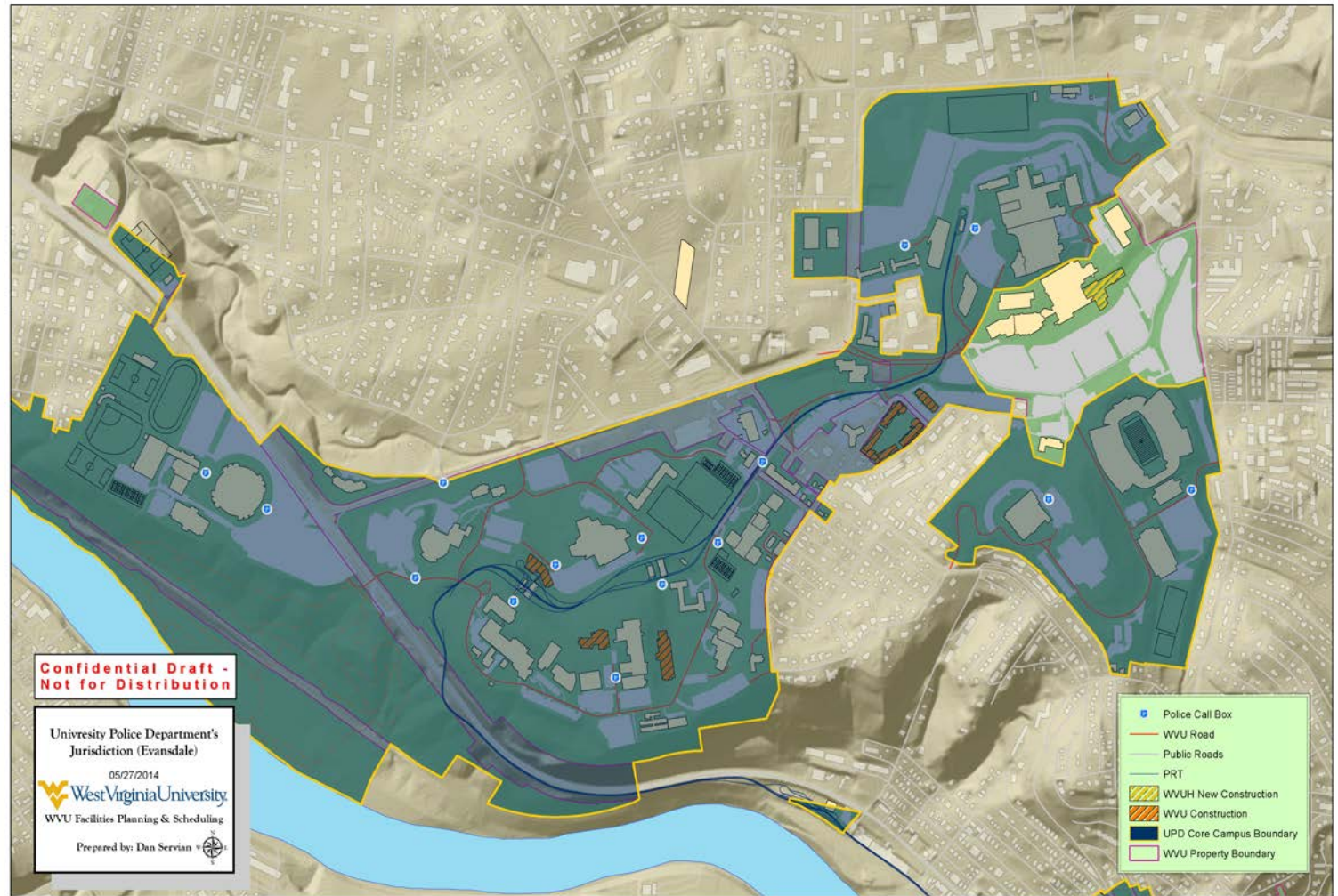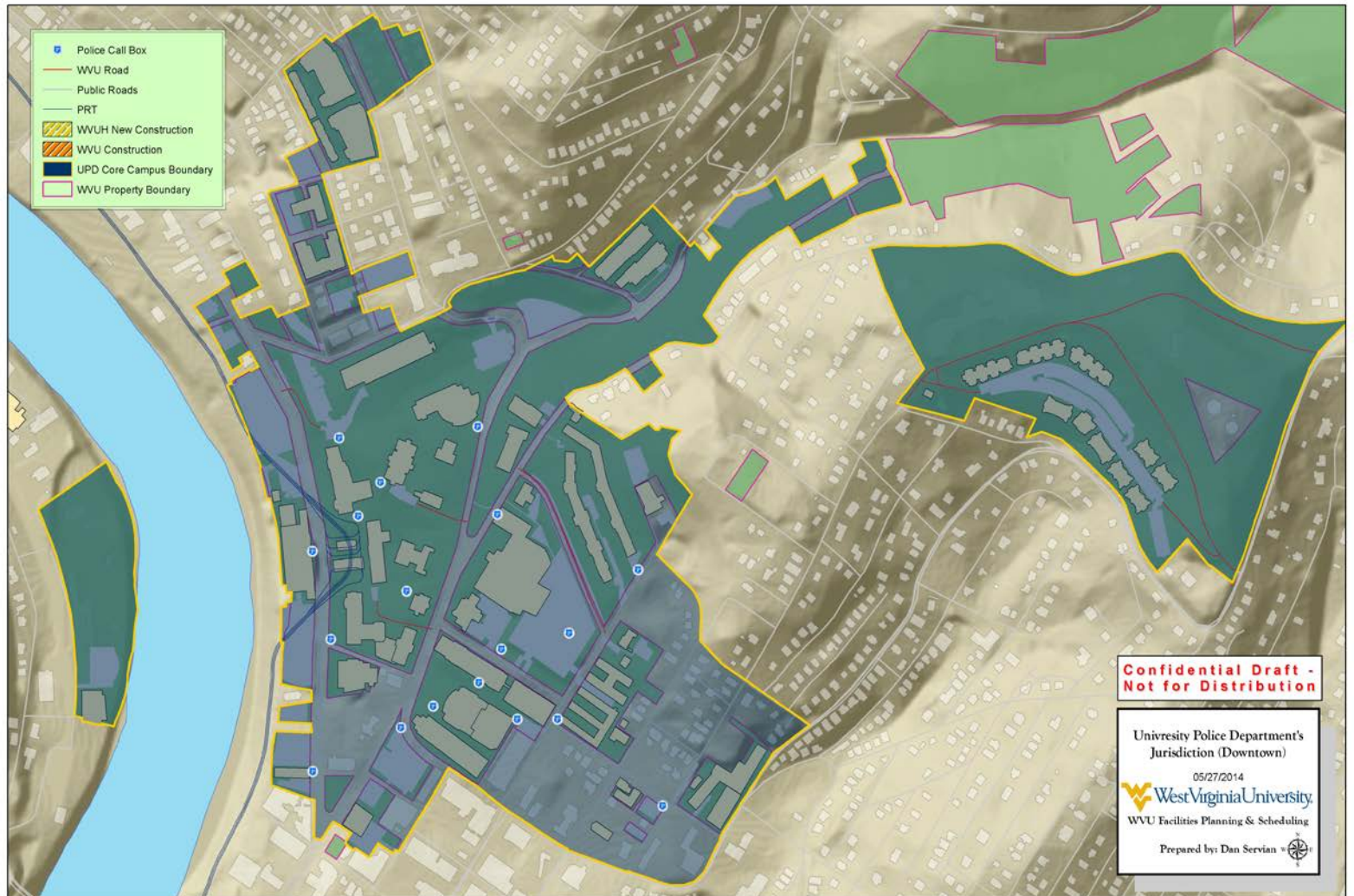
West Virginia University – University Police Department

- University Police Department use the jurisdictional map to adhere to "Cleary Act"

- The information also aids in jurisdictional matters

- Can be used for prediction models

- The data is used by students

West Virginia University Police Department
Evansdale/Health Sciences Center Core Campus Boundary

West Virginia University Police Department Downtown Core Campus Boundary

Univresity Police Department's Jurisdiction (Downtown)
05/27/2014
West Virginia University
WVU Facilities Planning & Scheduling
Prepared by: Dan Servian

Confidential Draft - Not for Distribution

Legend:
- Police Call Box
- WVU Road
- Public Roads
- PRT
- WVUH New Construction
- WVU Construction
- UPD Core Campus Boundary
- WVU Property Boundary

Valcik and Servian, 2019

Trespassing on West Virginia University Property (Dirt Bike Course)

