

Ecological Services



Delivering an integrated environmental approach to advance your project.

Groundwater & Environmental Services, Inc. (GES) has a 37-year track record of helping clients achieve regulatory success by delivering practical solutions in the areas of environmental planning, permitting, compliance, and construction support. Over the last few years, GES has grown its Ecological Services practice nationally to provide expert consulting and expertise on a broad scope of ecological and natural resource projects. GES Ecological Services staff have degrees (many with advanced degrees) in environmental science, zoology, biology, wildlife ecology, environmental geography, natural resource management, wildlife and fisheries resources, applied ecology, environmental engineering, forestry, and horticulture. These professionals are highly experienced and accomplished and include Professional Wetland Scientists, Certified Wildlife Biologists, Certified Arborists, FAA-qualified Wildlife Biologists, and Rosgen-trained Natural Stream Designers. GES ecological services staff are supported by more than 350 GES geologists, engineers, and other environmental professionals and technicians to provide complete environmental solutions.

Core Ecological Services

With such a deep bench of expertise and experience, GES can successfully tackle any need for ecological or natural resources support. Our typical projects include:

- **Ecological Risk Assessments.** GES develops ERAs (and similar ecological risk evaluations) under both EPA and state guidelines at hazardous waste and fuel-release sites.
- **NEPA Documentation.** GES takes the project through the entire NEPA process for a variety of projects, including highways, utility lines, and airports.
- **Waters of the U.S. Delineations and Permitting.** GES staff have performed thousands of stream and wetland delineations pursuant to the Clean Water Act and several state programs and have developed permit applications and Mitigation Plans for many of them.
- **Stream and Wetland Mitigation Banks and Projects.** GES' Rosgen-trained Stream Designers and Professional Wetland Scientists have designed, constructed, and monitored streams and wetlands across the country.
- **Protected Species Habitat Evaluations and Surveys.** GES Ecological Services staff are experienced in evaluating habitat for protected species and, where needed, performing presence-absence surveys and guiding the project sponsor through mitigation action.

Contact Us

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- **Biological and Natural Resource Surveys.** GES performs a broad variety of surveys for flora and fauna, sensitive habitats, and resource mapping in all types of aquatic and terrestrial settings.
- **Wildlife Hazard Management.** GES provides wildlife hazard management for airports and conducts avian risk assessments and wildlife management for towers and other facilities where wildlife could pose a conflict.
- **NPDES Permitting.** GES professionals are highly experienced in developing NPDES permit applications and monitoring for wastewater and stormwater discharges.
- **Environmental Inspection/Construction Monitoring.** GES Ecological Services staff routinely perform construction monitoring for new pipelines and other infrastructure that impact land or water. The oversight typically ensure that wetland impacts are mitigated or avoided, and impacts on protected species are avoided.

Our clients are manufacturing, energy, transportation, land development, government, solid waste, and a wide variety of other entities. Please contact us to find out how we can support you.



Pipeline Construction Permitting and Field Compliance

- Construction of natural gas liquids pipelines across 226 counties and three states
- Conducted stream surveys, aquifer studies, wetland delineations, and expert testimony in support of revised permit application
- Performing hydrogeologic risk assessment, baseline sampling, rapid response and waste management as part of HDD oversight responsibilities
- Managing the identification, removal, stockpile and replacement of soils in more than 250 open-cut wetlands sites spread across 10 counties



Ecological Regulatory Compliance – Former Petroleum Terminal

- Development and implementation of a remedial investigation of ecological receptors on a 300-acre former petroleum terminal
- Providing wetland delineation, land-use permitting, threatened and endangered species support
- Directing sediment and surface-water toxicity testing and providing Ecological Risk Assessment services



Environmental Survey & NEPA Documentation

- Environmental surveys for oil and gas development on federally-owned lands
- Evaluated threatened and endangered species habitat, surface water, and potential archaeological sites
- Facilitated discussions with Forest Service personnel for special-use permit approvals



1,500-Acre Utility-Scale Solar Farm Ecological Evaluation

- Performed threatened and endangered species and migratory bird habitat assessments on agricultural and forested parcels
- Conducted Phase I environmental site assessment
- Delineated jurisdictional wetlands and other waters of the U.S., totaling over five miles of streams and 15 acres of wetlands

Stormwater Management & Compliance



An integrated approach to stormwater compliance

Stormwater runoff is one of the leading contributors to surface water pollution. The frequency of severe weather events and continued escalation of National Pollutant Discharge Elimination System (NPDES) regulatory requirements has increased the demand and urgency for the development of more integrated and effective stormwater management solutions. Private and public sector organizations face the challenge of implementing smart and affordable strategies for the ongoing collection and treatment of stormwater in their communities.

