



West Virginia Purchasing Division

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Header

List View

General Information

Procurement Folder: 205124

SO Doc Code: CRFQ

Procurement Type: Central Purchase Order

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Solicitation Description: ADDENDUM 2 INVASIVE SPECIES SURVEY- CAMP

Total of Header Attachments: 0

Total of All Attachments: 0



Purchasing Division
 2019 Washington Street East
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 Charleston, WV 25305-0130

**State of West Virginia
 Solicitation Response**

Proc Folder : 205124

Solicitation Description : ADDENDUM 2 INVASIVE SPECIES SURVEY- CAMP DAWSON

Proc Type : Central Purchase Order

Date issued	Solicitation Closes	Solicitation No	Version
	2016-05-04 13:30:00	SR 0603 ESR05031600000005328	1

VENDOR
000000174326 ENVIRONMENTAL SOLUTIONS & INNO

FOR INFORMATION CONTACT THE BUYER
 Crystal Rink
 (304) 558-2402
 crystal.g.rink@wv.gov

Signature X **FEIN #** **DATE**

All offers subject to all terms and conditions contained in this solicitation

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
1	Invasive Species Survey-Camp Dawson				\$26,000.00

Comm Code	Manufacturer	Specification	Model #
77111507			

Extended Description : Invasive Species Survey Inventory and Assessment, and Update of the Plant Community Mapping Data per the attached specifications.

RESPONSE TO REQUEST FOR QUOTE
INVASIVE SPECIES INVENTORY, ASSESSMENT,
AND PLANT COMMUNITY MAPPING DATA UPDATE
ON CAMP DAWSON ARMY TRAINING SITE
KINGWOOD, WEST VIRGINIA (PRESTON COUNTY)
SOLICITATION NUMBER: CRFQ ADJ1600000021

3 May 2016

Prepared for:



Ms. Crystal Rink, Senior Buyer
Department of Administration, Purchasing Division
2019 Washington Street, East
Charleston, WV 25305

Prepared by:



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TABLE OF CONTENTS

	<u>Page</u>
1.0 Introduction.....	1
2.0 Botanical Experience.....	1
2.1 Dr. Robert P. Jean – Project Manager.....	2
2.2 Lawrence G. Brewer – Senior Botanist.....	2
2.3 Field and Support Staff.....	4
3.0 GIS Experience.....	4
4.0 Department of Defense (DOD) Experience.....	5
5.0 Plant Survey Experience.....	5
6.0 Proposed Scope of Work.....	7
6.1 Invasive Species Survey and Assessment.....	7
6.2 Vegetative Communities Survey.....	7
6.3 Species of Special Concern Survey.....	7
6.4 Data Management.....	7
6.5 Digital Mapping.....	7
7.0 Cost and Assumptions.....	8
8.0 Addenda.....	8
9.0 Contacts at ESI.....	9
10.0 Literature Cited.....	9

LIST OF TABLES

<u>Table</u>	<u>Page</u>
Table 1. ESI staff botanical survey experience.....	3
Table 2. Projects managed by ESI for Department of Defense (DOD).....	5
Table 3. Botanical surveys completed by ESI and current staff.....	6

Appendices:

- Appendix A: Bid Form
- Appendix B: Resumes
- Appendix C: Abstracts
- Appendix D: Required Paperwork

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1.0 Introduction

Environmental Solutions & Innovations, Inc. (ESI) is pleased to respond to the West Virginia Purchasing Division's Request for Quote (RFQ) on behalf of the West Virginia Army National Guard's (WVARNG) Camp Dawson Army Training Site's (Camp Dawson) Environmental Office (Solicitation Number CRFQ ADJ1600000021). The intent of the RFQ is to establish a contract for an invasive species inventory, assessment, and plant community mapping data update. A completed Bid Form is provided in Appendix A.

ESI understands the project has multiple objectives:

- Survey 652.0 acres within the Cantonment Area and Volkstone Track to assess efforts to reduce or eliminate invasive species;
- Survey previously documented extant, historical, and new occurrences of known federal and state listed plant species of special concern;
- Survey 275.8 acres of newly developed land to assess, record, and update changes in vegetative community;
- Update all current and new vegetative community data to conform to the National Vegetation Classification System (NVCS);
- Produce digital maps (1) of the vegetative communities and (2) of results of the invasive species survey.

ESI will provide more than a technically competent survey. We will partner with Camp Dawson's Environmental Office to develop and implement a comprehensive survey with a primary objective of generating the highest quality results, results providing valuable data for future planning. Our team's extensive botanical expertise and many years of experience conducting similar surveys throughout the central Appalachians demonstrates our familiarity and understanding of the area. Furthermore, we house a dedicated team of GIS specialists to collect, manage, categorize, inventory, and manipulate spatial and tabular data translating complex spatial phenomena into a user friendly format such as digital mapping.

2.0 Botanical Experience

ESI routinely completes botanical surveys and incorporates data and results into a variety of natural resource analyses. Our staff's experience ranges from field

assistants responsible for collecting and identifying plants as part of short-term projects to professional botanists who often provide species-level identifications and surveys of poorly known groups for government agencies and university researchers. This work often encompasses invasive species surveys and management.

Table 1 highlights the botanical experience of select members of our staff, and the following sections provide a snapshot of key members of the survey team. Resumes for key members are provided in Appendix B.

2.1 Dr. Robert P. Jean – Project Manager

Dr. Robert Jean is an authority in pollination biology, a specialty requiring proficiency in both plant and insect identification. He recently joined ESI after a successful career at St. Mary-of-the-Woods College where he authored numerous publications on rare plant communities and their pollinators. Much of Dr. Jean's career centers on surveying rare plant communities such as prairies, glades, barrens, black oak savannas, dunes, and deciduous forests of the Midwest and Appalachia and the rare plants found within them. He has completed multiple surveys for such rare plants as eastern and western fringed prairie orchid, Virginia sneezeweed, Missouri bladderpod, Mead's milkweed, false decurrent aster, and running buffalo clover. Locally, Dr. Jean's focus encompasses plant surveys in Appalachia including surveys for such species as Virginia spirea, harperella, rock skull cap, crane fly orchid, and pinnate lobed and smooth coneflowers. Dr. Jean's numerous years of experience also comprise addressing issues related to invasive plants including identification as well as management plan development, implementation, and monitoring. Dr. Jean will serve as Project Manager, primarily responsible for ensuring the project meets the needs of Camp Dawson.

2.2 Lawrence G. Brewer – Senior Botanist

Mr. Lawrence Brewer's career spans 35-years and 16 states. He routinely completes botanical surveys and contributes to rare plant community management. Over the course of his career, he identified rare plant species on dozens of occasions and often located previously unknown populations including a subpopulation of running buffalo clover on the Monongahela National Forest. As a practicing restoration ecologist, Mr. Brewer serves on the Kentucky Invasive Species Board, a body that evaluates and decides which species to place on the invasive list and suggests best management practices to avoid or eradicate these species. He also provides instruction for students at Northern Kentucky University regarding identification and management for multiple species of invasive plants that threaten active restoration sites. Mr. Brewer writes invasive species management plans for various nature preserves. These management plans provide detailed maps of vegetation types, map percent cover of invasive species within these vegetation types, describe the best methods for controlling target species, and prioritize natural areas with regard to the value of the vegetation types and the need for controlling invasive species.

Table 1. ESI staff botanical survey experience.

Staff	No. of Botanical Courses	In-field Mapping	Tree Identification	Plant Identification	Invasive Species Management	Rare Plat Surveys	Found Rare Plants	Work on DOD Facilities	Highest Level of Education	Experience (Years)
Botanist/Survey Director										
Robert Jean	8	✓	✓	✓	✓	✓	✓		Ph.D.	25
Larry Brewer	29	✓	✓	✓	✓	✓	✓	✓	M.S.	35
Field and Support Staff										
Virgil Brack	9	✓	✓	✓	✓	✓	✓	✓	Ph.D.	35
Dale Sparks	9	✓	✓	✓	✓	✓	✓	✓	Ph.D.	25
Wendy Baltzersen	2	✓	✓	✓	✓	✓			Ph.D.	20
Bryan Bayer	2	✓	✓	✓	✓	✓	✓	✓	B.A.	18
Daniel Judy	2	✓	✓	✓	✓	✓	✓	✓	M.S.	10
Ken Landgraf	4	✓	✓	✓	✓	✓	✓		B.S.	39
Kory Armstrong	3	✓	✓	✓	✓			✓	M.S.	7
Adam Benschhoff	3	✓	✓	✓	✓	✓	✓		B.S.	7
Shane Brodnick	9	✓	✓	✓	✓			✓	B.S.	6
Tim Brust	2	✓	✓						M.S.	5
Megan Caylor	2	✓	✓	✓				✓	M.S.	9
Valerie Clarkston	4	✓	✓	✓		✓	✓		M.S.	10
Nicholas Gikas	0	✓	✓	✓	✓			✓	M.S.	8
Doug Gilbert	6	✓	✓	✓	✓		✓		B.S.	10
David Jeffcott	2	✓	✓	✓		✓	✓	✓		10
Joe Johnson	2	✓	✓	✓	✓			✓	M.S.	2
Nate Light	2	✓	✓	✓		✓			M.S.	9
Mike Mairose	1	✓	✓	✓		✓			B.A.	3
Aaron Prewitt	0	✓	✓	✓		✓			B.S.	2
Tyler Russell	2	✓	✓	✓		✓			B.A.	2
Renea Wilson	3	✓	✓	✓	✓	✓	✓		B.S.	1

2.3 Field and Support Staff

ESI's staff includes wildlife biologists specializing in habitat assessments and surveys for rare, threatened, and endangered (RTE) species including bats, mussels, insects, reptiles, amphibians, and as illustrated in Table 1, plants. Our field crews are trained in proper field protocols and remain current with federal and state regulations. Habitats and species observed are photographed and environmental and ecological data are recorded on an interactive platform in real time via hand held computer devices, GPS units, and cloud-based data service for immediate access and sub-meter accuracy. ESI provides comprehensive botanical inventory services, as well as detailed floristic surveys to identify species of conservation concern and collect data suitable for inclusion in technical documents or for development of management plans.

3.0 GIS Experience

ESI uses GIS, often in combination with remote sensing, prior to commencing field work on virtually all of our projects. Typical applications include cartography, spatial data management, and geostatistical and spatial analysis. Data visualization is a core component of most projects at ESI. We generate maps to effectively represent complex spatial phenomena in an easily understood format that provides insight on the scope and scale of a project and guides project design and implementation, including field collection activities. We produce 2- and 3-dimensional graphical representations, in the form of figures, maps and video files, of species-specific habitat suitability, stream and wetland delineations, groundwater and soil contamination, flood inundation, and biological and archaeological inventories. Development of these products involves the use of GIS, in tandem with relational database management systems, to collect, create, manage, categorize, inventory, and manipulate spatial and tabular data. When appropriate, spatial data is created and managed using compliant formats and associated metadata according to the Federal Geographic Data Committee content standards and the Spatial Data Standards. ESI also has a strong background in geospatial and statistical analysis, including hierarchical, geostatistical, spatial and network analysis. Applications of these analyses include spatial explicit predictive models of species distributions and habitat, soil and water transport and deposition models, risk and decision models, and land use classification using multispectral images. These models have been used to identify impacts (e.g., mortality, disturbance) resulting from project development and to aid implementation of conservation measures.

4.0 Department of Defense (DOD) Experience

ESI has completed multiple projects on DOD facilities (Table 2). Our experience includes surveys for the U.S. Army, U.S. Air Force, and National Guard at ten facilities including two separate surveys at Camp Dawson in 2002 and 2006. We also currently hold a two-year Indefinite Delivery, Indefinite Quantity (IDIQ) contract with the Kansas National Guard to provide environmental services.

