

CYNDI V. CASTRO, P.E.

*University of Illinois at Urbana-Champaign
NSF Postdoctoral Fellow | Department of Civil & Environmental Engineering
Department of Geography & Geographic Information Science*

CONTACT

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Urbana, IL 61801, USA

RESEARCH

Nature-based solutions

Air-energy nexus

Watershed modeling

Human-water systems

Decision sciences

Sustainability governance

*Geographic information
systems science*

*Multi-criteria
decision making*

Systems-thinking

Fuzzy-cognitive mapping

Feedback loops

Environmental justice

Social equity

Resilience in complex systems

REGISTRATIONS

Professional Engineer
Texas No. 123286

Certified Floodplain Manager
TFMA No. 2977-16N

LEED Green Associate

EDUCATION

Ph.D., Civil & Environmental Engineering, University of Houston, 12/2021
Emphasis: Complex Human-Water Systems

M.S., Civil Engineering, University of Texas – Austin, 05/2016
Emphasis: Geomatics & Public Policy

B.S., Civil Engineering, Texas A&M University – College Station, 05/2011
Water Resources Engineering Track

PROFESSIONAL APPOINTMENTS

2022-Present **University of Illinois at Urbana-Champaign**, Urbana, IL
NSF Postdoctoral Fellow | Mentor: Prof. Murugesu Sivapalan
Department of Civil & Environmental Engineering
Department of Geography & Geographic Information Science

2019-2020 **City of Houston**, Houston, TX
NSF Sustainability Intern
Office of the Mayor | Department of Sustainability & Resilience

2015-2019 **Jones|Carter Engineering**, Austin, TX & Houston, TX
Civil Engineer & Project Manager
Department of Hydrological & Hydraulic Sciences

2014-2016 **University of Texas**, Austin, TX
NSF Graduate Research Fellow | Advisor: Prof. David Maidment
Department of Civil, Environmental, & Architectural Engineering

2014 **City of Houston**, Houston, TX
Municipal Consulting Engineer
Department of Public Works & Stormwater Management

2013-2014 **AECOM Technical Services**, Ghana
Construction Manager
Ghana National Gas Company

2011-2014 **AECOM Technical Services**, Houston, TX
Graduate Civil Engineer
Department of Community Infrastructure & Public Works

2010-2011 **Texas A&M University**, College Station, TX
Undergraduate Research Assistant / Department of Ocean
Engineering, NSF CAREER Project to Prof. Scott Socolofsky

** Indicates correspondence article. * Indicates book chapter.

- 4.* **Castro, C.V.** and Rifai, H.S. (2022). Gulf Coast Rivers of the Southwestern United States: Trinity River, San Jacinto River, Neches River. *Chapter 5* in: Delong, M.D., Jardine, T.D., Benke, A.C., Cushing, C.E. (Eds.) Rivers of North America: 2nd Edition. Elsevier.
- 3.** Pande, S., Haeffner, M., Blöschl, G., Alam, F., **Castro, C.V.**, Di Baldassarre, G., Elshorbagy, A., Frick-Trzebitzky, F., Hogeboom, R., Kreibich, H., Mukherjee, J., Mukherji, A., Nardi, F., Nüesser, M., Tian, F., van Oel, P., Sivapalan, M. (2021). Never ask for a lighter rain but a stronger umbrella. *Frontiers in Water*, 204. doi: 10.3389/frwm.2014.00005
2. **Castro, C.V.** and Rifai, H. S. (2021). Development and assessment of a web-based national spatial data infrastructure for nature-based solutions and their social, hydrological, ecological, and environmental co-benefits. *Sustainability*, 13(19):11018. doi: 10.3390/su131911018.
1. **Castro, C.V.** and Maidment, D. R. (2020). HMS-PrePro: A GIS preprocessing tool for rapid initialization of HEC-HMS basin models. *Environmental Modelling & Software*, Vol 130, pp 104732. doi: 10.1016/j.envsoft.2020.104732.

