## Sound GIS Project Experience

### Marine Vegetation Atlas for Washington State

*Washington Department of Natural Resources.* September 2012 – January 2014

Sound GIS supported the marine scientists of DNR's Nearshore Habitat Program by developing a web-accessible atlas of marine vegetation for Washington State. Sound GIS designed a relational geodatabase to store a broad range of source information in a common framework, from scientific journal articles and permit applications, to long-term monitoring data. Sound GIS conducted a user needs assessment, developed QA/QC procedures, Python scripts, and SQL queries to validate the data entered by DNR staff. Sound GIS and subcontractor, ChopShop Geospatial, developed a web-mapping application that allows users to query and display a map of presence or absence of marine vegetation, as well as filtering the source information on a number of criteria, including vegetation type, dates of surveys, survey methods, and organization. The Marine Vegetation Atlas has facilitated access to numerous obscure information sources in an easy-to-use web interface. This will improve planning and decision-making by resource managers who must protect sensitive marine vegetation habitats, such as kelp beds and seagrass meadows.

### Seafloor Habitat and Species Modeling in Puget Sound, Washington

*The Nature Conservancy.* January 2013 – June 2013

Sound GIS collaborated with The Nature Conservancy and Robert Burn (statistical consultant) to develop a comprehensive spatial dataset delineating seafloor habitat in Puget Sound, including bathymetry, substrate, and geoform. Sound GIS reviewed existing data sets for quality, spatial coverage, classification consistency, and resolution. Based on these criteria, the best data sets were synthesized into a consistent, soundwide data set. Once the data sets were compiled, they were used to develop models of species/habitat associations for rockfish using Bayesian modeling techniques in R. Sound GIS acquired rockfish field survey data to identify known rockfish habitat locations, which was used to train the spatial models. Sound GIS supported the spatial modeling by providing various input data sets as well as mapping the outputs from the model.

### Feeder Bluff Mapping in Puget Sound, Washington

*Washington Department of Ecology via Coastal Geologic Services.* May 2012 – June 2013

Sound GIS collaborated with Coastal Geologic Services to synthesize existing GIS data sets and new field mapping into a consistent, comprehensive map of feeder bluffs in Puget Sound. As the QA/QC lead, Sound GIS designed procedures and decision rules for evaluating the quality of existing data sets. Sound GIS also developed methods for validating and improving the accuracy and consistency of new field data collection. Feeder bluffs are an essential part of the nearshore environment that provide an on-going supply of material to build and sustain beaches and coastal wetlands. This comprehensive map of feeder bluffs provides a new, consistent, and detailed data set for local and regional shoreline planners concerned with protecting and restoring critical shoreline processes and functions.

**Puget Sound Eelgrass Monitoring Site Transect Analysis Tools**
*Washington Department of Natural Resources.* February 2007 – June 2007, January 2009 – June 2009, April 2012-June 2013

Sound GIS developed several ArcGIS geoprocessing tools for Washington DNR's Submerged Vegetation Monitoring Project (SVMP). One tool produces shapefiles from text files of eelgrass monitoring transect data and includes associated attributes for each sample point. Additional tools use the transect data to calculate and output statistical summaries of eelgrass area and depth ranges by transect, by site and by year. The tools are written in Python and are provided through a custom ArcGIS toolbox. These tools save DNR many hours of staff time by eliminating the need for tedious manual conversions, copying and pasting, and spreadsheet calculations.

**Open Source Web-Mapping Support for Oil Spill Response and Restoration**
*NOAA, NOS, ORR, Assessment and Restoration Division via Genwest Systems.* May 2010 – December 2012

Allison Bailey, principal of Sound GIS, supported the development NOAA's Open Source web-mapping application, ERMA, for oil spill response and restoration. Allison played a key role as technical liaison between ERMA users and developers, which included trouble-shooting and user technical support, prioritizing new feature development and bug fixes, representing developer team at internal and external meetings, optimizing development workflow, improving user workflow within ERMA application.

Allison also served as co-lead for development of a new Arctic ERMA regional site. Responsibilities include facilitating stakeholder workshops, making contacts for data and web services, presenting demonstrations of ERMA to users and partners, prioritizing data collection and loading in ERMA, project management for Arctic ERMA team tasks.

**Puget Sound Eelgrass User Needs Assessment and Geodatabase Development**
*Washington Department of Natural Resources.* October 2010 – June 2011

Sound GIS conducted a needs assessment for potential users of Washington DNR's eelgrass monitoring data sets. Based on this needs assessment, Sound GIS designed a geodatabase suitable for public distribution. Sound GIS converted and synthesized DNR's existing eelgrass data into this distribution database, performed QA/QC, and contributed documentation. This geodatabase will save time for scientific staff that previously created custom products for each request for eelgrass data.