Table 2. Projects managed by ESI for Department of Defense (DOD)

DOD Facility	Branch	Location	Survey Focus	Year
Fort Leonard Wood	U.S. Army	Missouri	Bat Acoustic Survey and BA	2016
Fort Leavenworth	U.S. Army	Kansas	Bat Acoustic Survey and BA	2016
Camp Ashland	National Guard	Nebraska	Bat Acoustic Analysis	2015, 2016
Fort Leonard Wood	U.S. Army	Missouri	Bat Habitat Assessment	2015
Patrick Air Force Base	U.S. Air Force	Florida	Bat Acoustic Survey	2013
West Point Garrison	U.S. Army	New York	Environmental Analysis	2012
Fort Drum	U.S. Army	New York	Bat Mist Net Survey	2007, 2009-2010
Wright-Patterson	U.S. Air Force	Ohio	Bat Habitat Assessment	2006
Camp Dawson	National Guard	West Virginia	Bat Mist Net Survey	2006
Camp Ravenna	National Guard	Ohio	Bat Mist Net Survey	2004
Camp Dawson	National Guard	West Virginia	Bat Mist Net Survey	2002, 2006
Fort McClellan	National Guard	Alabama	Bat Mist Net Survey	2002

We understand the constraints associated with completing natural resource studies on a facility with a dedicated military mission, as well as working on facilities training personnel for a variety of combat situations. We further understand how survey data fit within Integrated Natural Resource Management Plans and the need to adhere to specific standards such as NVCS.

5.0 Plant Survey Experience

Table 3 presents a summary of botanical surveys completed by ESI's staff. Our staff is familiar with various survey techniques including desktop reviews, meander searches, transect surveys, fixed radius plots, variable radius plots, and common stand reviews. Abstracts further detailing our experience are presented in Appendix C.

Table 3. Botanical surveys completed by ESI and current staff.

Project	Species*	Location	Period of Performance
Mountain Valley Pipeline	ETRS, ARS, forest inventory	WV and VA	2015-present
Certified Main-5 Pipeline	NNIS	NY	2015-Present
AEP/Jefferson National Forest	ETRS, ARS, invasive species	VA	2015
Broad Run Expansion Project	ETRS, ARS	PA	2014
Lake Erie Connector Project	ETRS, ARS, NNIS	PA	2014
Bailey East Longwall Mine Panel 2L	ETRS, ARS	PA	2014
Cloverdale-Lexington Transmission Line	ETRS, ARS	VA	2014
Tenmile-Yablonski Waterline	ETRS, ARS	PA	2014
Saint Mary of the Woods	Trees, wildflowers	IN	2011-2014
Superior Appalachian Pipeline	ETRS, ARS	PA	2010
Indiana Dunes National Lakeshore	Forbs, NNIS	IN	2010
Jenkins-Pound 69 Transmission Line	ETRS	VA	2010
Clintwood – Freemont Transmission Line	ETRS	VA	2010
Black Moshannon Pipeline	ETRS, ARS	PA	2010
Identification and Mapping of High Quality Forest The Conservation Fund's Green Infrastructure Model	Assessment of Forest Quality	KY, PA, TN, OH and NY	2009
Ozark-St. Francis National Forest	ETRS, ARS, NNIS	AR	2009
Four Canyons Nature Preserve	Forbs	OK	2009
Mid-south Expansion Project	ETRS, ARS	NC	2009
Missouri Department of Conservation	ETRS, ARS, NNIS, forbs, trees	MO	2006-2009
Monongahela National Forest	ETRS, ARS, NNIS, forbs, tress	WV	2000, 2003, 2004, 2005, 2008
North Summit 3-D Seismic Survey Site	ETRS, ARS, trees	PA	2008
Missouri Department of Conservation	Missouri bladderpod	MO	2006
North Carolina Piedmont	Rare plants, trees	NC	2006
I-69 Patoka River Region	All plants	IN	2005
Kitty Todd Nature Preserve	Trees, forbs, grasses	OH	2005
Smith Cemetery Prairie Remnant Inventory	Forbs	IN	2003
AEP/Jefferson National Forest	ETRS, ARS, invasive species	VA	2002-2014
Huron-Manistee National Forest	ETRS, ARS, NNIS	MI	2002
Kankakee Sands	Trees, forbs, grasses	IN and IL	2001-2002
Indiana State University	Trees, spring wildflowers	IN	1998-2000
Hoosier National Forest	Rare plants	IN	1996, 1998
Wayne National Forest	Rare plants	OH	1996

***ETRS** = Endangered, Threatened, Rare, and forest sensitive species; **ARS** = At-Risk Species; **NNIS** = Non-native, Invasive Species

6.0 Proposed Scope of Work

6.1 Invasive Species Survey and Assessment

ESI will follow U.S. Fish and Wildlife Service (USFWS) monitoring protocol for National Wildlife Refuges as adapted in the West Virginia Division of Natural Resources (WVDNR) Invasive Plant Inventory, Assessment, and Management Plan (Grafton 2004) included in Amendment 2 of the RFQ. Survey techniques used for the 2004 inventory and assessment include walking roads, trails, utility corridors, and/or transects across plant communities. Following established protocols from the previous survey ensures an accurate assessment of efforts to reduce or eliminate invasive species. Based on Addendum 1, Figure A of the RFQ, data collected will be organized by “stands” to facilitate comparison of treatment success or need for additional efforts among individual areas. In place of a Trimble TSCI GPS unit, an iPad equipped with an Arrow 100 GNSS unit will be used to collect and record data. These devices provide a similar level of accuracy at a lower cost and afford biologists the ability to review data at multiple scales in real-time.

6.2 Vegetative Communities Survey

ESI will use aerial photographs to digitize changes in vegetative cover associated with recent development activities on 275.8 acres of land illustrated in Addendum 1, Figure B of the RFQ. A site visit will be completed to ground-truth the resulting map.

6.3 Species of Special Concern Survey

ESI will visit each point mapped on Addendum 1, Figure C of the RFQ to verify presence of extant and historical occurrences of federal and state listed plant species of special concern. When possible, this will be completed in conjunction with invasive species surveys and/or site visits of newly developed lands. A dedicated survey for new occurrences of special concern plant species is not required. However, if a new occurrence is encountered in the process of completing other surveys, ESI will photograph the plant, describe the occurrence, and record the location using the iPad enabled mapping system described in section 2.3.

6.4 Data Management

All GIS data recorded conforms to current NVCS standards including all attribute fields, required attributes, and required metadata. GIS data collected during previous surveys will be updated to current NVCS standards.

6.5 Digital Mapping

ESI will generate two separate digital maps and/or map layers: a digital map of plant communities and a digital map of the results of the invasive species survey.

7.0 Cost and Assumptions

ESI proposes a total cost of **\$26,000.00**. This cost includes all travel, lodging, field work, GIS mapping, equipment use, data updates, and reporting.

Assumptions:

- Costs are based on a maximum sampling effort of 927.8 acres.
- ESI assumes the client or its agent will arrange and provide land access - interpreted as not just as providing permission to be on the parcel, but also providing a clear route to access the parcel.
- Costs **do not** include any special safety gear beyond a hard hat and ANSI class 1 safety vest. If such materials are required, please notify ESI in advance and these costs are billed as incurred.
- Costs assume ESI's staff can work 7 days per week.

8.0 Addenda

In fulfillment of the RFQ, the following items can be found in Appendix D:

- Signed RFQ
- Signed Certification and Signature Page
- Signed Addendum Acknowledgement Form
- Designation of Contract Manager
- Vendor Preference Certificate
- Signed and Notarized Purchasing Affidavit.

9.0 Contacts at ESI

ESI appreciates the opportunity to bid on this project. Please do not hesitate to contact us if you have any questions. All communications should be directed to:

Dr. Rob Jean

Environmental Solutions & Innovations, Inc.
1811 Executive Drive, Suites C-D
Indianapolis, IN 46241

Phone: (513) 451-1777
Fax: (513) 451-3321
Cell: (217) 218-4604
E-mail: RJean@ENVSI.com

If he is unavailable, please contact:

Dr. Dale Sparks

Environmental Solutions & Innovations, Inc.
4525 Este Avenue
Cincinnati, OH 45232

Phone: (513) 451-1777
Fax: (513) 451-3321
Cell: (513) 503-2667
E-mail: DSparks@ENVSI.com

10.0 Literature Cited

Grafton, E. 2004. Invasive plant inventory, assessment and management plan. Camp Dawson collective training center. West Virginia Division of Natural Resources, Natural Heritage Program, Wildlife Resources Section, Elkins, West Virginia. pp63.

**APPENDIX A
BID FORM**



EXHIBIT A
CRFQ # ADJ160000021

ALL LABOR, MATERIALS, EQUIPMENT, AND SUPPLIES NECESSARY TO CONDUCT AN INVASIVE SPECIES INVENTORY AND ASSESSMENT AND TO UPDATE PLANT COMMUNITY MAPPING DATA, ON CAMP DAWSON ARMY TRAINING SITE AT KINGWOOD, WV

BID FORM

The undersigned, hereafter called the Bidder, being familiar with and understanding the bidding documents; and being familiar with the required qualifications and the mandatory requirements of the Project with regards to the deliverables and associated timelines, hereby proposes to furnish labor, material, equipment, supplies, and transportation to perform the work as described in the bidding documents

BIDDERS COMPANY NAME: Environmental Solutions & Innovations, Inc.

VENDOR ADDRESS: 4525 Este Avenue
Cincinnati, Ohio 45232

TELEPHONE: (513) 451-1777

FAX NUMBER: (513) 451-3321

E-MAIL ADDRESS: dsparks@envsi.com

CONTRACT TOTAL BID:

Twenty-Six Thousand Dollars and Zero Cents

(\$ 26,000.00) *** (Contract bid to be written in words and numbers.)

The contract will be awarded to the Bidder with the lowest contract total bid meeting all of the specifications. Bidder understands that to the extent allowed by the West Virginia Code, the OWNER reserves the right to waive any informality or irregularity in any bid, or bids, and to reject any and all bids in whole or in part; to reject a bid not accompanied by the required bid security or by other data required by the bidding documents; to reject any conditions of the bid by the Bidder that is any way inconsistent with the requirements, terms, and conditions of the bidding documents; or to reject a bid that is in any way incomplete or irregular.

Failure to use this bid form may result in bid disqualification.

SIGNATURE:



DATE: 05-03-2016

NAME: Dale Sparks
(Please Print)

TITLE: Sr. Project Manager

**APPENDIX B
RESUMES**





ENVIRONMENTAL SOLUTIONS & INNOVATIONS, INC.

Résumé

Robert P. Jean, Ph.D.

EDUCATION

Ph.D., Ecology/Entomology, Indiana State University, 2010. Dissertation: "Studies in bee diversity in Indiana: the influence of collection methods on species capture, and a state checklist based on museum collections"

M.S., Ecology, Indiana State University, 2002. Thesis: "The pollinator fauna of two spring wildflowers of Midwestern deciduous forest, *Erigenia bulbosa* and *Claytonia virginica*"

B.S., Life Sciences, Indiana State University, 1998

A.S. Biological Education, Lake Land College, 1995

PROFESSIONAL CERTIFICATIONS

Incremental Sampling Method, MSECA

Manufactured Gas Plant Coal Tar Remediation, MSECA

QUALIFICATIONS AND EXPERIENCE

Dr. Jean is a wildlife biologist involved in a variety of terrestrial ecology research positions and has extensively studied rare plants and insects including the federally endangered American burying beetle (*Nicrophorus americanus*). Dr. Jean is a recognized expert in ecology and conservation biology. He is experienced in many ecological field techniques, including: species identification, habitat assessment, pit fall traps, aerial nets, pan traps, malaise traps, and vane traps. He completed a four-year study for the federally endangered American burying beetle at multiple sites in western Missouri in an attempt to find populations of this species, as well as to document the presence and local abundance of other species of Silphidae, including other burying beetles. He also designed a four-year monitoring program, prepared annual reports and identified over 120,000 insects collected in traps. In 2006, he introduced over 100 pairs of American burying beetles to Waterloo Wildlife Area in Ohio. As part of this project, he handled, sexed, matched pairs by size, attached bee tags for later identification, and appropriately transported the beetles from the St. Louis Zoo to the wildlife area.

