Matthew Jamieson
Scientist

Education and Credentials

M.F.A., Digital Art and New Media, University of California Santa Cruz, Santa Cruz, California, 2014

B.A., Geography, University of Guelph, Guelph, Ontario, Canada, 2002

GCert, Geographic Information Systems, Hunter College, New York, New York, 2010

Continuing Education and Training

Spanish Immersion, Vida Verde School, Quito, Ecuador, 2006

3D Modeling I, Pratt Institute Continuing and Professional Studies, New York, New York, 2010

Achievements and Awards

Graduate Student Researcher Grant, Project: Rising Sea Levels of the San Francisco Bay, 2013

Art^{2}NRS Program Grant, Project: Sagehen a Proving Ground: Mapping and Visualizing Climate Change in the High Sierras, 2014

Professional Profile

Matthew Jamieson is a geographic information systems (GIS) professional with a background in geographic science, coastal processes, and digital art. Mr. Jamieson has been working professionally with GIS technology since 2004 and has focused on applying GIS to coastal hazard modeling and analysis since 2014. Mr. Jamieson holds an M.F.A. in digital art and new media and has been working for many years with artists and scientists to communicate complex spatial and environmental information. Having worked on a diverse range of projects, Mr. Jamieson has developed skills in data visualization, scripting for task automation, web programming, designing interactive experiences, report writing, and 3-dimensional visualization.

Relevant Experience

Spatial Analysis and Technical Reports

PlaNYC Parks Climate Resiliency Report, New York, New York—In a collaborative effort with the Mayor's Office and the Parks Planning Office, performed a climate resiliency analysis that encompassed the city's 28,000 acres of parkland and 14 miles of beaches and dunes. Spatial analysis investigated potential effects of future sea level rise and storm surge on parkland and park assets, changes in the urban heat island effect and its relationship to parkland, and how parks can play a role in climate change mitigation and adaptation strategies. Some outcomes from the analysis included identifying where to locate cooling stations, where to focus tree planting efforts, access to add green space, and coastal resiliency efforts.

NYC Parks and Playground Access Report, New York, New York—In an effort led by the Parks Planning office, performed an analysis that included determining the location of every park access point and public and privately accessible playground. A network analysis was conducted to determine the accessibility of the city's parkland, as well identify potential locations where park access could be improved. Statistics from all of the city's neighborhoods were then analyzed and ranked according to their park and playground accessibility. This information was paired with demographic, economic, and cultural attributes to determine where and what park improvements should be prioritized in each community. Maps and reports were then created for field surveys and community

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workshops, and the feedback from these efforts was incorporated into further spatial analysis. Information from this effort was incorporated in the city's PlaNYC goals which influenced planning and policy decisions for the city.

Tsunami Exposure and Vertical Evacuation Plan, Honolulu, Hawaii—Working with state and federal partners, performed an analysis on the Island of Oahu for emergency evacuation by foot. The analysis including locating all road and trail networks, potential barriers to evacuation, and any vertical evacuation to safety locations. Analysis included building a high-resolution digital elevation model from LiDAR data, and then performing an evacuation analysis that combined tsunami run-up extents, land use types, slope, and barriers to construct a cost-weighted surface. This surface was used to determine evacuation distances and times for each structure on the island, as well as optimal evacuation routes. This analysis was then combined with demographic and location information on vulnerable members of the community and was used to inform evacuation strategies for communities on the island.

Forestry Analysis and Wood Utilization Analysis for the Eastern Sierra, Truckee, California—Working with a team of forestry consultants, performed a forest structure survey on more than 300,000 acres of land in eastern California and western Nevada centered around Reno. Forest structures were determined from both publicly available data sets as well as from novel approaches. Novel approaches involved developing a cognitive neural network with machine learning to determine forestry characteristics from forest inventory survey data, and building an imputation engine using a nearest neighbor strategy to determine forest structure from known data locations. Analysis included determining forest structure, ownership, fire history, and access data for approximately 1 million landscape units (with an average size of one-quarter acre). Each unit was given a forest treatment strategy under numerous scenarios, and this was used to develop a watershed scale plan for restoring ecological and fire resilience. A wood utilization analysis was also conducted that incorporated treatments and watershed access, hauling costs, mill capabilities, economic constraints, and planning given the spatial distribution of species. The project is part of an effort to encourage an industry around small diameter timber and finding a market for low-value wood, with the goal of developing incentives and technologies that can help restore ecological function and fire resiliency.

Coastal Vulnerability and Sea Level Rise Analysis for West Cliff Drive, Santa Cruz, California—Working with a consultant team, performed an assessment of a coastal hazards along a scenic and highly trafficked 3-mile stretch of coast. Working closely with engineers, ecologists, and other members of the consulting team, translated various spatial data sets, and conducted a full assessment of existing conditions. Historical data were also analyzed using georeferenced historical surveys and compared with modern ones to determine erosion rates and areas of concern along both horizontal and vertical areas of the cliff. These data were valuable in constructing a highly localized erosion hazard layer accounting for various levels of risk tolerance. Erosion hazard layers were then used to determine private and city infrastructure and assets at risk, as well as potential changes to land use and ecologies. Through stakeholder meetings, the team developed adaptation, mitigation, and monitoring strategies.

