Society for American Archaeology - Geoarchaeology Task Force: Statement on Deep Testing and Professional Qualifications for Geoarchaeologists in Cultural Resources Management (2025)

In September 2024, the SAA Advisory Board approved the Geoarchaeology Interest Group's (GIG) request to form the Geoarchaeology Task Force (hereafter GTF). Chaired by Heidi Luchsinger (Environmental Resources Management/ERM) and Karl Kibler (Cross Timbers Geoarcheological Services), GTF members consist of geoarchaeologists from the cultural resource management (CRM) industry and academia.

As a group, we are concerned about the lack of deep testing in contemporary US archaeology. We are also troubled by the prevalent misconceptions throughout the industry regarding buried archaeological sites (e.g., only floodplains contain deep deposits, urban landscapes don't have buried resources, and hydric soils/wetlands can be "written off"). Significant archaeological sites are potentially being destroyed without the requirement of deep testing of alluvial, colluvial, aeolian and coastal landforms and urban landscapes. Our concerns brought us together to share our different backgrounds and experiences to develop guidance for future archaeological investigations in CRM.

CONTEXT IS EVERYTHING

Context is everything in archaeology and varies in scale. It ranges from the spatial and temporal relationships between artifacts and features within an archaeological site to a site's setting or location within the greater landscape. High resolution context can significantly advance the interpretative value of the archaeological record. It is sometimes forgotten that "context" also includes the relationship and interaction between archaeological materials and the sedimentary deposits they are buried within.

Archaeological sites are not just products of past human behaviors–they are also products of geologic and soil formation processes that interact with site materials during and following occupation. The combination of natural and cultural formation processes can be highly variable and complicated, but an understanding of these processes adds interpretative value to the site.

Although both deserve equal attention to arrive at the most comprehensive interpretation of the archaeological record, this happens too seldom in contemporary archaeology. Understanding the natural formation processes and their interactions with an archaeological site is the core of geoarchaeology.

More often than not, sites with high contextual integrity are invisible on the landscape because they are buried, often below the terminal limits of shovel testing (as defined by SHPO/THPO and federal guidelines). In CRM, such sites are most commonly found through geoarchaeological assessment and deep testing (e.g., backhoe trenching, augering, and coring). In the absence of geoarchaeological assessments and deep testing, buried resources often become unanticipated discoveries, which can lead to project delays, cost increases, and potential litigation. A better or more efficient approach in the search for buried archaeological resources would be to routinely include geoarchaeological assessments of Areas of Potential Effect (APE) as part of the archaeological assessment, making the latter more cost effective in terms of person-hours spent without sacrificing ethical responsibilities. It is also, simply put, better archaeology.

As members of the archaeological community, we are deeply concerned with the inconsistent consideration of buried cultural materials within the compliance and consultation process. Embedded within the regulatory framework, it is the responsibility of agencies and reviewing bodies to uphold rigorous standards for identifying and evaluating archaeological resources. Even so, as active practitioners, it is ultimately our responsibility to ensure that the APE is thoroughly and systematically investigated for cultural materials, including those that are deeply buried and not readily visible on the surface. To neglect this aspect of the archaeological record through inadequate methodologies and limited strategies not only undermines our ethical obligations but also contradicts the standards of "good archaeology" that we demand from ourselves and our peers. As a community, we must advocate for the routine inclusion of geoarchaeological assessments and deep testing in CRM projects to address this significant gap in practice.

ARCHAEOLOGY'S TWO MAIN INCONSISTENCIES

The GTF convened in September of 2024 and identified two critical inconsistencies in the process by which archaeological investigations/research designs investigate the potential for deeply buried sites. These include the lack of:

1. Standardized geoarchaeological assessment for buried surfaces and associated archaeological sites below the terminal limit of shovel testing (i.e., SHPO, THPO, or federal agencies) and deep testing guidelines, and
2. Qualifications for geoarchaeologists across the 50 states.

GTF's goal was to examine the variability of deep testing requirements and qualifications for professional geoarchaeologists in archaeology across the US. Based on this evaluation, GTF proposes this Statement on the standardization of deep testing and qualifications necessary to conduct geoarchaeological desktop/in-field assessments and deep testing fieldwork, applicable for any archaeological project.

Of primary concern to GTF is compliance with the Section 106 of the National Historic Preservation Act (NHPA) of 1966- a mandate for federal agencies to take into account the effect of their undertakings on cultural resources which are on or eligible for inclusion to the National Register of Historic Places (NRHP) and to adequately identify any adverse effects that may directly or indirectly alter the characteristics that make those resources eligible for the NRHP. Critically, this includes buried resources below the terminal limit of shovel testing, which historically have been overlooked. This has led to an underrepresentation of early sites (e.g., Pre-Clovis and Paleoindian), and extra time and costs added to projects due to unanticipated finds during construction.

