

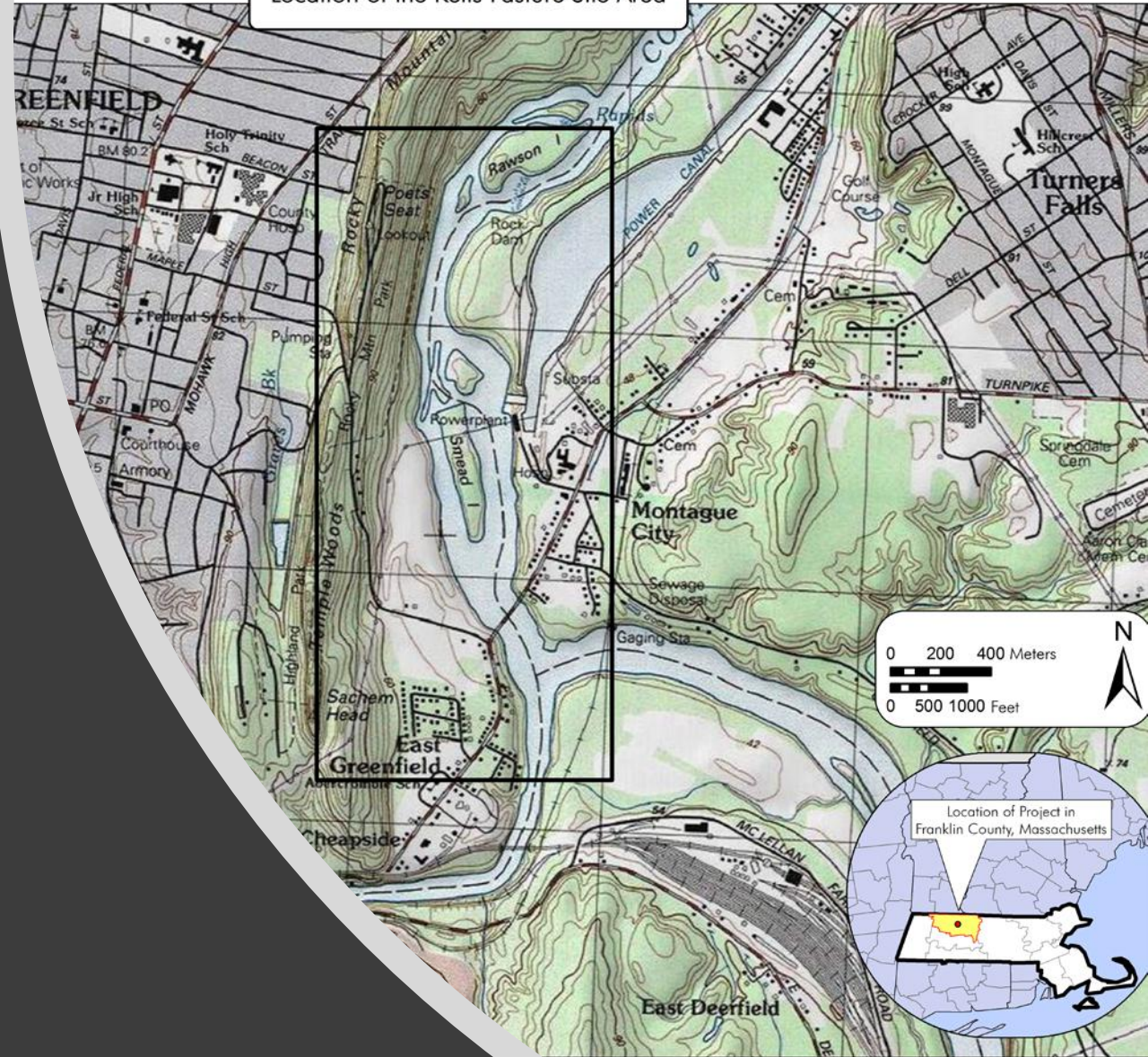
Kells Pasture: Archaeological and Geoarchaeological Investigation of a Native American Site in the Connecticut River Valley



The Archaeology: The Kells Pasture Site Story

Broadly defined,
Archaeology is the study of
humans of the past through
the material evidence
(artifacts) they left behind

Location of the Kells Pasture Site Area



Location

- The Kells Pasture Native American site was identified on a high terrace above the west bank of the Connecticut River, in Greenfield, Massachusetts, approximately 4 kilometers downstream of the dam at Turners Falls.

The Archaeology Survey

- The Kells Pasture Site was identified through a Phase I Archaeological Survey, where trained archaeologists systematically searched for archaeological materials and sites
- The landform the site was found on was close to the Connecticut River and such landforms can be composed of alluvium: sediment deposited by river during floods
- Alluvium can be very thick from years of flooding and can bury archaeological sites and artifact deeply below the ground surface
- As such, survey excavations were taken to depth of 1.0 meter (3.3 feet)





The Survey Results

- The survey was conducted utilizing 0.5x0.5 meter square test pits, that were excavated carefully so as to record the natural or cultural stratigraphy encountered
- Stratigraphy is the order and position of layers of geological (sediments or soils) and/or archaeological materials
- Soils were carefully screened through wire mesh to look for artifacts, while paying attention so as to not mix different soils together
- Survey investigations found Native American artifacts near the surface of the site and to depths deeper than 1.2 meters below surface in intact natural soils.
- Native American cultural features (remnants of specific activities, like fire pits) were identified in these natural soils.