In-Review/Editing:

5. **Castro, C.V.** Optimizing nature-based solutions by combining social equity, hydro-environmental efficiency, and economic costs through a novel Gini coefficient. Submitted to: *Journal of Hydrology*. Preprint doi: 10.31223/X5HS68.
4. **Castro, C.V.** Holistic systems-thinking for policy coherence: A case study of socio-institutional challenges and opportunities for improved adoption of nature-based solutions. Submitted to: *Environmental Science & Policy*. Manuscript ID: 21-01508. Preprint doi: 10.31223/X5M32S.
3. **Castro, C.V.** and Rifai, H. S. (2021). Integrating social, economic, and environmental risk into flood management of aging dam infrastructure by combining cost-benefit and multi-criteria decision analyses. Submitted to: *Natural Hazards and Earth System Sciences*. Preprint doi: <https://doi.org/10.5194/nhess-2021-144>. (In 2nd-round revisions).
- 2.* **Castro, C.V.**, Penny, G., Gunda T., Montanari, A., Polo, M.J. (Lead Authors). Limaye, S., Cavus, Y., Aksoy, H., Khatami, S., Kalantari, Z., Oel, P., Odongo, V., Casterllarin, A., Persiano, S., Papacharalampous, G., Tyralis, H., Llasat, M., Kohnova, S., Szolgay, J., Strasser, U., Shanono, N., Pistocchi, A., Ganora, D., Conrad, L., Pande, S., Teweldebrhan, M., Sanderson, M., Kinghton, J., Finger, D., Hendricks, D., Li, B., Evers, M., Losada, M., Dong, X., Civantos, J., Sivapalan, M., Medeiros, P., Mazvimavi, D., Allasia, D., Arumi, J., Rivera, D., Pouladi, P. *Chapter 11: Panta Rhei Case Studies*. Tian, F., Wei., J., Sivapalan, M., Blöschl, G. (Eds.) Coevolution and prediction of coupled human-water systems: A synthesis of change in hydrology and society. (Anticipated Publication: May 2023).

- 1.* Viglione, A., Mukherjee, J., Archfield, S., **Castro, C.V.**, Hirabayashi, Y., Lafaye de Micheaux, F., Leong, C., Mazzoleni, M., Merz, B., Nakamura, S., Nardi, F., Rusca, M., Szolgay, J., Yan, H. *Chapter 6: Human-Flood Systems*. Tian, F., Wei., J., Sivapalan, M., Blöschl, G. (Eds.) Coevolution and prediction of coupled human-water systems: A synthesis of change in hydrology and society. (Anticipated Publication: May 2023).

In-Progress Manuscripts:

Included if substantially complete with a full draft available (by request and co-author agreement).

5. Jonas, Z., **Castro, C.V.**, Midgley, G. F. Using remote sensing and GIS-based NRCS-CN approach to map and monitor runoff source areas in a poorly gauged catchment area in South Africa from 1940 to 2010. To submit to: *Remote Sensing*.
4. **Castro, C.V.**, Schaefer, K. L., Gonzalez, A., Haces-Garcia, F., Rifai, H. S. Capturing benefits for the air-energy nexus by adopting high-efficiency supercritical CO₂-based power production. To submit to: *Nature Energy*.
3. Shafiei, M., Gharari, S., Gharesifard, M., **Castro, C.V.** Sustainability assessment: The role of indicator-based frameworks in sustainable water management.
2. Penny, G., **Castro, C.V.**, Gunda, T. Socio-hydrology: A decadal reflection and vision for the future. To submit to: *Water Security*.
1. Kiaghadi, A., Loveland, M., **Castro, C.V.**, Hunter, T., Dawson, C., Rifai, H. S. Modeling estuarine salinity recovery in compound flood events: A case study of Galveston Bay response for Hurricanes Ike and Harvey. To submit to: *Ocean Modelling*.

TEACHING EXPERIENCE

University of Houston:

Associate-level STEM Teaching Certification, 2021

Center for Integration of Research, Teaching, and Learning (CIRTL)

Future Faculty Fellowship (F³) Program Training, 2018-2019

Professional development training for student engagement, instruction, & assessment.

University of Texas:

Guest Lecturer, Spring 2015 - CE 397, Flood Forecasting

Guest Lecturer, Fall 2014 - CE 394K.3, GIS in Water Resources

Texas A&M University:

STEM Tutor, 2009-2010

Texas A&M Center for Student-Athlete Services

Individual tutor for student-athletes in various math and engineering courses.