Finally, nearly three-fourths of archaeological survey conducted in the US today is carried out in CRM. This will grow as annual spending efforts dramatically increase due to the 2021 Bipartisan Infrastructure Law. With this growth will come an increased need for buried landform/surface assessment, geophysical prospecting, and predictive modeling, all of which will require specialized skills in geoarchaeology. Yet while the demands for geoarchaeological fieldwork will increase significantly, there is a lack of standardization in how we educate geoarchaeologists for their role in CRM. Because training the next generation of geoarchaeological professionals is critical to fulfilling our Section 106 obligations, the GTF concludes this statement with recommendations for the minimum qualifications and experience necessary to perform geoarchaeological assessments and field work in CRM.

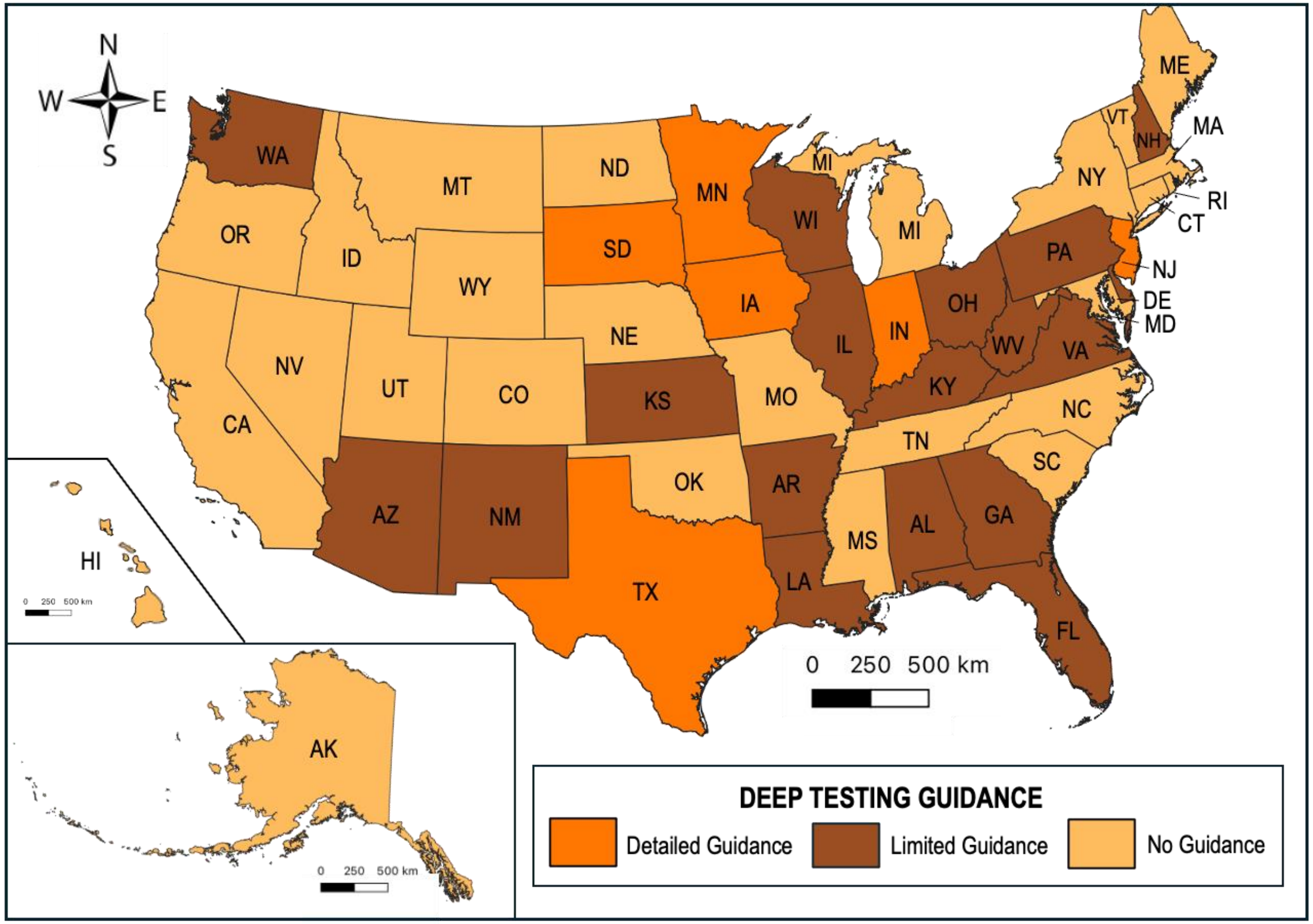
SURVEY OF DEEP TESTING GUIDELINES

The GTF conducted an extensive review of the published SHPO standards and guidelines for all 50 states, which revealed significant variability in deep testing guidelines for buried sites and qualifications for professional geoarchaeologists conducting the deep testing.

