

**Environment and Natural Resources Trust Fund**

# 2022 Request for Proposal

## **General Information**

**Proposal ID:** 2022-045

**Proposal Title:** Charting Minnesota’s Future Natural Resources

## **Project Manager Information**

**Name:** Brian Huberty

**Organization:** SharedGeo

**Office Telephone:** (651) 285-5015

**Email:** bhuberty@sharedgeo.org

## **Project Basic Information**

**Project Summary:** Create a recommendation report to coordinate and collaborate future collections of aerial and satellite imagery to help Minnesotans make better decisions for natural resource management and emergency response.

**Funds Requested:** $142,000

**Proposed Project Completion:** June 30 2024

**LCCMR Funding Category:** Small Projects (H) **Secondary Category:** Foundational Natural Resource Data and Information (A)

## **Project Location**

**What is the best scale for describing where your work will take place?** Statewide

**What is the best scale to describe the area impacted by your work?** Statewide

**When will the work impact occur?** During the Project and In the Future

## **Narrative**

**Describe the opportunity or problem your proposal seeks to address. Include any relevant background information.**

Remote Sensing imagery is an essential tool to monitor our natural resources effectively and efficiently. The federal government spends billions on imagery every year and the state can take advantage of this to reduce costs while gaining more frequent coverage for resource managers. This project will create a long-term report for the State of Minnesota to effectively access, acquire and distribute remote sensing imagery (aerial and satellite) for natural resource management and emergency response. Minnesota has sporadically, acquired and used imagery to assess, manage, map and monitor our natural resources for over 70 years. These aerial views provide current view of our landscape as well as a historical record for future generations. With our rapidly changing landscape, a plan is needed by Minnesota to leverage partnerships and create collaborative frameworks for acquiring, accessing and sharing imagery. This recommendation report will be developed by a coalition of professional experts across the state for planning collaborative and systematic acquisitions. In this digital age, we will also show how to best to access and share these massive aerospace imagery datasets since more of the imagery is now licensed; which further inhibits access by the public and land managers.

**What is your proposed solution to the problem or opportunity discussed above? i.e. What are you seeking funding to do? You will be asked to expand on this in Activities and Milestones.**

The American Society for Photogrammetry and Remote Sensing-Western Great Lakes Region (ASPRS-WGL), Minnesota Chapter, will lead a coalition of remote sensing experts to create "Charting Minnesota’s Future Natural Resources” recommendation report to outline potential state and federal programs which could support long term image access, acquisition, and distribution for the natural resources users and emergency responders. ASPRS is a professional scientific society which represents academic, business and government sectors. The Minnesota Geospatial Advisory Council, Emergency Preparedness Committee, Geospatial Assistance Sub-committee will also assist since neither Minnesota nor FEMA has a dedicated process to acquire imagery during a disaster. This report will define and recommend imagery collections and derived products for Minnesota. The Minnesota non-profit geospatial group, SharedGeo, will help administer the project in addition to supporting cloud solution demonstrations for image storage, access, analysis and delivery.
Specific tasks include:
● Conduct surveys and workshops to gather stakeholder input for report formulation and demonstrate cloud imagery access. ● Formulate the report for jointly funding, accessing, storing, analyzing and distributing imagery and derived products through a digital cloud approach. This includes imagery for emergencies such as wildfires, floods and oil spills in coordination with the Minnesota Geospatial Advisory Council, Emergency Preparedness Committee.

**What are the specific project outcomes as they relate to the public purpose of protection, conservation, preservation, and enhancement of the state’s natural resources?**

ROI: Remote sensing provides at least a 10x return. Outcomes: 1) Better conservation and improvement of Minnesota’s natural resources from more increased measurement, monitoring modelling, mapping and inventory continually through time by reduction in field costs. 2) Improve access to federal remote sensing programs to help reduce the state’s burden while continuing to conserve and enhance our state’s natural resources. 3) Statewide historical views of the landscape over time for future generations. 4) Saving lives and property during fire and flooding disasters with timely imagery for both first responders and landowners. 5) Better carbon credit accounting.

## **Activities and Milestones**

### **Activity 1: Coordination and Collaboration Remote Sensing Workshops**

**Activity Budget:** $36,000

**Activity Description:**ASPRS WGL with the admin support of SharedGeo, will hold virtual and in-person workshops around the state to survey imagery needs and demonstrate cloud solutions with users.
To minimize travel costs for all, these workshops may be hosted in conjunction with other geospatial meetings hosted by the University of Minnesota,, ASPRS, and/or Minnesota GIS/LIS .