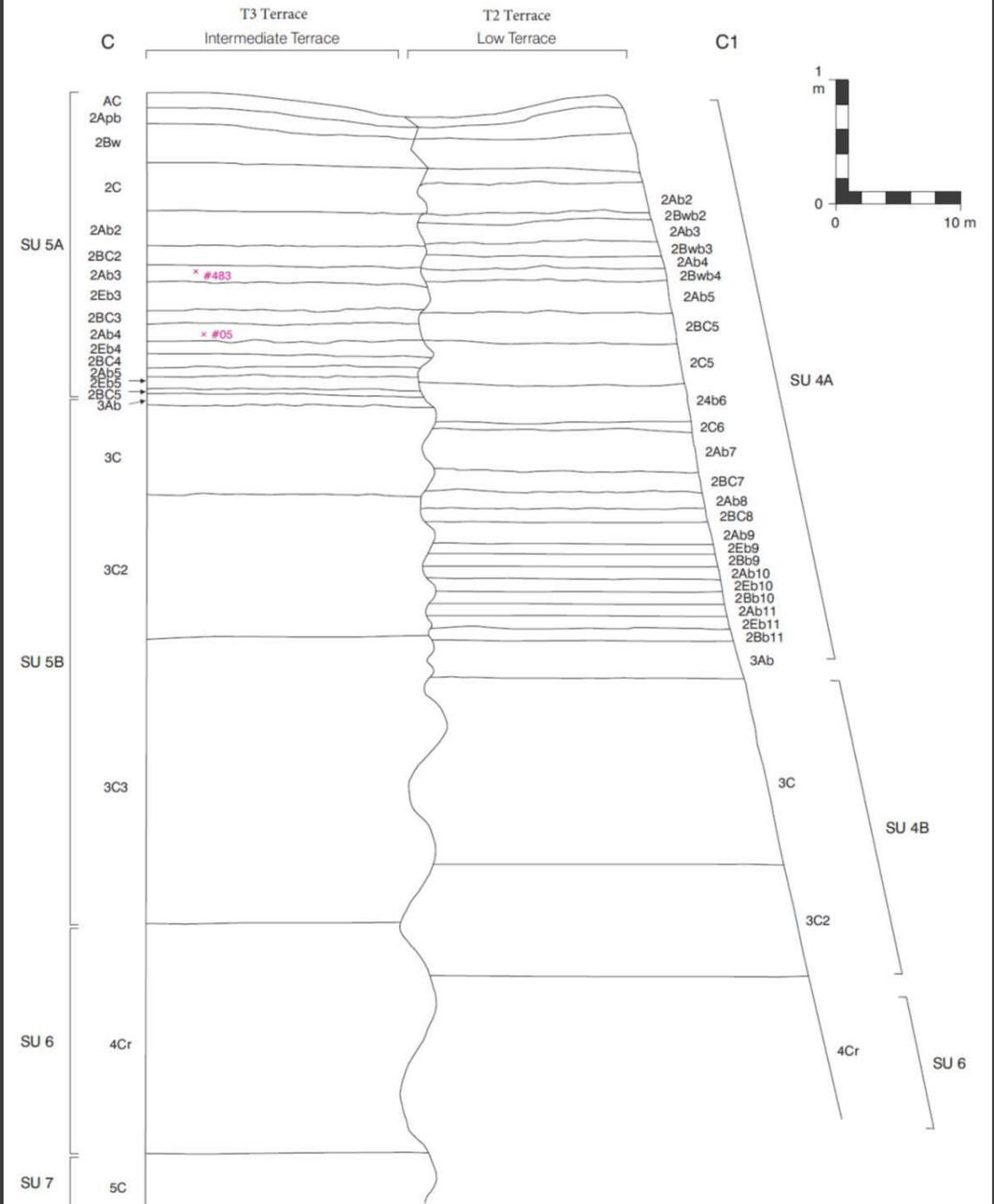
The Intensive Investigation

- Intensive Archaeological investigations followed which included block excavation of 4.0x4.0 meter pits to depths of 2.0 meters below surface
- These block excavations were used to identify exact horizontal and vertical location of archaeological deposits within the site stratigraphy



Site Stratigraphic Profile

- As the potential for further deeply stratified archaeological deposits was considered to be high, a geoarchaeological investigation of the site was incorporated into the additional investigations
- More details on the geoarchaeological investigation will follow later in this presentation
- From the geoarchaeological investigations, two terrace landforms were identified within the site area: the T2 terrace and the T3 Terrace. A lower T1 terrace was located between T2 and the Connecticut River (not pictured here)
- A master site stratigraphic profile was produced so that the stratigraphy of every excavation (block, cores, augers) could be viewed together
- Radiocarbon dates taken from organic material was used to date layers within this profile to place it within history and to understand when these alluvial sediments were deposited by the river
- Distinct within this profile was an observable pattern of repeated soil types: an A type soil followed underneath by a B type soil
- An A type soil is a topsoil, while a B type soil is a subsoil; both have specific identifiable characteristics and both are referred to as soil horizons
- This A-B soil horizon pattern became important to the archaeological interpretation of the site



Native America Cultural periods of the New England Region

- Southern New England has been home to humans for approximately 13,000 years
- Only the last four centuries of these millennia are documented through written records
- The history of the previous years can be reconstructed only through Native American oral traditions and the study of material remains of human behavior (archaeology)
- This table presents a chronology of major cultural Native American periods in the Northeastern U.S. as designated by archaeologists and based on broad observable cultural changes in the archaeological record
- Some of these periods include distinct cultural sub-periods referred to as complexes or traditions
- All dates given in years before present (BP)

Period	Dates	Diagnostic Artifacts	Cultural Traits
Paleoindian	13,000–10,000 B.P.	Fluted points, unifacial scrapers	Few diffuse groups with extensive migratory pattern, following game. Sites are rare, and few have been excavated. Raw materials come from a few widely spaced sites.
Early Archaic	10,000–8000 B.P.	Bifurcate points	Sites poorly known, few are preserved, possibly due to changing environmental conditions. Raw materials more locally available.
Middle Archaic	8000–6000 B.P.	Neville, Stark, Merrimack points, first groundstone	Establishment of large camps along rivers, exploiting fish, part of a seasonally migratory system. Larger populations, with multiple site types. Burials include grave goods. Sites much better known than in previous times.
Late Archaic	6000–3000 B.P.	Otter Creek, Squibnocket, Small Stemmed, Brewerton, Susquehanna points, steatite	Multiple ethnic groups present in the area, with local raw materials becoming more important. Site types vary, and all ecological niches are exploited. Populations appear much larger, and coastal sites are common.
Early Woodland	3000–2000 B.P.	Small Stemmed, Orient Fishtail, Meadowood, Rossville points, steatite, pottery	Sites easily confused with those of the Late Archaic. Multiple site types and increased localization inferred. Mortuary influences visible from the Midwest. Pottery first utilized.
Middle Woodland	2000–1000 B.P.	Fox Creek, Jacks Reef points, pottery	Large settlements present within probable loose territorial affiliations. Extensive trade networks and the first use of cultigens such as corn, beans and squash in some areas.
Late Woodland	1000–500 B.P.	Levanna, Madison points, pottery	Establishment of modern ethnic identities, such as the Pocumtuc, Nipmuc, and Abenaki. Conflict and trade both apparent, while horticulture became more widespread. Numerous large settlements present, with smaller camp sites in other environments. Contact with Europeans following this period rapidly altered traditional lifeways.

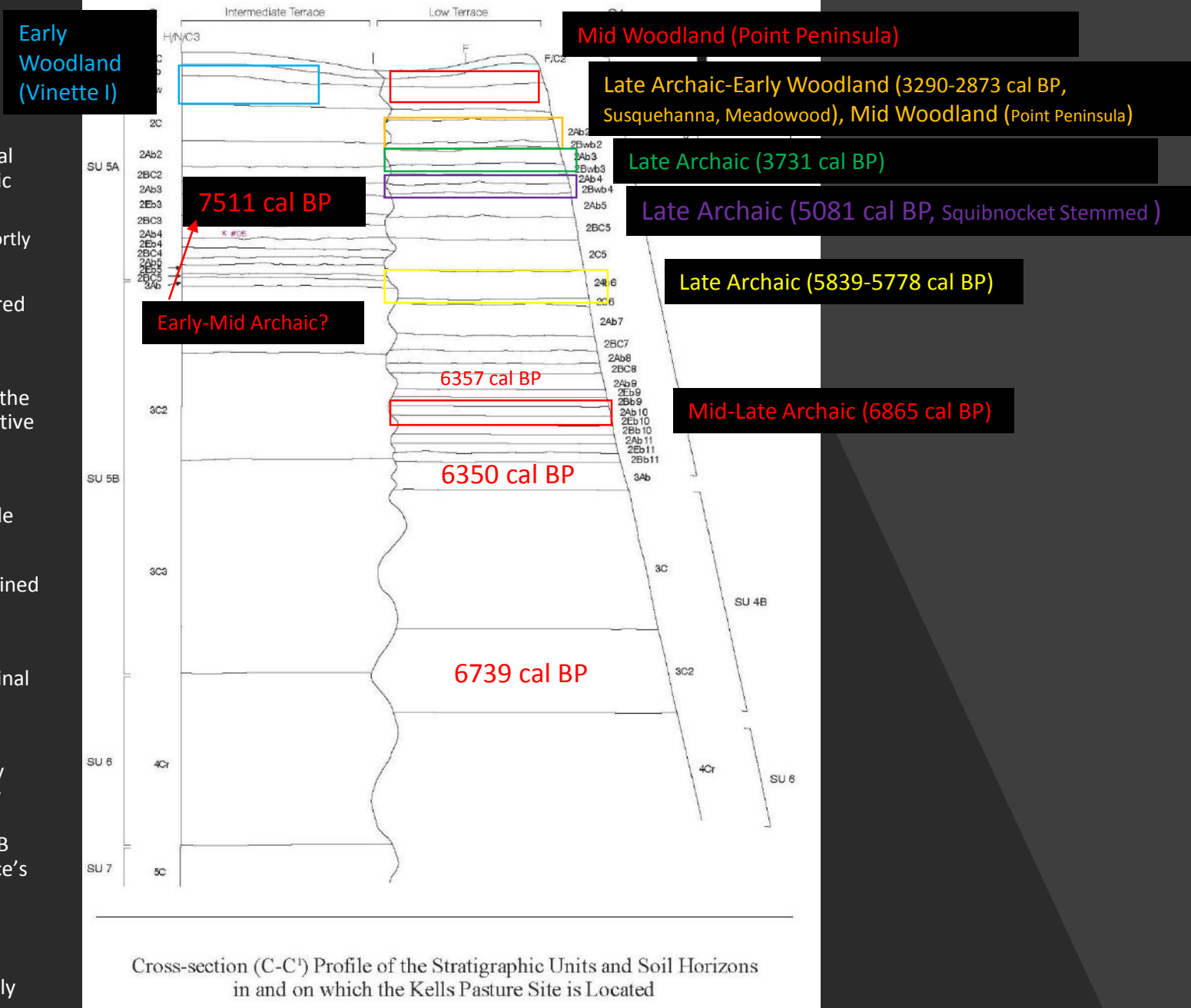
Native American Cultural Period Occupations