WVU Property Boundary

WVU Property (06/02/1916)
Deed: Vol. 140, Page 463
Tax Map: 22
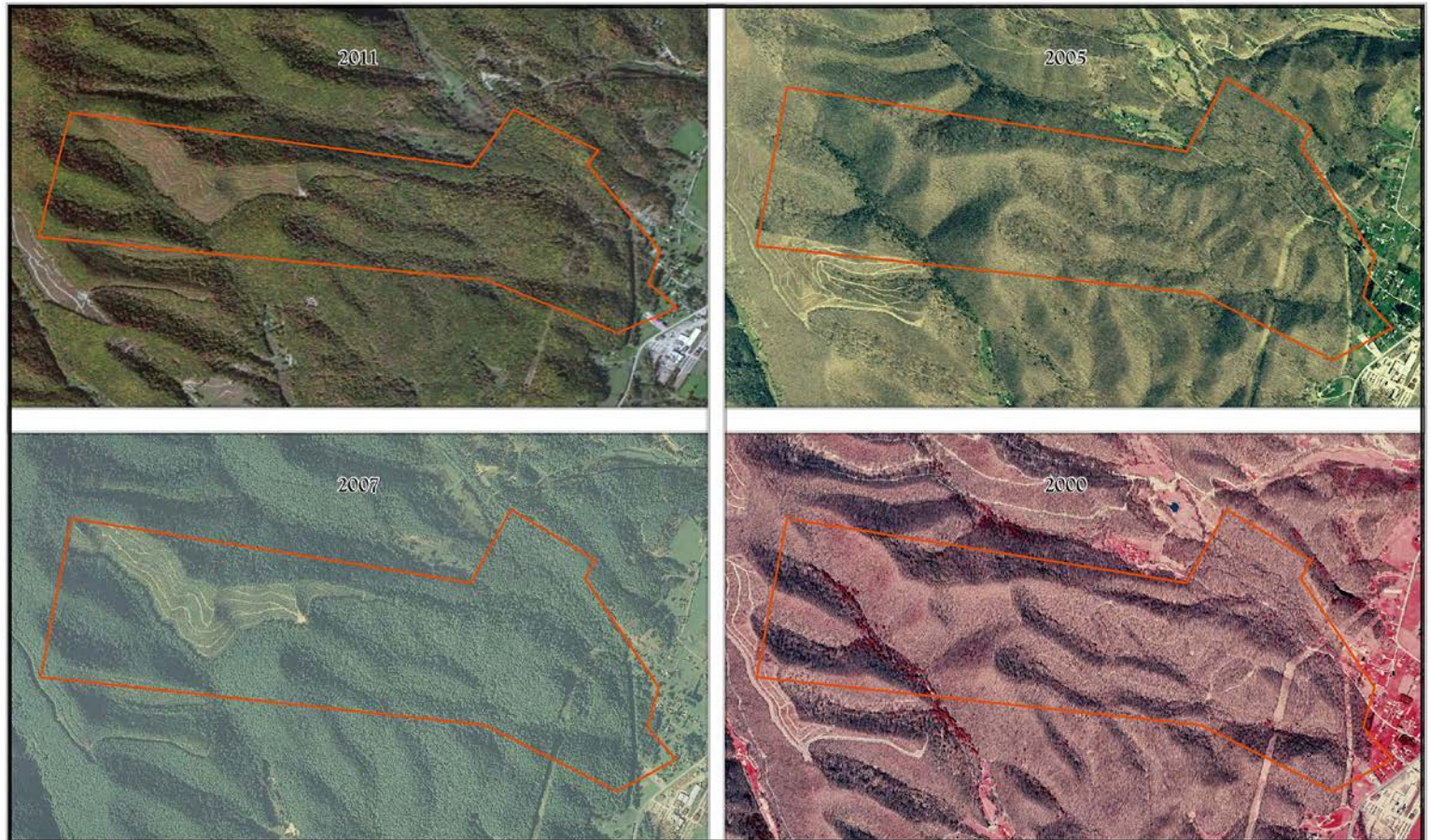Parcel: 41

Possible
Main Entry Points

WVU - Motorpool / Isolation Pasture

Note: The boundary displayed is a GIS estimate and not an official survey.

West Virginia University's Tygart Valley Forest – Possible Illegal Logging


WVU - Tygart Valley Forest (2000-2011)

*** Please note that the dates are estimations

Valcik and Servian, 2019

West Virginia University - Planning

- Method
  - Created a representation of the existing condition
    - Located where possible future facility would be located

  - Used DEMs to create the following
    - Hillshade
    - contours
    - Slope
    - Aspect

  - Layered NRCS soils layer

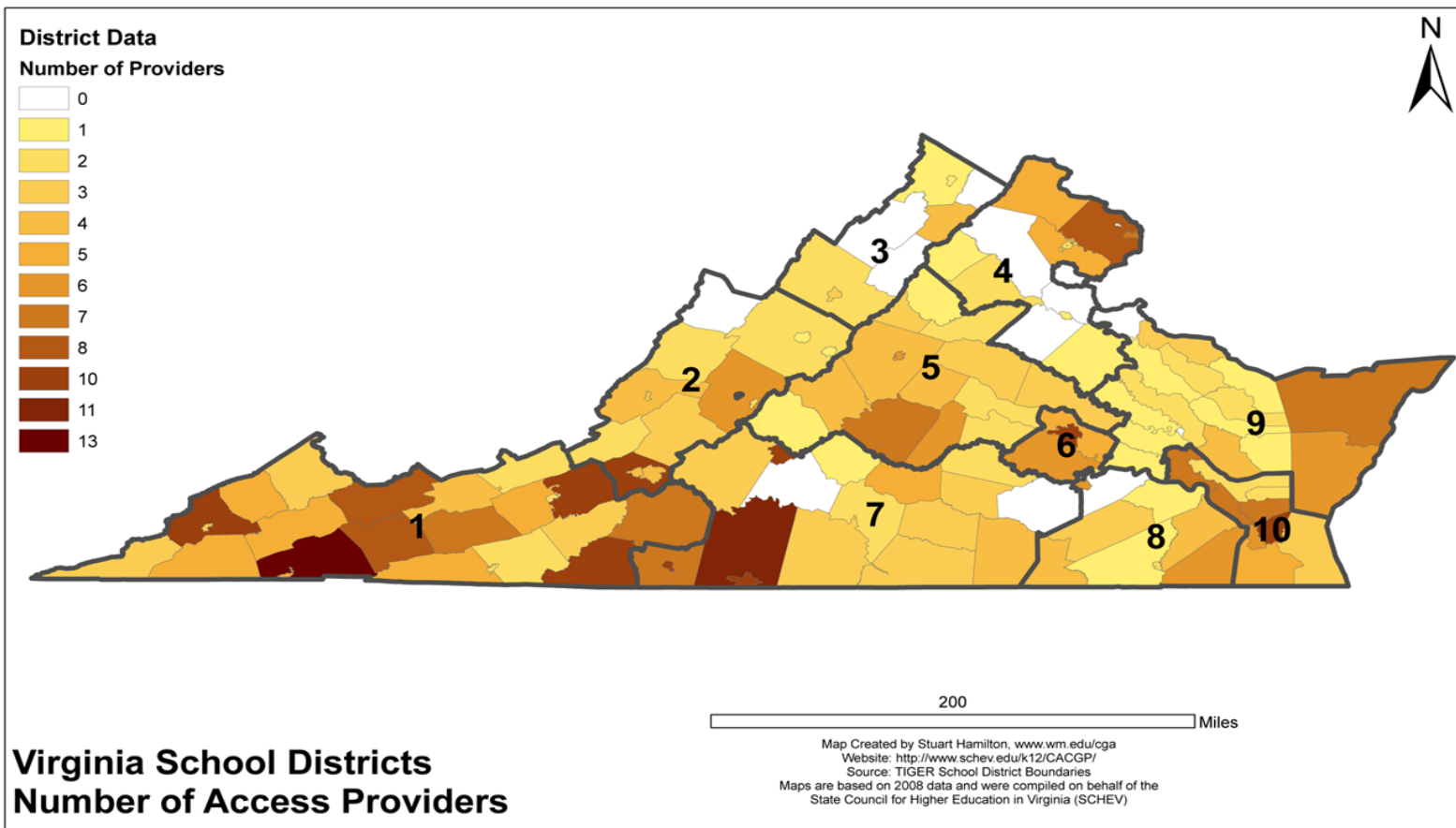# West Virginia University – Planning Packet
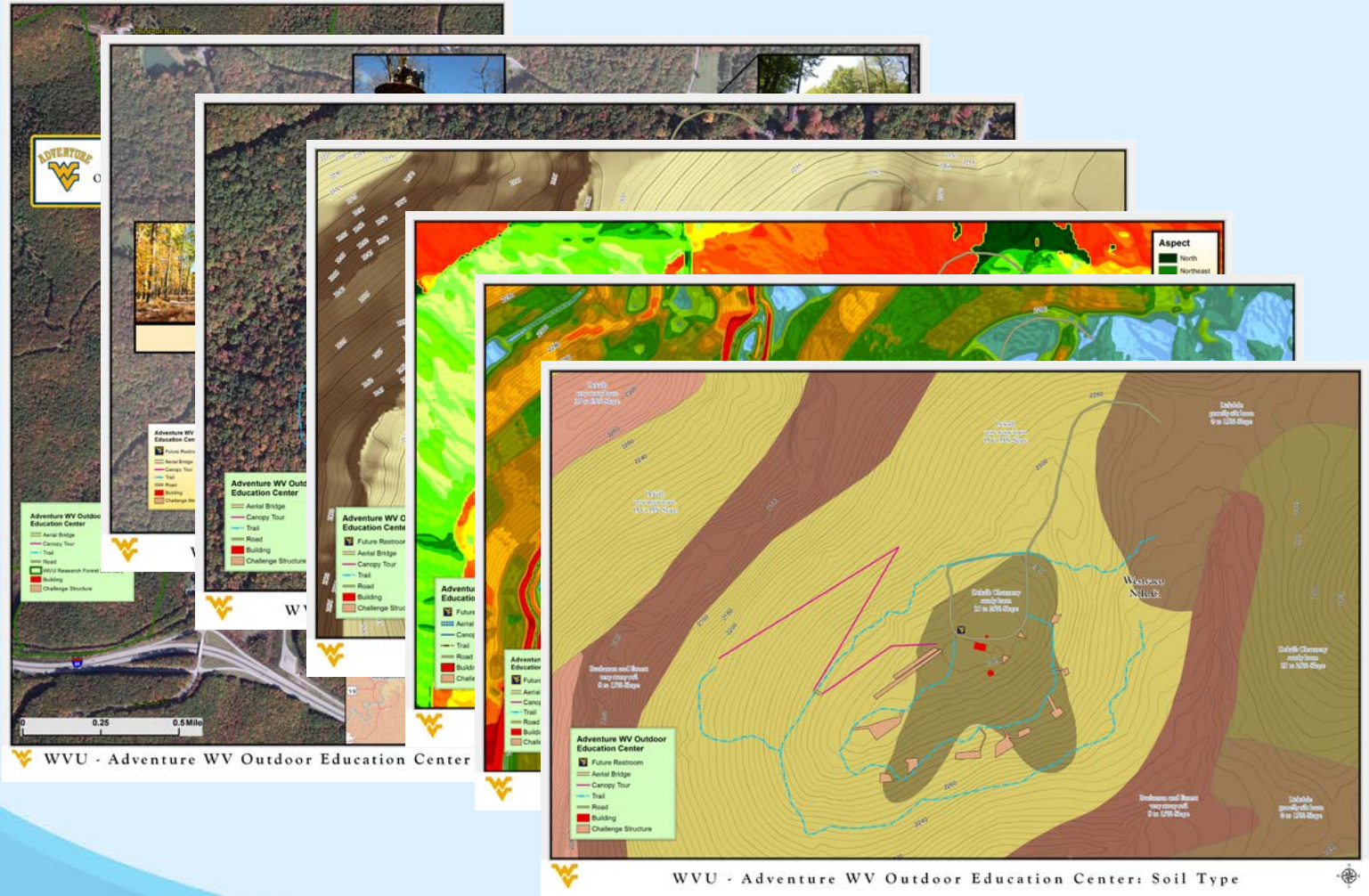
Conclusion