GES helps clients plan, design, implement, and operate stormwater management programs that improve water quality, reduce flooding, and achieve long-term compliance in a cost-effective manner. Our collaborative team of engineers, scientists, and field technicians partner with clients and regulators to develop practical and sustainable solutions that balance regulatory requirements and business objectives. GES provides a wide range of consulting and field services associated with stormwater management, NPDES permitting, and related pollution prevention planning and facility compliance issues.

Field Services

- Stormwater and effluent discharge sampling programs
- Whole Effluent Toxicity (WET) testing for biological/ecological monitoring
- Early release detection programs, including monitoring well inspections, vapor monitoring, and non-stormwater discharge evaluations/certifications
- Rapid response field services via 24-hour emergency response programs

Environmental Consulting and Design Services

- NPDES five-year permit renewal applications, including sampling plans for collection and analysis of supporting analytical data
- Wetland and stream restoration design, construction, and monitoring programs
- Development of effective Stormwater Pollution Prevention Plans (SWPPP)
- Best Management Practices (BMP) program review and design, including existing system upgrades, storm drain layouts, and grading plan development
- Erosion and sediment control structure design and inspection
- Regulatory permitting including pre- and post-development drainage evaluations and construction permitting plans

Areas of Expertise

- NPDES Permitting
- SPCC Plan Development
- SWPPP Management
- BMP Review and Design
- Facility Compliance Audits
- Erosion and Sediment Control Plans and Inspection
- Wetland/Stream Restoration Design and Construction
- Stormwater and Effluent Discharge Sampling
- Rapid Response Field Programs



Stormwater Treatment Wetland Design and Construction

A Texas university proposed restoration of a wetland to help reduce pollutant concentrations from stormwater runoff on campus. The client envisioned a design that would convert the existing swale and deep pond into a natural stream and wetland complex, with interpretive signage and infrastructure to support education. GES designed, permitted, and constructed a multiple-use stream and wetland complex on campus. A USACE Section 404 wetland permit and a water-rights permit were obtained to fulfill regulatory requirements. The campus amenity has been restored and post-construction monitoring of water quality has demonstrated a significant reduction in concentrations for several pollutants of concern, including E. coli, nitrogen, phosphorous, and total suspended solids. The project was completed on time, within budget, and to the client's satisfaction.



Water Quality Monitoring and Modeling at Storm Sewers

GES was retained by the Minnesota Department of Transportation (MnDOT) to conduct water-quality monitoring at two storm sewer locations in conjunction with the reconstruction and widening of a highway. The two storm sewer locations are positioned after the convergence of all storm sewer lines in their respective drainage networks, prior to discharge into Green Lake. A programmable liquid-sampling unit was connected to a telemetry system for remote access and programmed to electronically record data and collect samples. Collected water samples were submitted to a certified laboratory for analysis. GES simulated non-point source pollutant loadings within the respective drainage areas (catchments) using the USEPA Stormwater Management Model. Annual water quality reports were prepared by GES and submitted to MnDOT over a four-year period.



Stormwater Monitoring and Inspection

GES was contracted to implement a monitoring and inspection program at a petroleum bulk storage terminal facility with multiple discharge points. The project also required preparation of reports in accordance with the facility's General Permit. During facility inspections, GES personnel reviewed all maintenance and repair areas checked hazardous materials/waste storage areas, observed the use of best management practices (BMPs), and noted any additional BMPs that may be required. Stormwater samples from two separate rain events were collected at the facility and analyzed. GES submitted reports which included copies of the stormwater inspection reports, visual observation reports, and annual comprehensive site compliance evaluation inspection records, and summarized recommendations for improvements to the SWPPPs and monitoring activities.



Compliance Program for Freight Rail Company

A North American freight railway company engaged GES to manage an integrated compliance and permitting program at 22 rail and intermodal facilities across California. The project included SPCC plans, stormwater monitoring, hazardous materials/waste management, integrated compliance plans, wastewater management, air quality permitting, health and safety training, and regulatory reporting. GES worked with terminal operators to plan a streamlined field inspection approach that prioritized sites based on stormwater sampling needs and other issues requiring immediate attention. Efficiencies were achieved by scheduling services, such as on-site corrective actions, concurrent with inspections. The approach reduced labor costs by 50%. Non-compliance issues have decreased significantly, and reportable quantity releases have been reduced or eliminated.