- Based on the artifacts recovered from the site, at least four cultural components in three cultural periods are present at the site:
 - Late Archaic Small Stemmed tradition (~4000-1500 BP),
 - Late Archaic Susquehanna tradition (~3700-2700 BP),
 - Early Woodland Meadowood complex (~3300-2700 BP),
 - Middle Woodland Point Peninsula complex (~2600-1300 BP)
- These artifacts include such items as projectile points, stone waste flakes from tool production, groundstone vessels fragments, and pottery vessel fragments
- Food processing artifacts, such as nutting or grinding stones, were also recovered from the site in small quantities



Native American Cultural Stratigraphy

- The oldest and deepest buried Native American occupation includes a single feature contained within the tenth buried A-B soil pair within the T2 terrace, associated with a radiocarbon date of 6865 calibrated years before present (cal BP); approximately the transition between the Middle Archaic and Late Archaic cultural periods.
 - This depth indicates that occupation of the T2 terrace landform occurred shortly after it started to build vertically above the water line.
- The next to oldest buried Native American occupation in the T2 terrace occurred in the sixth buried A-B soil horizon pair and includes three features, with a representative radiocarbon date range around 5800 cal. B.P.
- The next Native American occupation buried within the T2 terrace, located in the fourth buried soil horizon pair, includes two features, with a single representative radiocarbon date of 5081 cal. B.P.
- The next youngest Native American occupation buried within the T2 terrace, found in the third soil horizon package, also includes two features, with a single representative radiocarbon date of 3731 cal. B.P.
- The youngest Native American occupation buried within the T2 terrace, contained within the second buried soil package, dates to the Late Archaic to Middle Woodland period (based on radiocarbon dates and artifacts)
- Middle Woodland Point Peninsula pottery found in the plowzone indicates a final occupation period on the T2 terrace at its surface
- While composed of older sediments, the T3 terrace also exhibits periods of sedimentation and stability similar to those seen in the T2 terrace stratigraphy (here seen as a repeated pattern of buried A-E-B horizon sequences). An Early Woodland period occupation was found on the T3 terrace, as represented by Vinette I pottery and a Wading River projectile point recovered from the first B horizon buried beneath the plowzone on this landform, essential at this terrace's surface
- While no deeply buried cultural deposits were identified in the T3 terrace, radiocarbon samples taken from between one and two meters below surface indicate that earlier Native American cultural deposits could exist buried deeply within its sediments



Cultural Features

- Archaeological cultural features are the remnants of activities that are preserved in the soil and site stratigraphy
- Features found at the Kells Pasture site (nearly all of which dated to the Late Archaic occupations) provide little indication of what activities were occurring there, besides those related to food processing or heating
- One feature from the Kells Pasture site produced butternut shell, providing at least some indication of the types of resources being collected at or brought to the site, as well as the seasonality of the occupation(s)
- Butternuts are ripe and ready for collection in the fall, so it may be that the fall was the season that Native Americans were most likely to visit this site



Kells Pasture Site Archaeological Conclusions

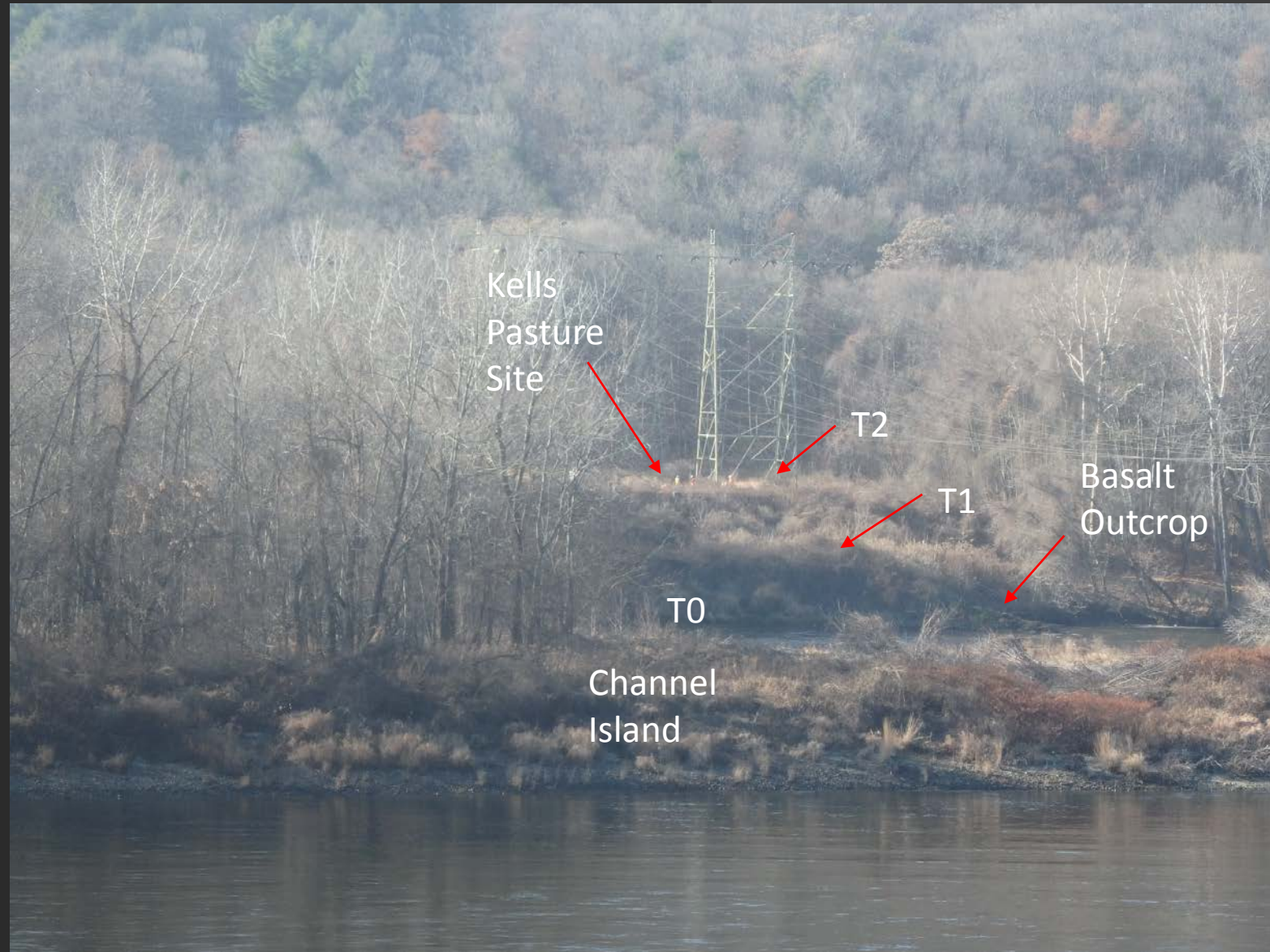
- The features present seem to relate to food process or general heating
- Given the proximity to the river, it may be assumed that aquatic resource (fish, clams, reeds, etc.) collection could have been an activity at the site, but no evidence was found to support this speculation
- The few stone tools that were found at the site do not indicate a specific site activity; however, the stones the tools are made from come from a wide region (as far away as from the Hudson River Valley,) indicating the people who lived here were used to long distance travel or maintained good relationships with their neighbors so that trade for non-local goods was possible
- A preference for non-local tool stone raw material is nearly universal throughout the different occupations of the site
- Other sites in this region of the Connecticut River valley of similar age do not exhibit the same focus on non-local tool stone.
- This is suggestive of a single group of people, with a wide travel or trading sphere, who occupied and reoccupied this site over much, if not all, of its history, from the Late Archaic to the Middle Woodland period
- These people might have known of this site for its location near to the large basalt outcrops that projected into the river (pictured here), cobbles from which they used to line their fire hearths
- The site could have functioned as a stop while on yearly travel route for people using the river
- Other site activities or meaning of the site's location not the people who once used it can not be known from the archaeological record this site has produced so far

The Geoarchaeology: Reading the Landscape of the Kells Pasture Site

Geoarchaeology is an aspect of archaeological study that uses methods from the science of geology to answer archaeological questions (questions like: “How did these artifacts get buried so deep?”)

