Environmental Services

Statement of Qualifications

Where a past, present or future use of radiation or radioactive material intersects with potential environmental concerns or impacts, Foxfire Scientific, Inc. is uniquely suited to meet your needs. Through a strong combination of highly qualified staff, the right equipment, and carefully chosen and compliant methods, we can provide the optimal solution. Whether your needs encompass due diligence efforts, analysis of distressed and abandoned properties, environmental remediation or restoration, including full-spectrum project management, or even public speaking and stakeholder involvement, Foxfire Scientific, Inc. produces outstanding results.

The President's Perspective

As President and Founder

of Foxfire Scientific, Inc., I want to begin by sharing a few personal words. Within these pages I hope you get an idea of who we are, what we've accomplished, and why Foxfire Scientific, Inc. is the best choice to fill your environmental and operational health physics, and radiation protection engineering needs.

Who We Are

C.S. Lewis wrote that there are four cardinal virtues, pivotal virtues that everyone would recognize as right behavior: prudence, temperance, justice, and fortitude. Today, we recognize these virtues as common sense, moderation, fairness, and courage. At Foxfire Scientific, Inc. we feel strongly that everyone represented on these pages practices these virtues every day of their lives. We wouldn't have it any other way.

What We Know

Everyone who works for Foxfire Scientific, Inc. was handpicked for their personal character and technical acumen, as well as their ability to work as part of the Foxfire team. As you read, you will see that Foxfire Scientific, Inc. is multifaceted, with capabilities and experience in everything from MCNP modeling to environmental remediation-project management, industrial hygiene to laser safety program oversight, and clinical medical physics to radiation protection engineering/shielding design. In addition to these areas of practical expertise, we specialize in radiation safety education and training, including emergency response and domestic preparedness.

Where We've Been

A veteran-owned small business, Foxfire Scientific, Inc. has worked for a variety of clients on myriad health physics, medical physics, and radiation protection engineering projects. Our environmental services work has taken us around the United States and abroad. In consistently meeting our clients' environmental project needs, we have earned a reputation for flexibility, dependability, unimpeachable quality and value that no other company can match. With an eye on continuous improvement, we continue to add capabilities and equipment to our corporate toolbox, ensuring that our clients' needs are properly matched with the best solutions.

Why We're Valuable To You

When I started Foxfire Scientific in 1999, I founded it on the core values of integrity, accountability, flexibility (maneuverability), and technical excellence. While every value I've just listed is something you should expect from any firm you hire, I want to point out a few of the reasons why Foxfire represents a unique value to its clientele — points to keep in mind while you review information on the following pages. Notice that the majority of Foxfire Scientific, Inc. staff possesses either an MS or PhD in Nuclear Engineering or Health Physics. While you might expect to pay a premium for such competence - don't! The professional-level expertise you gain by choosing Foxfire Scientific, Inc. comes to you at a cost closer to what other, larger companies have to charge for technician-level help. It has always been one of my goals to provide health physics prowess at an economical rate, making these skills available for a wider range of

Ian Scott Hamilton, PhD, CHP, DABR(D)

radiation protection problems. And, we wouldn't be able to accomplish such without keeping our overhead low, which brings me to our next point — Foxfire Scientific is flexible. I liken it to a comparison between a whale and a school of fish. Both may weigh 20 tons, but which one can maneuver to pivot on a dime? Finally, because all of our people have an academic pedigree, we approach every project as if it were up for peer-review among our more esteemed colleagues (some of whom consult with us regularly). We approach every task with state-of-the-knowledge techniques and experience. Foxfire Scientific, Inc. — because results matter.

God Bless!

Who We Are

Foxfire Scientific, Inc. is a veteran-owned small business dedicated to providing clients with comprehensive environmental and operational health physics, and radiation protection engineering solutions of the highest quality. Foxfire Scientific, Inc. has enjoyed consistent growth since its incorporation in 1999 on a framework of specialized, senior-level services in health physics and litigation support. With offices in Houston, Amarillo, Arlington, Austin, and College Station, Texas, USA, and Manchester, UK, we conduct business both in the United States and abroad.