Small Unmanned Aircraft System Operations



Delivering safe, value-driven data collection, remote monitoring, and inspection services

The commercial applications for the operation of small Unmanned Aircraft Systems (sUAS), commonly referred to as drones, continue to evolve in safety-critical industries such as oil and gas, power, mining, and construction. Growing regulatory acceptance and recent technology advancements in flight payload and remote sensing have created opportunities to leverage sUAS platforms for tasks such as environmental assessment, asset inspection, field compliance monitoring, data collection, and other emerging applications.

Groundwater & Environmental Services, Inc. (GES) provides specialized sUAS services in support of your infrastructure development and compliance programs. We have put professional grade sUAS technology in the hands of degreed environmental professionals who are FAA-licensed and trained to enhance our field monitoring and data management capabilities.

Our clients benefit from the seamless integration of sUAS technology in their existing workflows, providing scientific evaluation of environmental conditions and data that is accurate, quantifiable, and defensible. We leverage state-of-the-art imaging and remote sensing technologies to improve data quality and reduce investigation costs. Our deployment of GPS-guided aircraft capable of autonomous and repetitive flights, equipped with anti-collision sensing and redundant power systems, also provides a higher level of overall project safety.

Our sUAS program offerings are backed by the following unique qualifications.

- FAA-certified remote pilots on staff
- FAA-compliant standard operating procedures (SOPs)
- sUAS pilot training, certification, and recertification programs
- Robust sUAS equipment maintenance and inspection program
- Industry-leading and cutting edge sensors and processing software
- sUAS-specific health and safety plans developed in accordance with GES' Loss Prevention System (LPS) behavior-based program

Service Capabilities

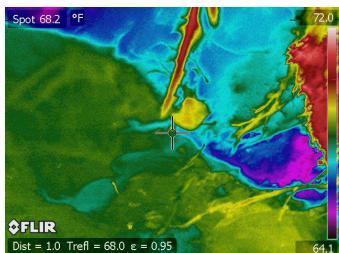
- Methane Monitoring
- Thermal Imaging
- Magnetometry Survey
- Photogrammetric Mapping
- LiDAR Survey
- Infrastructure and Asset Inspection
- Digital Elevation Mapping
- Construction Monitoring
- Right-of-Way (ROW) Corridor Inspection
- Emergency Response and Documentation
- Wetland Mitigation and Monitoring
- Stockpile Volumetrics

Relevant sUAS Experience

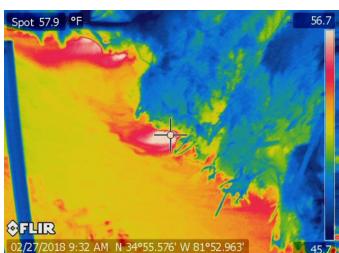


Right-of-Way Monitoring and Inspections

A national midstream energy client required routine monitoring and inspections of pipeline right-of-ways located within areas that were difficult to access and considered environmentally sensitive. GES' sUAS was utilized for pipeline installation monitoring and progress documentation as well as other inspections, including compliance with pipeline installation permit conditions, such as erosion and sedimentation controls.



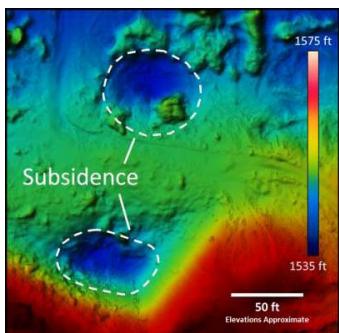
Late Summer 2017



Winter 2018

Thermal Imaging to Identify Discharges to a Stream

GES conducted two stream-survey events that included a visual inspection in conjunction with the use of thermal imaging equipment to identify groundwater discharges to a stream. GES used a FLIR camera to photograph the banks of the stream, to locate and characterize thermal anomalies. The temperature of groundwater stays relatively constant, whereas surface water is subject to greater temperature variability due to climate/air temperature. These temperature differences can be discerned by thermal imaging equipment and used to locate groundwater seepages into the stream. The first event was completed in September 2017, in late summer, when the air and surface-water temperatures were warmer than groundwater. GES looked for cooler water emerging from the bank or into the stream. The second event was conducted in February 2018, during late winter, when the air and surface-water temperatures were cooler than groundwater. The warmer water discharge from groundwater would therefore appear lighter in color than the surrounding surface temperatures of the stream water. GES looked for this temperature signature emerging from the bank or into the stream.