Deep testing guidelines are categorized into three levels: "Guidance", "Detailed Guidance", "Limited Guidance", and "No Guidance" (Figure 1). Detailed Guidance consists of clear, comprehensive, and specific instructions that outline exact procedures, methodologies, tools, or standards to follow with minimal room for ambiguity. In contrast, Limited Guidance provides only a basic or minimal framework that offer broad principles but leave significant room for interpretation and flexibility without specific instructions on implementation. No Guidance, on the other hand, refers to the absence of any formal direction, protocols, or standards, with no prescribed framework or recommendations. If SHPO has no general guidelines, projects are generally completed via programmatic agreements with federal or state agencies, or project-specific treatment plans. The mapping exercise revealed that 12% of states (or 6 states) have Detailed Guidance, 34% of states (or 17 states) have Limited Guidance, and 54% of states (or 27 states) have No Guidance on deep testing.

SURVEY OF PROFESSIONAL QUALIFICATIONS FOR GEOARCHAEOLOGISTS

To assess the qualifications for professional geoarchaeologists, educational and experience recommendations were reviewed across all 50 U.S. states, categorizing them into two qualification levels: "Educational or Experience Recommendations" and "No Recommendations" (Figure 2). Educational or experience recommendations refers to states that recommend the involvement of a geomorphologist or geoarchaeologist in a testing project or require that geoarchaeologists have a relevant educational geoscience background and/or experience in the field. No recommendations refers to states that do not specify the involvement of a geomorphologist or geoarchaeologist in a testing project or do not require that individuals possess appropriate education and professional experience in geoarchaeology. This mapping exercise revealed that 32% of states (or 16 states) require a geoarchaeologist with recommended educational or field experience, while 68% of states (or 34 states) have no specific education or experience requirements.