Communication and Interactive Experiences

Aquapuncture: An Interactive Exploration of Santa Cruz County Watersheds, Santa Cruz, California—Participated on a team that created an interactive exhibit on the nature of water, water use, and land use practices that influence water in Santa Cruz County, California. The exhibit was on display for 2 weeks at an exhibition culminating from a 2-year investigation involving fieldwork, interviews, research, and mapping. This project coincided with community discussions on the city's water future as it was in the midst of a record drought and a debate on a ballot measure to consider a desalination facility. The interactive exhibit included photographs, quotes, video, and a large digital touch screen that included an artistically rendered interactive map of Santa Cruz County. The map allowed the audience to take a tour of across five regions of the county, and depicted images, stories, and information on water and land use relationships. The exhibit was attended by a diverse range of community members including students, professors, artists, and city council members. It also coincided with a series of presentations and talks to foster engagement and discussion about broader freshwater water sustainability and resiliency in the county.

On the Deep Wealth of This Nation, Aberdeen, Aberdeenshire, Scotland—In an effort led by an environmental artist, developed an expansive environmental assessment of the Country of Scotland, which culminated in an internationally touring art exhibit that appeared at numerous galleries, museums, and biennales. The effort included working with a diverse group of scientist and citizen collaborators and brought together their insights to map out ideas on the future sustainability of Scotland in a visually arresting and informative manner. Over its many iterations, the project included creating more than twenty 10 by 10 ft maps, each variously collaged with local stories, photography, and poetics. The work addressed various aspects of the public commons, such as the soil, water, forest biota, air, and community networks. The goal of the work was to provoke thought and discussion on integrating community and individual actions with ecological functions, as well as understanding how harvesting from the landscape can benefit ecological functions.

Hazards Exposure Reporting and Analytics (HERA), Menlo Park, California—Working with a team that included coastal and geographic scientists, database engineers, and GIS analysts, helped developed a web-based interactive mapping and data visualization platform to communicate community exposure to coastal hazards and sea level rise. The project is a broad-based effort to improve community awareness of coastal hazard risk under future sea level rise and coastal storm scenarios, as well making the science of coastal hazards accessible in a manner that encourages experiential learning and exploratory engagement. The project involved a full web development cycle, including pitching and prototyping, writing scripts to automate geoprocessing tasks, developing a visual template for the experience, and working on data visualization and interactive maps using a modern web development framework. The project has been showcased in community workshops and events throughout California and has proved valuable for community stakeholders to understand future levels of risk.

Fieldwork

St. Marks National Wildlife Refuge Existing Habitat and Boundary Mapping, St. Marks, Florida—Working with U.S. Fish and Wildlife Service biologists, refuge managers, and prescribed fire staff, developed a GIS database that included an updated refuge boundary along both land and sea and an updated habitat layer. Boundaries were developed through a combination of scanning and geolocating paper documents, as well as fieldwork using GPS to verify refuge boundary markers throughout the 68,000-acre refuge. Water boundaries were delineated using digital elevation models and aerial surveys. Habitat types were developed by scanning and integrating historical fire management plans, along with input from staff and field observations. The completed habitat layer encompassed historical and present habitat types, ongoing and future treatment activities, and notable species of concern. The data set proved valuable in migrating refuge biological and fire treatment planning activities from paper to digital and opened up many avenues for future spatial analysis. Used also in refuge brochures and display maps, the data sets vastly improved the level of spatial detail in those documents.

Sagehen, a Proving Ground: An Ecology and Paleobotany Study to Identify Plant Clusters That Can Move Up the Watershed, Sagehen Creek Field Station, Tahoe National Forest, California—As part of an effort led by an environmental artist, in collaboration with a museum of art and the environment in Reno and the University of California Berkeley, participated on a team of that worked to identity, analyze, and implement a plan to plant clusters of eastern Sierra plant species at five locations throughout the Sagehen Creek watershed near Truckee, California. The process included a thorough watershed investigation for identification of optimal planning locations, a paleo botanical survey, modeling of future bioclimatic forcing to determine likely species migrations, and implementation of the plan. Enacting the plan involved preparing the sites by clearing existing vegetation, constructing fencing, planting, and over the course of a year, making ongoing visits in to water, mulch, and care for seedlings. The process of monitoring and reporting is ongoing, and future exhibitions will emerge that include novel cartography, video, data visualization, and site tours.

Publications

Jones, J.L., M.R. Jamieson, and N.J. Wood. 2016. Community Exposure to Tsunami Hazards in Hawai'i. Scientific Investigation Report 2016-5053, U.S. Department of the Interior, U.S. Geological Survey.

Jones, J.M., K. Henry, N. Wood, P. Ng, and M. Jamieson. 2017. HERA: A dynamic web application for visualizing community exposure to flood hazards based on storm and sea level rise scenarios. *Computers & Geosciences* 109:124–133.

Presentations / Posters

Jamieson, M. 2015. Community exposure and sensitivity to far-field tsunamis in Hawai'i. Poster presentation. CalGIS 2015: 21st Annual California GIS Conference, Sacramento, CA. June 1–3.

Jamieson, M. 2016. Variations in exposure and sensitivity to far-field tsunamis in the state of Hawai'i. Poster presentation. NASA Ames Earth Science Laboratory, Mountain View, CA. February.

Jamieson, M., J. Jones, N. Wood, and J. Jones. 2016. Using data driven documents (D3.js) for effective visualization of community exposure to sea level rise and storm surge around San Francisco Bay. Platform presentation. American Association of Geographers Annual Meeting, San Francisco, CA. March 29–April 2.