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Humboldt

Analyzing Landslide Susceptibility in Monterey County, California Using Maxent Modeling Software

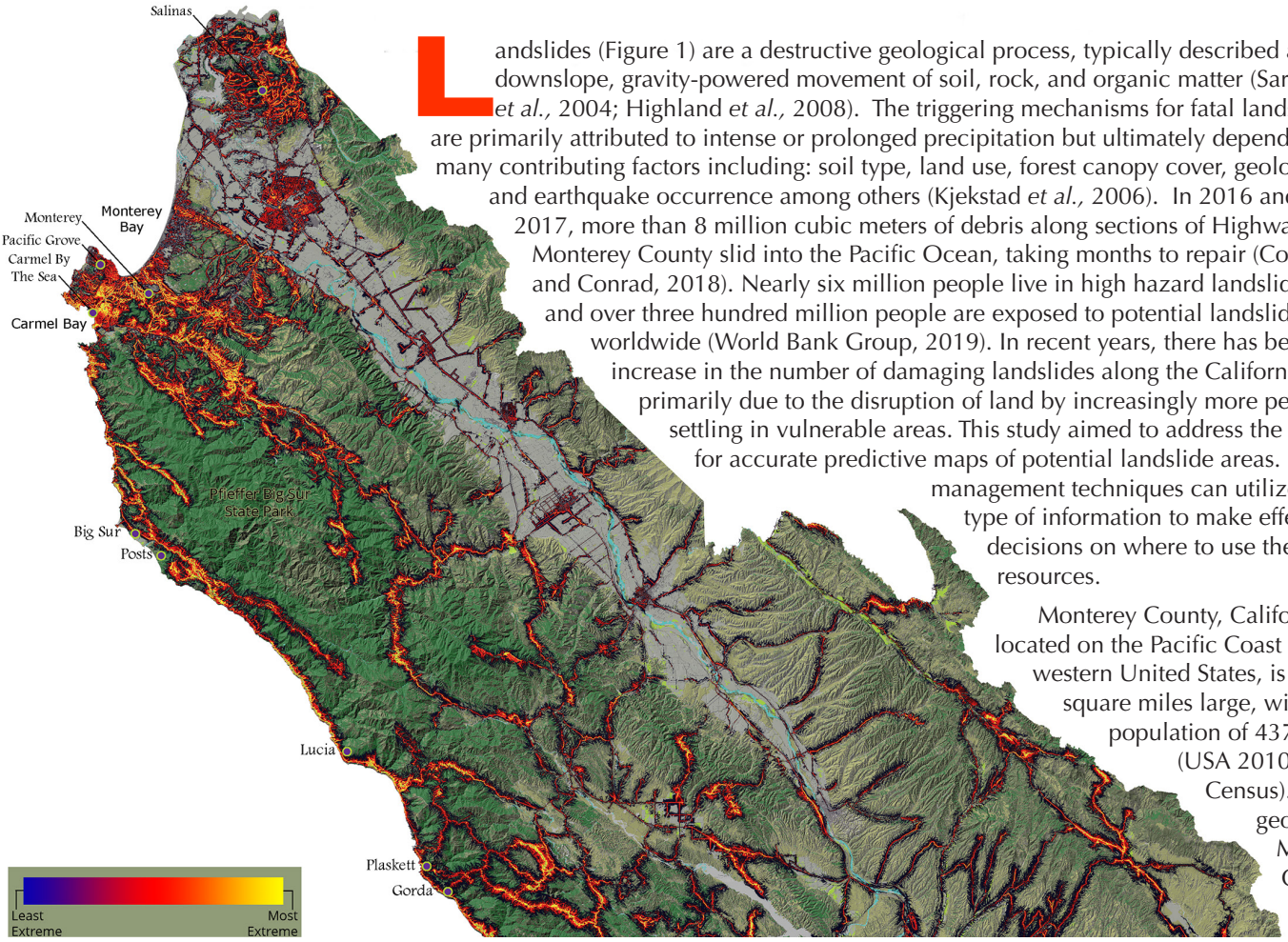


Figure 2: Map of landslide susceptibility throughout Monterey County, California.