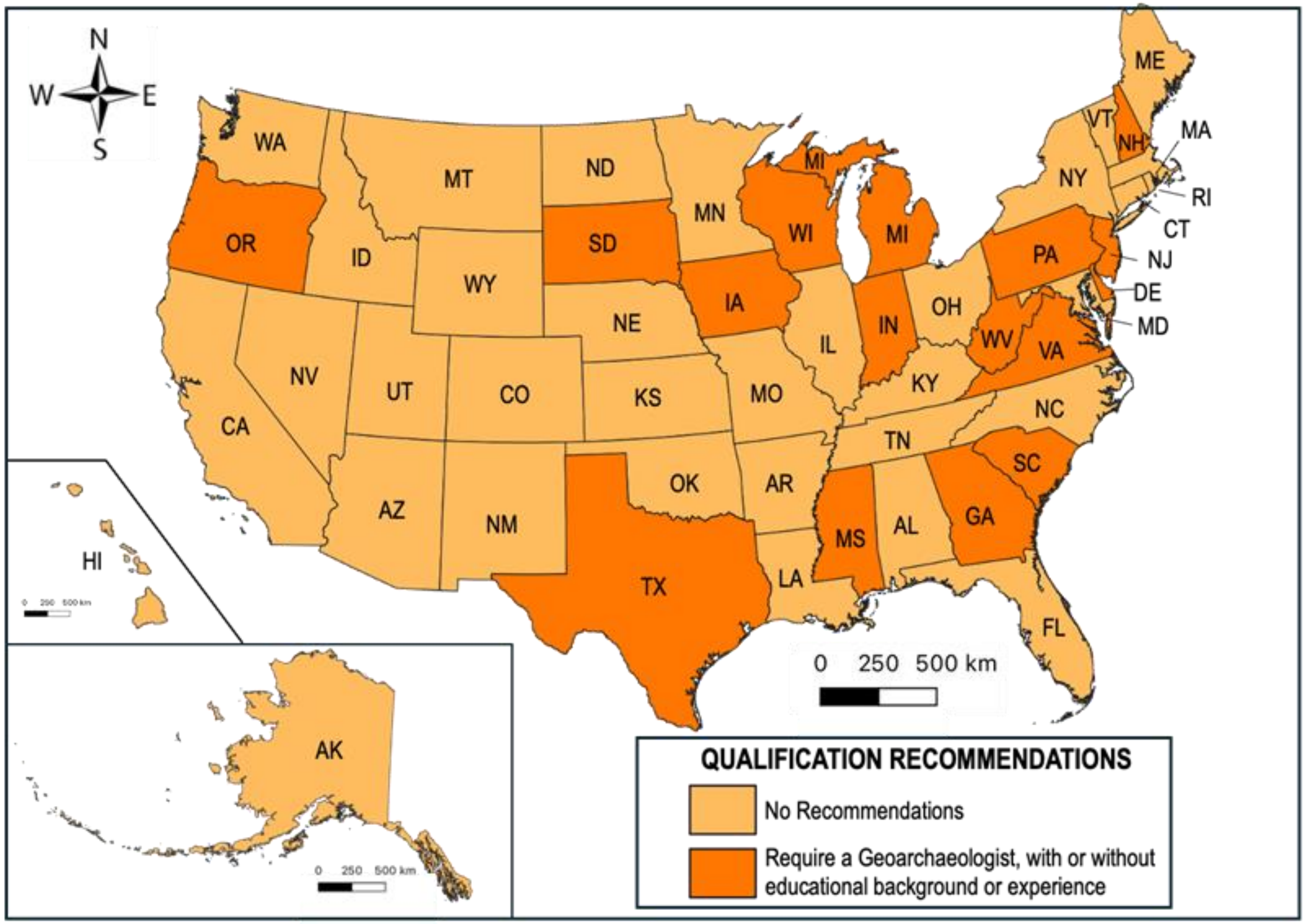


DEEP TESTING GUIDANCE DEFINITIONS

Detailed Guidance: Clear, comprehensive, and specific instructions or protocols. Detailed guidance outlines exact procedures, methodologies, tools, or standards to follow, leaving little room for ambiguity.

Limited Guidance: Guidance that provides only a basic or minimal framework, often leaving significant room for interpretation or flexibility. It might offer broad principles but lacks specifics on how to implement them in various situations.

No Guidance: The absence of any official or formal direction, protocols, or standards on the matter. There is no prescribed framework or recommendations, and decisions are left entirely to the discretion of the individuals or organizations involved.



QUALIFICATIONS DEFINITION

Educational or Experience Recommendations: States that recommend the involvement of a geomorphologist or geoarchaeologist in a testing project or require that the geoarchaeologists have some educational background and/or experience in the field.

No Recommendations: States that do not specify the involvement of a geomorphologist or geoarchaeologist in a testing project, or do not require that the individual have appropriate education and professional experience in geoarchaeology.

THE “TESTING GAP”