- A picture is worth a thousand words, an accurate picture is worth it's weight in gold.

- GIS adds an extra dimension to a research project that can potentially provide an answer or key insight on a particular research issue.

- One should consider using GIS when working through their methodology on a given research project.

- GIS can be used in a variety of different ways and tie in vast amounts of data to a geographical location.

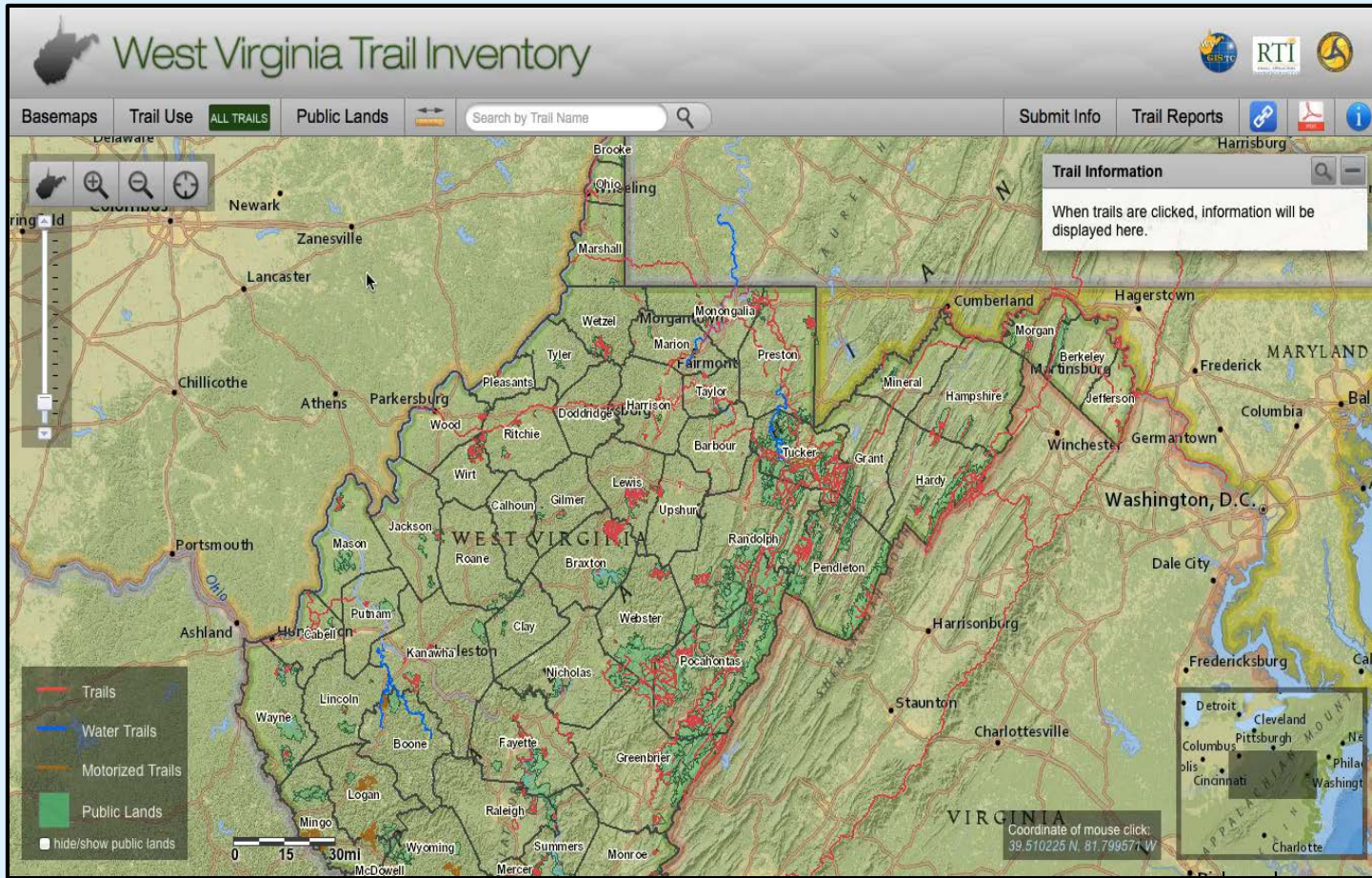GIS image taken from Valcik, 2015

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Points to Ponder

▷ Would a visual component assist you in your project?

▷ How can Gis enhance your research?

▷ Have you documented your gis maps appropriately?

▷ Are your citations correct for your gis map?