Kells Pasture Site Geomorphological Characterization

- The geoarchaeological investigation was initiated with a geomorphologic (the study of the origin of topographic features of the earth) characterization of the landforms within the landscape the site exists within.
- The site is located on two landforms surfaces, initially designated the T3 (not pictured here) and T2 terraces, found approximately 10 m above the normal water level of the Connecticut River.
- Below these to the east are a T1 and T0 terrace, while a higher T4 terrace can be found to the southwest of the site.
- A prominent basalt bedrock outcrop extends from the T1 terrace out into the river channel.



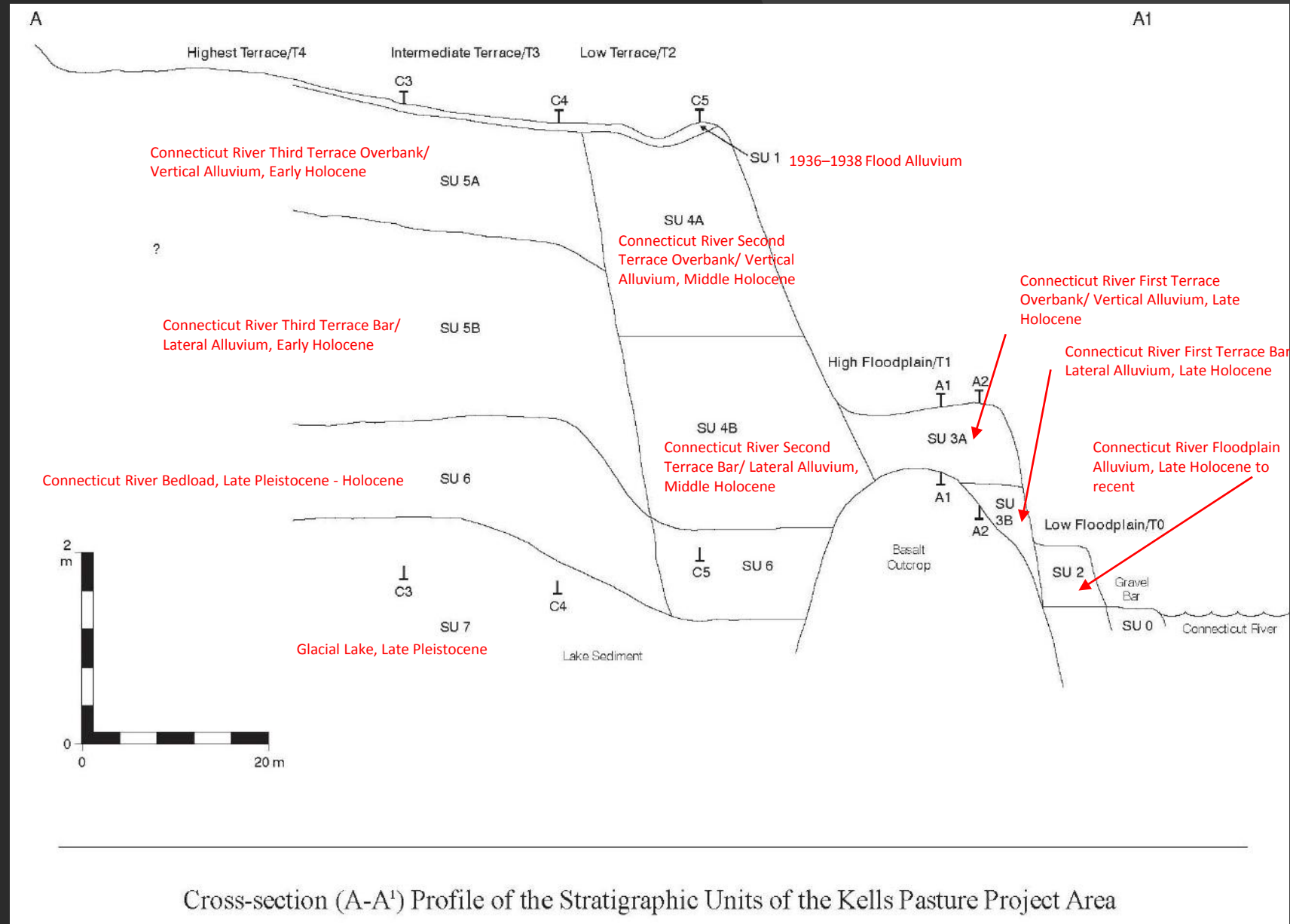
Geoarchaeology Field Investigations

- The geoarchaeological study investigated the origin of the landforms that make up the terraces on which the Kells Pasture site is found
- This was done with a series of machine extracted soil cores that were placed on the T2 and T3 terraces, supplemented with information from the hand excavated archaeological blocks and hand augered cores
- The T1 terrace was investigated with hand augered cores.
- The machine extracted soil cores ran to depths of 10.0 meters below surface and hand augered soil cores to depths of 4.5 meter below surface.