RESEARCH GRANTS & FELLOWSHIPS

2021-2022	<u>NSF Earth Sciences Postdoctoral Fellowship (EAR-PF)</u> Principal Investigator (PI). NSF Solicitation No. 18-565. Award No. 2052598. “Green infrastructure scaling from local observations to regional applications as a coupled human-water system.”	\$174,000
2019-2020	<u>NSF Non-academic Research Internship for Graduate Students (INTERN) Supplemental Funding Opportunity</u> Supplement for active NSF GRFP fellows. NSF Solicitation No. 18-102. Award No. 1934192. “Enhancing flood resilience strategies through academic-governmental partnerships.” Awarded to PI Hanadi S. Rifai.	\$55,000
2014-2019	<u>NSF Graduate Research Fellowship Program (GRFP)</u> Fellow. NSF Solicitation No. 13-085. Award No. 2013162199. “Flood and landslide risk analysis using LiDAR.”	\$142,000
2021	<u>NSF Human-Environmental and Geographical Sciences Program (HEGS)*</u> Primary Author with Principal Investigator: Hanadi S. Rifai. NSF Solicitation No. 20-547. “Assessing the multifunctionalities of nature-based solutions for addressing societal and environmental stressors.”	

* Submitted January 2021, awaiting final decision.

AWARDS, HONORS, & SCHOLARSHIPS

2021	Cullen Graduate Fellowship Travel Grant	\$750
2021	American Geophysical Union (AGU) Student Travel Grant	\$1,000
2021	Cullen Graduate Student Success Fellowship	\$500
2019-2022	Crawford and Hattie Jackson Foundation Fellowship (x3)	\$15,000
2019-2022	Texas Section American Water Works Association (AWWA) (x3)	\$6,000
2019-2020	Union Plus Firefighter Scholarship	\$1,000
2019-2020	University of Houston Future Faculty Fellowship	\$3,000
2019-2020	CHI University Award for 2D PC-SWMM Hydraulic Model	\$2,000
2018-2019	Southeast Texas Chapter AWWA Award	\$1,750
2018-2019	University of Houston President’s Endowed Scholarship	\$4,000
2018-2021	University of Houston Graduate Tuition Fellowship	\$42,000
2014-2016	University of Texas Thrust Endowed Fellowship	\$18,000
2012-2014	Engineers Without Borders Houston Professional Chapter, Officer	
2009-2011	Texas A&M Chi Epsilon National Honor Society, President	
2009-2010	Study Abroad Scholarship Katholieke Universiteit, Leuven, Belgium	\$6,000
2009-2010	Judy K. and Donald Ray ’68 Scholarship	\$1,000
2009-2010	British Petroleum American Scholarship	\$1,000
2007-2011	Texas A&M University President’s Endowed Scholarship	\$12,000
2007-2011	Texas A&M Academic Achievement Award	\$10,000
2007-2008	Industrial Engineering Endowed Scholarship	\$1,000
2008-2009	Barnes & Noble Merit Award	\$1,000
2008	Dean McCorkle Endowed Scholarship	\$1,000

Total Awarded Funding (including NSF fellowships): \$499,000

PRESENTATIONS

* Presentation by co-author. ** Poster presentation.

Conferences:

12. **Castro, C.V.**, Penny, G., Gunda, T., Montanari, A., Polo, M.J. (2021). H51F-04: Panta Rhei: Hydrology, Society, and Environmental Change: A decadal reflection of case studies encompassing the Panta Rhei paradigm. *American Geophysical Union Fall Conference*, New Orleans, Louisiana.
11. ** **Castro, C.V.** and Rifai, H.S. (2021). SY25E-0619: Science to Action: Enabling Water Resources Management Decisions Driven by Science and Data: Decision-making for nature-based solutions through a user-friendly and holistic web-app. *American Geophysical Union Fall Conference*, New Orleans, Louisiana.
10. **Castro, C.V.** (2021). Institutional and societal feedbacks and influences regarding nature-based solution implementation. *Delft Conference on Socio-hydrology*. Delft University of Technology, Netherlands.
9. Penny, G. *, **Castro, C.V.**, Gunda, T., Montanari, A., Polo Gómez, M.J. (2021). Panta Rhei: A decadal review of cause-effect pathways from global case studies. *Delft Conference on Socio-hydrology*. Delft University of Technology, Netherlands.
8. Viglione, A. *, Mukherjee, J., Annis, A., Archfield, S., **Castro, C.V.**, Hirabayashi, Y., Hollermann, B., de Micheaux, F.L., Carmen Llasat, M., Mazzoleni, M., Merz, B., Nakamura, S., Nardi, F., Rusca, M., Yan, H. (2021). Panta Rhei Chapter 6: Human-Flood Systems. *Delft Conference on Socio-hydrology*. Delft University of Technology, Netherlands.
7. **Castro, C.V.** (2020). The levee effect and socio-hydrological adaptation. *Women in STEM Symposium*. University of Chicago, Chicago, Illinois.
6. Rifai, H.S. * and **Castro, C.V.** (2020). At the intersect of engineered systems for flood mitigation, society, and resiliency: the Harvey posed challenge in greater Houston. *HurriCon Conference: Science at the intersection of hurricanes and the populated coast*. East Carolina University, North Carolina.
5. ** **Castro, C.V.** (2019). GH13C: Hydrological, societal, and environmental impacts of flood control reservoir releases on downstream communities using remote sensing and modeling during Hurricane Harvey. *American Geophysical Union Fall Conference*, San Francisco, California.
4. **Castro, C.V.** (2017). Public geospatial data sourcing and processing for watershed analyses. *Texas Floodplain Management Administration Conference*, Austin, Texas.
3. **Castro, C.V.** (2016). A GIS framework for gathering data and preparing HEC-HMS basins. *Texas Natural Resources Information Systems GeoRodeo*, Austin, Texas.

