Nick Santos

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Current Affiliations

- Geospatial Applications Developer, UC Davis Center for Watershed Sciences
- Instructor, UC Davis Extension
- Software Developer, University of Oregon
- GIS Technician, Applied Technology and Science (A-T-S)
- GIS and IT Consultant

Education

University of California, Davis

B.S. with honors in Environmental Policy Analysis and Planning, 2009
Minor in Geographic Information Systems

Enrolled, MA in Geography. Specialization in Geographic Methods, Models, and GIS. Expected 2019

Research Activities

California Environmental Flows Framework

Providing geographic data support and development, as well as systems optimization analysis for the development of a stream flow framework based on stream hydrology, human impacts, and species composition and health.

McMurdo Oceanographic Observatory

Developed custom software for capturing, storing, managing and displaying data, video, and ultrasonic audio coming from the McMurdo Oceanographic Observatory in McMurdo Station, Antarctica. Work included development of custom software to interface with specific instruments. Built a kiosk for display on station, set up restreaming of feeds to station TV, and set up infrastructure to pass limited media to public Internet. http://moo-antarctica.net.

Estimating Evapotranspiration with METRIC and Landsat

In conjunction with evapotranspiration (ET) experts, I translated a model that helps estimate consumptive use of water through ET into Javascript for use in the Earth Engine remote sensing environment. Additionally, I wrote significant Python code to help compare results from 7 different ET models for use by the State of California in selecting models for policymaking.

Streamlapse

Streamlapse builds time lapse videos of rivers with hydrographic and temperature data. Videos available at https://vimeo.com/channels/streamlapse.

Virtual Field Trips

Captured spherical imagery, audio, and localized scientific data for locations in the Tuolumne and Merced River Watersheds in Yosemite National Park and connected them together into educational virtual field trips. Sample available here.

Amaptor

Amaptor is a Python library that unifies the mapping APIs between ArcMap and ArcGIS Pro. It allows developers to code against a single API for cross-platform applications. Free and open source.

Flood Mitigation

Developed calibrated statistical model (random forests) using Python, scikit-learn, and Django, to predict relocation sites for towns at risk of severe flood hazard. Modeled flood risk for small Midwestern communities using Hazus-MH.

PISCES

PISCES is software and data describing the best-known ranges for California's 133 native fish and numerous non-native fish. The data are compiled from multiple sources and are expert verified. Layers and the software can be downloaded online. My work was in authoring the software, database, and documentation. http://pisces.ucdavis.edu

California Drought

We classified multiple years of Landsat imagery to estimate crop fallowing resulting from California's drought. Additionally, we are developing tools to optimize water deliveries based on water rights – my involvement has been in generating the hydrologic networks necessary for the economic optimizations.

Monitoring Amphibian Breeding with Remotely Sensed Imagery

We are exploring methods for using Landsat and drone imagery to remotely monitor changes in montane meadow toad breeding habitat over the summer season.

Sierra Meadows

Generated hydrologic attributes for our layer of 17,000 Sierra Nevada mountain meadows. See http://meadows.ucdavis.edu/.

Cosumnes Research Group

I provide GIS, data management, video, and drone imagery for a multi-campus, multi-decade research study in floodplain restoration involving over a dozen researchers.

arcpy_metadata

ArcGIS supports robust geoprocessing and map generation from Python, but provides no interface to add or edit metadata indicating what a program has done to a dataset. This open source library, initially written for PISCES, provides that programmatic interface to ArcGIS metadata from Python.

Climatic Variable Extraction

Built a general-purpose tool for extraction of climatic and elevation data to attach to meadows and catchments generated from dam locations.

Other Projects

Climate Mirror
Started and managed a large volunteer effort to collect and provide online copies of climate research information for safety and redundancy. Involved infrastructure, management, and public fundraising. https://climatemirror.org.

ShowerCap
Web application and mobile apps to guide and motivate individuals to reduce shower duration and save water. http://showercap.us.

Consumer Environmental Impact Reduction
Through Environmental Consumer, I built web-based tools to enable individuals to: 1) quickly send companies letters about their products' environmental performance; 2) look up profiles for municipal curbside recycling services to easily answer the question "is this recyclable?"; 3) Get answers to questions on how to reduce their environmental impact.

Vote Climate Change
My fellowship project for Roosevelt Institute. A web application allowing individuals to very publicly tell elected officials that votes they received were because of their position on climate change.