**Washington Coastal Kelp Data Consolidation**
*Washington Department of Natural Resources.* May – June 2005, 2007, 2009, and 2011

Washington DNR has a time-series of imagery delineating kelp beds off the Washington coast. In order to use these data for management and analysis, they need these data converted to a

common, consistent GIS format. Sound GIS developed raster-to-vector data conversion scripts, performed QC, documented methods, and provided technical oversight and support.

**Geodatabase for Monte Cristo Mine Area Remedial Investigation**
*Washington Department of Ecology via Hart Crowser.* January 2011 – April 2011

Sound GIS assisted and mentored Hart Crowser staff in designing and developing a comprehensive and flexible geospatial database for existing baseline and contaminant data in the Monte Cristo Mine Area near Granite Falls, Washington. Sound GIS also provided mentoring and support in data conversion, cartography, documentation, and metadata development.

**Fishery Hotspot Mapping**
*Environmental Defense Fund.* January 2011 – April 2011

Sound GIS designed a geospatial database and data collection approach for interviewing groups of fishermen to map known hotspots for fish species with low catch quotas. Sound GIS conducted interviews, converted hard-copy maps and coordinate information into GIS format, and produced maps with consolidated information for review and use by fishermen. This information supported the creation and operation of fishing cooperatives to share catch quota and reduce individual fisherman's risk of exceeding new, individual quotas.

**Watershed GIS and Database Support**
*NOAA, NOS, Assessment and Restoration Division via Exa Data and Mapping Services.*
December 2009 – ongoing

Sound GIS provides on-call GIS and database support for NOAA's watershed, natural resource damage assessment and restoration projects. This support includes creating and converting data to GIS format, conducting spatial analyses, performing QA/QC, writing documentation, and producing project maps.

**Aquatic Habitat Mapping**
*BioSonics.* November 2008 – ongoing

Sound GIS provides on-call GIS support for aquatic habitat mapping projects conducted by Biosonics using hydroacoustic data. This support includes generating survey transect lines, interpolating bathymetry surfaces, contour lines, substrate type surfaces, vegetated areas, and producing project maps.

**Cultural Resource Assessments**
*Paragon Research Associates.* March 2008 – January 2012

Sound GIS provided on-call GIS support for a wide range of cultural resource assessments. This support includes generating geographic coordinates for field surveys, creating Area of Potential Effects (APE) boundaries, and producing project maps.

**Gap Analysis of Marine Protected Areas in Washington State**
*The Nature Conservancy.* July 2009 – March 2010

To identify gaps in marine ecosystem protection, Sound GIS, in collaboration with The Nature Conservancy, conducted spatial analyses of Marine Protected Areas (MPAs) in Washington State. These analyses included data acquisition from a wide range of agencies and organizations; evaluation and categorization of regulations into type(s) of protection; methodology development; synthesis of disparate data sets into a single geospatial database; production of summary statistics and maps; and documentation.

**Change Analysis of Puget Sound's Nearshore Ecosystem**
*United States Corps of Engineers via Anchor Environmental.* June 2007 – March 2010

Allison Bailey, Sound GIS principal, was a GIS expert on a large, multi-disciplinary team assessing change to the shoreline and estuarine conditions in Puget Sound, Washington. Allison's involvement in the project included data discovery and compilation of existing data sets for Puget Sound, development of a set of nested geographic units used to summarize changes, classification of historic shoreforms, QA/QC of spatial data sets, and development of queries for data analysis. These products will inform a system-wide assessment of nearshore ecosystem restoration priorities in Puget Sound for the Puget Sound Nearshore Ecosystem Restoration Project General Investigation study and the Puget Sound Nearshore Partnership.

**Marine Protected Area Information Management System User Needs Assessment**
*California Ocean Science Trust via Exa Data and Mapping Services.* October 2008 – July 2009

Sound GIS collaborated with the Exa team to conduct a needs assessment for future users of an on-line information management system to provide access to monitoring information for the statewide network of Marine Protected Areas (MPAs) in California. With the Exa team, Sound GIS designed an on-line user survey, developed interview approach, conducted user interviews, performed data analysis, and documented results for the user needs assessment. The final report will assist in developing requirements and design of the on-line information management system.

**Integrated Decision Support System for Tidal Energy Projects**
*Bonneville Power Administration via Pacific International Engineering.* April 2008 – April 2009

Sound GIS supported the development of an integrated decision support system (IDSS) to aid evaluation and permitting of in-stream tidal energy projects in Washington State. The system is spatially explicit and incorporates regional GIS data as well as detailed, site-specific oceanographic models. This phase of the multi-year project consisted of identifying user needs for this system as well as a conceptual and preliminary design. Stakeholders range from Public Utility Districts who are proposing projects to federal and state agencies who are required to evaluate and issue permits for these projects. It is expected that the system will assist in synthesizing data and models needed for comparison of potential tidal energy generation sites.