Subsidence Identification and Monitoring

GES conducted a detailed analysis of surficial sinkhole expressions that appeared in the vicinity of an active pipeline. GES utilized video and orthomosaic images taken from an sUAS flyover and conducted elevation modeling to determine the location and extent of the sinkholes. These findings are now being used to monitor any continued subsidence.



Pre-Construction Analysis

Prior to the construction of a municipal water-well field and treatment plant, GES conducted a detailed photogrammetry analysis of the planned construction area. Utilizing a sUAS, the photogrammetry was used as an underlay for the construction drawings, providing real-time analysis of current structures and terrain features that will be disturbed during construction. Additionally, the analysis provided documentation on the accuracy and progress of the construction effort.

Beyond Visual Line of Sight (BVLOS)



You don't have to walk a mile in those shoes with BVLOS

Linear infrastructure projects, such as petroleum and natural gas pipelines and electric utilities, typically require inspections before, during, and/or after construction to document that an asset and surrounding area are deemed safe and compliant with the design, permits, and regulations. Post-construction inspections are required to document conditions, including following a man-made disturbance, storm event, or other severe weather or natural disaster. Historically, these inspections were limited to ground-based environmental inspectors (EIs) putting one foot in front of the other or using costly fixed-wing aircraft and helicopters, visual line of sight (VLOS) drones, or a combination of these methods. The work of an EI often poses serious health and safety risks accessing and traversing right-of-ways. Beyond Visual Line of Site (BVLOS) has the potential to change this.

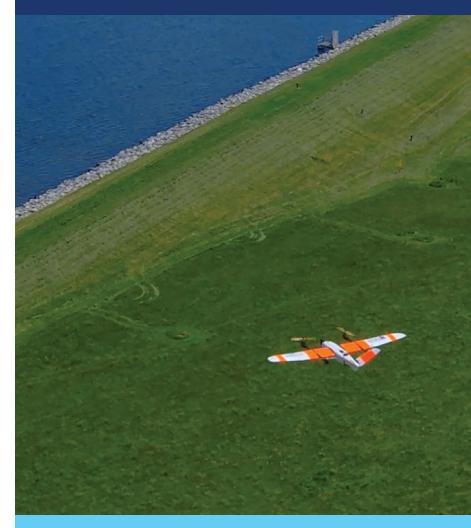
Small Unmanned Aircraft Systems (sUAS), commonly referred to as drones, continue to evolve in safety-critical industries such as oil and gas, power, mining, and construction. Growing regulatory acceptance and recent technology advancements in flight payload and remote sensing have created opportunities to leverage sUAS platforms for tasks such as environmental assessment, asset inspection, field compliance monitoring, data collection, and other emerging applications.

Compliance made safer, farther, better. GES' latest offering in our sUAS program is the addition of BVLOS which allows our pilots to fly these small craft farther than the eye can see, covering more area faster and safer than an EI on foot. BVLOS is exceptionally suited for inspecting areas that are challenging to access, such as steep slopes, rugged terrain, or subject to damage from severe weather, flooding, earth movement, or man-made incidents. BVLOS enhances the ability to demonstrate asset integrity, permit compliance, and safe area conditions without exposing EIs to the hazards present along linear infrastructure corridors.

A picture is worth a thousand words. Instead of multiple inspection forms supplemented with scant digital images, the primary documentation for permit compliance using BVLOS is the abundant quality imagery collected from the drone. With BVLOS, the EI no longer traverses the right of way or the inspection area by foot or in a vehicle. The EI stays put while the drone "inspects" at speeds of up to 40 mph. The EI then confirms conditions based on review of the images collected from the drone. By covering a greater distance with the drone, fewer daily inspection forms need to be completed to document the condition and integrity of your assets and demonstrate permit compliance. Our EIs can also assist with completing client forms or create a project-specific deliverable to meet your needs.

Service Capabilities

- Construction documentation
- Earth movement (e.g., slips and slides)
- Erosion and sedimentation (E&S) control inspection
- Inadvertent return monitoring
- NPDES related inspection
- Permit required inspection
- Post precipitation inspection
- Surface and storm water (e.g., pooling, scouring)
- Third party disturbance
- Trespassing monitoring
- Vegetation health (e.g., revegetation, stressed vegetation)
- Wetland restoration



Sustainable Land Management



Identifying profitable and sustainable land use.