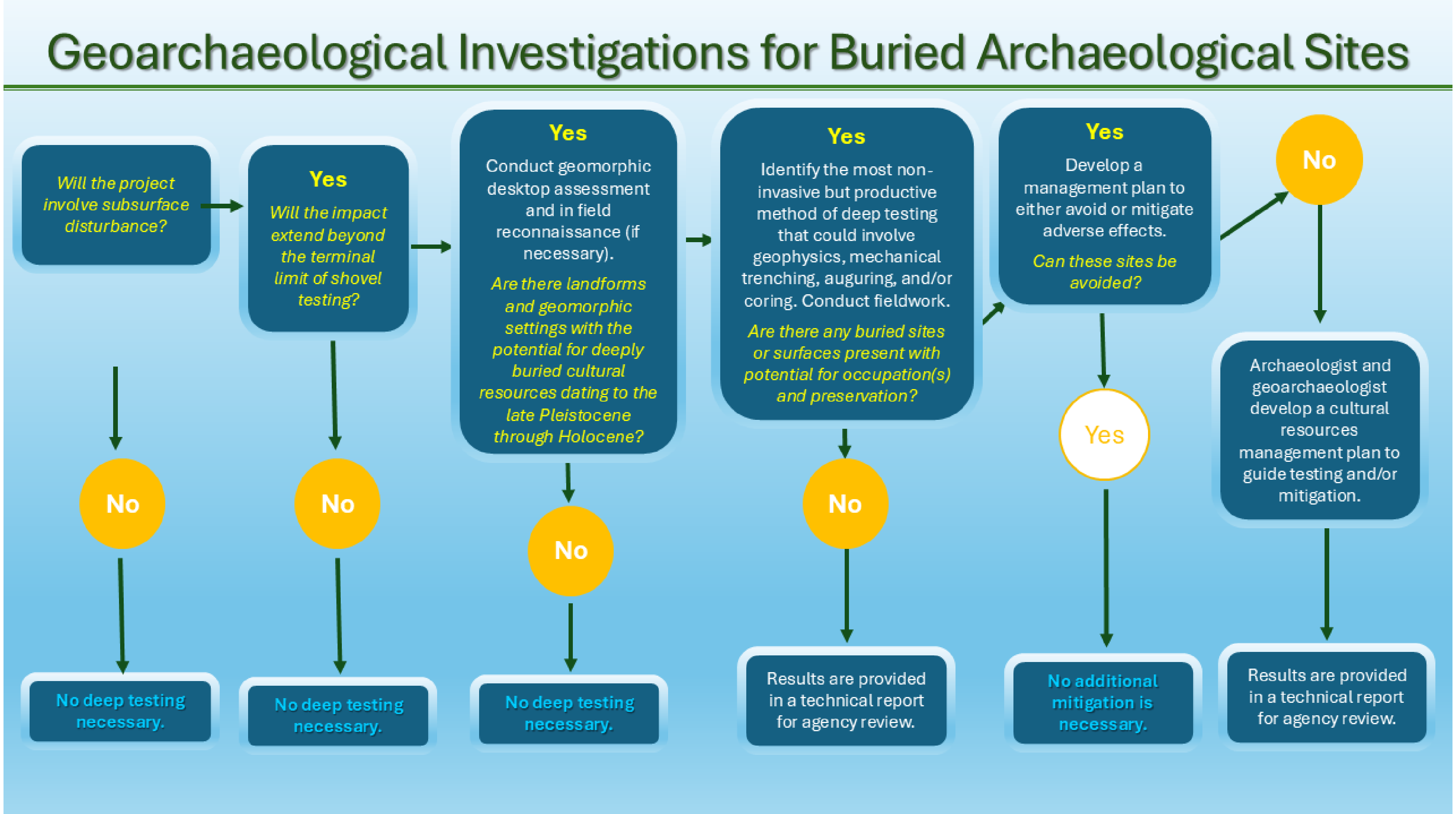
In the absence of sufficient deep testing methodologies, a “Testing Gap” within a project’s vertical APE exists. GTF defines the Testing Gap as the area of the APE between the terminal limits of shovel testing and the terminal vertical limits of a project’s physical impacts. This is important to archaeology because this Testing Gap potentially contains significant buried archaeological sites that can go undetected and ultimately destroyed. Or it can leave these buried resources to be detected only during construction resulting in site damage, project delays, and increased costs.

How do we test the Testing Gap? That is up to the project’s geoarchaeologist in determining the best practice and specifically customize it for each project. However, it is important for all archaeologists to understand the general geoarchaeological thought and decision-making processes to determine whether deep testing is necessary or not. These thought and decision-making processes are illustrated in the GTF flow chart (Figure 3).

The GTF flow chart provides both CRM archaeologists and agency reviewers a means to determine the necessity of deep testing. Ideally, the goal is to assist construction projects in avoiding unanticipated discoveries, costly mitigations, and/or legal action.

GTF proposes that every CRM project assess the vertical APE proceeding through a series of five questions as posted in the GTF flow chart:

1. Will the project involve subsurface disturbance or impacts?
2. Will the impact extend beyond the terminal limit of shovel testing?
3. Are there landforms and geomorphic settings with the potential for deeply buried cultural resources dating to the late Pleistocene through Holocene?
4. Are there any buried surfaces or soil horizons present with potential for occupation(s) and preservation?
5. Can these sites be avoided?

1. 
Geoarchaeological Investigations for Buried Archaeological Sites
Will the project involve subsurface disturbance?
Yes
Will the impact extend beyond the terminal limit of shovel testing?
Yes
Conduct geomorphic desktop assessment and in field reconnaissance (if necessary).
Are there landforms and geomorphic settings with the potential for deeply buried cultural resources dating to the late Pleistocene through Holocene?
Yes
Identify the most non-invasive but productive method of deep testing that could involve geophysics, mechanical trenching, auguring, and/or coring. Conduct fieldwork.
Are there any buried sites or surfaces present with potential for occupation(s) and preservation?
Yes
Develop a management plan to either avoid or mitigate adverse effects.
Can these sites be avoided?
No
Archaeologist and geoarchaeologist develop a cultural resources management plan to guide testing and/or mitigation.
Results are provided in a technical report for agency review.
Yes
No additional mitigation is necessary.
No
Results are provided in a technical report for agency review.
No
No deep testing necessary.
No
No deep testing necessary.
No
No deep testing necessary.