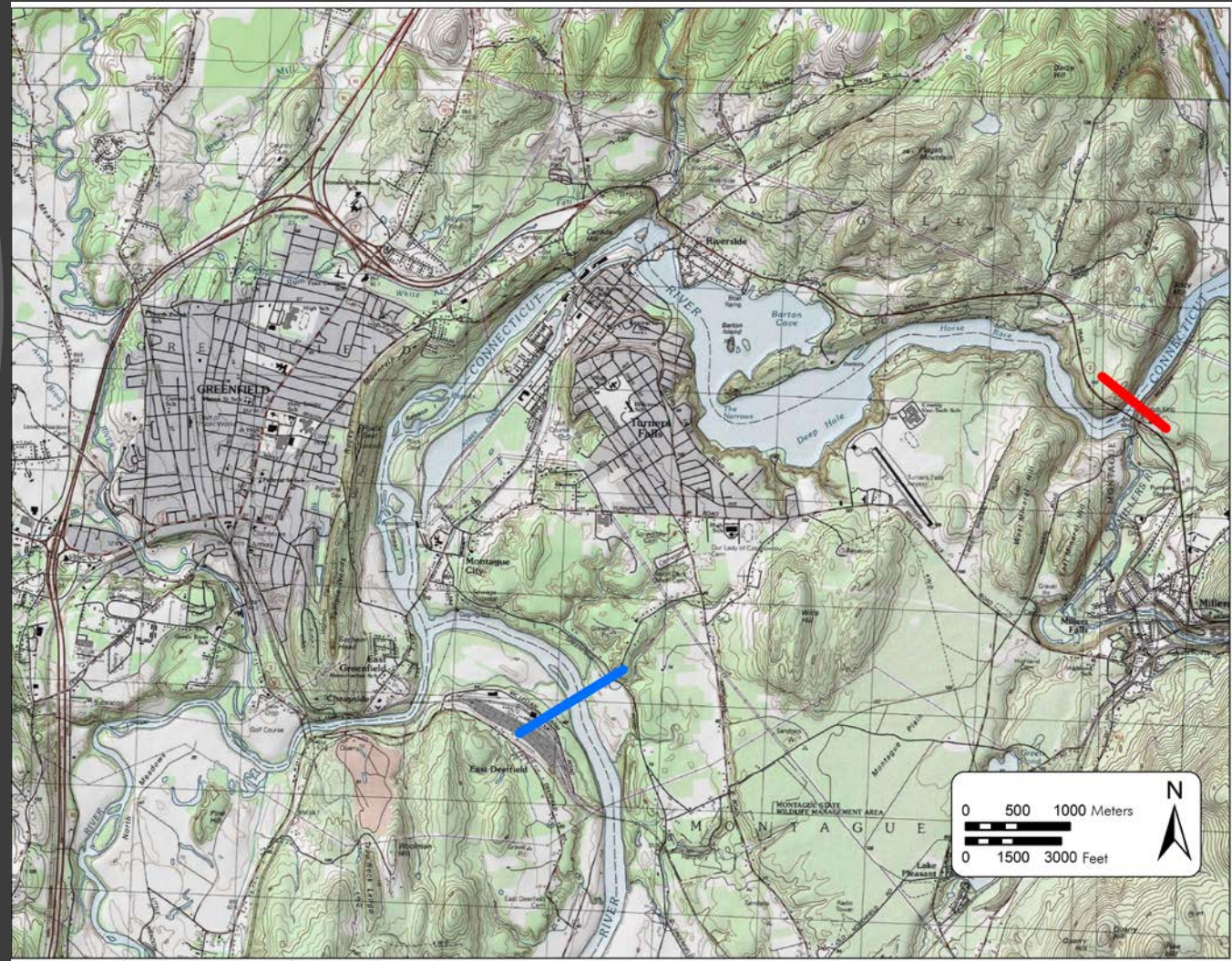
Site Stratigraphic Units

- A Stratigraphic Unit (SU) is an informally defined geological layer of either bedrock or sediment (unconsolidated materials made from the erosion of bedrock materials)
- Seven SUs were identified at the Kells Pasture study site based on landscape and/or topographic position and sediment or soil properties
- Mapped in a west to east cross section here, major SUs are designated by numbers and lithofacies within them by letters
- SUs range in age from the late Pliestocene to late Holocene geological epochs, and include river sediment from the historic 1936/1938 floods
- Age designations here are based on radiocarbon dating, temporally diagnostic artifacts, and relative landform position
- SUs 1-6 were deposited by the post-glacial age Connecticut River and SU 7 was deposited by of glacial Lake Hitchcock.
- The Kells Pasture site is found across SUs 4 and 5, which relate to the T2 and T3 terraces respectively.



Tuners Falls Gorge Geomorphological Study

- From this point, the investigation was extended to a wider study area to try to better contextualize the site in a larger landscape
- The Turners Falls Gorge region of the Connecticut River in Massachusetts is an approximately 14.5 river kilometer run from the French King narrows (red line) to just south of the Deerfield River confluence (blue line)
- In this area, the river channel is fairly constricted between the bedrock ridge of Rocky Mountain on the west and the Montague Plains delta on the east
- A delta is a landform created when sediment carried by a river leaves the rivers mouth and is deposited as it enters slower-moving water, such as a lake or ocean
- The Montague Plains delta was created during the end of the last glacial period when a large glacial lake (Lake Hitchcock) once occupied the Connecticut River Valley
- Much of the geomorphological development of this gorge region developed after the end of the last glacial ice age, around 15,500 BP



Previous Geomorphological Studies: Jahns (1947 and 1966)

- In 1947, Richard Jahns described five distinct post-glacial age river terraces in the Turners Falls region of the Connecticut River valley, which are defined primarily on the basis of their height above mean river level (seen here in Table 1)
- He assigned no time period to these terraces
- He described them as alluvial deposits, underlain by glacial lake deposits and capped by deposits from the historic 1936 and 1938 floods
- In 1966, Jahns produced a detailed map of the surficial geology of the Greenfield Quadrangle, in which the Turners Falls Gorge is located, which, among other details, maps terrace scarps across the alluvial landscape

Terrace Name	Height Above Mean River Level in Meters (Feet)		
	Average	Low	High
Lily Pond Terrace	24 (80)	32 (76)	84 (26)
Highest Terrace	15 (49)	13 (43)	52 (16)
Intermediate Terrace	11 (37)	11 (36)	38 (12)
Low Terrace	9 (30)	8 (27)	33 (10)
High Floodplain	6 (18)	5 (17)	21 (6)
Low Floodplain	3 (10)	2 (8)	12 (4)
Gravel Bar	0	0	0

Previous Geoaercaheological Investigations: Curran (2003)

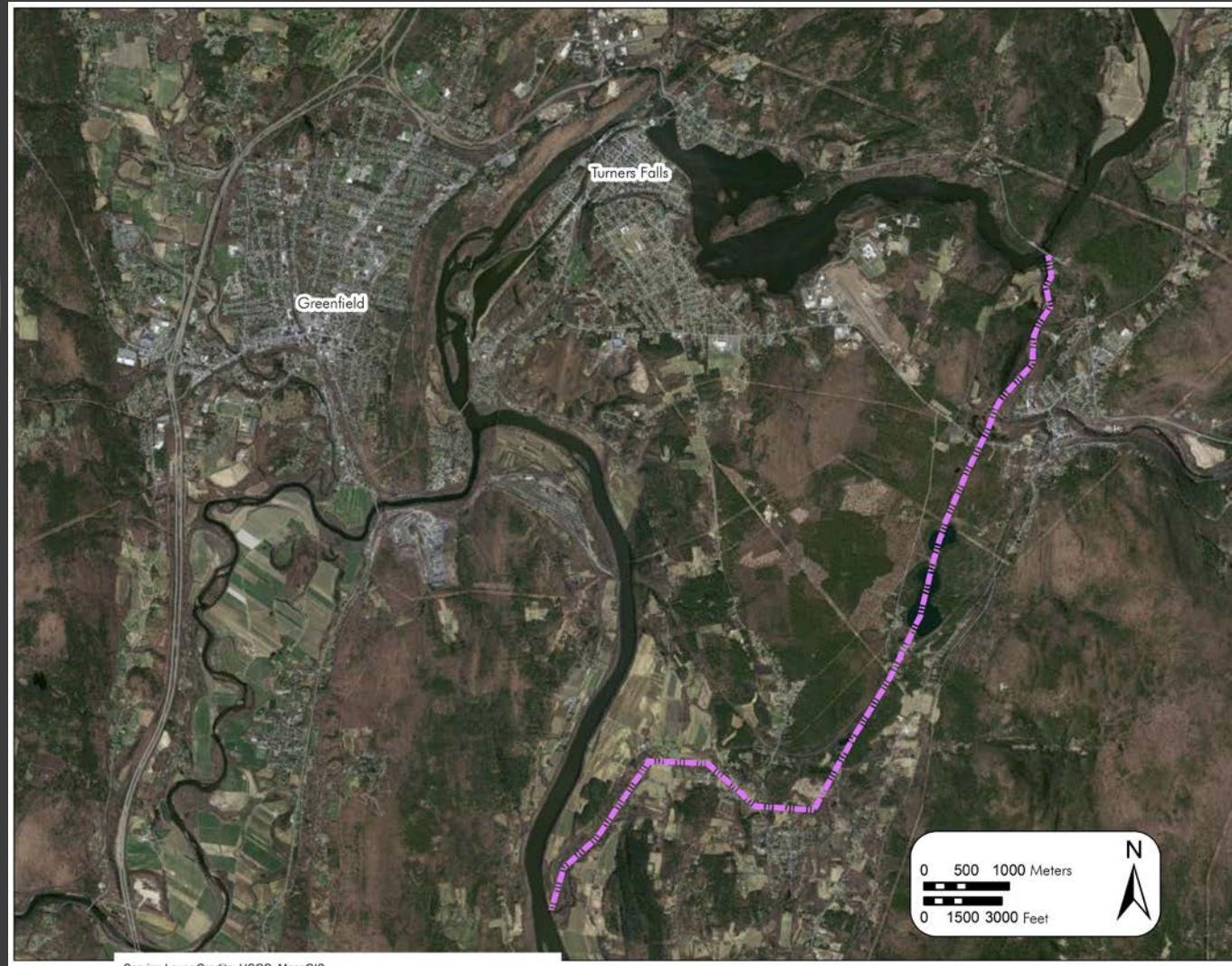
- Kathryn Curran's 2003 study provided a geoaercaheological assessment of terraces and cultural deposits from the Riverside Archaeological District in Gill, Massachusetts (located approximately 4 kilometers upstream from Kells Pasture, above the natural Falls)
- The Riverside sites contain Native American cultural deposits that span the late Pleistocene (12,000 BP) through to the historical period (1700 AD). Curran compared these archaeological findings to the terrace scarps on Jahns' (1966) surficial geology map to date and identify five terraces. These are shown in Table 2 along with Jahns' terrace definitions for comparison.
- While Curran's study only officially identified five terraces, based on the information in that study and the earlier studies of the Riverside sites, it is likely that a sixth terrace exists there which has been obscured by modern development. This terrace was, therefore, also included in Table 2.
- At the Kells Pasture site area, five terrace surfaces were identifiable, based on discrete landform elevation observations, with a sixth located further to the south. The elevation of these landforms above the river agree well with Jahns' descriptions.
- As seen in Table 2, the T2 and T3 terraces on which the Kells Pasture site is found correspond to the Low and Intermediate Terraces, respectively.