Landslides (Figure 1) are a destructive geological process, typically described as downslope, gravity-powered movement of soil, rock, and organic matter (Sarkar *et al.,* 2004; Highland *et al.,* 2008). The triggering mechanisms for fatal landslides are primarily attributed to intense or prolonged precipitation but ultimately depend on many contributing factors including: soil type, land use, forest canopy cover, geology, and earthquake occurrence among others (Kjekstad *et al.,* 2006). In 2016 and 2017, more than 8 million cubic meters of debris along sections of Highway 1 in Monterey County slid into the Pacific Ocean, taking months to repair (Conrad and Conrad, 2018). Nearly six million people live in high hazard landslide areas, and over three hundred million people are exposed to potential landslides worldwide (World Bank Group, 2019). In recent years, there has been an increase in the number of damaging landslides along the California coast, primarily due to the disruption of land by increasingly more people settling in vulnerable areas. This study aimed to address the need for accurate predictive maps of potential landslide areas. Proper management techniques can utilize this type of information to make effective decisions on where to use their resources.

Monterey County, California, located on the Pacific Coast of the western United States, is 3,771 square miles large, with a population of 437,907 (USA 2010 Census). The geology of Monterey County is

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Figure 1: This landslide occurred at Mud Creek along Highway 1 in Monterey County, California in May of 2017 (Photograph by Mark Reid, U.S. Geological Survey).



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SAVE THE DATE! Please note that the 2020 ESRI User Conference is going remote and will now be from July 13-15.

Empower Community to Use LA City's Data Portal and GeoHub for Public Good: The Perfect Marriages of GIS and Big Data, Education and the Urban Community, Public University and Nonprofits

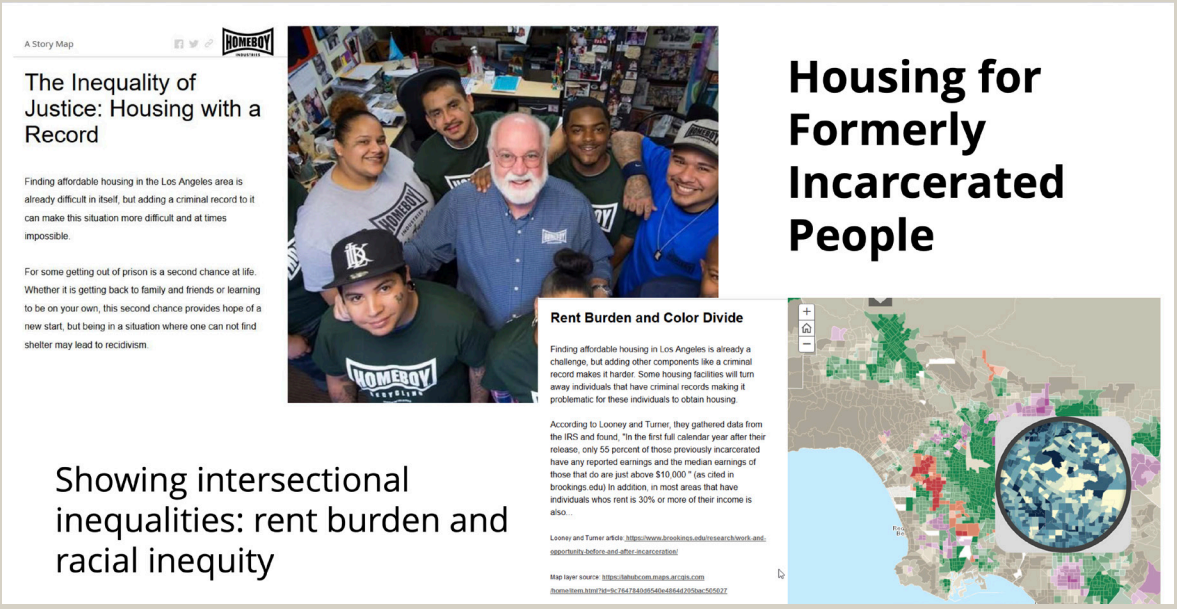


Figure 1: Mapping rent burden (% of households with rent > 30% of income) against predominant racial population to show intersectional housing challenges.