2. **Castro, C.V.** (2016). Living Atlas of the World provides data services for hydrologic modeling. *Esri ArcGIS Water Conference*, Austin, Texas.
1. **Castro, C.V.** (2015). Performance assessment of WFDEI satellite data for estimating global rainfall intensity. *Global Flood Partnership Annual Conference*, National Center for Atmospheric Research (NCAR), Boulder, Colorado.

Invited Talks: Seminars & Workshops

17. **Castro, C.V.** and Kiaghadi, A. (2020). Urbanization Challenges & Solutions in Public Policy, Engineering, and Academic Research. Houston Early Research Experience, *University of Houston*, Houston, TX.
16. **Castro, C.V.** (2019). Lessons Learned from Hurricane Harvey at the Intersection of Stormwater & Environmental Engineering. Houston Scholars Program, *University of Houston*, Houston, TX.
15. **Castro, C.V.** (2018). Natural Disaster Response and Preparation using Social-media and Citizen Science. *Taste of Science* Community Event, Houston, TX.
14. **Castro, C.V.** (2018). Insights into Stormwater and Drainage Impacts after Multiple 500-Year Events. *Harris County Flood Control District*, Houston, TX.
13. **Castro, C.V.** (2017). The Future of Flooding. **TEDx** Sugar Land, TX.
12. **Castro, C.V.** (2017). Girls in STEM: A Day in the Life. *Girls in STEM Education Conference*, Klein, TX.
11. **Castro, C.V.** (2017). Regional Stormwater Detention and Environmental Mitigation for Native Vegetative Species and Natural Habitats. *City of Houston Public Works Department*, Houston, TX.
10. **Castro, C.V.** (2017). Feasibility analysis of dental college civil engineering rehabilitation in Ludhiana, India. *Jones/Carter Engineering Firm*, Houston, TX.
9. **Castro, C.V.** (2016). ArcGIS Preprocessing for Extracting Geospatial Data from Cloud-based Repositories. *Lower Colorado River Authority*, Austin, TX.
8. **Castro, C.V.** (2016). Hydraulic and Hydrologic Engineering and Modeling Frameworks and Best Practices. Sole instructor. Jones|Carter University Program, Houston, TX.
7. **Castro, C.V.** (2016). AutoCAD Civil 3D Site Grading and Detention Ponds. Sole instructor. Jones|Carter University Program, Houston, TX.
6. **Castro, C.V.** (2016). FEMA Floodplain Mapping: Trending toward Data as a Service. *City of Austin Public Works Department*, Austin, TX.
5. **Castro, C.V.** (2015). National Flood Interoperability Experiment (NFIE) Geospatial Framework. *University of Texas*, Civil Engineering Departmental Seminar, Austin, TX.

4. **Castro, C.V.** (2015). Hydraulic Modeling Overview and Case Study of Onion Creek Floodplain. *University of Texas, Austin, TX.*
3. **Castro, C.V.** (2014). Unified Methods for GIS-based Hydrological Modeling. *University of Texas, Civil Engineering Departmental Seminar, Austin, TX.*
2. **Castro, C.V.** (2014). Hydraulics and Hydrologic Largescale Modeling for City of Jeddah, Saudi Arabia. American Society of Civil Engineering, *Texas A&M University, College Station, TX.*
1. **Castro, C.V.** (2013). Urban Design, Land Development, & Stormwater Masterplan. American Society of Civil Engineering, *Texas A&M University, College Station, TX.*