**Activity Milestones:**

|  |  |
| --- | --- |
| **Description** | **Completion Date** |
| Conduct workshops around the state (3 at a minimum) | June 30 2024 |

### **Activity 2: Charting Minnesota's Future Natural Resources - Recommendation Report**

**Activity Budget:** $40,000

**Activity Description:**1) Create a Charting Minnesota's Future Natural Resources - Recommendation Report by collaboration members.
The report will address the best strategies to use multiple sensors (optical, radar, lidar, thermal,sonar) on drones, aircraft and satellites for a variety of applications. This report will help set the stage for the next cycle of the MN Lidar Plan for example.
2) Communication of requirements and collaboration with the federal government.
This will help Minnesota on where to focus state resources to fill gaps not covered by federal programs.

**Activity Milestones:**

|  |  |
| --- | --- |
| **Description** | **Completion Date** |
| Task chapter write-ups by applications, platforms and sensors | September 30 2022 |
| Review first draft - Charting Minnesota's Future Natural Resources | June 30 2023 |
| Coordinate with federal programs for recommended objectives | October 31 2023 |
| Publish final draft | June 30 2024 |

### **Activity 3: Cloud based image access, processing storage demonstration for natural resource applications and emergency response.**

**Activity Budget:** $50,000

**Activity Description:**The cloud is becoming the central 'virtual' location for hosting public and licensed remote sensing imagery. Users of imagery are shifting from downloading silos of data to sharing data on the cloud. Entwine.usgs.io is an example where LIDAR data is stored, accessed and served for the nation overseen by USGS on Amazon Web Services. SharedGeo will follow this model to work with MNIT, MNDNR, MnGeo and other coalition members to demonstrate the cloud system. This demonstration will help provide a better understanding of future costs to administer future access and image data applications with cloud service providers such as Amazon Web Services and Google for natural resource applications.

**Activity Milestones:**

|  |  |
| --- | --- |
| **Description** | **Completion Date** |
| Host cloud sharing workshops across the state for natural resource and emergency response stakeholders. | June 30 2023 |
| Workshop demonstrations of remote sensing image cloud approaches for natural resource applications and emergency response. | June 30 2024 |

### **Activity 4: ASPRS WGL Charting MN Quarterly virtual and in-person meetings**

**Activity Budget:** $2,000

**Activity Description:**Quarterly virtual and in-person meetings

**Activity Milestones:**

|  |  |
| --- | --- |
| **Description** | **Completion Date** |
| Quarterly MN Remote Sensing Collaboration virtual and in-person meetings | June 30 2024 |

### **Activity 5: Collaboration Meetings with federal programs and cloud services**

**Activity Budget:** $14,000

**Activity Description:**Collaboration Meetings with Federal Remote Sensing Programs, Airborne Data Systems and cloud services for improved collaboration and coordination in order to reduce state costs.

**Activity Milestones:**

|  |  |
| --- | --- |
| **Description** | **Completion Date** |
| Coordination and collaboraiton with OSTP, USGS, NOAA, NASA, NGA, FEMA, AWS, MS, Google, etc. | June 30 2024 |