Table 2. Comparison of Jahns (1947) Terraces with the Riverside Archaeological District Terraces (Curran 2003) and the Kells Pasture Study Area Terraces.

Terrace Name	Jahns	Riverside		Kells Pasture	
	Average Meters Above River Level	Terrace Meters AMSL	Meters Above River Level	Terrace Feet AMSL	Meters Above River Level
Lily Pond Terrace (T5)	32 - 26	79-?	27.4 -?	55-?	23.8-?
Highest Terrace (T4)	13 - 16	64-76	12.2-27.4	47-55	16.2-23.8
Intermediate Terrace (T3)	11 - 12	61-64	9.1-12.2	46-47	10.2- 16.2
Low Terrace (T2)	8 - 10	59-61	7.6-9.1	43-46	9.1-10.1
High Floodplain (T1)	5 - 6	56-59	4.6-7.6	38-43	4.6-9.1
Low Floodplain (T0)	2 - 4	49-56	2.4-4.5?	35-38	2.1-4.6
Gravel Bar	0	0	0	0	0

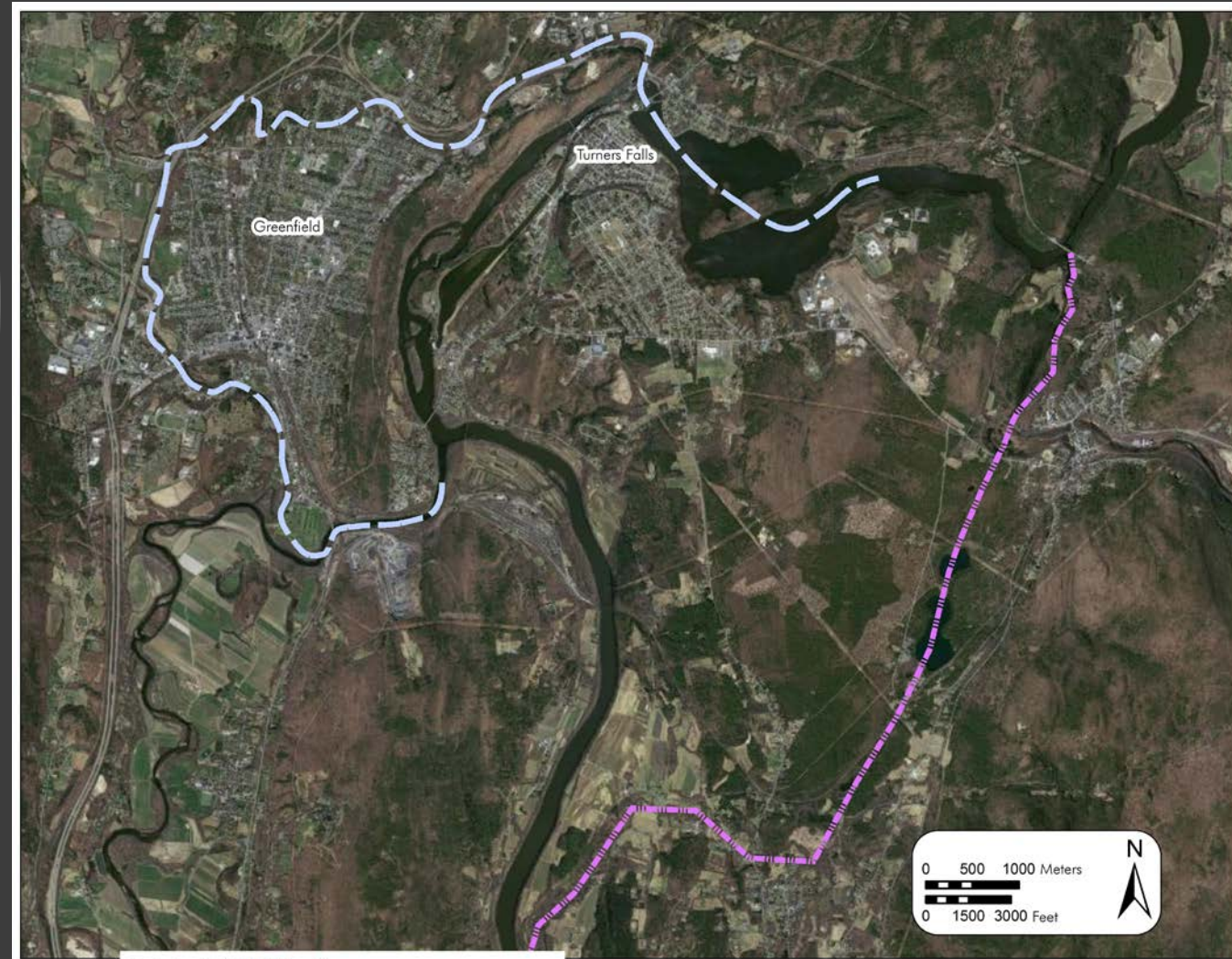
Turners Falls Gorge Landscape Reconstruction: 1

- Jahns' and Curran's studies were combined with the Kells Pasture site geomorphological results to produce a detailed reconstruction of the development of the post-glacial alluvial landscape in the Turners Falls Gorge region of the Connecticut River Valley.
- By between 14,000–13,500 BP Glacial Lake Hitchcock drained from this area, leaving the lake bed and its delta exposed.
- East of the village of Turners Falls, the old path of the Connecticut River had been blocked by deltaic and kettle pond deposits.