SERVICE ACTIVITIES

- 2022 **Session Convener:** AGU Frontiers in Hydrology Meeting, San Juan, Puerto Rico.
 Primary Convener, Session Series: “Bridging resolutions in human-water science.”
- Bridging resolutions: Sustainable solutions & policy-making
 - Bridging resolutions: Place-based research for water science & society
 - Bridging resolutions: Natural disasters & civilization
 - Bridging resolutions: Hydrological phenomena & human behavior
 - Bridging resolutions: Water security & liability
- 2021 **IAHS Working Group:** Citizens and Hydrology (CANDHY) for International Association of Hydrological Sciences (IAHS), Working Group Participant
- 2021 **Session Convener:** AGU Fall Meeting, New Orleans, Louisiana, USA.
 “Socio-hydrology: Integrating complex dynamics and broadening social impacts.”
- Primary Convener / Chair: Session SY52A-I, Oral
 - Convener / Co-chair: Session SY35A-III, eLightning
 - Convener / Co-chair: Session SY55D-IV, Posters
 - Primary Convener / Liaison: SY55D, Student Presentation Awards
- 2021 **Session Chair:** International Conference on Socio-hydrology, Delft, The Netherlands.
 Session 2, Theme 4.2: “New human-water datasets, algorithms, and analytical tools.”
- 2021 **NSF Workshop Convener:** NSF GRFP Workshop Facilitation for Society for Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS)
- 2020-2021 **Diversity and Inclusion Committee:** Texas American Water Works Association (TAWWA) Southeast Texas Chapter
- 2020 **Conference Reviewer:** AGU Fall Outstanding Student Presentation Awards (OSPA)
- 2020 **Grant Reviewer:** Sigma Xi Grants-in-Aid of Research, Research Honor Society

Peer Review:

- Journal of Geocarto International
- Journal of Hydrology
- Journal of Mountain Science

Community Mentoring:

2021-2022	Texas American Water Works Association (TAWWA) Professional Mentor
2019-2020	City of Houston – Hire Houston Youth Program Mentor
2017-2018	MathCounts, Texas Society of Professional Engineers
2012-2014	Rice University Engineers Without Borders, Student Chapter Professional Mentor
2011-2014	Architecture, Construction, Engineering (ACE) Mentor Program of America
2011-2013	Star of Hope Homeless Shelter Volunteer
2010-2011	Save Our Streets Youth Community Mentor
2009-2011	Society of Women Engineers Elementary Reading & Writing Lab Volunteer

International Initiatives:

2021	South African National Biodiversity Institute , Cape Town, South Africa Assistance watershed modeling for research regarding ecosystems and climate change.
2018	Respire Haiti , Gressier, Haiti Team leader to support community education and medical care.
2017-2018	Intra-American Development Bank , Gonaives, Haiti Drainage modeling for culvert design in flood-prone region.
2017	Engineering Ministries International , Ludhiana, India Civil engineering for rehabilitation of medical college & hospital.
2014-2015	Road to Mafraq, Inc. , Mafraq, Jordan Board member for 501c organization to expand educational opportunities.
2013-2014	United Nations High Commissioner for Refugees , Takoradi, Ghana Engineering assistance to UNHCR refugee camp leaders.
2013	Living Water International , Leon, Nicaragua Installed water wells and provided community training and education.
2011-2013	Engineers Without Borders , San Salvador, El Salvador Team leader for potable water system design and installation. Houston Professional Chapter. Traveled to site, gathered data, implemented design.
2012	Children’s Educational Center , Gonaives, Haiti Funded and coordinated installation of two water wells for children’s center.
2011	Disaster Assistance Response Team , Carrefour, Haiti Disaster response services and drainage remediation following earthquake.
2010	Water Purification , Lusaka, Zambia Worked with local engineers to employ low-cost water treatment devices.

REPORTS & CONTRIBUTIONS

Note: For engineering designs and analyses, all materials are copyrighted to the primary engineer-of-record (EOR), denoted by *. Technical products available by request. AECOM, 2011-2014; Jones|Carter, 2015-2018.