In 2018, California State University Los Angeles (Cal State LA) received a $1 M, 3-year National Science Foundation grant designed to use Big Data and geographic information system (GIS) science to promote active learning and curricular enhancements for community engagement and civic learning. We developed strategic partnerships with the City of Los Angeles Chief Data Officer, and with Community Partners' Senior Program Director and Programs and Operations Manager. Each of these organizations offered the integrity and vitality necessary for engaging Cal State LA students and faculty, serving local nonprofits and communities, and promoting the City of Los Angeles' data initiatives through the LA GeoHub and Open Data Portal (ArcNews 2016). This project closely aligns with the universities' mission (Gomez et al. 2019) to transform local communities by providing underserved residents access to data and technology (Willner 2019).

Methods

Courses: The collaborative team sent out calls for spring course redesign proposals in early fall. Applicants needed to demonstrate how using the LA GeoHub with local nonprofits could engage real-world problem solving and enhance their students' learning outcomes while impacting the Greater Los Angeles Area for the public good. To facilitate the participation of nonprofits, Community Partners recruited organizations and provided information sessions and tutorials on GIS and the GeoHub.

Once courses were selected, faculty participated in workshops on how to (1) use ArcGIS (many of them had little experience) and access data (Training Workshop list 2019); (2) create new learning outcomes for the course; and (3) match project goals among faculty, students, and nonprofits. In addition, six in-class and online workshops were developed for students taking these course as part of learning material (Training Workshop List 2019). Faculty and student participants were supported throughout the semester by two graduate assistants, a data analytics coordinator, and ESRI staff. Students created individual or group projects based on the goals mutually established by them, their faculty members, and the nonprofits. Students showcased their projects through ESRI StoryMaps or posters during a public community forum. Attendees included students, faculty, and external partners (nonprofits, Los Angeles Deputy Mayor, CEO of Community Partners, members of the business community).

Intern Selection: Students who have taken one of the spring redesign courses were encouraged to apply for paid summer internships and work for one of the nonprofits. Known as Social Equity Engagement geo-Data Scholars (SEEDS), these interns worked with their respective nonprofits on data acquisition, organization, management, and analyses. As a final culmination, SEEDS presented their work to all related constituents at an end-of-the-summer gathering that showcased their results and highlighted the impact of their work.

Results

Courses: We selected five courses for the first cohort (e.g., ANTH3200 – Where in the California Community Are You?; GEOG3690 – Fundamentals of GIS; SOC348 – Sociology of Race/Ethnicity, Class, and Gender; SOC4050 – Service Learning and Sociology Internships; and SOC4420 – Social Change). A total of 104 students who enrolled in the redesigned courses consulted with 28 nonprofits and produced 41 projects (Big Data Community Forum, 2019). One student, for example, created a Spyglass app that allowed users to see how rent burdens differentially affect neighborhoods of color (Figure 1) (Examples of products,

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2019). Additional examples of student projects that are important to our communities are shown in Figures 2-4.

Interns: We selected seven SEEDS to work with seven nonprofit organizations during the summer of 2019. Collectively, SEEDS worked a total of 1,440 hours (SEEDS projects 2019). Most began with a low level of confidence in their technical skills and all finished their internships confident in their projects and in their technical growth, which included strides in using the LA GeoHub, statistical computing and data management software, and coding. Many students were able to leave behind instruction manuals and structural frameworks for nonprofit employees and future interns to keep the projects going. All nonprofits expressed interest in more workshops, more help, and a long-term connection with the project having seen the immediate pay offs in the first year.

The impact of students' academic trajectory and self-assurance in using GIS was remarkable. Tarkhanyan Takouhi, a senior in Psychology and a GIS novice, cleaned up the Los Angeles Regional Reentry Project's (LARRP) outdated database and created an interactive map of resources and services for the reentry community. LARRP used her product to secure a $175,000 grant and offered her a full-time position that she described as "a dream job". She will further expand these interactive maps as a tool for their community resource advisors. Another student, Alfredo Estrada, a geology major, taught himself Visual Basic coding and cleaned and organized over 100,000 data entries for City Plants (during 2014-2019). He produced visualization products and set up automatic updates when new entries are added to the datasheet. Now, City Plants can see the distribution of their trees and spot underserved areas where they need to focus for the next year. City Plants is a partner of Mayor Garcetti's urban forest development to combat climate crisis (Mayors' Office Press release, 2019). Alfredo, inspired by internship experience, decided to enroll in our GIS certificate program. Martha Solorio, a junior in geology who worked with Wildwoods Foundation, increased her interests in GIS and took more GIS and coding courses. Her skills and interest secured her a summer internship position at ESRI for the upcoming summer 2020.