To each project, we bring a staff of highly qualified scientists and engineers with backgrounds in the military, federal government, industry, and academia. Our professionals offer over 180 years of nuclear industry experience with both MS and PhD educational backgrounds and a broad array of professional certifications and licensure (including CHP and PE). With our highly qualified staff, technical reviewers, board certified professionals, and teaming partners, Foxfire Scientific has the depth of resources necessary to meet any client need across the environmental and operational health physics, and radiation protection engineering disciplines.

Our goal is to provide the most complete, technically accurate and competent solution to our client's needs, while maintaining a cost-conscious approach to project management that guarantees each client gets the most out of their investment — that is our idea of value. We believe in fostering excellent client-consultant relationships, and thus strive to exceed client expectations in every way possible. We provide this essential, cost effective project and task-specific support with our experienced, professional staff and cadre of nationally/internationally renowned teaming partners, all well-recognized scientists and engineers in their respective disciplines.

With the experience our project managers possess, we can navigate many of the complex issues surrounding local regulatory, community, and environmental concerns. This enables us to provide rapid client support, and to work with minimal government or contractual oversight.

The Principals

Dr. Ian Hamilton, founder and President, is a Certified Health Physicist (CHP) and Certified Diagnostic Medical Physicist (DABR-D). He started his career as a nuclear technician in the US Navy aboard a ballistic missile submarine. Over the subsequent 27+ years of experience in reactor operations, applied and theoretical health physics, and general safety, he has been the Laboratory Manager, assistant professor, and Health Physics Program Director for the Texas A&M University, Department of Nuclear Engineering; associate professor of Radiologic Science and Director, Consulting Medical Physics Practice, for the Baylor College of Medicine, Department of Radiology; and President and Chief Operating Officer, Foxfire Scientific, Inc. During this time, he has also been an active public servant in varying capacities, including: head of the Work Area on Health and Safety, Amarillo National Resource Center for Plutonium; member of the National Council on Radiation Protection and Measurements (NCRP) Report No. 138 writing committee; chair of national Health Physics Society's Public Education Committee, and is currently on his second gubernatorial appointment as vice-chair of the Texas Radiation Advisory Board (TRAB). Dr. Hamilton

specializes in environmental health physics, radiological assessment, health physics training and education, and radiation protection engineering.

Dr. Matthew Arno, Vice-President, is a licensed Professional Engineer and CHP. He has worked in the US Department of Energy uranium fuel cycle complex and as a visiting assistant professor for the Texas A&M University, Department of Nuclear Engineering. He joined Foxfire Scientific in 2000 and has over 15 years experience with nuclear criticality safety, accident analysis, safety analysis, licensing and regulatory support, environmental assessment and remediation, and dose assessment. Dr. Arno specializes in environmental remediation, dose assessment, regulatory compliance, and radiation safety program management.

Key Staff

Mr. Robert Berry, MS, Senior Health Physicist, began his career as an engineering laboratory technician in the US Navy in 1977. Over the next 35 years, Mr. Berry compiled a solid record of experience in the nuclear industry including serving time as a senior reactor operator, safety officer and radiation safety officer. He was the reactor supervisor for Texas A&M University for 15 years. In addition to being a laboratory instructor and working in various operational health physics capacities, he also has experience in environmental health physics. Mr. Berry joined Foxfire in 2003 and is located in Manchester, UK.

Mr. Douglas Johnson, MS, Senior Health Physicist, has 37 years experience in industrial and occupational health, radiation safety, and environmental health. He is a former engineering auditor for the Department of the Navy, inspector for the Texas Department of Health, University Laser Safety Officer and Senior Health Physicist. He was also the General Manager for The National Center for Electron Beam Research overseeing operations, research and commercial contracts. He is a licensed medical physicist and former member of the ANSI committee for laser safety. Commander Johnson (USN) continues service in the Navy Reserve. His service tours included performing industrial hygiene and environmental health functions and he has headed radiological investigative teams in Europe, Asia, and the U.S. He has worked in Naval nuclear propulsion, weapons, and industrial sources and holds the highest DOD security clearances.

Mr. Larry Donovan, MS, Senior Medical Physicist, has 37 years experience in the health and medical physics field. He is a retired Air Force Major with experience managing the Air Force Master Materials license worldwide including low level radioactive & mixed waste management, dosimetry, nuclear weapon, nuclear reactor, material licensing, laser and radio-frequency hazard assessments. He is a licensed medical physicist and former US Nuclear Regulatory Commission nuclear materials inspector including portable gauges, radiopharmacies, hospitals, well logging & industrial radiography, and academic/ universities.