GIS image taken from Valcik, 2015

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State of Virginia: College Access Provider Distribution Map

L. Neal Holly and Nathan F. Alleman, 2019

West Virginia: Trail Inventory Process

David Donaldson and Kurt Donaldson, 2019

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State of Oregon: Outcome-based Governance for GIS

Cy Smith, 2019

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collin.edu
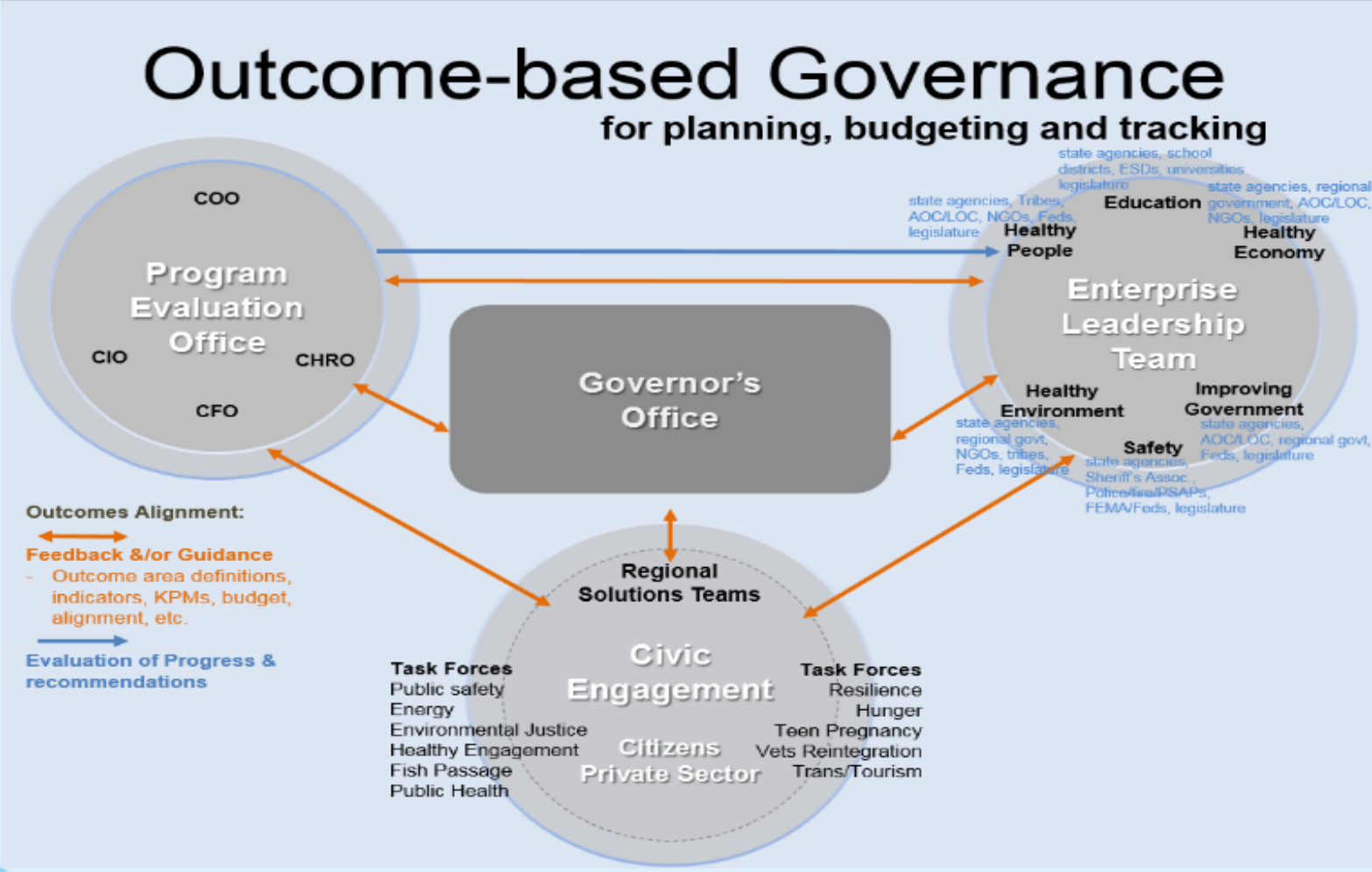
King County GIS Data Assessed Against a Portion of the GIS Capability Maturity Model

URISA GIS Management Institute
GIS Capability Maturity Model
Enabling Capability Data Assessment
Prepared by: King County GIS Center
Date: June 9, 2015
Validated by: KCGIS Management Team

Babinski, 2019

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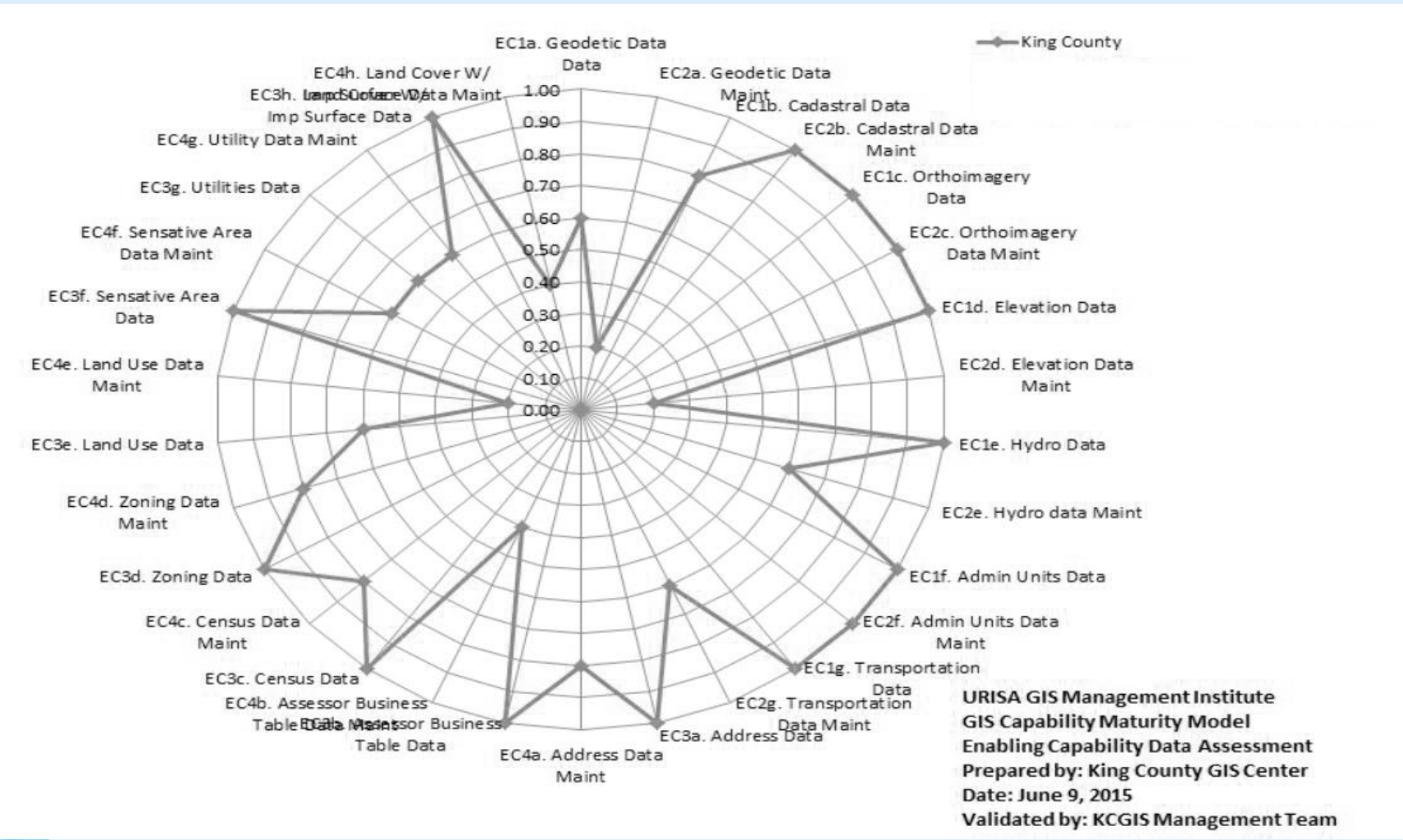
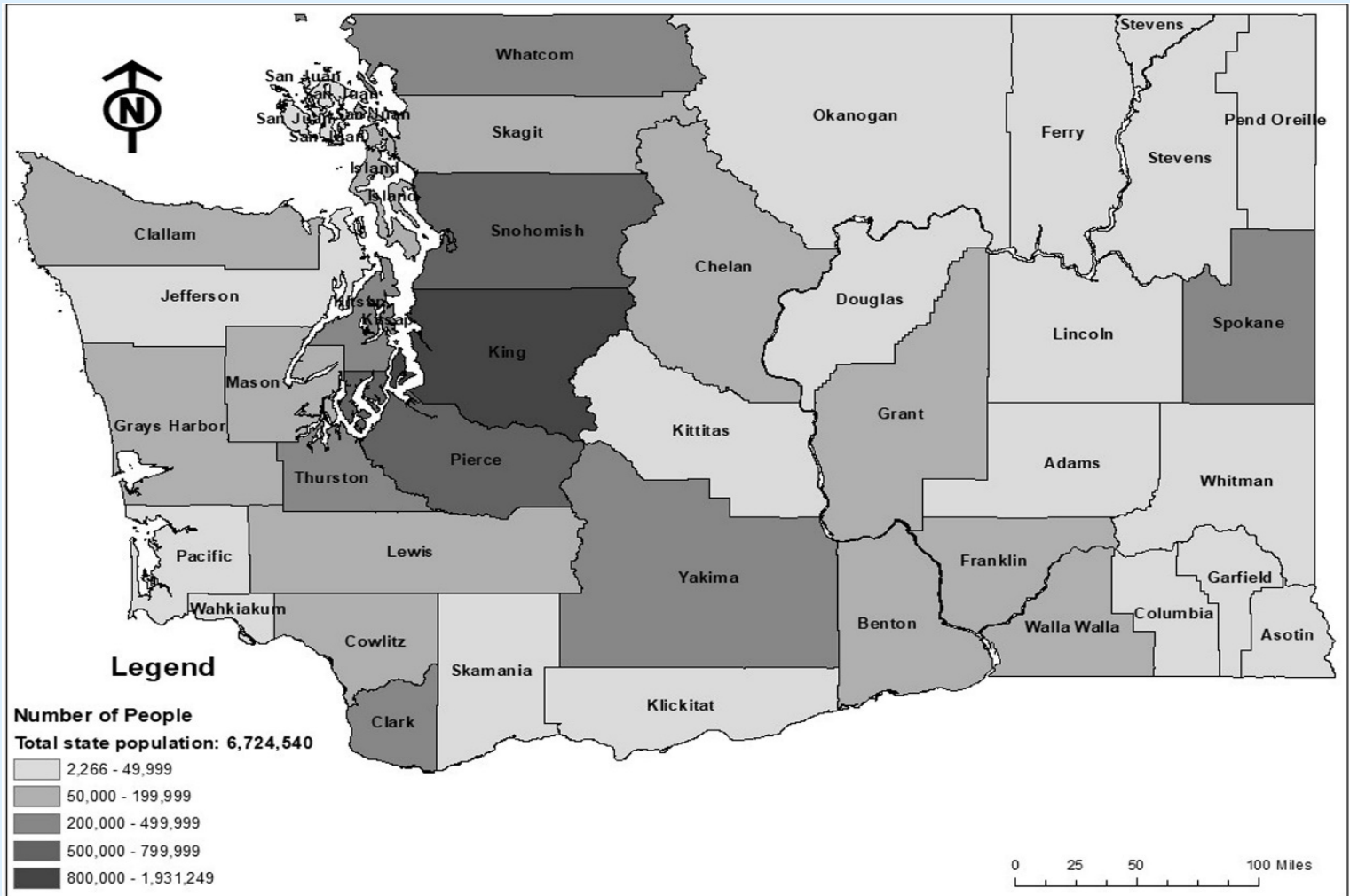# First Time Full Time Freshmen – Central Washington University – Fall 2017 – Washington Resident Point of Origin