His expertise also includes the study of bees, their habitat, and their relationship to various plant species. Over the last fifteen years, he has become an expert in their identification and taxonomy, with particular emphasis on the bee species of the eastern U.S. He assisted with development of matrix-driven bee genus and species identification guides, available for use on the internet. These guides are used to teach others how to identify bees to genus and species. He also works with regal fritillary, listed in Missouri as a species of concern as the population is declining in the state. The species is listed as endangered or threatened in other parts of its range.

His experience also includes rare plant studies including surveys for federally threatened Meads milkweed and western prairie fringed orchid. Many of his surveys include inventories of savanna dependent species on multiple natural and conservation areas in the Midwest. He is also familiar with tree species and has surveyed in Rocky Mountain National Park, Kings Canyon National Park, Redwoods National Forest, Crater Lake, Yellowstone National Park, Badlands, and many forests throughout Indiana.

Dr. Jean is an experienced public speaker, having taught university-level courses, presented educational lectures to the public, and presented technical papers to professional organizations. He also authored and co-authored numerous papers and presentations.

PROJECT EXPERIENCE

Project Manager – PSU Bees: Lead insect taxonomist on project researching Andrenid bees in Pennsylvania. Provided identifications on over 4,000 bees in the genus *Andrena*. Documented and verified at least three bee species previously undocumented in Pennsylvania. Identifications will advance knowledge of bees pollinating apple orchards in Pennsylvania, and of diversity of bees in general. These findings will be published and identifications will be used in future publications and to correct identification errors in past publications. In addition, all specimens were labeled with determination labels and make a valuable natural history collection for Pennsylvania.

Project Manager – MSU Bees: Lead insect taxonomic consultant for bees on project entitled “Integrating Native Bees into Sustainable Pollination Strategies for Specialty Crops” Project examines pollinators to specialty crops such as cranberries, blueberries, apples, watermelon, and almonds throughout the United States, including California, Michigan, Maine, Pennsylvania, and Florida. Examined and identified all difficult taxa of bees (Hymenoptera: Apoidea). Additionally, served as liaison between project team and other taxonomists with specialties in species that are among the most challenging to identify. The project is part of a five year, multimillion dollar USDA-NIFA SCRI grant; and is leading to numerous scientific publications and public outreach on pollinator importance and crop production and pollination.

Biologist – Energy Transfer Partners, Revolution Pipeline: 2015. Completed rare plant surveys and wetland delineations for proposed 40-mile, 30-inch diameter pipeline traversing Butler, Beaver, and Washington counties in Pennsylvania.

Biologist – American Electric Power, Bland Area Improvement: 2015. Completed rare plant surveys with focus on Rock skullcap along 7-mile 138 kV transmission

rebuild project in Bland and Wythe counties, Virginia and Mercer County, West Virginia.

Biologist – Mountain Valley Pipeline: 2015. Completed rare plant surveys with focus on pinnate-lobed coneflower along proposed 300-mile long natural gas pipeline in Braxton, Doddridge, Fayette, Greenbrier, Harrison, Lewis, Monroe, Nicholas, Summers, Upshur, Webster, and Wetzel counties, West Virginia and Franklin, Giles, Montgomery, Pittsylvania, and Roanoke counties, Virginia.

Biologist – Magnum Hunter Resources, Eureka Hunter Pipeline: 2015 Completed wetland delineations along three segments (Pyles-Miller-Pitman, Moser, and Stadler) of a natural gas pipeline in West Virginia.

Biologist – Indiana Department of Transportation, Interstate 69, Pre- and Post-construction Surveys: 2015. Completed acoustic surveys for federally endangered Indiana and federally threatened northern long-eared bats along final ROW for Section 3, and potential ROW for section 6.

Field Ecologist/Entomologist – U.S. Geologic Survey, Indiana Dunes National Lakeshore: 2010. Completed research on the pollination web at Howe's Prairie in Porter County, Indiana. Inventoried both plant and bee communities of the park and set up monitoring program for pollinators including Karner Blue butterflies. Assisted with design and implementation of studies. Prepared bee specimens and pollen for identification. Identified all plant and bee specimens. Also completed plant and pollinator inventory focused on pitcher plants, yellow and pink lady slipper orchids at Pinhook Bog.

Biologist – The Nature Conservancy: 2009. Completed inventory of flowering plants and pollinators on the Four Canyons Natural Area in Ellis County, Oklahoma. Two new bee species were collected during the study.

Biologist – Equitrans, Big Sandy Pipeline: 2007. Completed Indiana bat potential roost tree and habitat assessments in Carter, Lawrence, Johnson, and Floyd counties, Kentucky.

Assistant Natural History Biologist – Missouri Department of Conservation: 2006-2009. Sampled for rare plant and insect species using aerial nets, pan traps, and vane traps in multiple natural and conservation areas in Missouri. Preserved, pinned, labeled, and identified approximately 10,000 insects. Developed sampling regime and database for specimens. Also completed surveys focused on federally threatened Meads milkweed, western prairie fringed orchid, and Missouri bladderpod. Participated in greater prairie chicken release.

Field Researcher – St. Louis Zoo: 2006-2009. Sampled for carrion beetles including federally endangered American burying beetle (*Nicrophorus americanus*) in multiple conservation areas in Missouri. Completed sampling using pit fall traps and blacklights. Designed four-year monitoring program, prepared annual reports and

identified over 120,000 insects collected in traps. Sampling for ABB attracted other beetle species including dung beetles, hide beetles, tiger beetles, and rove beetles. All were tallied and identified.

Assistant Natural History Biologist – Missouri Department of Conservation: 2006-2009. Completed rare plant and insect inventories on Wahkontah Prairie in St. Clair and Cedar counties, Missouri. Surveys focused on pollinators, plant-insect interactions, and federally threatened Mead’s milkweed.

Field Researcher – St. Louis Zoo: 2006-2009. Completed insect inventories on WahKonTah Prairie in St. Clair and Cedar counties, Missouri. Surveys focused on federally endangered American burying beetle.

Assistant Natural History Biologist – Missouri Department of Conservation: 2006, 2008-2009. Completed rare plant and insect surveys on Linscomb Wildlife Area, Taberville Prairie Conservation Area, and Schell-Osage Conservation Area (2006 only) in St. Clair County, Missouri. Surveys focused on pollinators and plant-insect interactions.

Field Researcher – St. Louis Zoo: 2006, 2008-2009. Completed insect surveys on Linscomb Wildlife Area, Taberville Prairie Conservation Area, and Schell-Osage Conservation Area (2006 only) in St. Clair County, Missouri. Surveys focused on federally endangered American burying beetle.

Assistant Natural History Biologist – Missouri Department of Conservation: 2006, 2008-2009. Completed rare plant and insect surveys on Sky Prairie and Monegaw Prairie Conservation Areas in Cedar County, Missouri. Surveys focused on pollinators and plant-insect interactions.

Field Researcher – St. Louis Zoo: 2006, 2008-2009. Completed insect surveys on Sky Prairie and Monegaw Prairie Conservation Areas in Cedar County, Missouri. Surveys focused on federally endangered American burying beetle.

Assistant Natural History Biologist – Missouri Department of Conservation: 2006, 2008. Completed rare plant and insect surveys on Osage Prairie in Vernon County, Missouri. Surveys focused on pollinators and plant-insect interactions.

Field Researcher – St. Louis Zoo: 2006, 2008. Completed insect surveys on Osage Prairie in Vernon County, Missouri. Surveys focused on federally endangered American burying beetle.

Assistant Natural History Biologist – Missouri Department of Conservation: 2006. Completed rare plant and insect surveys on Osage, Ripgut, and Stillwell Prairies in Vernon County, Missouri. Surveys focused on pollinators and plant-insect interactions.

Field Researcher – St. Louis Zoo: 2006. Completed insect surveys on Osage, Ripgut, and Stillwell Prairies in Vernon County, Missouri. Surveys focused on federally endangered American burying beetle.

Assistant Natural History Biologist – Missouri Department of Conservation: 2006. Completed rare plant and insect surveys on Rocky Barrens Conservation Area, Greene County, Missouri. Surveys focused on federally threatened Missouri bladderpod.

Assistant Natural History Biologist – Missouri Department of Conservation: 2006. Completed rare plant and insect surveys on Caney Mountain Conservation Area in Ozark County, Missouri. Surveys focused on pollinators and plant-insect interactions.

Field Researcher – St. Louis Zoo: 2006. Completed insect surveys on Caney Mountain Conservation Area in Ozark County, Missouri. Surveys focused on federally endangered American burying beetle.

Assistant Natural History Biologist– Missouri Department of Conservation: 2007. Completed rare plant and insect surveys on Grand Trace Conservation Area, Pawnee Prairie, Wayne-Helton Wildlife Area, and Dunn Ranch Prairie in Harrison County, Missouri. Surveys focused on pollinators and plant-insect interactions.

Field Researcher – St. Louis Zoo: 2007. Completed insect surveys on Grand Trace Conservation Area, Pawnee Prairie, Wayne-Helton Wildlife Area, and Dunn Ranch Prairie in Harrison County, Missouri. Surveys included federally endangered American burying beetle.

Biologist – Confidential Client: 2007. Completed survey for threatened or endangered plant species in association with proposed construction of ethanol plant in Clark County, Illinois.

Biologist – The Nature Conservancy: 2005. Completed inventory of savanna plants and pollinators on the Kitty Todd Nature Preserve and Oak Openings in Lucas County, Ohio.

Curator – Indiana State University: 2001-2008. Maintained insect collection of approximately 150,000 specimens. Preserved and pinned specimens. Maintained data base containing over 30,000 insect specimens for research purposes.

Curator – Indiana State University: 2006. Maintained mammal collection in the vertebrate collection. Identified, prepared, and catalogued specimens in university data base.

Biologist – Confidential Client: 2005. Performed emergence counts of bats at the Indianapolis Airport. Studies were conducted to help determine whether bats were using trees scheduled for removal in association with road development project near the airport.

Biologist – Completed research on pollination ecology of spring wildflowers in west-central Indiana forests: 1999-2001. Studies involved relationships between visitation rates and species richness of bees and flies that visit early spring wildflowers and size of the forest in which they occurred. Performed vegetation sampling and

recorded phenology of flowering plants. Over 11,000 bees identified, prepared, catalogued, and entered in a database.

Biologist – Illinois Department of Natural Resources: 2001-2002. Completed plant and pollinator inventory on Hooper Branch Savanna in Kankakee County, Illinois. Studies focused on savanna dependent species such as goat's rue, lupine, etc.

Biologist – Completed plant inventory on Kieweg Woods, Morris Landsbaum Woods, Riley Lock, and Jackson Schnyder Nature Preserve in Vigo County, Indiana: 1998-2002.

Biologist – Smith Cemetery: 2002-2003. Completed multi-year survey to document prairie remnant persistence in Vermillion County, Indiana.