Foxfire Scientific has other full and part-time specialists that can assist on any project. We also maintain a team of highly specialized science and engineering consultants — all subject matter experts whom we work with on specific projects. This group includes past presidents of the American Industrial Hygiene Association and Health Physics Society, members and past members of National Council on Radiation Protection and Measurements writing committees and other prominent nuclear industry positions.

What We Do

Whether your particular need is for a small-scale survey, or a team skilled in designing and implementing an operational radiation safety or environmental monitoring program, Foxfire Scientific can be your "one-stop shop." We can take the lead on a contractual or subcontracted project at any stage of its development or execution. We serve a clientele with diverse backgrounds — from sole entrepreneurs, to government agencies, and large corporations. In short, we can provide expertise and teaming opportunities in:

- Environmental and radiological assessment
- Operational and applied health physics and radiation protection engineering
- Radioactive and mixed waste management
- Risk assessment and risk communication
- Training and education

Health Physics & Radiation Protection Engineering

Our staff includes health physicists with extensive experience in environmental and operational health physics and radiation protection engineering. Foxfire Scientific has developed numerous regulatory-compliant MARSIMM survey plans, ongoing environmental monitoring, and operational radiation protection programs. We provide a wide array of expertise in many topical areas including the following:

- Radiation protection program development, auditing and regulatory compliance
- Dose estimation, including reconstruction or projection
- Radiation litigation support
- Nuclear facility safety
- Criticality safety
- Licensing and registration
- External and internal dosimetry monitoring programs
- Design of radiation detection and monitoring systems
- Development and auditing of security controls for radioactive materials
- Laser systems hazards analysis and program management
- Training program development, and auditing

Environmental Assessment

Foxfire Scientific has participated in a number of environmental assessment and remediation projects for a wide range of sites and industries. We have addressed issues arising from Naturally Occurring Radioactive Materials (NORM) and Technologically Enhanced NORM (TENORM) for many of our clients. Many of our projects have involved the mineral extraction industry, including mining, milling, and petrochemical firms. Our services include:

- Historical site assessments
- Scoping surveys and sampling
- Characterization surveys and sampling
- MARSSIM final status surveys
- Environmental monitoring (both discrete and ongoing sampling)
- Public dose assessment
- Environmental remediation feasibility studies and work plan development
- Environmental transport pathway analysis

Risk Assessment & Risk Communication

Foxfire Scientific has a broad range of experience in risk assessment and communication of risks concerning radiation and chemical exposures. We have conducted dose and concomitant risk assessments for a variety of exposure scenarios including risk to an individual from occupational exposure, risk to off-site members of the public, and risk from long-term environmental contamination. We provide public speaking, as well as other forms of assistance for public and stakeholder meetings and for support of technical document development. The objective is to communicate and inform interested and/or impacted parties about the contextual meaning of estimated risks in understandable language. We routinely provide risk communications to workers through a variety of our training and education programs, and strive to provide the most up-to-date, scientifically sound information available. Through these experiences we have developed capabilities to:

- Perform retrospective and prospective dose assessments and communicate the findings

- Conduct atmospheric modeling and environmental transport analysis
- Perform accident analysis to determine credible accident scenarios
- Model and evaluate routine, non-routine and accidental releases
- Conduct planning, oversight, and review of Superfund site environmental remediation projects.

For risk communication in the concerned public and legislative arenas, Foxfire Scientific, Inc. staff members have considerable experience presenting technical information to a variety of non-technical audiences. This experience ranges from teaching high school science teachers about radiation sources, effects, and uses, to presenting the results of public dose assessments at public meetings under adversarial conditions.

It is our belief that even the best science in the world is of no use if its meaning and true impact cannot be effectively communicated. To this end, in any study we perform we always strive to make sure the results are presented (whether written or oral), in a clear, concise and readily understandable manner. Our past risk communication activities have also included expert witness written reports and testimony at both deposition and trial, as well as legislative testimony, and explanation of radiation effects and risks at Superfund site Public and Technical Working Group meetings.