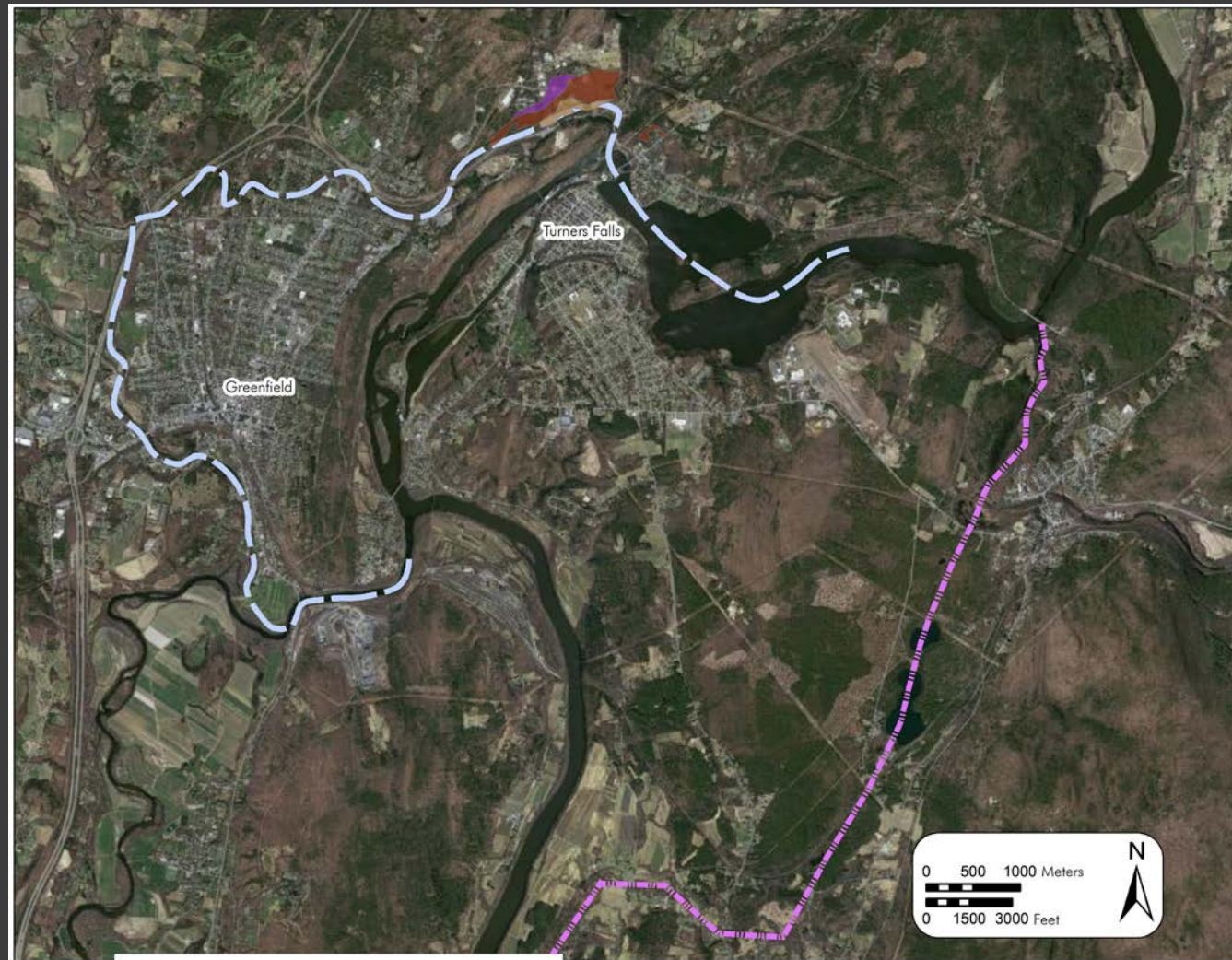
Turners Falls Gorge Landscape Reconstruction: 2

- This forced the postglacial Connecticut River in a new route to the west as indicated by large paleochannel (persevered remnant of an old river channel) found in the village of Greenfield
- This late Pleistocene river channel is referred to here as the White Ash Swamp Paleochannel.



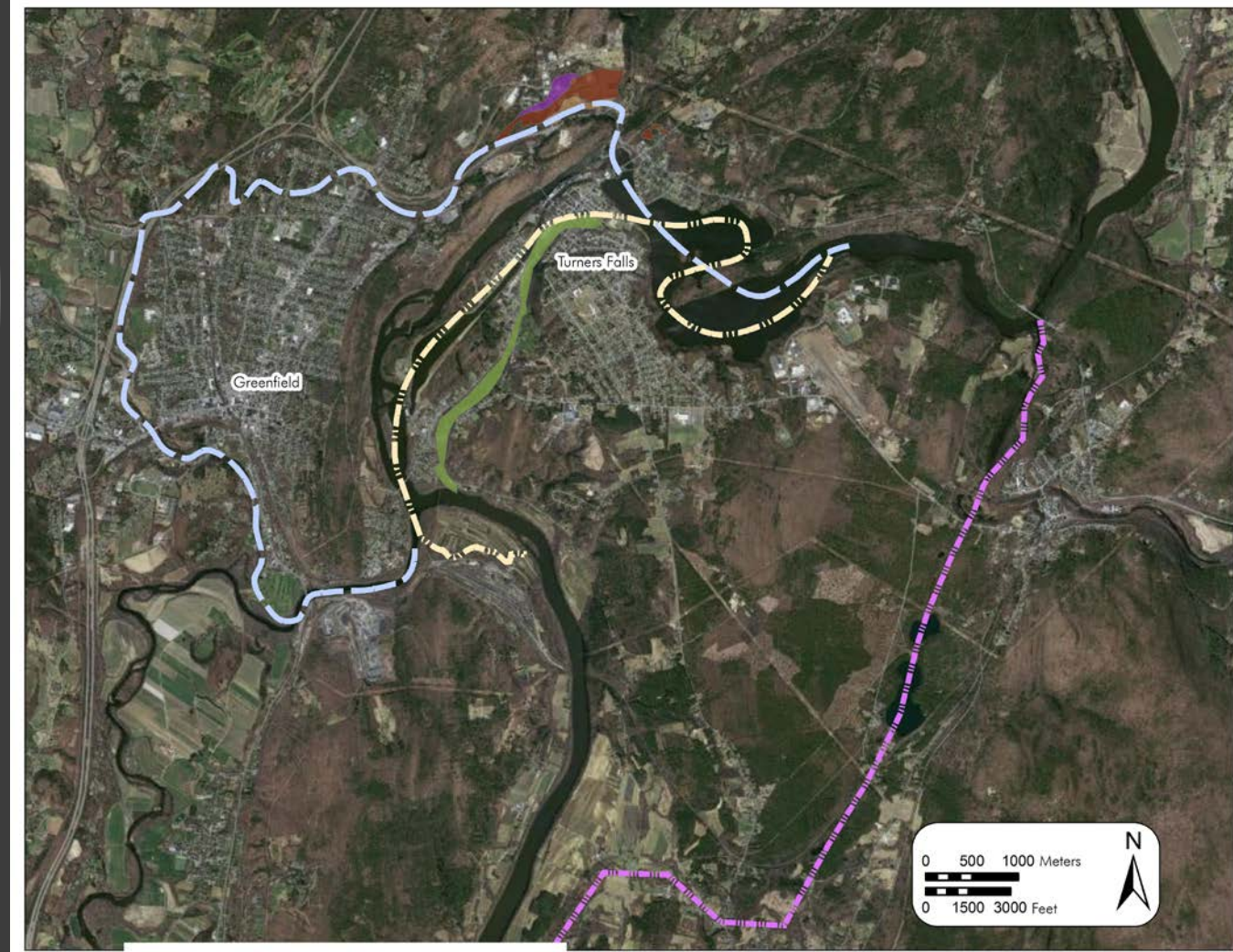
Turners Falls Gorge Landscape Reconstruction: 3

- The White Ash Swamp Paleochannel forms at least two floodplains that are preserved as a series of terraces, named here as the High White Ash Swamp Terrace (SEEN IN PURPLE) and the Low White Ash Swamp Terrace (SEEN IN BROWN).
- A lower surface is also present here that might represent the floodplain at the time that the White Ash Swamp channel was abandoned, here named the White Ash Swamp Floodplain (SEEN IN TAN).
- The individual ages of these landforms is unknown, however, they must have formed sometime between approximately 13,500 and 12,000 BP, based on the age of younger landforms.
- No cultural materials are known to be found on these surfaces.