**Woodard Bay Restoration Project**
*Washington Department of Natural Resources via Hart Crowser.* April 2008 – October 2008

Sound GIS developed a geodatabase for project information management with thematic-based data sets containing diverse information types. Work included compiling public map, survey, and other geographic data, along with new information from aquatic surveys and sediment quality chemical testing. The geodatabase for Woodard Bay provides a crucial platform for organizing and evaluating data through the feasibility study, design, and construction phases of the restoration project.

**Ranking Puget Sound Streams for Low Flow Enhancement – GIS Methodology and Tool Development**
*Washington Department of Ecology via ESA Adolfson.* March 2007 – June 2007

Sound GIS developed a GIS approach and ArcGIS geoprocessing tools for testing Washington Department of Fish and Wildlife's (WDFW) "Draft Guidance for Ranking Puget Sound Streams for Low Flow Enhancement." The ranking methodology incorporates information about fish occurrence or potential, habitat value, hydrology, and flow/passage. For this pilot project, the approach and tools focus on data and methods that are straightforward and easily transferable to watershed groups throughout Puget Sound. Allison developed ArcGIS geoprocessing models for each component of the ranking methodology.

**The Offshore Component of the Nature Conservancy's Marine Ecoregional Assessment**
*The Nature Conservancy.* February 2006 – December 2007

To support the Nature Conservancy in extending their Pacific Northwest Coast (PNWC) ecoregional assessment into the offshore waters, Sound GIS investigated the utility of National Marine Fisheries Service's (NMFS) groundfish trawl survey and commercial trawling data as input into the TNC's conservation planning and prioritization process. Sound GIS evaluated appropriate spatial scales and multiple metrics for input into MARXAN, one of TNC's conservation modeling tools.

**Snohomish County Eelgrass Inventory**
*Snohomish County Marine Resources Committee.* April 2007 – June 2007

Allison Bailey, principal of Sound GIS, served as project manager and GIS analyst for a county-wide eelgrass inventory. The county requested a synthesis of existing GIS data delineating eelgrass beds, as well as new mapping of subtidal eelgrass beds using underwater videography and side-scan sonar. Subcontractors performed field surveys and Sound GIS synthesized the data into a coherent data set to be used by Snohomish County for planning and resource management purposes.

**West Coast Groundfish Essential Fish Habitat Environmental Impact Statement**
*NOAA, National Marine Fisheries Service.* August 2002 – November 2006

Allison Bailey, Sound GIS principal, was the GIS lead for an assessment of Essential Fish Habitat (EFH) for West Coast Groundfish and development of an Environmental Impact Statement. Because of her skill in a geographic analysis and programming, combined with her experience in marine science, she was a key member of the scientific and modeling team. She created, synthesized, and analyzed datasets to develop a comprehensive GIS for groundfish including such diverse datasets as geologic habitat, species abundance, bathymetry, fishing effort, and non-fishing impacts. She worked closely with the client, presented project results to technical reviewers and stakeholders, and contributed to technical and policy documents. This project received a 'Special Achievement in GIS' Award from ESRI in 2004. The project also successfully informed policy decisions to protect essential fish habitat (EFH) off the West Coast.

**Oil Spill Response Atlas for Puget Sound and Straits of Juan de Fuca**
*Concurrent Technologies Corporation (CTC).* November 2005 – May 2006

CTC developed a web-based application for marine oil spill responders in Puget Sound and the Straits of Juan de Fuca, Washington. To support this application, the 20-year-old paper maps depicting sensitive biological and human resources were updated with current data in GIS format. Sound GIS provided GIS and biological expertise to compile and develop data into a geodatabase that is consistent with NOAA's Environmental Sensitivity Index (ESI) mapping protocol. Allison Bailey, principal of Sound GIS, used her extensive experience with marine GIS data to quickly filter through existing data sets and identify strengths and limitations of these data. Sound GIS automated data processing with Python scripts, using ESRI's geoprocessing commands, and SQL commands. Sound GIS was also responsible for mentoring CTC's GIS staff working on the project. As a supplemental product, Sound GIS developed a logical and physical geodatabase data model for a Geographic Response Plan.

**Essential Fish Habitat Bayesian Network Model**
*Marine Resource Assessment Group (MRAG).* May – November 2005

MRAG and University of Reading have developed a Bayesian Network (BN) model to delineate West Coast groundfish habitat for 82 species. Sound GIS developed automated routines to consolidate and format spatial data input for the model. In addition, Sound GIS automated the process for incorporating model output data into GIS and generating maps for over 160 groundfish species and lifestage combinations. Interaction between the GIS data and the model was smooth and seamless and allowed for multiple re-runs of the model and updates to the map to occur during interactive scientific review meetings. Sound GIS and others in the EFH team presented these models, data sources, and model output for numerous reviews by scientific, statistical, and other advisory committees of the Pacific Fishery Management Council.