Biologist – The Nature Conservancy: 2000-2002. Completed 3-year plant and pollinator inventory of Ober Savanna in Starke County, Indiana. Studies focused on savanna dependent species such as goat's rue, lupine, etc.

Biologist – The Nature Conservancy: 2000-2002. Completed 3-year plant and pollinator inventory of Prairie Border, NIPSCO Savanna, and Stoutsburg Savanna in Jasper County, Indiana. Studies focused on savanna dependent species such as goat's rue, lupine, etc.

Biologist – The Nature Conservancy: 2000-2002. Completed 3-year plant and pollinator inventory of Conrad Station Savanna in Newton County, Indiana. Studies focused on savanna dependent species such as goat's rue, lupine, etc.

Biologist – Indiana Department of Natural Resources: 2002. Completed inventory for savanna species remnants at Jasper-Pulaski Fish & Wildlife Area in Jasper County, Indiana.

PUBLICATIONS

Jean, R. P. and P. E. Scott. In preparation. Characterizing bee communities of Midwestern black oak savannas: a comparison of net and bowl-trap collections. Preparing to submit to Journal of the Kansas Entomological Society.

Jean, R. P., P. E. Scott, J. Ascher, and R. Grundel. In preparation The bees of Indiana. Preparing for submission to Journal of the Kansas Entomological Society.

LeBuhn, G, S. Droege, E. Connor, B. Gemmill-Herren, R. P. Jean, S. Potts, G. Frankie, R. Minckley, D. Roubik, F. Parker, K. Wetherill, E. Kula. 2015. Evidence based conservation: reply to Tepedino et al. Conservation Biology 29(1): 283-285.

Colla, S. R.J. S. Ascher, M. Arduser, J. Cane, M. Deyrup, S. Droege, J. Gibbs, T. Griswold, H. G. Hall, C. Henne, J. Neff, R. P. Jean, M. G. Rightmyer, C.

- Sheffield, M. Veit, and A. Wolf. 2012. Documenting Persistence of Most Eastern North American Bee Species (Hymenoptera: Apoidea: Anthophila) to 1990–2009. *Journal of the Kansas Entomological Society* 85 (1): 14-22.
- LeBuhn, G., S. Droege, E. Connor, B. Gemmill-Herren, R. P. Jean, S. Potts, G. Frankie, R. Minckley, D. Roubik, F. Parker, K. Wetherill, J. Cane, T. Griswold, E. Kula. 2012. Detecting insect pollinator declines on regional and global scales. *Conservation Biology* 27: 113-120.
- Karns, D. R., R. P. Jean, et al. 2012. Results of a biodiversity survey at Goose Pond Fish and Wildlife Area, Greene County, Indiana. *Proceedings of the Indiana Academy of Science* 121 (1): 45-53.
- Grundel, R., K. J. Frohnapple, R. P. Jean, and N. B. Pavlovic. 2011. Effectiveness of bowl trapping and netting for inventory of a bee community. *Journal of the Kansas Entomological Society* 40 (2): 374-380.
- Grundel, R., R. P. Jean, K. J. Frohnapple, J. Gibbs, G. A. Glowacki, and N. B. Pavlovic. 2011. A Survey of Bees (Hymenoptera: Apoidea) of the Indiana Dunes and Northwest Indiana. *Journal of the Kansas Entomological Society* 84: 105-138.
- Grundel, R., R. P. Jean, K. R. Frohnapple, G. A. Glowacki, P. E. Scott, and N. B. Pavlovic. 2010. Floral and nesting resources, habitat structure, and fire influence bee distributions across an open-forest gradient. *Ecological Applications* 20(6): 1678-1692.
- Bioblitz of Goose Pond Fish and Wildlife Area, Greene County Indiana June 16-17 2010. Published online at <http://www.indianaacademyofscience.org/Events-Meetings/BioBlitz-Archive.aspx>
- Jean, R. P. 2005. Quantifying a rare event: Pollen theft by honey bees from bumble bees and other bees (Apoidea: Apidae, Megachilidae) foraging at flowers. *Journal of the Kansas Entomological Society* 78 (2): 172-175.

PRESENTATIONS

- 2015 Native bees and their conservation. Wabash Valley Audubon Society, Terre Haute, IN, February 15.
- 2014 Native bees and how to attract them. Illinois State Beekeepers Association, Springfield IL, November 8.
- 2013 I gave a workshop on bee identification for the ASPIRE team on Jan 19 in Gainesville, Florida. The ASPIRE team is a group of scientists (myself included) that have recently received a large grant to study the pollinators of many crop species across the U.S., how to manage native bees and attract them to agricultural areas and to develop public outreach to share the information we gain from these studies.

- 2013 The bees of Indiana and how to attract them. Purdue University, West Lafayette, IN.
- 2013 Bee management in forested systems, Tri-State Woodland Workshop in Southern IN.
- 2010 Bee diversity of black oak savanna remnants in Indiana. Natural Areas Conference Pollinator Symposium, Osage Beach, MO.
- 2008 Bee sampling methods and the differences between sampling with nets and pan traps. "Pollinator Conference: Information for Action." UMASS, Amherst, MA; Oct. 3-4. Can be viewed online at <http://www.millersriver.net/pollen/>
- 2005 The bees of Indiana with a focus on the bees of black oak savannas. Master Naturalist Program, Mt. Ayr, IN
- 2004 Inventorying biodiversity while restoration proceeds: native bee communities of black oak sand savannas "Restoration Ecology: current research and the future." The Wildlife Society, Bloomington, IN

INVITED BEE AND INSECT IDENTIFICATION WORKSHOPS

- 2014 Co-instructed "Insect communities of tall grass prairies" for the Missouri Department of Conservation; July 21-25, Schell-Osage, El Dorado Springs, MO.
- 2009 Co-instructed "How to identify insects in the Natural Communities of Missouri" for the Missouri Department of Conservation; July 20-23, Shaw Nature Preserve, Grays Summit, MO.
- 2009 Co-instructed Native Bee Identification, Ecology, Research and Monitoring; May 4-8; National Conservation Training Center, Shepherdstown, WV; Course CSP2225; 30 students; Co-instructors-Mike Arduser, Sam Droege, and Jason Gibbs.
- 2009 Co-instructed "How to catch and identify a bee"; February 9-13; Patuxent Wildlife Refuge, Beltsville, MD; 14 students; co-instructor-Sam Droege
- 2008 Co-instructed "How to catch and identify a bee"; December 1-5; Patuxent Wildlife Refuge, Beltsville, MD; 14 students; co-instructor-Sam Droege
- 2008 Co-instructed Native Bee Identification, Ecology, Research and Monitoring; March 24-28; National Conservation Training Center, Shepherdstown, WV; Course CSP2225; 14 students; co-instructor-Sam Droege.
- 2008 Co-instructed "How to catch and identify a bee"; February 4-8; Patuxent Wildlife Refuge, Beltsville, MD; 15 students; co-instructor-Sam Droege
- 2007 Co-instructed "How to catch and identify a bee"; December 10-14; Patuxent Wildlife Refuge, Beltsville, MD; 12 students; co-instructor-Sam Droege

- 2007 Co-instructed “How to catch and identify a bee”; April 16-20; Patuxent Wildlife Refuge, Beltsville, MD; 12 students; co-instructor-Sam Droege
- 2007 Co-instructed “How to catch and identify a bee”; February 5-9; Patuxent Wildlife Refuge, Beltsville, MD; 12 students; co-instructor-Sam Droege
- 2004 “How to identify the bees of Indiana: The Bee Workshop” Indiana Academy of Science, Anderson, IN

PROFESSIONAL AFFILIATIONS

Midwestern States Environmental Consultants Association
Our Green Valley Alliance For Sustainability – Board Member 2011-2014 – Education Committee
TREES Inc. – Board Member 2012-2015 – Keep Terre Haute Beautiful Committee and Big Trees Committee
Ouabache Land Conservancy – Board of Directors 2013-present
White Violet Center for Eco-Justice– Advisory Board 2015-present



ENVIRONMENTAL SOLUTIONS & INNOVATIONS, INC.

Résumé

Lawrence G. Brewer

EDUCATION

Ph.D., Botany, Miami University, In progress
Botany Coursework, Michigan State University, 1983-1987
M.A., Biology, Western Michigan University, 1982
Botany Coursework, University of Michigan Biological Station, 1979
B.A., Biology, Hope College, 1975

CERTIFICATIONS AND TRAINING

Ohio Department of Transportation – Ecological Training, 2011
Pesticide Training, Florence, KY, 2004
Geographic Positioning System (GPS) Field Training, Cincinnati, OH, 1998
Gopher Tortoise Training Course, Hattiesburg, MS, 1997
Writing and Grammar Skills Course, Cincinnati, OH, 1997
U.S Army Corps of Engineers Wetland Training Course, Ann Arbor, MI, 1996

USFWS QUALIFIED PLANT SURVEYOR:

Northeast bulrush (PA)
Small whorled pogonia (PA, VA, OH)
Smooth coneflower (VA)
Running buffalo clover, Eastern prairie fringed orchid (OH)
Virginia spiraea (VA)

QUALIFICATIONS AND EXPERIENCE

Larry Brewer is an experienced and trained Plant Taxonomist. He has conducted a wide variety of plant and natural community surveys over the last 35 years. He has conducted numerous rare plant surveys on public and private lands throughout the Midwest and eastern United States to address National Environmental Policy Act and Endangered Species Act concerns in environmental reports and permit applications. Mr. Brewer routinely conducts field surveys for federal and state listed threatened and endangered plants; plant community assessments; vegetation mapping; and habitat characterization. He writes technical sections of documents, prepares taxonomic plant lists, and conducts impact analyses for multidisciplinary environmental documents for federal and state agencies including Federal Energy Regulatory Commission (FERC), Departments of Transportation (DOT), Federal Aviation Administration (FAA), U. S. Army Corps of Engineers (ACOE), U. S. Fish and Wildlife Service (USFWS), and Department of Defense (DoD).

Mr. Brewer is experienced with wetland determination, delineation, habitat restoration, and preparation of detailed mitigation plans. He was the plant ecologist and wetland scientist for a project involving restoration and creation of 400 acres of wetlands for Indianapolis Airport Authority in Indiana. Mr. Brewer worked nine field seasons for the

Michigan Natural Features Inventory where he did ecological assessments in 30 different plant community types. For a 3-year study, he completed quantitative sampling of over 80 wetlands around the Great Lakes region. While at Western Michigan University, Mr. Brewer mapped the presettlement vegetation of 10 counties in southwestern Michigan. He has performed several wetland delineations throughout the Midwest and eastern US including Ohio, Indiana, Kentucky, West Virginia, Kansas and New York. One such project was at the Wright-Patterson Air Force Base, Ohio which also involved development of a wetland management plan. He is trained in GPS and regularly implements mapping procedures during field surveys while assessing wetland and terrestrial ecosystems.

Over the last six years, Mr. Brewer has been Senior Plant Ecologist for the Center of Applied Ecology at the Northern Kentucky University and permanent employee at ESI, Inc. Some of Mr. Brewer's research interests include the following: rare plant species studies, changes in composition and structure of Ohio's oak savannas in relation to natural and human disturbances, distribution and causes for the existence of Michigan's plant tension zone using presettlement tree disturbances, causes for the biodiversity of plant species in mixed mesophytic forest, changes in the herb layer of Indiana Dunes Oak savannas following fire, ecology of the survival and recovery from blight in American chestnut trees, presettlement vegetation mapping, and factors affecting the distribution of *Hydrastis canadensis* in Hoosier National Forest.