Consulting
Recent projects in consulting include web mapping and applications for the Tahoe Rim Trail Association and GIS services for Nevada County Municipal Services Review and GIS support for riparian restoration in a major San Francisco Bay Area watershed. Past projects include web-based applications for viewing and delivery of commercial digital photography and a web application for collaborative writing of fiction.

Courses Taught

- Instructor for the Coursera Specialization in GIS, equivalent to ~2 quarters of GIS training – 42,000 active student learners as of January 2018 and 4.8/5 rating on over 500 reviews. Ranked 2nd highest in Data Science on Coursera.
- GIS for Resource Managers and Professionals, fall 2013, 2014, 2015 and 2016
- GIS for Watershed Analysis: Intermediate, fall 2013 and 2014
- GIS for Watershed Analysis: Advanced, fall 2013 and 2014

Professional Activities

- Cofounder, Nevada County Hackers
- Open source code publishing for open data access (github, bitbucket)
- Member: Society for Conservation GIS, Association of American Geographers, and URISA
- Active in StackExchange GIS community (nickrsan)
- Fellowship: 2012 Roosevelt Institute: Pipeline Fellow for climate change

Selected Published Works and Presentations

- Santos, Bell, and Viers. PISCES and arcpy_metadata. Presentation at the 2016 Society for Conservation GIS Conference.
- Grantham et al. 2016. Missing the Boat on Freshwater Fish Conservation in California. Conservation Letters. 1755-263X. DOI 10.1111/conl.12249
- Howard, et al. 2015. *Patterns of Freshwater Species Richness, Endemism, and Vulnerability in California*. PLoS ONE. 10(7)

- Viers and Santos. 2014. *Hydrolapse videography: a coupled hydroinformatic stack for improved visual assessment of river dynamics*. Proceedings of the International Conference on Hydroinformatics.
  Santos, Katz, Viers, and Moyle. 2014. *PISCES: a programmable information system for management and analysis of aquatic species range data,* Environmental Modelling & Software. http://dx.doi.org/10.1016/j.envsoft.2013.10.024
- Viers et al. 2013. Montane Meadows in the Sierra Nevada: Changing Hydroclimatic Conditions and Concepts for Vulnerability Assessment. Center for Watershed Sciences Technical Report. :63.
- Santos. *Remote Sensing, Event-Based Monitoring, and Change Detection Using Off-the-Shelf Hardware*. Presentation to *Groundtruths and Airwaves*. April 2014
- Santos. *Changing our Culture of Consumption.* Book chapter in "*Millennials Speak. Essays on the 21st Century.*"
- Santos and Viers. *Integration of Geospatial Technology into Multidisciplinary Biophysical Monitoring and Research.* Presentation at the 2013 Esri International User Conference.
- Santos and Gee*. Sierra Climate Change Toolkit.* Book distributed to planners and resource managers. January 2011.
- Atwell, Burow, and Santos. *LED Standard Traffic Signals.* Published in 25 Ideas to Solve the Energy Crisis (Spring 2007).
- Santos. *Congestion Charging in Large Cities (Big City Car Tax).* Published in 25 Ideas to Solve the Energy Crisis (Spring 2007).

Research Interests

- Automated extraction and processing of geographically-based parameters for use in applications and research.
- Data models, databases, and applications for environmental decision support.
- Remote sensing, collection, and transmission networks for environmental monitoring.
- Information systems for changing consumer behavior.

Technology Experience

GIS: ArcGIS, QGIS, GDAL/OGR, Leaflet, ArcGIS Server, Google Earth Engine, ArcGIS Online, Erdas IMAGINE, ENVI
Preferred Languages and frameworks: Python, Perl, Javascript, HTML/CSS, Django, D3.js, JQuery
Other Languages I've worked in: R, PHP, C, C++, Lua
Databases: PostgreSQL/PostGIS, MySQL, SQLite, Microsoft Access

Former Affiliations

- 1Sky (now 350.org), Policy Fellow
- Sierra Nevada Alliance, Regional Climate Change Program Assistant
- UC Sustainable Agriculture Research and Education Program (SAREP), Programmer and IT

Online Profiles

Portfolio on nicksantos.com
Center for Watershed Sciences Website
Google Scholar
StackExchange

GitHub
Bitbucket
LinkedIn