Rose and Henderson, 2019
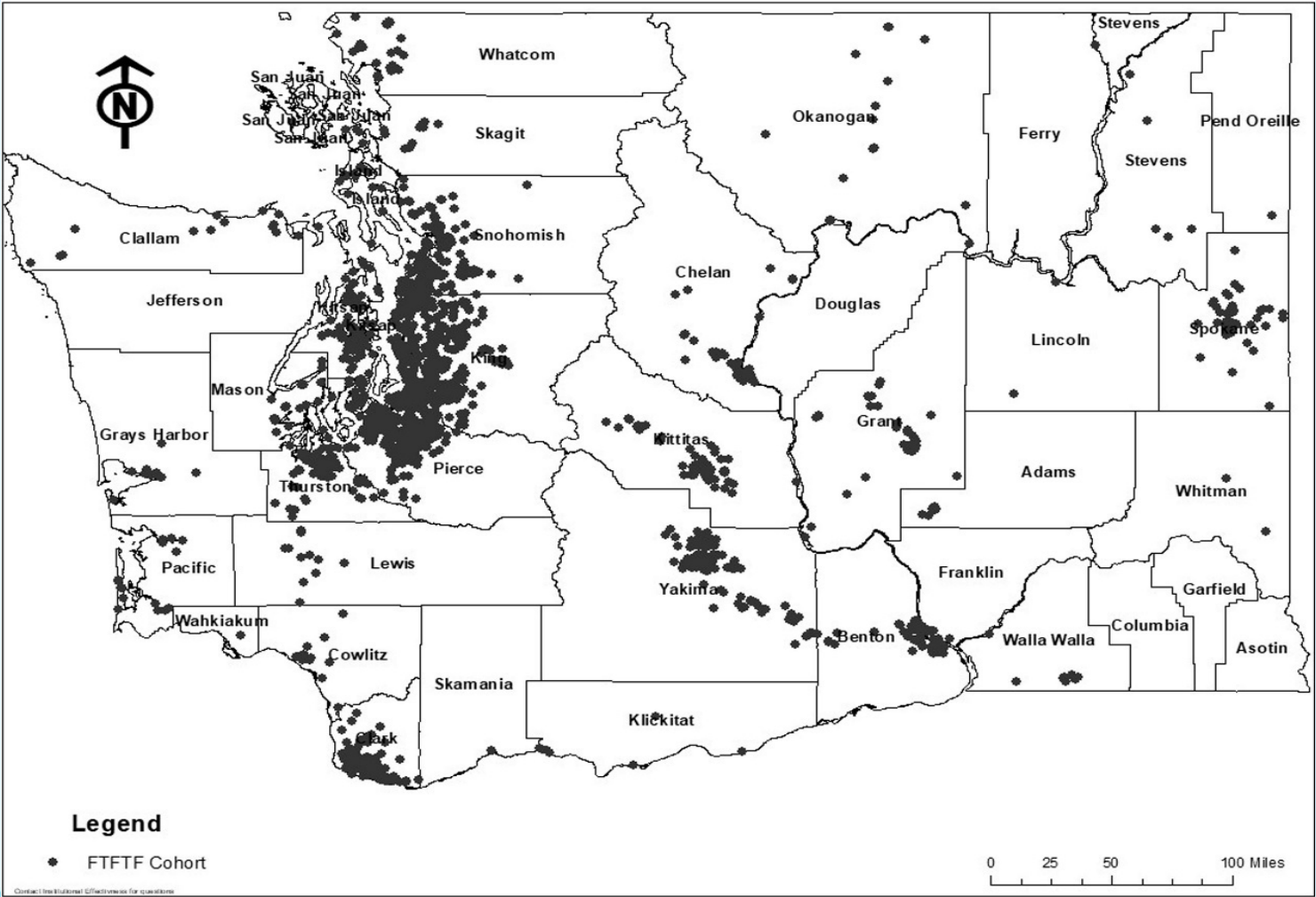
# Buffer Rings to Illustrate How Far Students Live from the Main CWU Campus and Remote CWU Centers - FTFTF

Rose and Henderson, 2019

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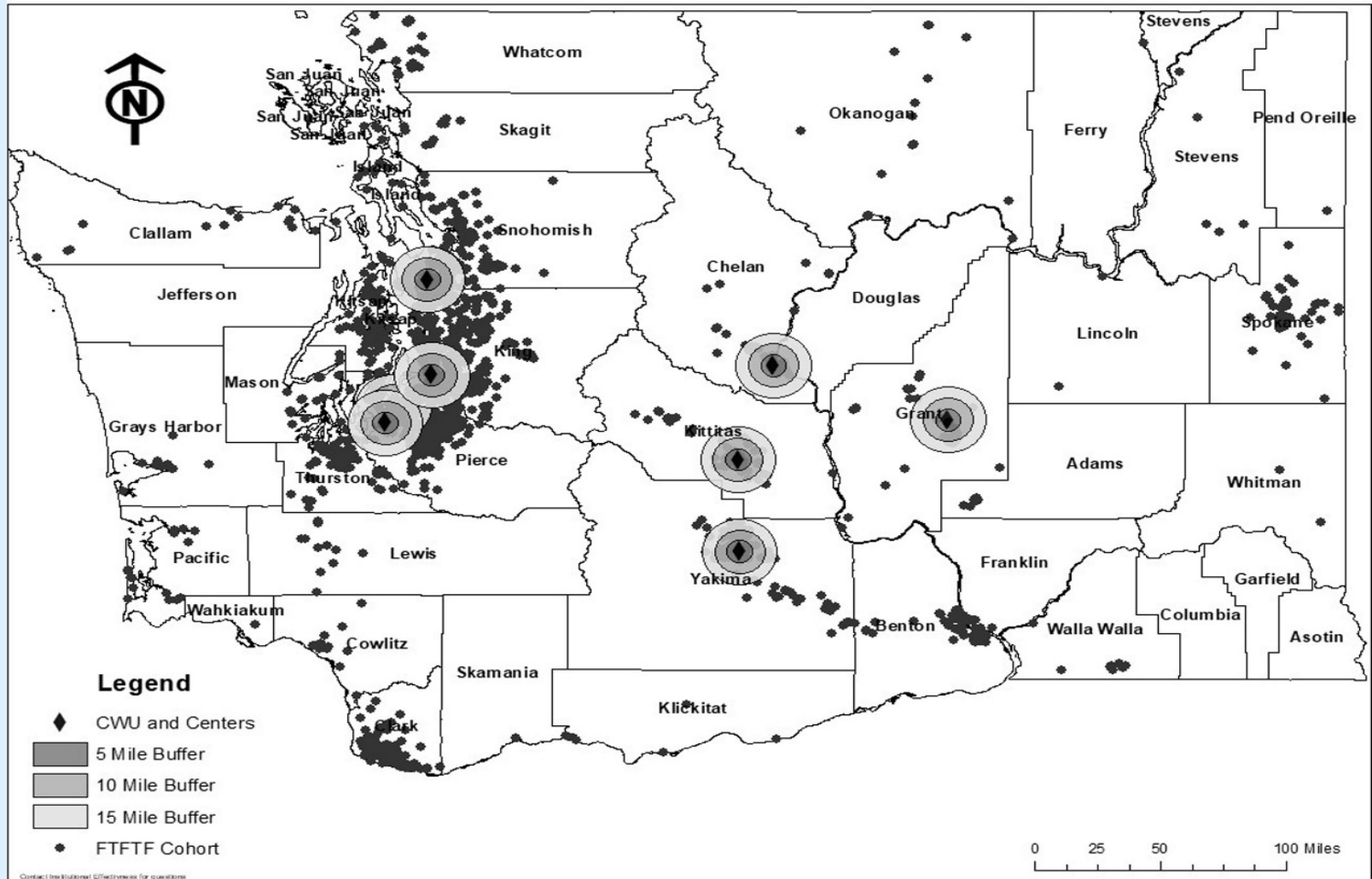
2010 State of Washington Census Report