## **Project Partners and Collaborators**

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Organization** | **Role** | **Receiving Funds** |
| Brandon Krumwiede | NOAA & Great Lakes Remote Sensing Network Leader | Professional - American Society for Photogrammetry and Remote Sensing - Western Great Lakes Past-PresidentGreat Lakes Remote Sensing NOAA | No |
| Dr. Jennifer Corcoran | MN DNR Resource Assessment | State Government -Natural Resources Sector | No |
| David Fuhr | Airborne Data Systems | Fire, floods & oil spill Emergency Response Expert. Airborne Camera Systems Manufacturer. | Yes |
| Paul Morin | University of Minnesota - Polar Geospatial Center | National Science Foundation - Remote Sensing SciencePolar and Earth DEM | No |
| Adam Smith | Minnesota Department of Natural Resources | ASPRS WGL President, Transportation Sector | No |
| Michelle Carroll | Woolpert | Business Sector - Bathymetry Project ManagerUnmanned Aerial Systems Mapping Expert | No |
| Dan Ross | MnGeo | State Government - MNGEO | No |
| Tom Hollenhorst | EPA | Federal Government - EPA and Great Lakes Remote Sensing | No |
| Dr. Joe Knight | University of Minnesota - Remote Sensing and Geospatial Analysis Laboratory | University of Minnesota - Remote Sensing Science | No |
| Miles Strain | KBM Geospatial | Mapping Engineering SectorOptical and Lidar image acquisition and processing | No |
| Dr. Nancy Read | Metropolitan Mosquito Control District | Entomology Science | No |
| Mark Korver | Amazon Web Services | Open Source Public Data Cloud SectorRemote sensing imagery cloud storage, analysis and distribution for public and private sectors. | No |
| Gerry Sjervin | Allete - Minnesota Power | Public Utilities | No |
| Howard Butler | Hobu.co | Open Source Digital Cloud Structure and formulation guidance based on experience creating for USGS ENTWINE system - nationwide lidar cloud on AWS: usgs.entwine.io | Yes |
| Will Bartsch | University of Minnesota NRRI | Minnesota Natural Resource Atlas | No |
| Ryan Mattke | University of Minnesota, Borchert Map Librarian | University of Minnesota Map Library - ArchiveLong term library archive for all of Minnesota's aerial and satellite imagery as well as derived products. | No |
| Len Kne | University of Minnesota U-Spatial | University of Minnesota - U-SpatialGeospatial data training, serving and archiving | No |
| Allison Slaats | MN.IT @ MnGEO | MN.IT MnGeo's Data Coordination Leader | No |
| Dr. Leif Olmanson | University of Minnesota - Waters | University of Minnesota - Water Science Remote SensingMinnesota Lakes water quality monitoring. | No |
| Greg Stensaas | USGS Eros Data Center | Federal Government - Aerial and Satellite Systems | No |
| Steve Martinez | Martinez Geospatial | ASPRS Minnesota Representative - Laser Scanning Mapping Industry | No |
| Dan Little | Planet | Commercial Satellite Perspective | No |
| Dr. Steve Kloiber | MN DNR | Lake Ecology | No |
| Dr. William Befort | MN DNR Resource Assessment (retired) | MN DNR Historical Remote Sensing Leader | No |
| Mike Hoppus | MN DNR Resource Assessment (retired) | MN DNR Remote Sensing Program History | No |
| Dr. Marvin Bauer | UMN - retired | Landsat or agriculture and natural resourcesNASA connections | No |
| Dr. Ben Richason | St Cloud State University - Retired | Remote Sensing HIstory and Education for Minnesota | No |

## **Long-Term Implementation and Funding**

**Describe how the results will be implemented and how any ongoing effort will be funded. If not already addressed as part of the project, how will findings, results, and products developed be implemented after project completion? If additional work is needed, how will this be funded?**The recommendation report will be transmitted by ASPRS WGL to government, industry and academic leaders with supporting media (websites, documents, etc.) to help plan and formulate actions for future years. This includes recommendations for acquiring aerial and satellite imagery as well as cloud access, storage, analysis and distribution approaches. As programs permit in the future, MNGEO and USGS may have additional resources to update the report in future years in which members of ASPRS WGL will be available to assist.

## **Project Manager and Organization Qualifications**

**Project Manager Name:** Brian Huberty

**Job Title:** Remote Sensing Advisor

**Provide description of the project manager’s qualifications to manage the proposed project.**Office of Science & Technology Policy - 2019 National Plan for Civil Earth Observations
Ag & Forestry Chapter Lead
Federal Assessment Working Group – 2nd Earth Observation Assessment
2016 & 2018 Federal Satellite Needs Working Group - FWS Leader
Professional Certification: American Society for Photogrammetry & Remote Sensing - ASPRS - Remote Sensing Mapping Scientist #RS130
Professional Leadership:
American Society for Photogrammetry & Remote Sensing (ASPRS)
Director - Primary Data Acquisition Division
President- Western Great Lakes Region
 2011 ASPRS Annual Conference Co-Chair
 2002-2012 Professional Digital Aerial Mapping Camera Systems Workshop Instructor
 1997 First North American Symposium on Small Format Aerial Photography Co-Chair
Int’l Society for Photogrammetry & Remote Sensing – Airborne Sensors Working Group Chair
Experience:
Aerial Photographer, Minnesota Dept of Natural Resources, Resource Assessment
Inventory Forester, Minnesota Dept of Natural Resources, Resource Assessment
Instructor, USDA Forest Service, National Remote Sensing Program
Midwest GIS Leader, USDA Natural Resources Conservation Service
National Remote Sensing Leader, U.S. Fish & Wildlife Service