PROJECT EXPERIENCE

Project Botanist – AEP, Bland Area Improvements: 2015-2016. Completed rare plant surveys along 138 kV Transmission Line Rebuild Project crossing Jefferson National Forest in Bland County, Virginia. Surveys included federally endangered northeastern bulrush, smooth coneflower, and small whorled pogonia.

Project Botanist – MVP, Mountain Valley Pipeline: 2015-2016. Completed rare plant surveys along portions of 300-mile natural gas pipeline crossing eleven counties in West Virginia and six counties in Virginia. Surveys included federally endangered species: northeastern bulrush, running buffalo clover, shale barren rock cress, small whorled pogonia, smooth coneflower, and Virginia spiraea. Surveys also focused on state listed species and species of concern.

Project Botanist – Dominion Virginia Power, Jetersville to Ponton 115 kV Transmission Line: 2015. Completed presence/absence surveys for smooth coneflower along 8-mile transmission line and multiple access roads in Amelia County, Virginia.

Biologist – Confidential Client, Electric Transmission Line: 2014-2015. Completed rare plant surveys for multiple species along 8-mile transmission line in Erie County, Pennsylvania. Canada yew (*Taxus canadensis*) and shellbark hickory (*Carya laciniosa*) were found during the 2015 survey.

Biologist – Confidential Client, Natural Gas Pipeline: 2014. Delineated wetlands and vegetation covertypes for Michigan portion of international gas pipeline extending from Ontario, Canada to Illinois. Identified, estimated percent coverage, and determined dominance for all plants in paired wetland/upland sample plots for 100+ wetlands.

Biologist – Appalachian Power Company, Wythe Area Improvements 138 kV Transmission Line: 2014. Completed presence/absence surveys for smooth coneflower and Virginia spiraea along 15-mile transmission line in Wythe County, Virginia.

Biologist – Texas Eastern, Bailey East Longwall Mine Panel 2L – Subsidence Mitigation: 2014. Completed rare plant surveys for wild senna, single-headed pussy-toes, and leaf-cup in Greene County, Pennsylvania.

Biologist – Appalachian Transmission Company, Cloverdale-Lexington 500 kV transmission Line: 2014. Habitat assessments and surveys for smooth coneflower and shale barren rock cress in Botetourt and Rockbridge counties, Virginia.

Biologist – WPX Energy, Marcellus Gathering System: 2014 (ongoing). Completed weekly and post rainfall event E&S inspections along 30 miles of restored natural gas pipeline right-of-way in northeastern Pennsylvania. Completed inspections using site restoration plans and permits approved by the PADEP.

Biologist – Appalachian Power Company, Richland's-Whitewood 138 kV Transmission Line: 2014. Completed presence/absence surveys for federally listed Virginia spiraea along 10-mile line in Buchanan and Tazewell counties, Virginia.

Wetlands Scientist – Crosstex, Lowell North Pipeline: 2013-2014. Completed wetlands and waterways delineation along 35 miles of proposed liquefied gas pipeline right-of-way in eastern Ohio.

Biologist – EQT, Valley View Well Line: 2013. Delineated aquatic resources on approximately 17-acre site in Greene County, Pennsylvania.

Biologist – Hawks Nest & Glen Ferris Hydroelectric Project (FERC): 2013. Completed field reconnaissance surveys including wetlands and waterways delineation, Indiana bat habitat assessment, acoustic surveys for endangered bats, and surveys for rare plants and animals along 10-mile stretch of the New River Gorge. Field studies were in support of preparation of FERC relicensing report for two Hydroelectric Projects.

Wetlands Scientist – First Energy, 345 kV Glenwillow Transmission Line: 2013. Completed wetlands and waterways delineation along 22 miles of proposed access roads associated with proposed electrical transmission line in eastern Ohio.

Wetlands Scientist – Tenaska, Blue River Natural Gas-Fueled Electrical Generation Power Plant: 2013. Completed wetlands delineation on 111-acre parcel located in the Town of Morristown, Shelby County, Indiana. Wetlands were delineated consistent with the USACE regional supplement. Tasks included preparation of endangered species screening for those species known to occur in vicinity of proposed project.

Wetlands Scientist – First Energy, 345 kV Glenwillow Transmission Line Project: 2012. Completed wetlands and waterways delineation along 75 miles of proposed electrical transmission line right-of-way in eastern Ohio. Wetlands delineation was conducted consistent with the USACE regional supplement. All wetland areas were assessed as waters of the U.S. subject to USACE jurisdiction. Wetlands were evaluated consistent with the ORAM (Version 5.0), developed by the OEPA. The federally regulated OHW mark of streams within each site was delineated utilizing the definitional criteria as presented in Title 33, Code of Federal Regulations, Part 328. Streams were evaluated

using OEPA HHEI or QHEI as appropriate and scored. The delineation encountered approximately 500 wetland and stream features.

Wetlands Scientist – Confidential Client: 2012. Completed wetlands and waterways delineation along 68 miles of electrical transmission line right-of-way in eastern Ohio. Wetlands delineation was conducted consistent with the USACE regional supplement. All wetland areas were assessed as waters of the U.S. subject to USACE jurisdiction. Wetlands were evaluated consistent with the ORAM (Version 5.0), developed by the OEPA. The federally regulated OHW mark of streams within each site was delineated utilizing the definitional criteria as presented in Title 33, Code of Federal Regulations, Part 328. Streams were evaluated using OEPA HHEI or QHEI as appropriate and scored.

Wetlands Scientist – Indiana Department of Transportation: 2012. Co-authored conceptual wetland and stream mitigation plan for proposed SR 641 Bypass Project in Terre Haute, Vigo County, Indiana. Tasks included wetland delineation on three parcels totaling approximately 126 acres and reviewing each parcel for potential to create, restore, or preserve resources.

Wetlands Scientist – Confidential Client: 2012. Completed wetland and waterway delineations on multiple proposed gas well pad construction sites in several eastern Ohio townships. Wetland areas were assessed as waters of the U.S. subject to USACE jurisdiction, and classified consistent with the Classification of Wetlands and Deepwater Habitats of the United States. Evaluated isolated wetlands consistent with the Ohio Rapid Assessment Method (ORAM) (Version 5.0), developed by the Ohio Environmental Protection Agency (OEPA).

Project Botanist – American Electric Power, Huntington Court-Roanoke 138 kV Line: 2011. Completed presence/absence surveys for smooth coneflower and small-whorled pogonia along 5-mile transmission line in Roanoke, Virginia.

Project Botanist – AmerenUE, Taum Sauk Pumped Storage Project: 2010. Completed survey for federally threatened and Missouri endangered Mead's milkweed (*Asclepias meadii*) in Reynolds County, Missouri.

Project Botanist – Transco, Mid-South Expansion: 2010. Completed overall survey for sensitive plants concurrent with wetlands and water bodies field studies.

Project Botanist – Superior Appalachian Pipeline, Snow Shoe Pipeline: 2010. Completed survey for federally endangered northeastern bulrush (*Scirpus ancistrocheatus*) in Centre County, Pennsylvania.

Project Botanist – Williams, Northeast Supply Link: 2010. Surveyed for federally endangered northeastern bulrush (*Scirpus ancistrochaetus*) in three wetlands identified on gas pipeline loop in Monroe County, Pennsylvania.

Project Botanist – American Electric Power, Saltville-Kingsport 138 kV Rebuild: 2010. Completed survey for federally listed smooth coneflower (*Echinacea laevigata*) and Virginia spiraea (*Spiraea virginiana*) along four new access road sites (approximately 2,200 feet) in Washington County, Virginia.

Project Botanist – Superior Appalachian Pipeline, Black Moshannon Pipeline: 2010. Completed survey for federally endangered northeastern bulrush (*Scirpus ancistrochaetus*) and state endangered Carey's smartweed (*Polygonum careyi*) along 8-mile natural gas pipeline in Centre County, Pennsylvania.

Project Botanist – American Electric Power, Fleming to Jenkins Rebuild to Ferrus: 2010. Completed habitat assessments for small whorled pogonia and surveys for Virginia spiraea in Letcher County, Kentucky and Dickenson County, Virginia.

Project Botanist – Superior Appalachian Pipeline, Karthaus Pipeline: 2010. Completed survey for federally endangered northeastern bulrush (*Scirpus ancistrochaetus*) and state endangered Carey's smartweed (*Polygonum careyi*) along 7-mile natural gas pipeline in Centre and Clearfield counties, Pennsylvania.

Project Botanist – Metropolitan Sewer District of Greater Cincinnati, Mt. Airy Forest Sewer Replacement: 2009. Completed presence/absence survey for running buffalo clover along 2 miles of sewer lines proposed for replacement in Hamilton County, Ohio.

Project Botanist – American Electric Power, Sunscape 138 kV Extension: 2009. Completed smooth coneflower survey along 1.4-mile transmission line and associated access roads in Roanoke County, Virginia.

Project Botanist – American Electric Power, Matt Funk 138 kV Line: 2009. Completed smooth coneflower and piratebush surveys along 4.5-mile transmission line in Roanoke County, Virginia. Surveyed entire length of proposed project right-of-way and associated access roads.

Project Botanist – Tennessee Gas Pipeline Company, 300 Line: 2009-2010. Completed plant surveys in Sussex and Passaic counties, New Jersey and Potter, Tioga, Bradford, Susquehanna, Wayne, Pike, and Venango, counties, Pennsylvania. Surveyed for several New Jersey and Pennsylvania state listed plant species. Re-surveyed for red spruce in Sussex County, New Jersey in 2010.

Project Botanist – Ozark and Saint Francis National Forests: 2009. Completed rare plant surveys and habitat delineations in select areas of Ozark and Saint Francis National Forests in Arkansas.

Biologist – Tennessee Gas Pipeline Company, 300 Line: 2009. Completed bird habitat surveys in Sussex and Passaic counties, New Jersey. Surveyed for suitable habitat for listed bird species including barred owl; Cooper's, Goshawk, and red-shouldered hawks; and red-headed woodpecker.

Project Botanist – TW Philips, Bionol Clearfield Pipeline: 2008. Completed surveys for Allegheny plum along proposed 8-mile pipeline right-of-way and associated access roads and work spaces in Clearfield County, Pennsylvania.

Project Botanist – American Electric Power, Hickman-Riverbend 69 kV Line: 2008. Completed endangered smooth coneflower (*Echinacea laevigata*) survey along proposed 4.6-mile transmission line in Pulaski County, Virginia.

Project Botanist – Monongahela National Forest: 2008. Completed botanical survey including species inventory and identification for threatened and non-native invasive plants in selected stands in Greenbrier Ranger District. 2004 & 2005. Surveyed for

threatened, endangered and rare plants in Greenbrier, Nicholas, Tucker and Webster counties, West Virginia. Survey to identify the locations and types of Forest-listed and non-native, invasive plant species within the Cherry River watershed of the Gauley Ranger District, the Lower Clover Run watershed of the Cheat Ranger District, Greenbrier and Marlinton Ranger Districts. Requirements for this project included use of GPS equipment and delivery of all database files for GIS utilization. The data dictionary developed included Forest-listed plants, non-native invasive plants, and survey routes.

Project Botanist – Equitable Resources, Amity Pipeline: 2008. Completed threatened and endangered plant surveys for leaf-cup, gray-headed prairie coneflower, and mistflower along 12-mile pipeline corridor in Greene and Washington counties, Pennsylvania.

Project Botanist – Chestnut Flats Wind, Wind Farm: 2008. Completed endangered northeastern bulrush surveys for project involving construction of all aspects of wind farm including clearing/grubbing and subsequent construction of concrete pads, towers, access roads, buried cable lines, overhead transmission line, and electrical substation near Altoona, Blair, and Cambria counties, Pennsylvania.