Rose and Henderson, 2019

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First Time Full Time Freshmen – Central Washington University Choropleth Map – Geocoded Addresses

Rose and Henderson, 2019
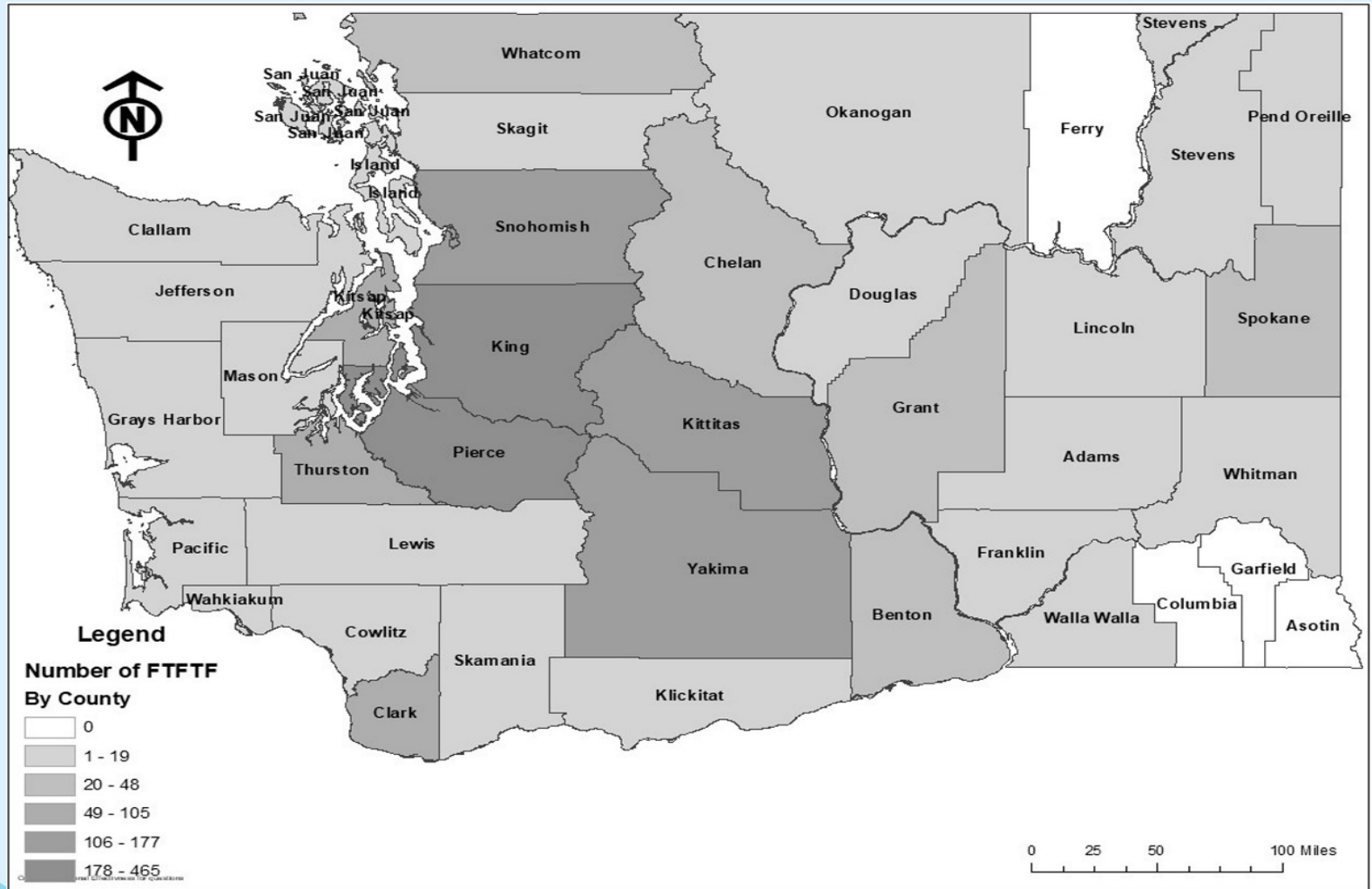
First Time Full Time Freshmen – Central Washington University Choropleth Map – Geocoded Addresses with Geographical Base Map

Rose and Henderson, 2019

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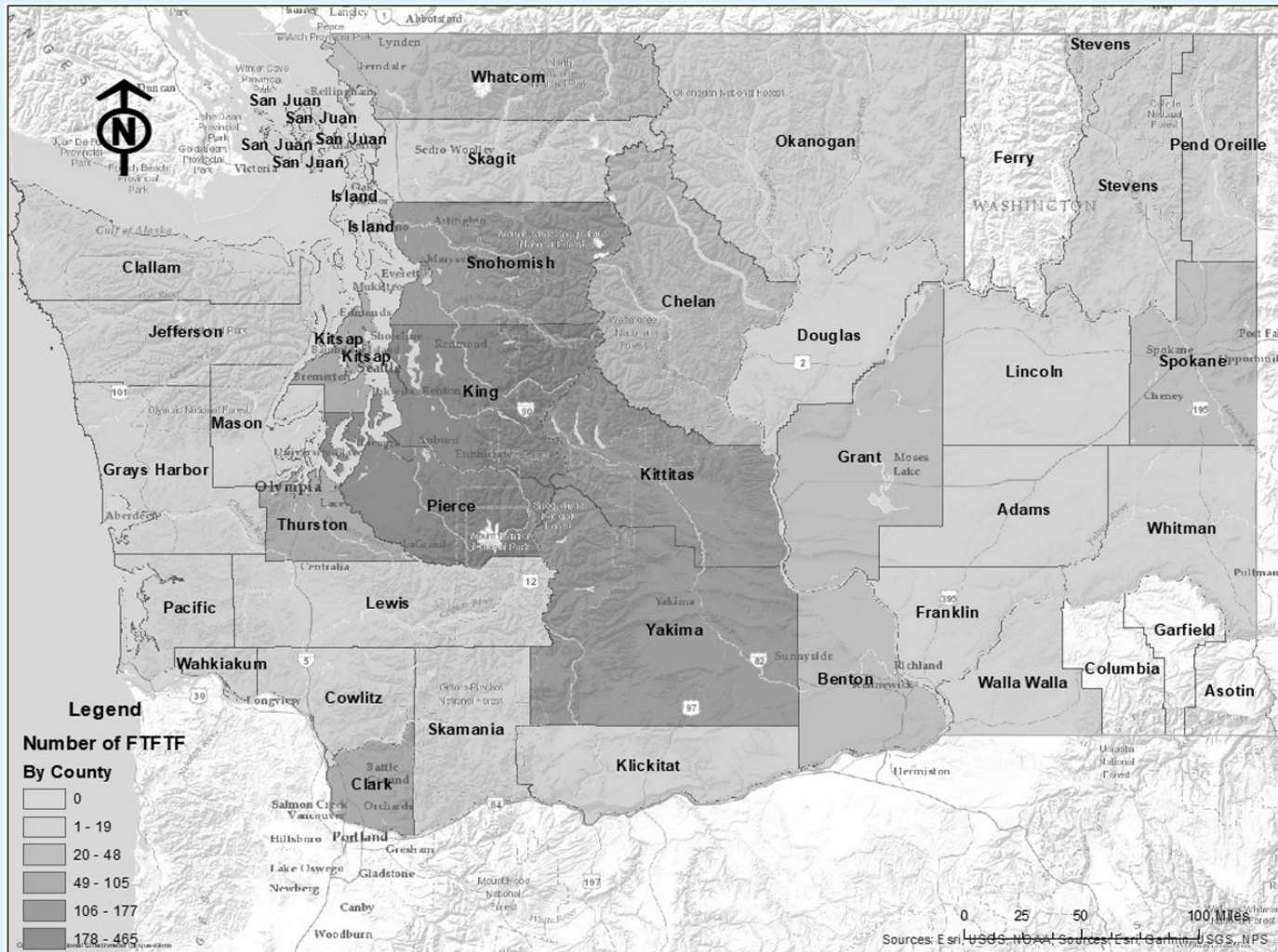
First Time Full Time Freshmen – Central Washington University Choropleth Map – Geocoded Addresses with Geographical Base Map – Census Blocks