**Organization:** SharedGeo

**Organization Description:**Sharedgeo formed the umgeocon.org collaboration conferences in 2016 and 2018 to forge cross-state collaboration for the GIS, surveying and remote sensing communities. SharedGeo was founded as a 501 c3 non-profit in September 2008 as a way to advance the use of mapping technologies and share geographic data in support of environmental disaster response and relief operations in the United States. Since 2008, SharedGeo has expanded its geospatial support roles in a wide variety of applications including: producing higher accuracy COVID-19 maps for the U.S. ( https://www.sharedgeo.org/COVID-19/ ); establishing the U.S. National Grid Center (https://usngcenter.org/ ), and the supporting the Great Lakes Restoration Initiative for the U.S. Fish & Wildlife Service (https://www.sharedgeo.org/portfolio-item/glri/).

## **Budget Summary**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Category / Name** | **Subcategory or Type** | **Description** | **Purpose** | **Gen. Ineli gible** | **% Bene fits** | **# FTE** | **Class ified Staff?** | **$ Amount** |
| **Personnel** |  |  |  |  |  |  |  |  |
| Brian Huberty |  | Project Manager and Plan Editor |  |  | 20% | 0.6 |  | $40,000 |
| Jim Klassen |  | High Performance Cloud Computing Training |  |  | 20% | 0.5 |  | $40,000 |
| Steve Swazee |  | Administration |  |  | 20% | 0.2 |  | $7,000 |
|  |  |  |  |  |  |  | **Sub Total** | **$87,000** |
| **Contracts and Services** |  |  |  |  |  |  |  |  |
| Airborne Data Systems | Sub award | Emergency Response remote sensing assistance from fire, flood and Gulf Oil Spill past experience. |  |  |  | 0.04 |  | $4,000 |
| Hobu | Sub award | Hobu.co created the cloud software engineering to build the USGS Entwine cloud. Their expertise will be tapped to provide the image distribution recommendation report. |  |  |  | 0.1 |  | $10,000 |
|  |  |  |  |  |  |  | **Sub Total** | **$14,000** |
| **Equipment, Tools, and Supplies** |  |  |  |  |  |  |  |  |
|  | Tools and Supplies | Cloud hosting services and imagery licensing access demonstration | Remote sensing data cloud hosting storage, analysis, and distribution subscription requirement |  |  |  |  | $26,000 |
|  |  |  |  |  |  |  | **Sub Total** | **$26,000** |
| **Capital Expenditures** |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | **Sub Total** | **-** |
| **Acquisitions and Stewardship** |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | **Sub Total** | **-** |
| **Travel In Minnesota** |  |  |  |  |  |  |  |  |
|  | Miles/ Meals/ Lodging | Statewide recommendation report survey and digital cloud workshops - Minimum 3 workshops-Duluth UMN NRRI, Cloquet UMN CFC, UMN Itasca Bio Station, Brainerd, St. Cloud, Mankato, and/or Rochester; 3000 miles est. 2 people | Stakeholder input and image access digital cloud demonstration - Huberty/Klassen |  |  |  |  | $5,000 |
|  |  |  |  |  |  |  | **Sub Total** | **$5,000** |
| **Travel Outside Minnesota** |  |  |  |  |  |  |  |  |
|  | Miles/ Meals/ Lodging | Federal Remote Sensing Programs collaboration | Leverage federal remote sensing programs to reduce state costs | X |  |  |  | $5,000 |
|  |  |  |  |  |  |  | **Sub Total** | **$5,000** |
| **Printing and Publication** |  |  |  |  |  |  |  |  |
|  | Printing | Charting Minnesota's Future Natural Resources - 30 pages 500 copies | Recommendation Report for observing Minnesota's natural resources and providing imagery during disasters |  |  |  |  | $4,000 |
|  | Publication | Postal distribution | report mailing and handling |  |  |  |  | $1,000 |
|  |  |  |  |  |  |  | **Sub Total** | **$5,000** |
| **Other Expenses** |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | **Sub Total** | **-** |
|  |  |  |  |  |  |  | **Grand Total** | **$142,000** |