Radioactive & Mixed Waste Management

Foxfire Scientific, Inc. offers a wide array of radioactive waste management services. Our staff has experience in all aspects of a waste management program, from limiting production of radioactive and mixed wastes, to characterization and disposal, including:

- Sorting and characterizing waste streams
- Packing and manifesting shipments
- Brokering and waste disposal
- Obtaining state-specific special waste permits
- Developing written procedures and program development
- Routine waste program management

Training & Education

Education is always the first step toward success in any field. At Foxfire Scientific, we believe that to be effective leaders in our profession, as well as in our community, we must continually strive to educate ourselves and others. In fact, some of our staff members hold concurrent positions as faculty at major universities and medical schools. We have worked with local authorities, educational institutions, and professional organizations and businesses to provide short courses and seminars that confer the necessary education and hands-on training concerning radiation protection, best management practices, and related medical physics and health physics topics. We are skilled in teaching difficult radiation concepts to adult learners. Our training provides attendees with the tools necessary to handle the obstacles that are part of the everyday radiation workplace. If you have a radiation-related training and/or education need, Foxfire Scientific can meet it. Many of our courses can be taken for continuing education credits, as well.

- Principles Of Health Physics 4-Week Professional Academy
- Internal Dose Assessment and Related Principles of Whole Body Counting (5-days)
- Management of Terrorist Events Involving the Use of Radioactive Materials (1-day)
- Radiation Safety Officer 40-Hour Short Course (5-days)
- Basic Counting Statistics (1-day)
- Principles of Radiation Detection and Measurement (5-days)
- First Responder Training (1-day)
- Radiation 101 (1-, 4-, or 8-hours)

Foxfire Equipment Inventory

Whatever the particular sampling or measurement need, Foxfire Scientific has the equipment and analytical services to make each project a success.

Foxfire Scientific is proud to announce the addition of a Geoprobe Model 4220 direct push soil sampling drill rig to our existing toolbox of high-quality client solutions. With this addition to our existing equipment inventory, our cadre of experts can provide a wide range of services from soil and groundwater sample extraction at-depth to complete site characterization and remediation planning.

Due to its compact size and mounting on an all-terrain utility vehicle, the Model 4220 drill unit is very rugged, easily transported, and can access a wide range of locations and terrain. Equipment transport and sampling activities result in minimal ground disturbance compared to tracked or over-the-road vehicle-mounted units. The Model 4220/ATV can also be crane-transported into areas that larger vehicles cannot access. Our Geoprobe principal features are:

- Highly transportable
- Capable of reaching the hard-to reach locations
- Low impact to environmentally-fragile sites
- No investigation-derived wastes produced during the sampling process
- Probing is fast and mobilization quick and economical
- Probing tools create small diameter holes that minimize surface and subsurface disturbance

Foxfire Scientific has contractual agreements with nationally-accredited analytical laboratories to provide any radiological sample analysis that may be required for any project.

In addition to the Foxfire Geoprobe, we can field the following equipment:

- Portable High Purity Germanium (HPGe) gamma-spectrometry systems
- Pressurized ion chambers
- Gamma survey instruments
- GM & alpha survey instruments
- Integrated GPS position logging survey capability
- Tissue-equivalent dose rate meters
- Exposure and dose rate meters
- Alpha-beta sample counters
- Liquid scintillation counter
- High volume air samplers
- Breathing zone samplers
- Cascade impactors and Respicons for particle size determination
- Dustraks and Sidepaks
- Radon sampling canisters
- Rad elec electrets
- Soil & water sampling equipment

PROJECT HIGHLIGHTS

Assessment of Legacy Copper Mining Activities

Client: Katanga Mining Company
Location: Kolwezi City, Katanga Province, Democratic Republic of Congo

A radiological environmental assessment was performed as part of a larger environmental assessment of a copper mining and milling concession near the city of Kolwezi in the Democratic Republic of Congo. The environmental assessment was performed in support of a World Bank financing request and to characterize the concession, which comprises several different open pit mines, underground mines, and at least three processing facilities, with respect to legacy environmental damage. Decades of prior activity by multiple owners had resulted in large disturbed areas. Complicating matters was that areas within the site had also been used as an ore storage pad for uranium ore from another location.