VARIED PATHWAYS FOR BECOMING A PROFESSIONAL GEOARCHAEOLOGIST

As there are many definitions of geoarchaeology, many individuals working as geoarchaeologists arrived at their position in a variety of ways. Few people have a degree in geoarchaeology, this fact is reflected in the educational backgrounds of GTF members, who hold degrees in geography, geology, pedology/soil science, and anthropology/archaeology. This is common for US geoarchaeologists and accounts for the mostly non-traditional training within the U.S. due to the lack of formal degree-bearing programs in geoarchaeology.

Our purpose here is to be inclusive and to reflect the varied paths to becoming a geoarchaeologist, as opposed to putting forth strict recommendations and qualifications. Rather, we want to provide guidance and recommendations for the educational background and skills necessary to carry out a geoarchaeological assessment of an APE, determine whether deep testing should be required within an APE, and to undertake that testing. Few people have a degree in geoarchaeology, this fact is reflected in the educational backgrounds of GTF members, who hold degrees in geography, geology, pedology/soil science, and anthropology/archaeology. This is common for US geoarchaeologists and accounts for the mostly non-traditional training within the U.S. due to the lack of formal degree-bearing programs in geoarchaeology.

While those on the GTF have all gained the skills and field experiences to qualify as professional geoarchaeologists by different paths, we agree that it requires years of graduate study in archaeology and the late Quaternary geosciences (e.g., geomorphology, pedology, stratigraphy, etc.), and extensive fieldwork under the mentorship of senior geoarchaeologists. The latter typically extends beyond a formal degree. Please note that geoarchaeology cannot be learned in a single workshop, short course, or master class. All of us continue to learn new skills, particularly as technologies that advance geoscience evolve and improve. What the GTF does understand is what needs to be done to properly assess an APE for buried landscapes and archaeological sites, even if we do not know how to do everything ourselves. We know who to ask.

The following recommendations are intended as guidelines for dealing with geoarchaeological investigations and testing for buried landscapes and potential archaeological sites during archaeological projects, including impact assessments and research. These principles provide recommendations for minimum qualifications for Geoarchaeological Consultants or Specialists.

RECOMMENDED MINIMUM QUALIFICATIONS FOR PROFESSIONAL GEOARCHAEOLOGISTS

GTF recommends the following minimum qualifications and experience for Geoarchaeological Consultants or Specialists conducting studies under government contract, permit, or review from the federal to the local level. For example, in the United States that includes investigations under Sections 106 and 110 of the National Historic Preservation Act (1966), as well as geoarchaeological investigations under state and local preservation laws or similar fieldwork authorizations. These standards are presented as minimum requirements that should be adhered to within the context of laws governing archaeological projects in other jurisdictions including the governments of Canada, Mexico, and the countries of Central and South America. The SAA does not adjudicate or enforce qualifications.

1. A graduate degree in:
    a. anthropology/archeology with a geoarchaeological focus, or closely related field with additional coursework in geomorphology, sedimentology, pedology/soil science, Quaternary geology, or related courses, or,
    b. geoscience or closely related field with additional coursework or field experience in archaeology.
2. The following skill sets are identified and listed in order of increasing and cumulative qualification to conduct a geoarchaeological assessment of complex landscapes to evaluate buried site potential. Skills (Artz 2011):
    a. Map layers in a profile and describe using standard nomenclature, minimally Munsell color(s), soil texture, inclusions, and krotovina. Desired, but not required: recognizing soil horizonation, formal lithostratigraphic units, and erosion surfaces.
    b. Recognize significant geomorphological landforms in the field and relate them to dominant depositional processes.
    c. Interpret buried site potential from NRCS soil surveys, including recognizing parent materials and landforms with potential to contain buried sites, interpreting soil horizonation in terms of relative age and site preservation and habitability potential, understanding the limitations of soils maps for geoarchaeological interpretation.
    d. Interpret aerial photographs and topographic maps to map landforms that represent lateral variation in depositional environments and will be underlain by similar soils and sediments in similar deposition.
    e. Describe profiles, cores, and trenches to full NRCS specifications; group strata into lithologic units and facies; and relate them to the landscape elements within which they occur.
    f. Develop a research design for placing cores and trenches to maximize information return for purposes of buried site potential; interpret results in terms of chronology and processes of landscape evolution and make recommendations for subsurface testing.
3. Professional geoarchaeologists should meet the Secretary of the Interior Professional Qualifications Standards for Archaeology (36 CFR Part 61) and/or fulfill the membership requirements of the Register of Professional Archaeologists (RPA) or documentation of professional certification by an accredited organization in a related field (e.g., Certified Professional Geologist (CPG) or Professional Geologist (PG).
4. Six months of supervised experience working with a professional geoarchaeologist.
5. Combined with a minimum of one-year cumulative independent professional experience planning, directing, and completing geoarchaeological assessments and deep testing projects involving fieldwork, analysis, and professional reporting.