### **Classified Staff or Generally Ineligible Expenses**

|  |  |  |  |
| --- | --- | --- | --- |
| **Category/Name** | **Subcategory or Type** | **Description** | **Justification Ineligible Expense or Classified Staff Request** |
| **Travel Outside Minnesota** | Miles/Meals/Lodging | Federal Remote Sensing Programs collaboration | Travel to USGS Sioux Falls, Washington DC, AWS Seattle. |

### **Non ENRTF Funds**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Category** | **Specific Source** | **Use** | **Status** | **Amount** |
| **State** |  |  |  |  |
| In-Kind | MN DNR Resource Assessment | MN DNR Remote Sensing Advisor, Dr. Jennifer Corcoran can provide 40 hours of project support. | Secured | $4,000 |
|  |  |  | **State Sub Total** | **$4,000** |
| **Non-State** |  |  |  |  |
| In-Kind | AWS Non-profit, Education, Research and Development Credits programs. | AWS Cloud Credits for Research for example supports research and development for accredited institutions. Researchers that apply for this program take an initiative to build a cloud-hosted service, software, or tools to migrate a research and development process and/or open data to the cloud. The credit amount awarded will vary depending on the cost model and usage requirements documented in the proposal. | Pending | $30,000 |
| In-Kind | Google Cloud Public Datasets - Google Earth Engine | Contributed remote sensing data for further public analysis using Google Earth Engine. Wildfire analysis through Google Cloud Public (GCP) dataset. | Pending | $30,000 |
| In-Kind | Microsoft Azure Open Datasets | Satellite Imagery open to the public | Pending | $10,000 |
| In-Kind | USGS Requirements Capabilities & Analysis for Earth Observations (RCA-EO)https://www.usgs.gov/land-resources/nli/rca-eoNASA Federal Satellite Needs Working Group (SNWG)https://earthdata.nasa.gov/esds/impact/snwg | Based on past national reports, USGS can contribute their time, approaches and survey expertise to help develop Charting Minnesota's Future Natural Resources recommendation report based on previous work for the federal Government- RCA-EO and SNWG. | Secured | $120,000 |
|  |  |  | **Non State Sub Total** | **$190,000** |
|  |  |  | **Funds Total** | **$194,000** |

## **Attachments**

### **Required Attachments**

#### ***Visual Component***

File: [4cbda32b-eb4.pdf](https://lccmrprojectmgmt.leg.mn/media/map/4cbda32b-eb4.pdf)

#### ***Alternate Text for Visual Component***

White House 2019 National Plan for Civil Observations...

#### ***Financial Capacity***

File: [c890ad23-ec5.pdf](https://lccmrprojectmgmt.leg.mn/media/financial_capacity/c890ad23-ec5.pdf)

#### ***Board Resolution or Letter***

|  |  |
| --- | --- |
| **Title** | **File** |
| SharedGeo Board Resolution Letter | [029d892e-951.pdf](https://lccmrprojectmgmt.leg.mn/media/attachments/029d892e-951.pdf) |

### **Optional Attachments**

#### ***Support Letter or Other***

|  |  |
| --- | --- |
| **Title** | **File** |
| MN LIDAR Plan | [bad40167-740.pdf](https://lccmrprojectmgmt.leg.mn/media/attachments/bad40167-740.pdf) |
| FEMA GIS Guide | [55aaffd8-b17.pdf](https://lccmrprojectmgmt.leg.mn/media/attachments/55aaffd8-b17.pdf) |
| MN DNR Support Letter | [83b1a641-bb8.pdf](https://lccmrprojectmgmt.leg.mn/media/attachments/83b1a641-bb8.pdf) |
| ASPRS WGL Support Letter | [5f280932-a62.pdf](https://lccmrprojectmgmt.leg.mn/media/attachments/5f280932-a62.pdf) |

## **Administrative Use**

**Does your project include restoration or acquisition of land rights?**
 No

**Does your project have potential for royalties, copyrights, patents, or sale of products and assets?**
 No

**Do you understand and acknowledge IP and revenue-return and sharing requirements in 116P.10?**
 N/A

**Do you wish to request reinvestment of any revenues into your project instead of returning revenue to the ENRTF?**
 N/A

**Does your project include original, hypothesis-driven research?**
 No

**Does the organization have a fiscal agent for this project?**
 Yes, SharedGeo