Extensive gamma radiation surveys were performed on the concession property and surrounding areas to determine the nature and extent of any environmental contamination.

Composite soil sampling in the same locations as the surveys, and biased sampling in suspect areas with elevated survey results were collected. Water samples from surface water bodies used by co-located populations were collected. Sampling data was used to conduct a scoping-level risk assessment of present and proposed site conditions. A final report of the findings was prepared in accordance with World Bank and International Finance Corporation standards and requirements.

The project was completed under the original budget and ahead of schedule in support of revised project deadlines.

Uranium Mill Disposal Site Characterization

Client: El Paso Natural Gas
Location: Navajo Reservation near Tuba City, AZ

An old waste burial site across the highway from a former uranium mill was believed to contain waste from the mill. Mill structures and tailings were remediated under UMTRA in the late 1980's. However, this waste burial site was not included in the remediation. Evidence that the waste came from the mill was a necessary next step in the clean up of radioactive debris at the site.

Foxfire Scientific performed gamma radiation surveys on tightly-spaced transects to identify areas with elevated radiation levels. Additional magnetic and electromagnetic surveys were performed by a geophysics-services teaming partner . The combined surveys identified multiple waste burial trenches, including locations where the burial cap had eroded or was nearly completely eroded. Confirmatory sampling was conducted to characterize the radioactive material.

During the course of sampling, waste specifically traceable to the mill, in the form of ball mill-ceramic balls, was discovered.
The team's efforts contributed to the US Congress setting aside $5M to remediate the site.

Copper Mine & Mill CERCLA Remediation

Client: BP
Location: Former Anaconda copper mine site near Yerington, NV

The former Anaconda copper mine near Yerington, NV, has gone through a series of owners; both traditional, open pit mining and heap leach extraction were conducted at the site. Historical operations resulted in contamination of ground water, as well as surface soils. Although the majority of contamination is related to heavy metals, potential issues with radioactive materials, especially uranium and radium, have been identified.
Foxfire Scientific, Inc. was originally retained on behalf of the Nevada Department of Environmental Protection (NDEP) to assist with worker radiological safety for NDEP contractor personnel performing caretaker functions at the site. When the US EPA assumed regulatory authority for the site under CERCLA, Foxfire Scientific transitioned to supporting BP, one of the potentially responsible parties, in efforts to conduct ongoing site maintenance, remedial investigation/feasibility study activities, and on- and off-site risk assessments.
Foxfire Scientific provides all the radiological risk assessment and characterization expertise for BP and their contractors. Activities include development and maintenance of the site Health and Safety Plan as related to radiological risks, preparation of operable unit-work plans with respect to radiological sampling, analysis, and assessment, conduct of field sampling, surveying activities, and oversight of EPA and EPA-contractor site activities.

Closure & Reclamation of a South Texas Uranium Mine

Client: Apollo Environmental
Location: Whitsett, Texas

Foxfire Scientific, Inc. provided radiation safety project management during the reclamation activities conducted at the Mabel-New Superior uranium strip-mine located near Whitsett, Texas. This former mine had not been in operation since 1978 and was currently part of a commercial deer-hunting ranch. Due to erosion, the ore body had been located in near-surface deposits and strip mining had left several irregularly-shaped pits with remnant ore material and mine tailings deposited in mounds across 22 acres of the ranch. Heavy equipment was used to backfill the pits with the mound material and to grade the property. Employees working at this site were exposed to both external and internal sources of radiation due to the uranium ore present in the soil being excavated and moved.
Services provided included:

- Dosimetry program
- Bioassay program
- Personnel air sampling
- Radiation safety training
- Contamination monitoring
- Area gamma surveys

In addition to the above services, Foxfire Scientific also acted as liaison between the Texas Department of State Health Services, the Texas Railroad Commission and Apollo Environmental.