Project Botanist – Dominion, North Summit: 2008. Completed sensitive plant surveys which included 17 state listed species on 18.14-square mile gas storage field seismic project in Fayette County, Pennsylvania.

Project Biologist – Confidential Client, Treated Effluent Line: 2008. Completed wetland delineation and wetland functional assessment along proposed 10-mile corridor in Stark County, Ohio.

Project Botanist – Dominion Transmission, 138 kV Hybrid Energy/Clinch River Transmission Line: 2008. Completed survey for federally threatened small whorled pogonia and one state-listed celadine poppy (*Stylophorum diphyllum*) along 9-mile transmission line corridor in Wise and Russell counties, Virginia.

Project Botanist – Columbia Gas, Ohio Storage Expansion: 2008. Completed survey for federally endangered small whorled pogonia (*Isotria medeoloides*) and federally threatened eastern prairie fringed orchid (*Platanthera leucophaea*) on natural gas storage fields and along proposed natural gas pipeline rights-of-way in Hocking and Fairfield counties, Ohio.

Project Botanist – American Electric Power, Penhook-Westlake 138 kV Line: 2008. Completed habitat survey for federally endangered smooth coneflower along 14-mile transmission line corridor in Franklin County, Virginia.

Project Botanist – Confidential Client, Proposed 250-mile Natural Gas Transmission Pipeline: 2008. Completed surveys for rare, threatened and endangered plants along ROW in Ohio, West Virginia and Pennsylvania.

Project Botanist – Dominion Transmission, Cove Point Pipeline Expansion TL-492 Extension 3: 2006. Completed survey for leaf-cup (*Polymnia uvedalia*) along 11 miles of proposed natural gas transmission line in Greene County, Pennsylvania and Wetzel County, West Virginia.

Project Biologist – American Electric Power, 765 kV Transmission Line Mitigation Ponds/Wetlands Creation: 2006. Involved with site selection and creation of three wetlands for bat habitat mitigation within electric transmission line corridor in Virginia.

Project Botanist – Indiana Department of Transportation, Interstate 69, Section 2 Environmental Studies Sensitive Plant Survey: 2005. Survey to identify federal and state listed and heritage plants within 29-mile interstate corridor in central Indiana. All natural habitats located along corridor were surveyed for presence of threatened and endangered species. Locations of all listed species found in field were recorded using hand-held GPS. In addition, ecological assessment of plant communities along corridor was made to determine presence of any unique habitat. Each natural area examined was given an ecological quality rating.

Biologist – Indiana Department of Transportation, Interstate 69, Segments 1 and 6: 2005. Participated in spring bird surveys and habitat assessments along 40-mile proposed highway corridor in central and southern Indiana.

Project Botanist – Dominion Transmission, Cove Point Pipeline Expansion PL-1 Extension 2: 2005. Survey for federally endangered northeastern bulrush (*Scirpus ancistrocheatus*) along proposed 80-mile pipeline corridor in Pennsylvania. Total of 194 wetlands within project area were surveyed.

Project Botanist – Centerpoint Energy Pipeline: 2004. Survey for federally listed decurrent false aster (*Boltonia decurrens*) along 3.6 miles of new natural gas pipeline and associated compressor station in Madison and St. Clair counties, Illinois.

Project Botanist – Monongahela National Forest: 2004. The largest known population of running buffalo clover (*Trifolium stoloniferum*), a federally endangered species, was discovered during the 2004 sensitive plant survey.

Project Botanist – Department of Defense, Fort Leonard Wood: 1992-1994. Survey for threatened and endangered species at U.S. Army facility in Pulaski County, Missouri.

PUBLICATIONS

Brewer, L. G. and J. L. Vankat. 2007. A four-year study on the germination, survival, and flowering of *Lupinus perennis* (wild lupine) along a prairie to forest gradient in the Oak Openings of northwestern Ohio. Accepted to Castanea.

Brewer, L. G. and J. L. Vankat. 2006. Richness and diversity of oak savanna in northwestern Ohio: proximity to possible sources of propagules. American Midland Naturalist 155:1-10.

Scott R. Abella, John F. Jaeger, and Lawrence G. Brewer. 2004. Fifteen years of plant community dynamics in a restored northwest Ohio Oak Savanna. The Michigan Botanist 43:117-127.

Brewer, L. G. and J. L. Vankat. 2004. Description of vegetation of the Oak Openings of Northwestern Ohio at the time of Euro-American settlement. Ohio Journal of Science 104(4):76-85 .

- Brewer, L. G., S. M. Dougherty, M. A. Leopold, B. R. Dalton, and D. L. Greis. 2002. Landscape changes in the forests of Boone County, Kentucky from 1954 to 1998. Abstract. 29th Annual Natural Areas Conference. p.4.
- Brewer, L. G. and J. L. Vankat. 2001. The vegetation of the Oak Openings of northwestern Ohio at the time of Euro-American settlement. Ohio Biological Survey. 36" x 46" Map.
- Dalton, B. R., and L. G. Brewer. 1997. A closer look at the shrub and herb layers of an old-growth remnant at the Curtis Gates Lloyd recreational and wildlife area in Crittenden, Kentucky. Abstract: Ancient Eastern United States Old-growth.
- Brewer, L. G. 1995. Ecology of survival and recovery from blight in American chestnut trees (*Castanea dentata* (Marsh.) Borkh.) in Michigan. Bulletin of Torrey Botanical Club 122:40-57.
- Dalton, B., H. Kunz, H., L. G. Brewer, B. Dalton, and V. R. Holmes. 1994. Mortality and condition assessment of 53 species of native trees and shrubs planted to restore a palustrine forested wetland in central Indiana. Abstract: Ecological Society of America Vol 72.
- Brewer, L. G. and M. Grigore. 1993. Restoring oak savannas in Northwest Ohio: monitoring the progress. In *Proceedings of the Midwest Oak Savanna Conference*, ed. R. Sterns and K. Holland. Chicato, Ill.: U.S. Environmental Protection Agency, Great Lakes National Program Office. Internet document. Address: [Http://www.epa.gov/glnpo/oak/](http://www.epa.gov/glnpo/oak/) .
- Brewer, L. G. and J. L. Vankat. 1992. Vegetational changes in Ohio's Oak Savannas. Abstract: Bulletin of the Ecological Society of America. p.122.
- Brewer, L. G. and J. L. Vankat. 1992. A photo-print guide to the flora of Ohio's Unglaciaded Region. Volume III: Dicots, from Ericaceae to Composite. Miami University, Oxford, Ohio, 245 pp. Prepared for Hoosier-Wayne National Forest.
- Brewer, L. G. and J. L. Vankat. 1992. A photo-print guide to the flora of Ohio's Unglaciaded Region. Volume II: Dicots, from Sururaceae to Cornaceae. Miami University, Oxford, Ohio. 330 pp. Prepared for Hoosier-Wayne National Forest.
- Brewer, L. G. and J. L. Vankat. 1992. A photo-print guide to the flora of Ohio's Unglaciaded Region. Volume I: Lower vascular plants, Gymnosperms, and Monocots. Miami University, Oxford, Ohio. 185 pp. Prepared for Hoosier-Wayne National Forest.
- Brewer, L.G. 1992. Environmental factors responsible for the decline of selective savanna herbs and oak seedlings as oak savanna succeeds to forest. Abstract: The Ohio Journal of Science 92(2): 16.
- Brewer, L. G. and J. L. Vankat. 1990. Vegetation changes in the oak savannas and woodlands of northwestern Ohio: 1989 final report. Submitted to Ohio Department of Natural Resources, Division of Natural Areas and Preserves, Columbus, Ohio, 61 pp.

- Brewer, L. G. 1989. The natural recovery of Michigan's American chestnut (*Castanea dentata*) trees. Abstract: American Journal of Botany 76: 93.
- Albert, D. A., M. R. Penskar, G. A. Reese, W. Brodowicz, L. G. Brewer, E.M. Chittenden, and U. C. Peterson. 1989. Factors affecting regional diversity of Great Lakes marshes in Michigan. Abstract: 2nd Indiana Dunes Research Conference: Restoration and Preservation of Great Lakes Coastal Ecosystems.
- Brewer, L. G. 1989. A survey of the oak barrens and savannas of the Oak Openings Preserve Metropark. Submitted to the Nature Conservancy, Ohio Chapter, Columbus, Ohio, 54 pp.
- Raup, H. A., T. W. Hodler, and L. G. Brewer. 1987. The presettlement vegetation of southwestern Michigan. The East Lakes Geographer 22: 216-217 + map.
- Graber, R. E. and L. G. Brewer. 1985. Changes in the population of the rare and endangered plant *Potentilla robbinsiana* Oakes during the period 1973 to 1983. Rhodora 87: 449-457.
- Brewer, L. G., T. W. Hodler, and H. A. Raup. 1984. The presettlement vegetation of southwestern Michigan. Michigan Botanist 23: 153-156.
- Brewer, L. G., T. W. Hodler, and H. A. Raup. 1984. The presettlement vegetation of southwestern Michigan. Department of Geography, Western Michigan University. Map.
- Brewer, L. G. 1982. The distribution of surviving American chestnuts in Michigan. Pp. 94-100. In H. Smith and W. MacDonald (eds.), Proceedings of the USDA Forest Service American Chestnut Cooperators' Meeting. University of West Virginia Agricultural Experiment Station and USDA.
- Brewer, L. G. 1982. The present status and future prospect for the American chestnut in Michigan. Michigan Botanist 21: 117-128.
- Hodler, T. W., R. Brewer, L. G. Brewer, and H. A. Raup. 1981. The presettlement vegetation of Kalamazoo County. Department of Geography, Western Michigan University. Map.
- Brewer, L. G. 1981. Mapping chestnuts in Michigan. Pp. 15-17 in D. Fulbright, Proceedings of the Michigan American Chestnut Workshop. MSU.
- Brewer, L. G. 1981. The American chestnut in Michigan. Northern Nut Growers Annual Report 71: 26-28.
- My American chestnut research was described in "Research News" of the journal Science (Vol. 209, August 22, 1980).

MANUSCRIPTS IN PREPARATION

- Brewer, L. G. 2008. Factors affecting the distribution of *Hydrastis canadensis* (goldenseal) in Hoosier National Forest. In preparation for Journal of Torrey Botanical Society.
- Brewer, L. G. and J. L. Vankat. 2008. An experimental study on the environmental factors affecting the regeneration of black oak (*Quercus velutina*) and white oak

(*Quercus alba*) in a former oak savanna in northwestern Ohio. In preparation for Canadian Journal of Forest Research.

Brewer, L. G. 2008. Michigan's plant tension zone as described by presettlement tree surveys. In preparation for American Midland Naturalist.

Brewer, L. G. 2008. The flora and vegetation of a six square mile area of Lawrence County, Ohio. In preparation for Ohio Journal of Science.

Brewer, L. G., B. R. Dalton, M. A. Leopold, and M. K. Reif. 2008. Landscape changes in the forests of Boone County, Kentucky from 1954 to 1998. In preparation for Natural Areas Journal.

SCIENTIFIC PRESENTATIONS

Brewer, L. G., B. R. Dalton, M. A. Leopold, S. M. Dougherty, M. K. Reif, D. L. Greis, and N. W. Wilson. 2002. Boone County forest quality assessment: an ecological evaluation, prioritization, and mapping. Kentucky Academy of Sciences, Northern Kentucky University, Highland Heights, Kentucky.

Brewer, L. G. 2000. Vegetation changes in Ohio's Oak Savannas. Illinois Natural History Survey, Campaign, Illinois.