Rose and Henderson, 2019
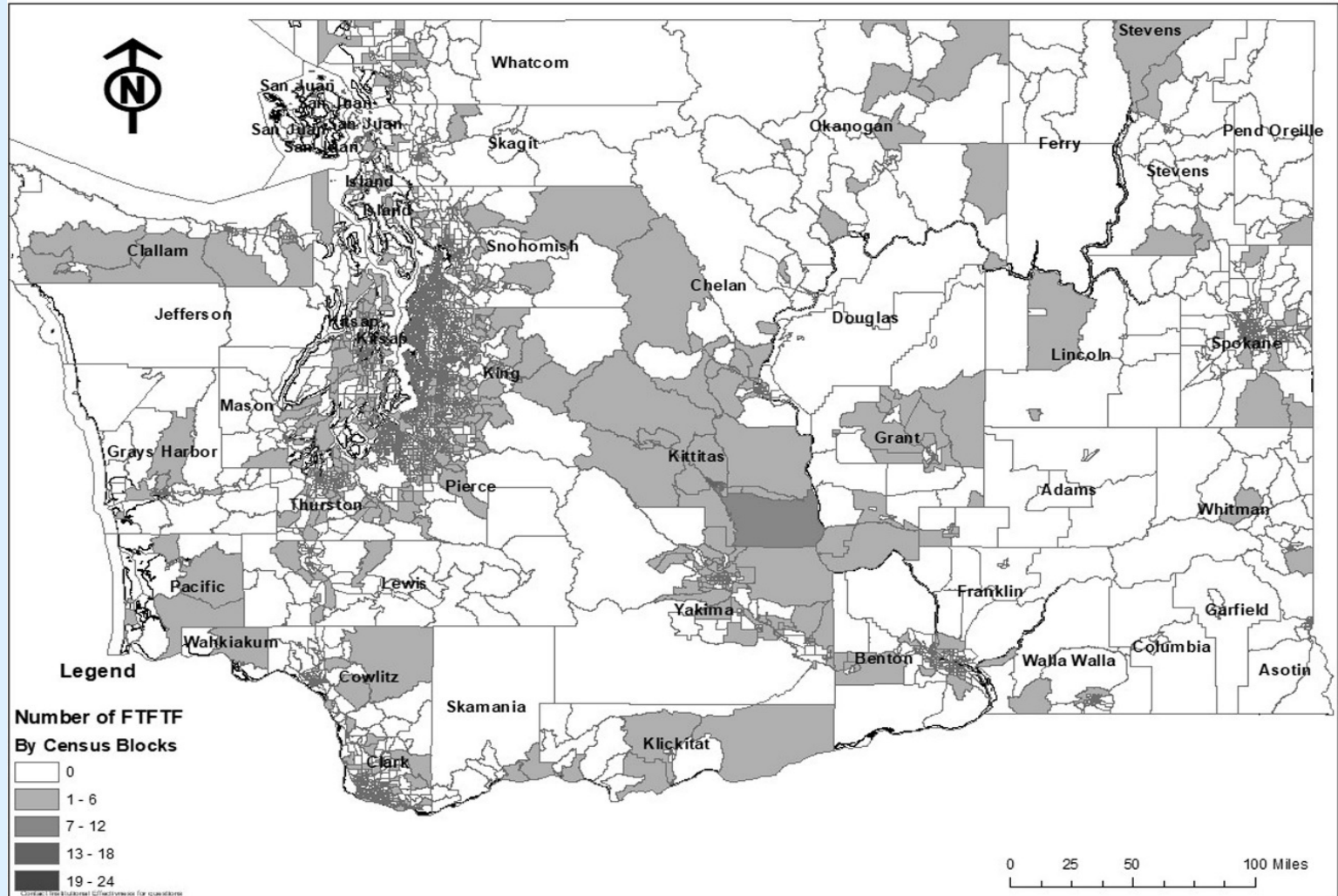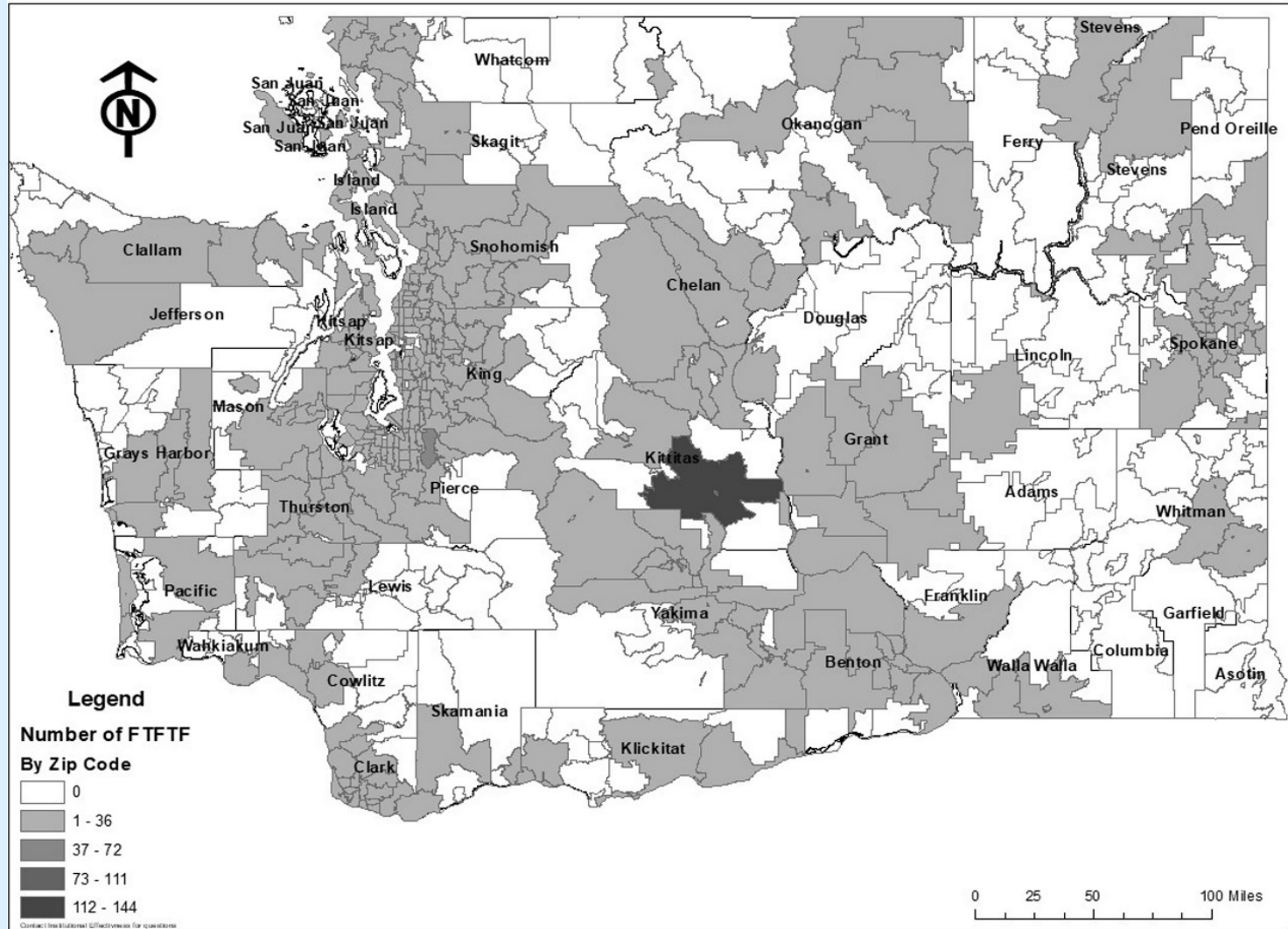
First Time Full Time Freshmen – Central Washington University Choropleth Map – Geocoded Addresses with Geographical Base Map – Zip Codes – outside city limits