Surface Radon Flux Sampling Over Phosphogypsum Piles

Client: URS-Green Earth
Location: Houston, Texas

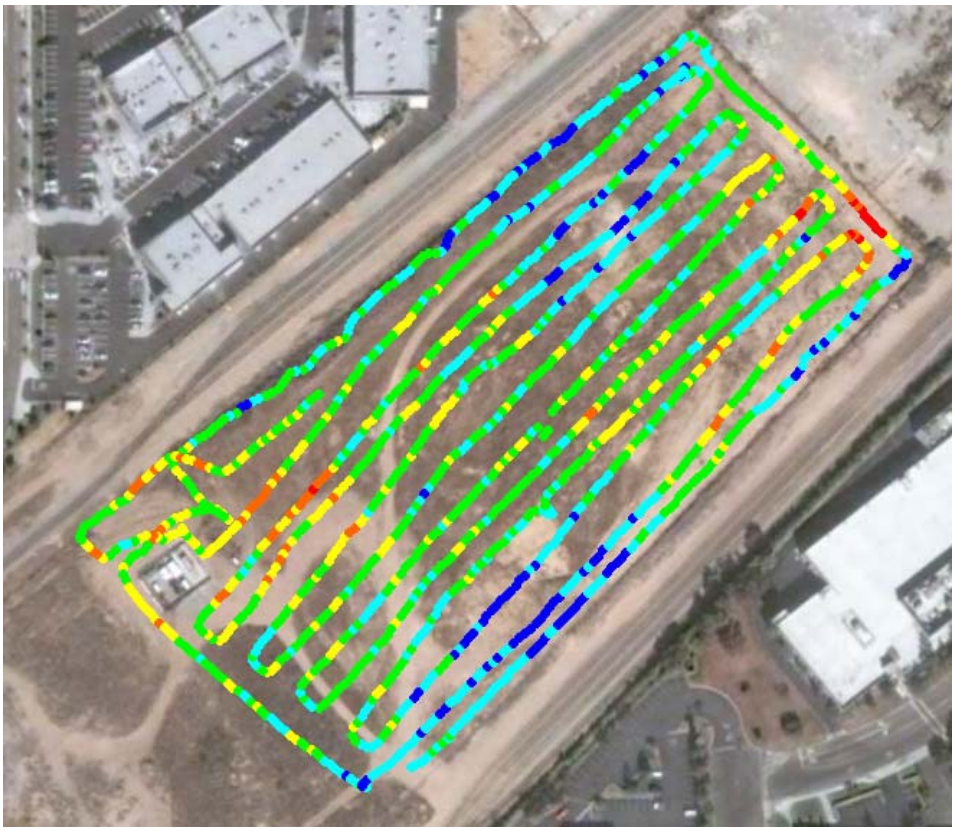
Foxfire Scientific, Inc. was retained for its capability to perform radon emanation measurements at a gypsum stack in Pasadena, TX. The site has been classified as an inactive stack since 1981. Over 300 large area activated charcoal canister (LAACC) units were used to measure radon emanation rates across the stack to obtain radon flux data needed to demonstrate that the inactive gypsum stack emanations were still below NESHAP 40CFR61 Subpart R criteria.

The results of surface radon flux-measurements conducted by Foxfire Scientific allowed the stack to remain classified as inactive, which allowed the stack to be reclassified as beneficial material for use as tank base, road base, etc., as part of a future fuel tank farm (industrial land use with appropriate institutional controls).

Closure of Bauxite Residue Tailings Pile

Client: ALCOA
Location: E. St. Louis, Illinois

Foxfire Scientific conducted surface gamma surveys, surface soil,sampling, and subsurface soil sampling to 12 feet below grade to characterize the bauxite residue/gypsum piles and vicinity areas. The gamma survey results were correlated with the radiological material soil concentrations to permit real-time estimation of soil concentrations without the delay and expense of extensive soil sampling.



Results of the surveys were used in baseline human and ecological risk assessments, to develop closure plans, and demonstrate closure compliance with applicable regulations.

For more information on how Foxfire Scientific can provide the right solution for your environmental challenges, contact us at +1 877-433-2029 or info@foxfirescientific.com.

Select List of Client Companies

- ALCOA
- Army Corp of Engineers
- Apollo Environmental Strategies, Inc.
- BP
- Brown & Caldwell, Inc.
- Browning Ferris Industries
- Chevron-Texaco
- Conoco-Phillips
- DuPont
- Exxon-Mobil
- Fulbright & Jaworski, L.L.P.
- Oak Ridge Associated Universities
- Rio Grande Resources
- SRK, Inc.
- Southwest Research Institute
- State of Nevada