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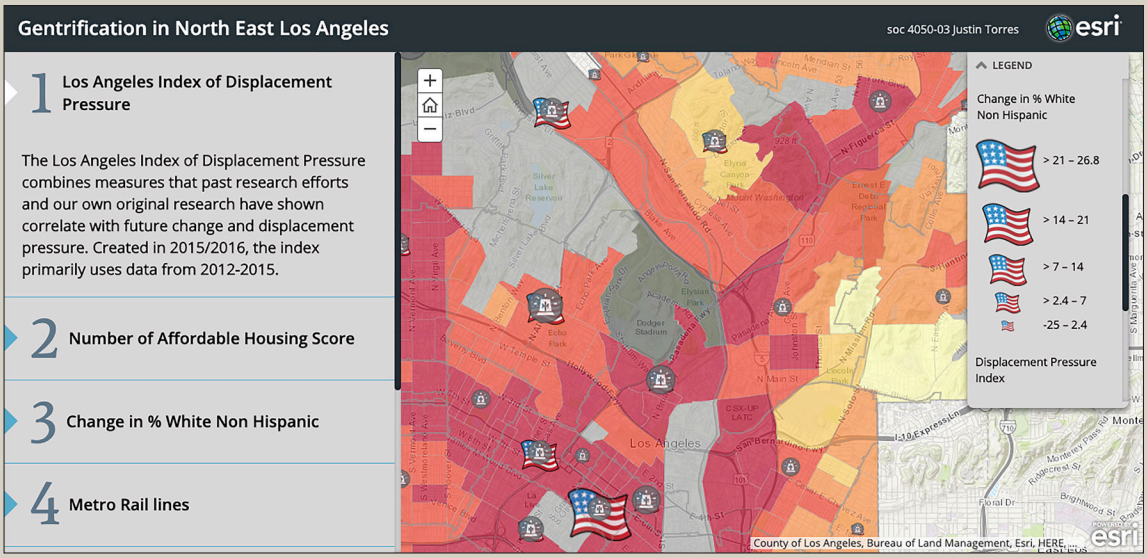


Figure 2: Gentrification map in North East Los Angeles (change in white non-Hispanic population).

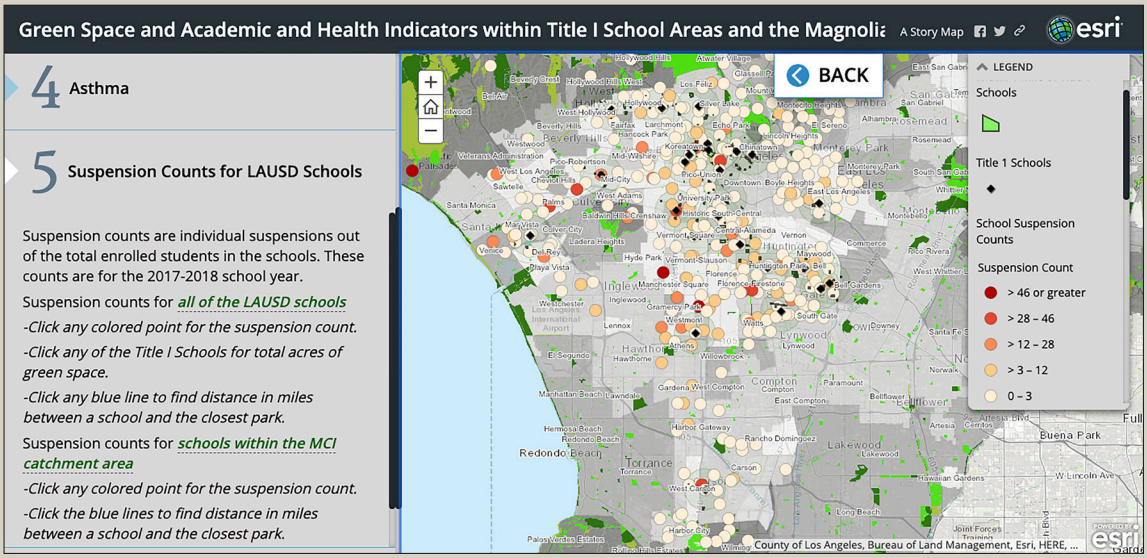


Figure 3: An interactive story map showing student suspension counts and green spaces in a student class project: Green Space and Academic and Health Indicators within Title 1 School.