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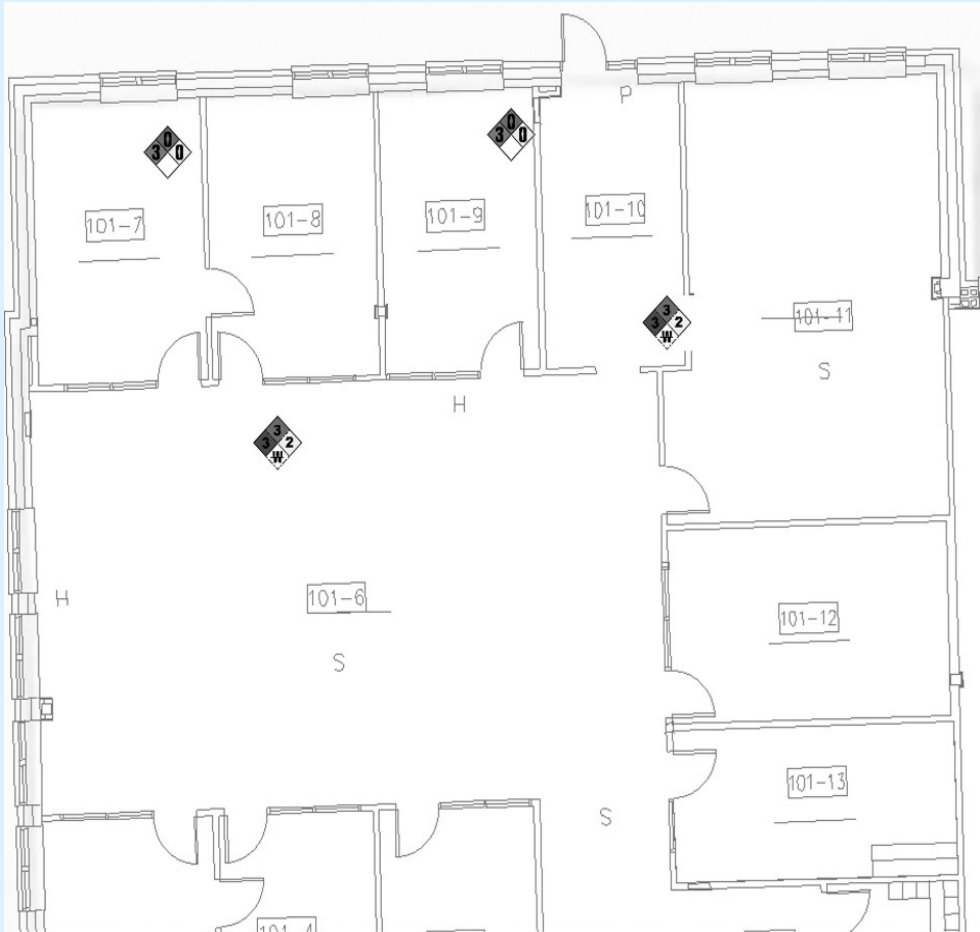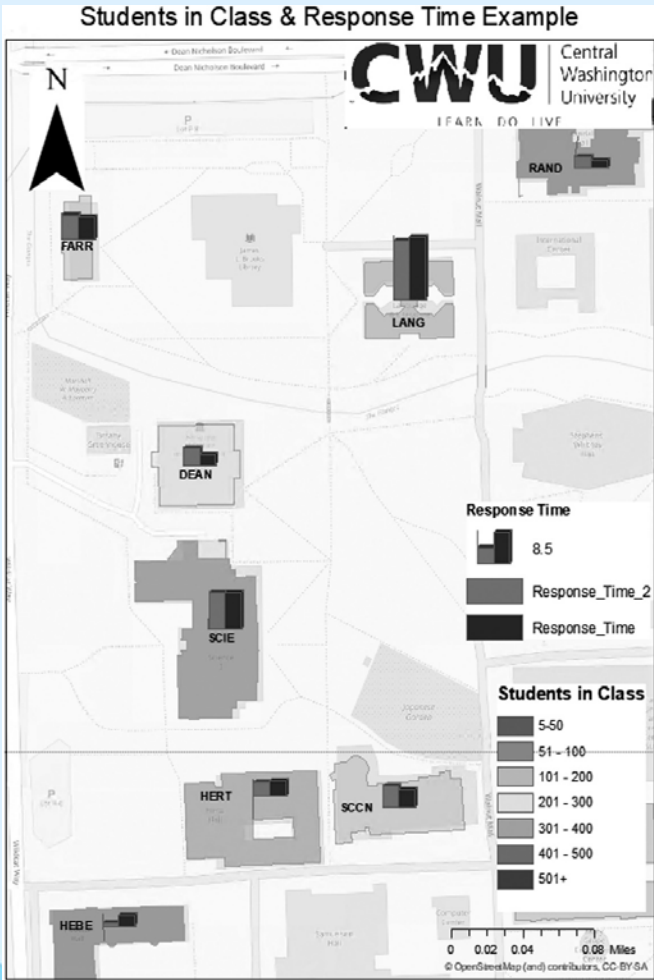# First Time Full Time Freshmen – Central Washington University Choropleth Map – Geocoded Addresses by School Districts for Recruitment Purposes
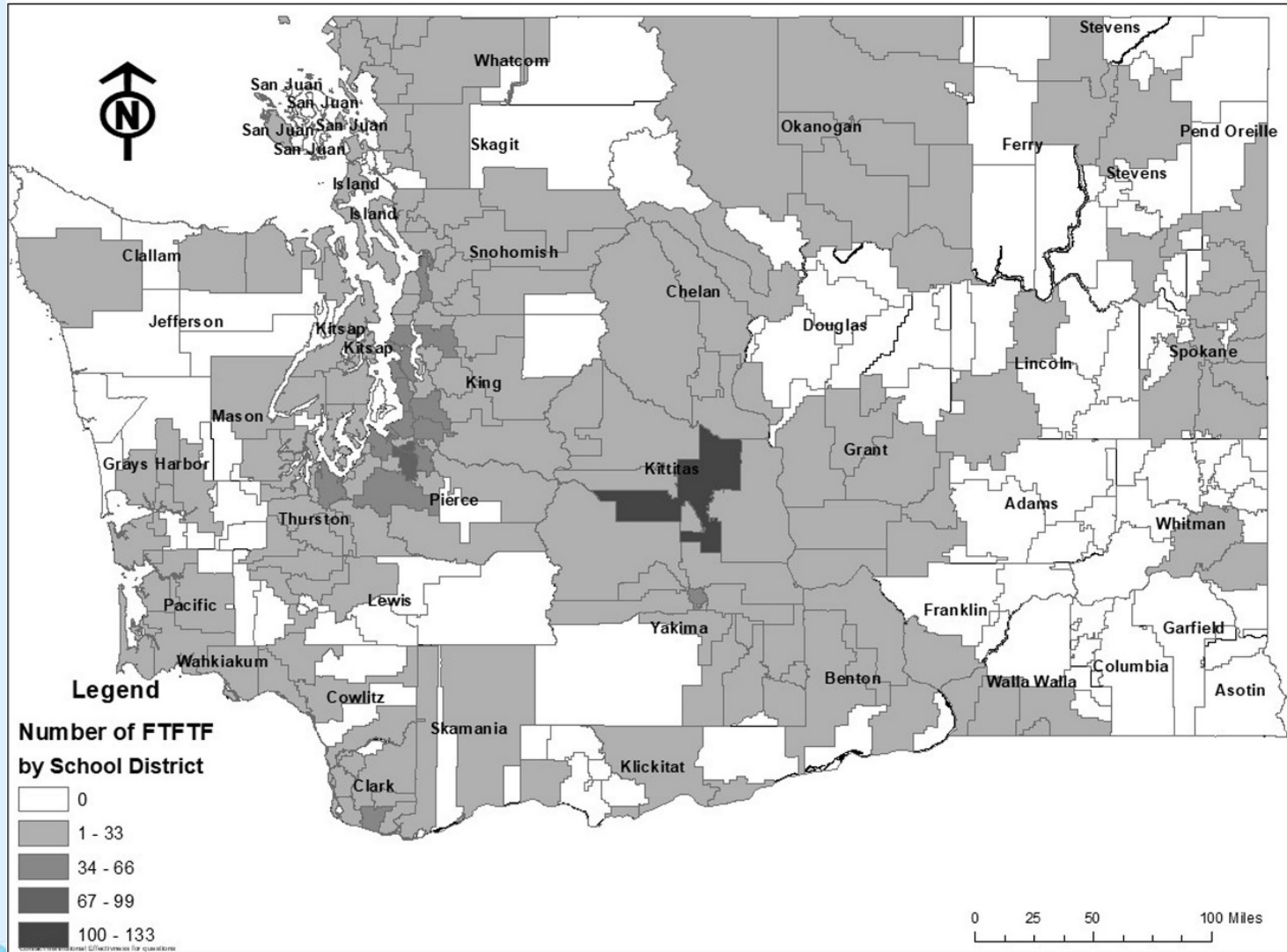
Central Washington University – Emergency Response Planning – Students in Class and Response Time and HAZMAT Examples

Rose and Henderson, 2019

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