SUMMARY

In the US:

- **54%** of states have **No Guidance on deep testing** and
- **68%** of states have **No Specific Education or Experience Requirements for Professional Geoarchaeologists**.

For the sake of archaeology, it is time to turn the page. Geoarchaeology enhances project efficiency without cutting corners and increases the quality of project deliverables. We all win.

Glossary

Aeolian/Eolian – materials formed, eroded, or deposited by or related to the action of wind.

Alluvial/Alluvium – materials transported or deposited by a channelized stream or flowing water. Includes deposits outside of the channel (e.g., overbank deposits from flooding).

Augering – method of incrementally removing sediment and soil samples using a hand or machine powered drill-like tool.

Backhoe Trenches -Backhoe trenches provide excellent profiles. Especially when equipped with a smooth-bladed, rather than toothed, bucket, backhoes can skim soil in horizontal slices, 5-10 cm thick, sufficient for detecting artifacts and features in situ. Depending on the size of the machine, trenches can be excavated from the ground surface to depths of 6 m. For safety and OSHA compliance, excavations deeper than 1.5 m should be shored or stepped back before personnel enter. In practice, this often means that a trench is first dug to 1.5 m, entered and described, and then carried to depth. This limits the ability to see and recover artifacts, and sediment descriptions must be made from chunks brought to the surface by the machine.

Colluvial/Colluvium – loose and poorly sorted sediments usually deposited at the foot of a slope or cliff through gravity-driven processes.

Bucket Augers - Standard tool for soil scientists similar to those manufactured by AMS (http://www.ams-samplers.com/). They range in diameter from 2¼-3 in, and with extensions can be advanced to depths of 3-4 m. The auger bit allows soil to enter the bucket relatively undisturbed, although some twisting and distortion of the sample occurs, due to friction with the side of the bucket. They are adequate for describing soil and sedimentary properties and detecting stratigraphic boundaries. Small-scale features such as very thin beds (laminations) of sand and silt are often difficult to discern because they get mixed together with the surrounding matrix. The small diameter reduces their usefulness for artifact sampling (see photo below)

Coastal - Sediments deposited by waves, tides, and currents. These deposits build up over time to form coastal landforms like marshes, beaches, spits, and sandbars, among others, that can bury older alluvial, colluvial and aeolian landforms as sea level rises.

Coring – method of extracting a continuous ***intact sediment*** or soil sample in a hollow tube or cylinder.

Ditch Witch Trenches -Ditch Witch trenchers are designed for excavating trenches for small diameter utility lines. They use a continuous chain, mounted with small, backhoe-like scoops to dig a narrow trench, 20-30 cm wide by 2-2.5 m deep. Back dirt is laid alongside the trench

Drill Rigs -Drill rigs extract solid, continuous cores to depths of >4 m. Giddings rigs push sampling tubes into the soil using a hydraulic piston and can also rotate a flight auger into the soil. The most commonly used tubes are 5-7.5 cm in diameter, although tubes up to 20 cm in diameter are available. Rigs can be mounted on trailers, truck beds, tractors, and six-wheel all-terrain vehicles.

Other core rigs in common use are the Vibracore and Geoprobe. The Vibracore minutely shakes the sampling tube at 3,000-11,000 vibrations, loosening a thin layer of soil around the tube, allowing it to penetrate the ground. A Geoprobe uses rapid, percussive force from a hydraulically powered hammer to drive the sampling tube.

The advantage of drill rigs is the extraction of a solid core that is large enough in diameter for a relatively detailed description of the sediments. The core tubes are open at the bottom, so there is minimal twisting or churning of the sample, although compaction of cohesive sediments can be a problem, especially with the Giddings. The disadvantage for archaeological purposes is that the small diameter decreases the probability of finding cultural material. Therefore, drill rigs are usually used to work out stratigraphy rather than find sites.

Edelman Auger – Specially designed for use in sandy to clayey soils. Augers have narrow blades in a screw pattern that meet with little resistance while the auger is being twisted into the soil. Diameters range from 4cm to 45cm. Soils are removed in small intact segments (averaging 10cm).