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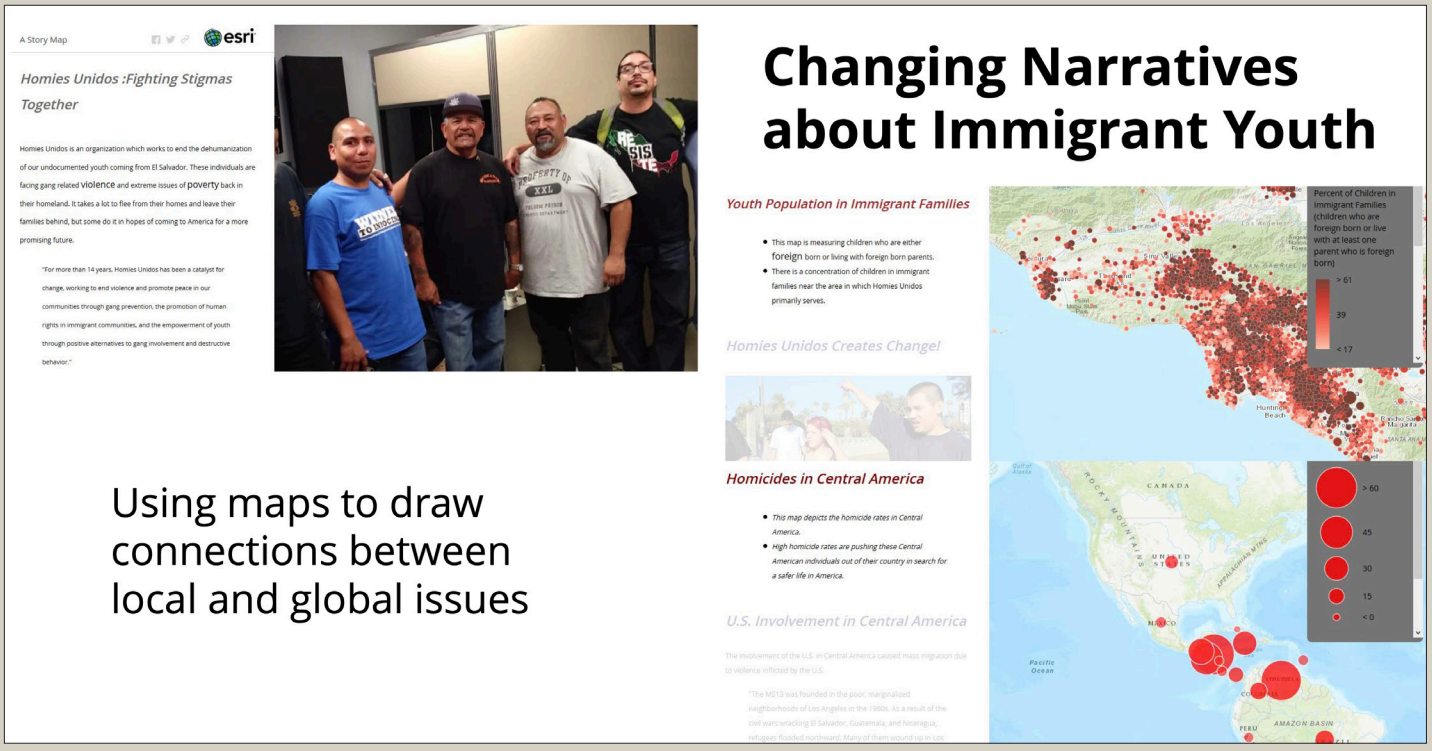


Figure 4: Mapping immigrant communities against homicide rates to situate local issues in global processes of Change.