Brewer, L. G. and S. Olson. 2000. Factors affecting the distribution of *Hydrastis canadensis* (goldenseal) in Hoosier National Forest. Natural Areas Meeting St. Louis, Missouri.

Brewer, L. G. 1997. Vegetation changes in Ohio's Oak Savannas. Midwest Oak Savanna and Woodland Conference. University of Wisconsin-Madison, Wisconsin.

Dalton, B.R. and L. G. Brewer. 1997. A closer look at the shrub and herb layers of an old-growth remnant of the Curtis Gates Lloyd Recreational and Wildlife Area in Crittenden, Kentucky. Ancient Eastern United States Forests. Process, Value, and Management. Clarion University, Clarion, Pennsylvania.

Brewer, L. G. and B. R. Dalton. 1995. A survey of rare plants and plant communities in a six square mile area in southern Lawrence County, Ohio. Lucy Braun Association for the Mixed Mesophytic Forest, Marshall University, Huntington, West Virginia.

Dalton, B. R., H. Kunz, V. R. Holmes, and L. G. Brewer. 1994. Mortality and condition assessment of 53 species of native trees and shrubs planted to restore a palustrine forested wetland in central Indiana. Ecological Society of America, University of Tennessee, Knoxville, Tennessee.

Brewer, L. G. and M. Grigore. 1993. Restoring oak savannas in northwest Ohio: monitoring the progress. Midwest Oak Savanna Conference, Northern Illinois University, Chicago, Illinois.

Brewer, L. G. 1993. The presettlement vegetation of northwestern Ohio. Midwest Oak Savanna Conference, Northeastern Illinois University, Chicago, Illinois.

- Albert, D. A., M. R. Penskar, G. A. Reese, W. Brodowicz, L.G. Brewer, E. M Chittenden, and U. C. Peterson. 1989. Factors affecting regional diversity of Great Lakes marshes in Michigan. Second Indiana Dunes Research Conference: Restoration and Preservation of Great Lakes Coastal Ecosystems. Indiana National Lake Shore, Portage, Indiana.
- Brewer, L. G. 1989. The natural recovery of Michigan's American chestnut (*Castanea dentata*) trees. AIBS Meeting, Toronto, Ontario, Canada.
- Brewer, L. G. 1982. A study on the vegetational tension zone using pre and post-settlement surveys. Michigan Academy of Science, Arts, and Letters, Kalamazoo, Michigan.
- Brewer, L. G. 1982. The distribution of healing American chestnut trees in Michigan. U.S. Forest Service American Chestnut Symposium, Morgantown, West Virginia.
- Brewer, L. G. 1982. The distribution of healing American chestnut trees in Michigan. U.S. Forest Service and American Chestnut Symposium, Morgantown, West Virginia.
- Brewer, L. G. 1981. Mapping chestnuts of Michigan. American Chestnut Workshop, Sponsored by Michigan State University and Consumers Power Company, Tippy Dam, Wellston, Michigan.
- Brewer, L. G. 1981. The chestnuts of Michigan. Northern Nut Growers Association Annual Meeting, Geneseo, New York.
- Brewer, L. G. 1980. The American chestnut (*Castanea dentata*) in Michigan. Michigan Audubon Annual Meeting, Traverse City, Michigan.
- Brewer, L. G. 1980. The present status and future prospect for the American chestnut (*Castanea dentata*). Michigan Academy of Science, Arts, and Letters, Wayne State University, Detroit, Michigan.

PROFESSIONAL MEMBERSHIPS

Ecological Society of America (ESA)
Ohio Academy of Sciences
Torrey Botanical Club
Southern Appalachian Botanical Society
Society for Ecological Restoration
Lucy Braun Association
Natural Areas Association
The Nature Conservancy

**APPENDIX C
ABSTRACTS**



SURVEYS FOR RARE PLANTS ALONG MVP'S PROPOSED MOUNTAIN VALLEY PIPELINE IN VIRGINIA AND WEST VIRGINIA

Client: Tetra Tech
Owner: Mountain Valley Pipeline (MVP)
Project Location: Virginia and West Virginia
Period of Performance: 2015 - Ongoing
Contract Effort: Rare Plant Surveys
Reference(s): Mr. Sean Sparks
 160 Federal Street, 3rd Floor
 Boston, MA 02110
 (617) 443-7565



MVP is an approximately 301-mile, 42-inch diameter natural gas pipeline originating in Wetzel County, West Virginia and extending to Pittsylvania County, Virginia. The proposed route traverses four Physiographic Provinces: Appalachian Plateaus throughout most of West Virginia, Valley and Ridge on the border of West Virginia and Virginia, Blue Ridge in Virginia, and Piedmont in Central Virginia. The proposed route also crosses portions of the Jefferson National Forest (JNF) managed by the U.S. Forest Service (USFS). These regions consist of many habitat types and plant communities; and potentially a high number of rare, threatened, and special concern species.

ESI was retained to conduct rare plant surveys along the proposed right-of-way in support of regulatory requirements. Species of concern included federal and/or state listed northeastern bulrush, running buffalo clover, shale barren rock cress, small whorled pogonia, smooth and pinnate-lobed coneflowers, Virginia spiraea, and sweet shrub, as well as forest sensitive species. Meander search surveys during requisite conditions and species-specific windows were completed over fourteen separate deployments from 22 May to 1 October 2015. None of the targeted federal and/or state listed species were detected, but two forest sensitive species were identified: American barberry and rock skullcap. These results were included in a Biological Evaluation (BE) prepared for USFS.

In addition to the BE and associated surveys, the USFS requested completion of common stand examinations and site index in areas where the MVP alignment is proposed to cross the JNF. Based on methods provided in the Region 8 Forest Service Common Stand Exam document, ESI completed variable radius plot sampling. Core samples were collected for laboratory analysis and the project area was examined for the potential presence of old growth forest. Data were also collected to determine the site index for the project area.

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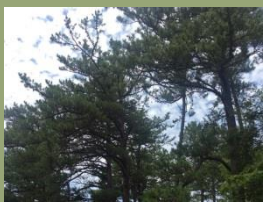
www.ENVSI.com



RARE PLANT SURVEYS FOR THE AEP BLAND AREA IMPROVEMENT: 138 KV TRANSMISSION LINE REBUILD PROJECT



Client / Owner:	American Electric Power
Project Location:	Bland and Wythe counties, Virginia
Period of Performance:	2015
Contract Effort:	Rare Plant Surveys
Reference(s):	Mr. John Van Hassel P.O. Box 2021 Roanoke, Virginia 24022 (540) 562-7038



ESI was retained by American Electric Power to provide professional environmental consulting services for the Bland Area Improvements 138 kV Transmission Line Rebuild Project in Bland and Wythe counties, Virginia and Mercer County, West Virginia. These services included surveys for rare plants, including forest sensitive species, on approximately 7 miles of the rebuild route and associated access road improvements on federal lands within the Jefferson National Forest Eastern Divide Ranger District in Virginia. Targeted species were identified through consultation with U.S. Forest Service (USFS), Virginia Department of Conservation and Recreation (VDCR), and U.S. Fish and Wildlife Service (USFWS).



Qualified biologists surveyed the project area over three seasons or phases using a meander search method. Surveys began in the early season (spring), continued through the mid-season (summer) and ended in the late season (fall). These phases correspond to optimum search windows for the identified rare plant species with potential to occur within the project area, often when these species are in bloom. Biologists searched for individual occurrences of rare plant species, while also identifying habitats capable of supporting rare plant communities and forest sensitive species. Information on land cover and dominant species present was collected.



Biologists delineated 107 habitat patches, represented by seven cover types: Developed Areas, Wetlands, Recent Clear Cuts, Coniferous Forest, Disturbed Land, Oak/Pine (Mixed Forest), and Deciduous Forest. No individual occurrences or suitable habitat for any federally listed plant species were found, and no species listed by the Commonwealth of Virginia were encountered. A USFS forest sensitive species, American barberry (*Berberis canadensis*), was encountered at six sites over the three phases of the survey.



Additionally, a rock outcrop with sandy substrate in the northern portion of the project was encountered. This natural feature may be suitable habitat for the northern barrens tiger beetle (*Cicindela patruela*), another forest sensitive species.

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ROCHESTER GAS AND ELECTRIC CERTIFIED MAIN-5 PIPELINE PROJECT

Client:	The DDS Companies
Owner:	Iberdrola - Rochester Gas & Electric (RG&E)
Project Location:	Monroe County, New York
Period of Performance:	2015
Contract Effort:	Habitat Assessments, Aquatic Delineations, Invasive Plant Survey, Tree Inventory
Reference(s):	Mr, Mark Petroski 45 Hendrix Road West Henrietta, New York 14586 (585) 359-7540



RG&E proposed to develop the Certified Main-5 natural gas distribution line and on their behalf, ESI was retained to provide the professional environmental services for the project. The Area of Investigation (AOI) included a 200-foot study corridor for the entire length of the line and proposed footprint of all staging and laydown areas, encompassing approximately 252 acres. Services included the following:

Habitat Assessments: ESI completed detailed habitat assessments for federal and state protected species with potential to occur within the AOI. Species of concern included northern long-eared bat, pink heelsplitter mussel, sixteen species of migratory birds, bald eagle, and big shellbark hickory. One protected natural community, the Black Creek Swamp, also had potential to be impacted.

Aquatic Delineations: Seventeen wetlands and two streams were delineated within and immediately adjacent the AOI. During field surveys, dominant flora species, hydrologic features, and soil conditions were recorded. Information regarding land cover consistent with the 2011 National Land Cover Database (NLCD) was obtained during the field survey as well.

Invasive Plant Survey: Nineteen invasive plant locations totaling 7.91 acres and comprising 8 species were identified and mapped within the project AOI. Common buckthorn was the most prevalent followed by purple loosestrife. Results of the field survey were incorporated in an invasive plant management plan for use during construction.

Merchantable Timber and Tree Inventory: ESI completed a general inventory of tree species within all wooded areas of the AOI. Field surveys employed a meander search technique, identifying 23 individual wooded areas. Data regarding dominant tree species and average diameter of species identified were collected. Within these woody areas, 11 merchantable timber stands were identified comprising a total of 12.3 acres.

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RARE PLANT SURVEYS ON MONONGAHELA NATIONAL FOREST

Client:	Monongahela National Forest
Owner:	U.S. Department of Agriculture - Forest Service
Project Location:	West Virginia
Period of Performance:	2000, 2003, 2004, 2005, and 2008
Contract Effort:	Field Survey for Threatened, Endangered and Sensitive Species and Non-native Invasive Species of Plants
Reference(s):	Melissa Van Gundy 200 Sycamore St. Elkins, West Virginia 26241



ESI was contracted five separate times by the Monongahela National Forest (MNF) to conduct sensitive plant surveys between 2000 and 2008. The projects involved surveying specific areas for the presence of plants listed on Region 9 Regional Forester's Sensitive Species List. Specific areas included in the surveys were identified by MNF where ground-disturbing activities such as new roads, timber harvest, trail construction, or wildlife habitat projects were scheduled to take place. The project areas ranged from between 2200 and 2900 acres and involved more than 60 wooded stands varying in age and composition, as well as a few pasture areas.

ESI botanists discovered the largest known population of running buffalo clover (*Trifolium stoloniferum*), a federally endangered species, during the 2004 survey. Monkshood (*Aconitum reclinatum*) and smooth rock skullcap (*Scutellaria saxatilis*), both Regional Forester Sensitive Species, were found in many locations during the 2005 survey. Detailed records of location, abundance, flowers, fruits, and threats to the species were recorded for all sensitive plants and communities located.

In addition, several non-native invasive species were identified and mapped during surveys. Data were gathered on the location and extent of invasive species.