Flight Augers - Flight augers are drilled into the ground like a screw, using spiral augers, connected together to form a continuous string of auger sections, called flights. Flight augering can be done with a drill rigs. These devices churn the soil, and it is difficult to accurately observe stratigraphic boundaries. They are therefore not amenable to soil description, and depth control may be difficult on recovered artifacts

Gouge Augers - Designed to minimize the distortion of a sample, which makes them suitable for soil/sediment sampling. The augers come in variable lengths (up to 1.5 meters) and diameters, similar to soil probes, but are suited for obtaining continuous soft and wet sediment segments typically related to tidal and freshwater wetlands. Sample segments can be taken to depths up to 15 meters using extensions depending on the system.

Geoarchaeology - a multidisciplinary approach to addressing archaeological questions using methods and techniques from various geosciences (e.g., geology, pedology, geomorphology, geography, etc.). Geoarchaeologists investigate and interpret soils, sediments, and landforms to better understand archaeological sites and past human activities.

Geomorphology – the study of surface landforms (i.e., the landscape), their underlying structures, and the processes that created them.

Ground-Penetrating Radar (GPR) – a geophysical method of mapping subsurface anomalies using radar pulses at specific frequencies sent into the ground. Anomalies are any deviation from the Earth's physical properties that differs from what's expected from natural processes.

Pedestrian Survey - Pedestrian methods allow the inspection of cutbanks, construction excavations, animal burrows, erosional cuts, and other sediment exposures for buried sites. It is limited by the availability of exposures, and their depth.

Pedology – scientific discipline focusing on the study of soil; particular emphasis is given to understanding soil formation, composition, and classification.

Posthole Augers (Manual) - Bucket-auger-style posthole diggers. These manual, T-handled posthole diggers are a standard tool. They consist of an open-sided bucket auger, 20 cm in diameter. They reach a depth of 1.2 m, but with the addition of ¾” steel pipe extensions, can be carried to greater depths. In loam, silt loam, and silty clay loam soils, a bucketful of soil can be recovered every 10 cm of depth, and thus stratigraphic control can be maintained in a standard depth interval. A disadvantage is that the auger blades are close-set, and the excavated soil is extensively churned. This disrupts soil structure and fine sedimentary layers, but soil color, texture, mottles, and carbonate/iron/manganese concretions can be recorded. These properties are more than sufficient to identify the depositional environment to a degree sufficient to determine buried site potential.

Residuum – materials that originate from weathered rock that has not been eroded or transported (i.e., not aeolian, colluvium, etc.).

Piston Sampler - A sampler that is suitable for taking continuous samples in wet and less cohesive sediments and soils. Piston sampler barrels are available in lengths of 75, 150 and 200 cm. Using extensions, samples can be taken to depths of 15m.

Posthole Diggers- Two-handled, "clam shell" type penetrate to depths of 1-1.2 m, and can dig a hole the same diameter as a circular shovel test. The holes can be excavated in levels for stratigraphic control of artifact recovery. At depth, profiles cannot be observed, but if the extracted soil often comes up in intact chunks large enough for description purposes. To be used effectively, the sharp blades have to strike and penetrate into the bottom of the hole with considerable force, risking damage to artifacts, if present. They are best not used on sites with high artifact density or fragile materials like bone or ceramics.

Power Augers -Power augers in common use excavate a 20-25 cm hole to depths of 1-1.2 m. They may be tractor mounted. These devices churn the soil and are too small in diameter to accurately observe stratigraphic boundaries. They are therefore not amenable to soil description, and there is no depth control on recovered artifacts.

Sedimentation - the process in which sediment is deposited and formed into layers.

Shovel Tests- Shovel testing is a standard archaeological method, used nationwide. The technique exposes a soil profile that can be described in detail. Shovel testing becomes increasing difficult below depths of 50 cm and can only detect near surface archaeological deposits.

Soil Probes - Soil probes, like those manufactured by Oakfield (http://www.soilsamplers.com/; http://www.jmcsoil.com/), range in diameter from .75-1 inch. Pushed or driven into the soil, they bring up a solid core of sediment that is sufficient to identify lithologic and soil properties and stratigraphic boundaries. They are too small for artifact sampling, and therefore should be considered a stratigraphic, not site identification tool.

Test Units -Test units, 1 x 1 m or larger, are used for subsurface testing and provide excellent stratigraphic control and profiles. If excavated deeper than 1.5 m, they need to be stepped back or shored for worker safety and OSHA compliance.

Trenching – method of mechanical excavation typically utilizing a backhoe or excavator to open long continuous windows for observation and interpretation of sub-surface soils; also known as Mechanical Trenching.

Bucket Augers

Soil Probe

Post Hole Auger

Edelman Auger

Gouge Auger

Piston Sampler