Surplus lands have unique potential. There are new options to the old paradigms of costly land management that may enhance return on investment. The marketplace for sustainability can add value to legacy properties, turning constraints into opportunities.

Corporations today are looking to their surplus properties for land management options that may unlock value. At GES, identifying profitable and sustainable land use is a multidisciplinary process that might involve GES ecologists, wildlife biologists, foresters, stream and wetland designers, engineers, soil scientists, and geologists. Success occurs when our GES team of experts works with your land managers to explore options based on new markets, regulations, technologies, and procedures.

GES can develop a detailed environmental constraints and opportunities analysis to identify a property's unique value propositions and monetize the potential of a site, effectively optimizing your land assets. The constraints could be environmental, such as existing land or water contamination or the presence of regulated wetlands and protected species. The constraints could also be financial, market, or regulatory uncertainty.

Potential opportunities include:

- Maximizing land value
- Optimizing sustainable land management practices
- Enhancing public image and relations
- Liability reduction for contaminated sites

Since every property presents a different mix of constraints and opportunities, the experience and broad skills of the GES team of experts ensures that the unique objectives of each client are understood and accomplished.

Areas of Expertise

- Constraints and opportunities analysis
- Carbon sequestration and credit trading
- Stream and wetland mitigation banks
- Carbon conservation land management
- Land management
- Regulatory consulting
- Cost/benefit analysis
- Site-specific business plans
- Brownfield redevelopment
- Hazardous waste and fuel remediation
- Unmanned aircraft system operations



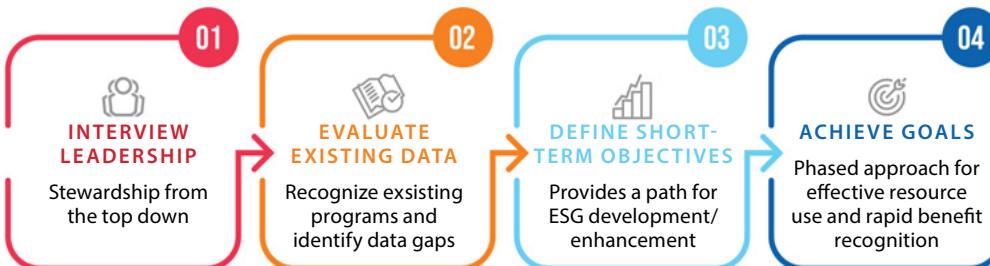
Environmental Social Governance (ESG)

Small steps add up to big results.

Environmental, Social, and Governance (ESG) is driving discussions in government, industry, investors, and consumers across the globe. At its heart, ESG practices describe how responsibly a business operates. Environmental metrics illustrate a business' stewardship of the environment such as carbon emissions, energy use, and climate change. Social factors include benefits to the local community, commitment to employees, and fairness to suppliers. Governance conveys the transparency and ethics of the business. High performance in ESG criteria announce that a company is conscientious of how its business practices affect the community and world around it, and that its operations will be reliably sustainable into the future. Today, these are companies that other firms want to do business with, investors want in their portfolio, consumers want to buy from, the public wants in their communities, and people want to work for. Industry trends indicate that firms with a strong ESG profile are financially out-performing those that do not.

Businesses have the choice of proactively embracing ESG and reaping the benefits of visible responsible operations, or can wait until they begin to lose reputation, investors, supply contracts, consumer confidence, and talented staff to begin developing an ESG program. At Groundwater & Environmental Services, Inc. (GES), we have found that many businesses already have the building blocks of an ESG program in place, but do not formally recognize them as such. We believe that taking small steps toward ESG goals can add up to big results. GES can assist both small and mid-sized firms with staff who manage ESG as one of their many roles, as well as large firms with dedicated ESG staff. Our experience indicates that developing a long-term strategy combined with implementing practical initial steps is the most successful path to achieving ESG excellence. It is critical for businesses to initiate, continue, and enhance their ESG profile.

Step towards ESG excellence. Have GES develop an ESG program, perfectly aligned with your vision. Our simple yet effective approach to developing and implementing an ESG strategy can be applied company-wide or to a specific facility. Our approach involves four key steps:



Areas of Expertise

Strategy development
Execution planning
Develop client programs

Environmental

Carbon emissions
Carbon offsets
Climate impact
Energy use
Nature-based projects
Pollution reduction
Resource consumption
Waste management

Social

Community relations
Diversity equity and inclusion
Employee engagement
Labor standards
Supply chain

Governance Practices

Auditing
Board/leadership
compensation and makeup
Bribery and corruption