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**APPENDIX D
REQUIRED PAPERWORK**





Purchasing Division
 2019 Washington Street East
 Post Office Box 50130
 Charleston, WV 25305-0130

**State of West Virginia
 Request for Quotation**

Proc Folder: 205124

Doc Description: INVASIVE SPECIES SURVEY- CAMP DAWSON

Proc Type: Central Purchase Order

Date Issued	Solicitation Closes	Solicitation No	Version
2016-04-01	2016-04-28 13:30:00	CRFQ 0603 ADJ1600000021	1

BID RECEIVING LOCATION

BID CLERK
 DEPARTMENT OF ADMINISTRATION
 PURCHASING DIVISION
 2019 WASHINGTON ST E
 CHARLESTON WV 25305
 US

VENDOR

Vendor Name, Address and Telephone Number:

FOR INFORMATION CONTACT THE BUYER

Crystal Rink
 (304) 558-2402
 crystal.g.rink@wv.gov

Signature X

FEIN # 31-1697213

DATE 05-03-2016

All offers subject to all terms and conditions contained in this solicitation

CERTIFICATION AND SIGNATURE PAGE

By signing below, or submitting documentation through wvOASIS, I certify that I have reviewed this Solicitation in its entirety; that I understand the requirements, terms and conditions, and other information contained herein; that this bid, offer or proposal constitutes an offer to the State that cannot be unilaterally withdrawn; that the product or service proposed meets the mandatory requirements contained in the Solicitation for that product or service, unless otherwise stated herein; that the Vendor accepts the terms and conditions contained in the Solicitation, unless otherwise stated herein; that I am submitting this bid, offer or proposal for review and consideration; that I am authorized by the vendor to execute and submit this bid, offer, or proposal, or any documents related thereto on vendor's behalf; that I am authorized to bind the vendor in a contractual relationship; and that to the best of my knowledge, the vendor has properly registered with any State agency that may require registration.

Environmental Solutions & Innovations, Inc.

(Company)

 Dale Sparks, (Sr. Project Manager)

(Authorized Signature) (Representative Name, Title)

P: 513-451-1777, F: 513-451-3321, 05-03-2016

(Phone Number) (Fax Number) (Date)

ADDENDUM ACKNOWLEDGEMENT FORM
SOLICITATION NO.: ADJ160000021

Instructions: Please acknowledge receipt of all addenda issued with this solicitation by completing this addendum acknowledgment form. Check the box next to each addendum received and sign below. Failure to acknowledge addenda may result in bid disqualification.

Acknowledgment: I hereby acknowledge receipt of the following addenda and have made the necessary revisions to my proposal, plans and/or specification, etc.

Addendum Numbers Received:

(Check the box next to each addendum received)

- | | |
|----------------------------------------------------|------------------------------------------|
| <input checked="" type="checkbox"/> Addendum No. 1 | <input type="checkbox"/> Addendum No. 6 |
| <input checked="" type="checkbox"/> Addendum No. 2 | <input type="checkbox"/> Addendum No. 7 |
| <input type="checkbox"/> Addendum No. 3 | <input type="checkbox"/> Addendum No. 8 |
| <input type="checkbox"/> Addendum No. 4 | <input type="checkbox"/> Addendum No. 9 |
| <input type="checkbox"/> Addendum No. 5 | <input type="checkbox"/> Addendum No. 10 |

I understand that failure to confirm the receipt of addenda may be cause for rejection of this bid. I further understand that any verbal representation made or assumed to be made during any oral discussion held between Vendor's representatives and any state personnel is not binding. Only the information issued in writing and added to the specifications by an official addendum is binding.

Environmental Solutions & Innovations, Inc.

Company



Authorized Signature

05-03-2016

Date

NOTE: This addendum acknowledgement should be submitted with the bid to expedite document processing.
Revised 6/8/2012

REQUEST FOR QUOTATION

CRFQ ADJ160000021

**Invasive Species Inventory & Assessment, Update of Plant Community Mapping Data on
Camp Dawson Army Training Site
Kingwood, WV (Preston Co.)**

11. MISCELLANEOUS:

11.1. Contract Manager: During its performance of this Contract, Vendor must designate and maintain a primary contract manager responsible for overseeing Vendor's responsibilities under this Contract. The Contract manager must be available during normal business hours to address any customer service or other issues related to this Contract. Vendor should list its Contract manager and his or her contact information below.

Contract Manager: Robert Jean
Telephone Number: (513) 451-1777
Fax Number: (513) 451-3321
Email Address: rjean@envsi.com

State of West Virginia VENDOR PREFERENCE CERTIFICATE

Certification and application* is hereby made for Preference in accordance with *West Virginia Code*, §5A-3-37. (Does not apply to construction contracts). *West Virginia Code*, §5A-3-37, provides an opportunity for qualifying vendors to request (at the time of bid) preference for their residency status. Such preference is an evaluation method only and will be applied only to the cost bid in accordance with the *West Virginia Code*. This certificate for application is to be used to request such preference. The Purchasing Division will make the determination of the Vendor Preference, if applicable.

1. Application is made for 2.5% vendor preference for the reason checked:

Bidder is an individual resident vendor and has resided continuously in West Virginia for four (4) years immediately preceding the date of this certification; **or,**

Bidder is a partnership, association or corporation resident vendor and has maintained its headquarters or principal place of business continuously in West Virginia for four (4) years immediately preceding the date of this certification; or 80% of the ownership interest of Bidder is held by another individual, partnership, association or corporation resident vendor who has maintained its headquarters or principal place of business continuously in West Virginia for four (4) years immediately preceding the date of this certification; **or,**

Bidder is a nonresident vendor which has an affiliate or subsidiary which employs a minimum of one hundred state residents and which has maintained its headquarters or principal place of business within West Virginia continuously for the four (4) years immediately preceding the date of this certification; **or,**

2. Application is made for 2.5% vendor preference for the reason checked:

Bidder is a resident vendor who certifies that, during the life of the contract, on average at least 75% of the employees working on the project being bid are residents of West Virginia who have resided in the state continuously for the two years immediately preceding submission of this bid; **or,**

3. Application is made for 2.5% vendor preference for the reason checked:

Bidder is a nonresident vendor employing a minimum of one hundred state residents or is a nonresident vendor with an affiliate or subsidiary which maintains its headquarters or principal place of business within West Virginia employing a minimum of one hundred state residents who certifies that, during the life of the contract, on average at least 75% of the employees or Bidder's affiliate's or subsidiary's employees are residents of West Virginia who have resided in the state continuously for the two years immediately preceding submission of this bid; **or,**

4. Application is made for 5% vendor preference for the reason checked:

Bidder meets either the requirement of both subdivisions (1) and (2) or subdivision (1) and (3) as stated above; **or,**

5. Application is made for 3.5% vendor preference who is a veteran for the reason checked:

Bidder is an individual resident vendor who is a veteran of the United States armed forces, the reserves or the National Guard and has resided in West Virginia continuously for the four years immediately preceding the date on which the bid is submitted; **or,**

6. Application is made for 3.5% vendor preference who is a veteran for the reason checked:

Bidder is a resident vendor who is a veteran of the United States armed forces, the reserves or the National Guard, if, for purposes of producing or distributing the commodities or completing the project which is the subject of the vendor's bid and continuously over the entire term of the project, on average at least seventy-five percent of the vendor's employees are residents of West Virginia who have resided in the state continuously for the two immediately preceding years.

7. Application is made for preference as a non-resident small, women- and minority-owned business, in accordance with *West Virginia Code* §5A-3-59 and *West Virginia Code of State Rules*.

Bidder has been or expects to be approved prior to contract award by the Purchasing Division as a certified small, women- and minority-owned business.

Bidder understands if the Secretary of Revenue determines that a Bidder receiving preference has failed to continue to meet the requirements for such preference, the Secretary may order the Director of Purchasing to: (a) reject the bid; or (b) assess a penalty against such Bidder in an amount not to exceed 5% of the bid amount and that such penalty will be paid to the contracting agency or deducted from any unpaid balance on the contract or purchase order.

By submission of this certificate, Bidder agrees to disclose any reasonably requested information to the Purchasing Division and authorizes the Department of Revenue to disclose to the Director of Purchasing appropriate information verifying that Bidder has paid the required business taxes, provided that such information does not contain the amounts of taxes paid nor any other information deemed by the Tax Commissioner to be confidential.

Under penalty of law for false swearing (*West Virginia Code*, §61-5-3), Bidder hereby certifies that this certificate is true and accurate in all respects; and that if a contract is issued to Bidder and if anything contained within this certificate changes during the term of the contract, Bidder will notify the Purchasing Division in writing immediately.

Bidder: Environmental Solutions & Innovations, Inc. Signed: Dale Sparks

Date: 05-03-2016 Title: Sr. Project Manager

Environmental Solutions & Innovations, Inc. is not applying for Preference.

STATE OF WEST VIRGINIA
Purchasing Division

PURCHASING AFFIDAVIT

MANDATE: Under W. Va. Code §5A-3-10a, no contract or renewal of any contract may be awarded by the state or any of its political subdivisions to any vendor or prospective vendor when the vendor or prospective vendor or a related party to the vendor or prospective vendor is a debtor and: (1) the debt owed is an amount greater than one thousand dollars in the aggregate; or (2) the debtor is in employer default.

EXCEPTION: The prohibition listed above does not apply where a vendor has contested any tax administered pursuant to chapter eleven of the W. Va. Code, workers' compensation premium, permit fee or environmental fee or assessment and the matter has not become final or where the vendor has entered into a payment plan or agreement and the vendor is not in default of any of the provisions of such plan or agreement.

DEFINITIONS:

"Debt" means any assessment, premium, penalty, fine, tax or other amount of money owed to the state or any of its political subdivisions because of a judgment, fine, permit violation, license assessment, defaulted workers' compensation premium, penalty or other assessment presently delinquent or due and required to be paid to the state or any of its political subdivisions, including any interest or additional penalties accrued thereon.

"Employer default" means having an outstanding balance or liability to the old fund or to the uninsured employers' fund or being in policy default, as defined in W. Va. Code § 23-2c-2, failure to maintain mandatory workers' compensation coverage, or failure to fully meet its obligations as a workers' compensation self-insured employer. An employer is not in employer default if it has entered into a repayment agreement with the Insurance Commissioner and remains in compliance with the obligations under the repayment agreement.

"Related party" means a party, whether an individual, corporation, partnership, association, limited liability company or any other form or business association or other entity whatsoever, related to any vendor by blood, marriage, ownership or contract through which the party has a relationship of ownership or other interest with the vendor so that the party will actually or by effect receive or control a portion of the benefit, profit or other consideration from performance of a vendor contract with the party receiving an amount that meets or exceeds five percent of the total contract amount.

AFFIRMATION: By signing this form, the vendor's authorized signer affirms and acknowledges under penalty of law for false swearing (W. Va. Code §61-5-3) that neither vendor nor any related party owe a debt as defined above and that neither vendor nor any related party are in employer default as defined above, unless the debt or employer default is permitted under the exception above.

WITNESS THE FOLLOWING SIGNATURE:

Vendor's Name: Environmental Solutions & Innovations, Inc.

Authorized Signature: _____ Date: 05-03-2016

State of Kentucky

County of Statewide, to-wit:

Taken, subscribed, and sworn to before me this 03 day of May, 2016.

My Commission expires 09-September, 2017.

AFFIX SEAL HERE

NOTARY PUBLIC

Purchasing Affidavit (Revised 07/01/2012)

IRALA JO SALYERS
NOTARY PUBLIC
STATE AT LARGE
KENTUCKY

MY COMMISSION EXPIRES SEP. 9, 2017