14. **Castro, C.V.*** (2018). Field reconnaissance, geomorphological analysis, and three-dimensional bank stabilization for Hurricane Harvey stream damage. *Harris County Flood Control District & Federal Emergency Management Agency (FEMA)*. ID Z100-00-00-X274.
13. Landry, K.* and **Castro, C.V.*** (2018). Drainage analysis for major street rehabilitation within FEMA flood zone. Houston Avenue and White Oak Drive. *Memorial Heights Redevelopment Authority & City of Houston*. ID N-T05000.
12. **Castro, C.V.*** (2017). Flood reservoir stability and downstream conveyance analysis for channel improvements and structural floodwalls. U.S. Army Corps of Engineers' Addicks & Barker Reservoirs. *Houston Energy Corridor District*.
11. **Castro, C.V.*** (2017). Earthen channel slope stabilization and sediment transport improvement for major tributary following Hurricane Harvey damage. Buffalo Bayou Park bank improvements. *Harris County Flood Control District*. ID W100-00-00-X036.
10. **Castro, C.V.*** (2017). FEMA hazard mitigation for regional detention pond and weir flood control system. *City of Houston, Spring Creek Utility District, & FEMA*. ID 17005056.
9. **Castro, C.V.*** (2017). Nature-based solution stormwater detention basin rehabilitation of three regional ponds, including ecological investigation and environmental protection for endangered species. *City of Houston*. ID M-430296.
8. **Castro, C.V.*** (2017). Revised flood hazard modeling and delineation to modify effective floodway zones and elevations for FEMA National Flood Insurance Program. *Federal Emergency Management Agency*.
7. **Castro, C.V.** and Haerber, J.* (2016). Hydrologic and hydraulic analysis for new bridge highway over Grapevine Creek waterway of Interstate 635 in Dallas County, Texas. *Texas Department of Transportation*. ID 2374-07-063.
6. Williford, E.* and **Castro, C.V.** (2013). Green infrastructure stormwater assessment for tennis court facility and site development at Rice University. *City of Houston & Rice University*.
5. **Castro, C.V.** (2013). Health, safety, and environmental protection analysis for natural gas infrastructure development in rural Ghana. *Ghana National Gas Limited Company*.
4. Williford, E.* and **Castro, C.V.** (2012). Revitalization and transformation of natural stream into community recreational resource. Buffalo Bayou Park. *Harris County Flood Control District & Buffalo Bayou Park Partnership*. ID No. W100-00-00-X036.

3. Williford, E.* and **Castro, C.V.** (2012). Comprehensive drainage analyses, street paving improvements, and sub-surface utility rehabilitations for various large neighborhoods in greater-Houston area. *City of Houston*. ID M-420126-0076.
2. Holder, A., Zeve, M.* , Williford, E.* and **Castro, C.V.** (2013). Hydrologic and hydraulic modeling drainage analysis and construction plan design for major highway expansion, US-59 in Rosenberg, Texas. *Texas Department of Transportation*.
1. **Castro C.V.** (2012). Urban stormwater drainage masterplan for 7 regional basins following fatal flash flooding, including large-scale LIDAR collection and processing, geospatial big data analytics, novel unit hydrograph development, integrated two-dimensional SWMM modeling, and computer aided drafting (CAD) of construction plans. *Kingdom of Jeddah, Saudi Arabia*. ID WER06-REP-0040-C.

Media Articles:

2. **Castro, C.V.** (2021). HMS-PrePro: An automated GIS toolbox for extracting cloud-based data, delineating watersheds, and calculating hydrological parameters. *Esri ArcGIS Water Blog*. <https://tinyurl.com/HMSPreProEsri>
1. **Castro, C.V.** (2016). The Living Atlas can provide better access to data for hydrologic modeling. *Esri ArcUser Article*, Volume Spring 2016, pp 32-35. <https://tinyurl.com/LivingAtlasEsri>

Open-source Products:



2. **Castro, C.V.** (2021). GeoNBS: Web-mapping application to explore and download seamless, authoritative, inter-disciplinary social, environmental, and hydrological datasets regarding nature-based solution planning. <https://tinyurl.com/nbsgeo>
1. **Castro, C.V.** (2019). HMS-PrePro 10.7.1: Global GIS processing tool for HEC-HMS hydrological basin models using cloud-based data and automated spatial analysis. Github Repository. <https://doi.org/10.5281/zenodo.3662765>

MODELING EXPERTISE

Air Quality Modeling:	EPA COBRA Program
Energy Modeling:	EPA AVERT Program
Engineering Design:	AutoCAD, AutoCAD Civil 3D, Microstation
Geographic Systems:	Esri ArcGIS, ArcPy Coding, ArcHydro
Natural Hazards:	FEMA Hazus Program
Remote Sensing:	ENVI Geospatial
Water Distribution:	Bentley OpenFlows WaterGEMS
Watershed Modeling:	HEC-HMS, HEC-GeoHMS, HEC-RAS 1D/2D, HEC-GeoRAS, HY-8 Hydraulics, FlowMaster, Winstorm, SWAT, SWMM 2D