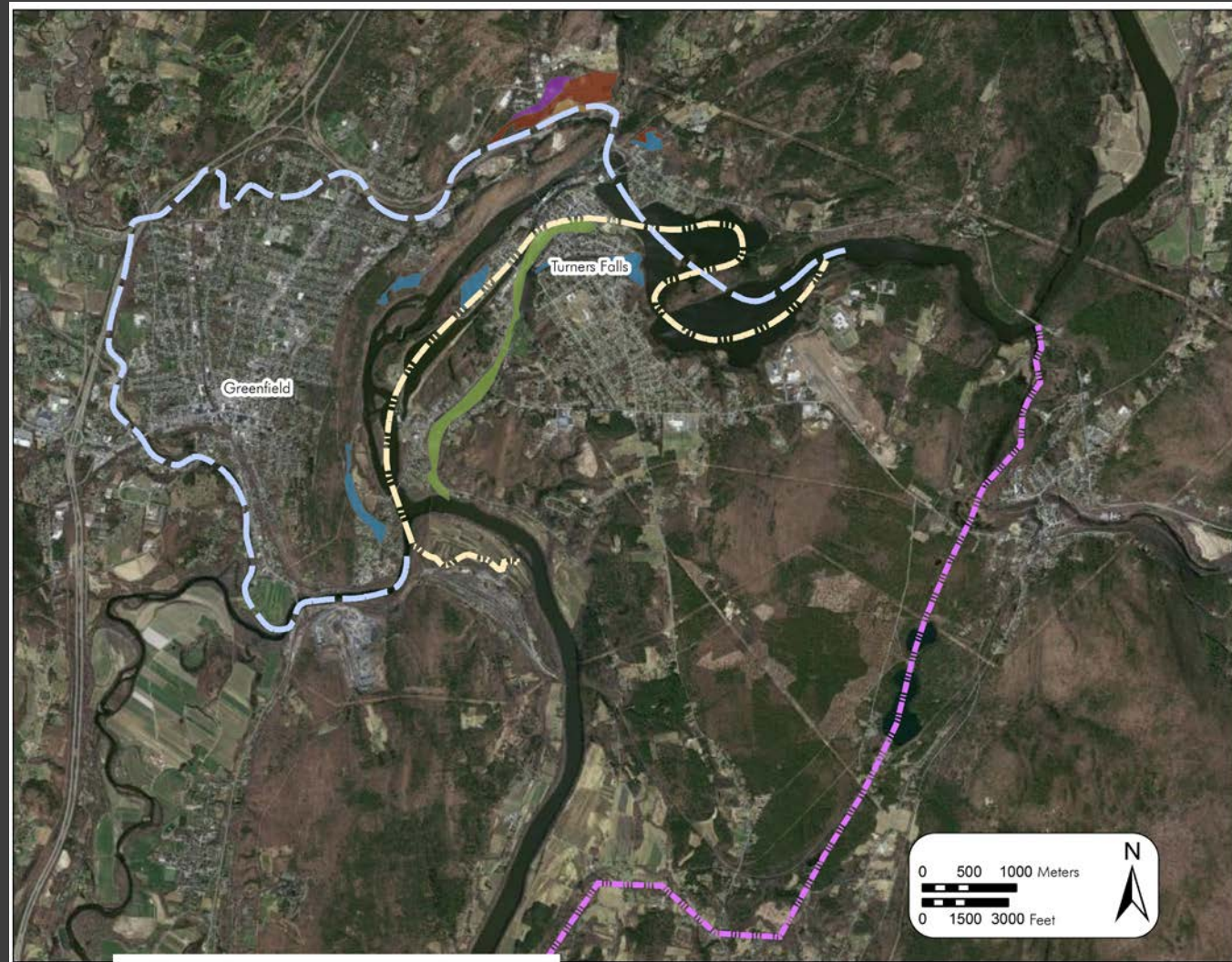
Turners Falls Gorge Landscape Reconstruction: 4

- When the White Ash Swamp Connecticut River eroded to an elevation of 82–79 meters above mean sea level (AMSL) the Connecticut River abandoned this channel and then ran south and east of the Canada Hill/Rocky Mountain ridge
- A paleochannel of this version of the river (*SEEN IN PALE GREEN*) was later occupied by the Papacumtaquash Brook.



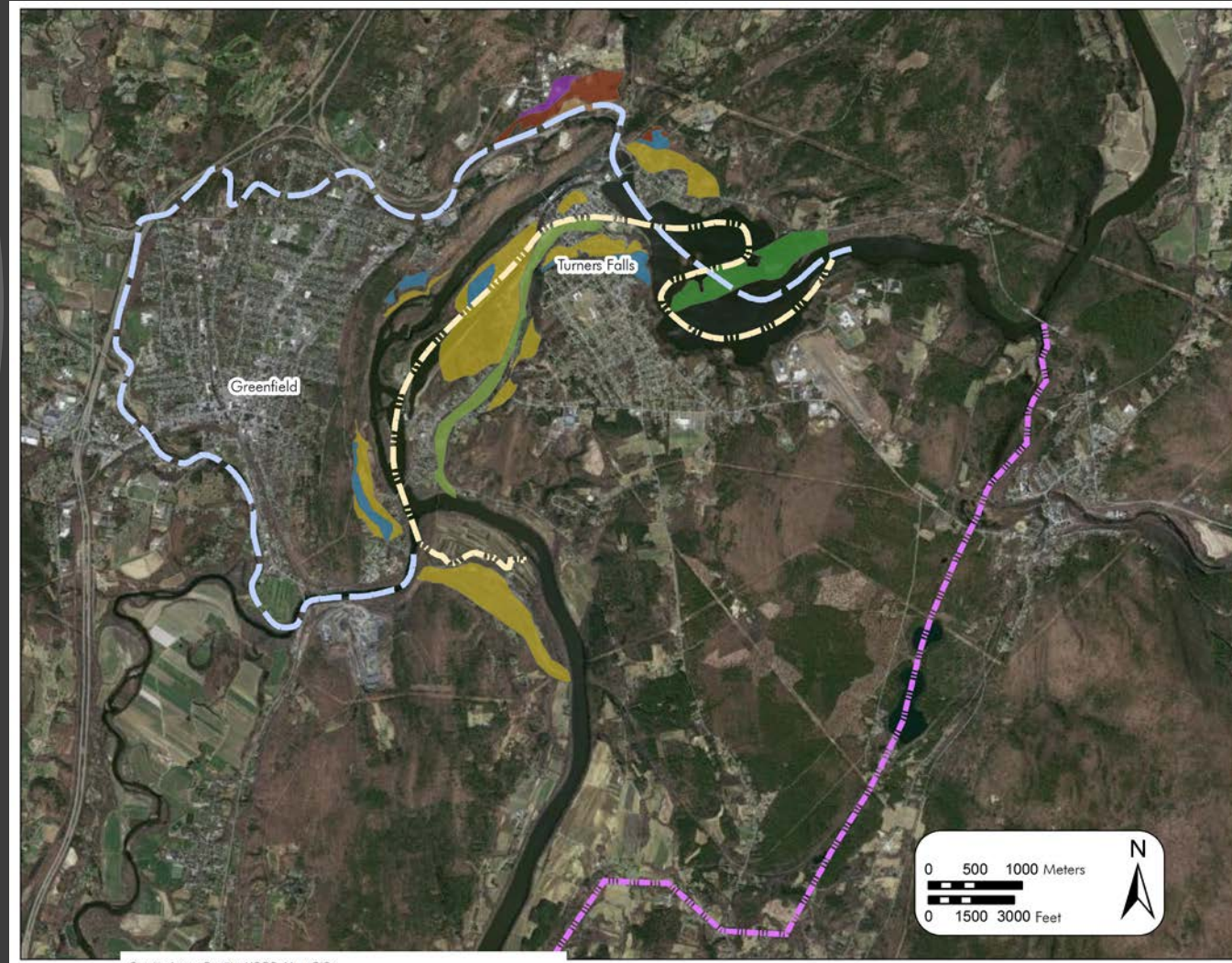
Turners Falls Gorge Landscape Reconstruction: 5

- This Papacumtaquash Brook channel, formed sometime prior to 12,000 BP, based on archaeological remains found on the Lily Pond Terrace (*SEEN IN LIGHT BLUE*).
- The Lilly Pond terrace is the earliest floodplain east of the Canada Hill/Rocky Mountain ridge



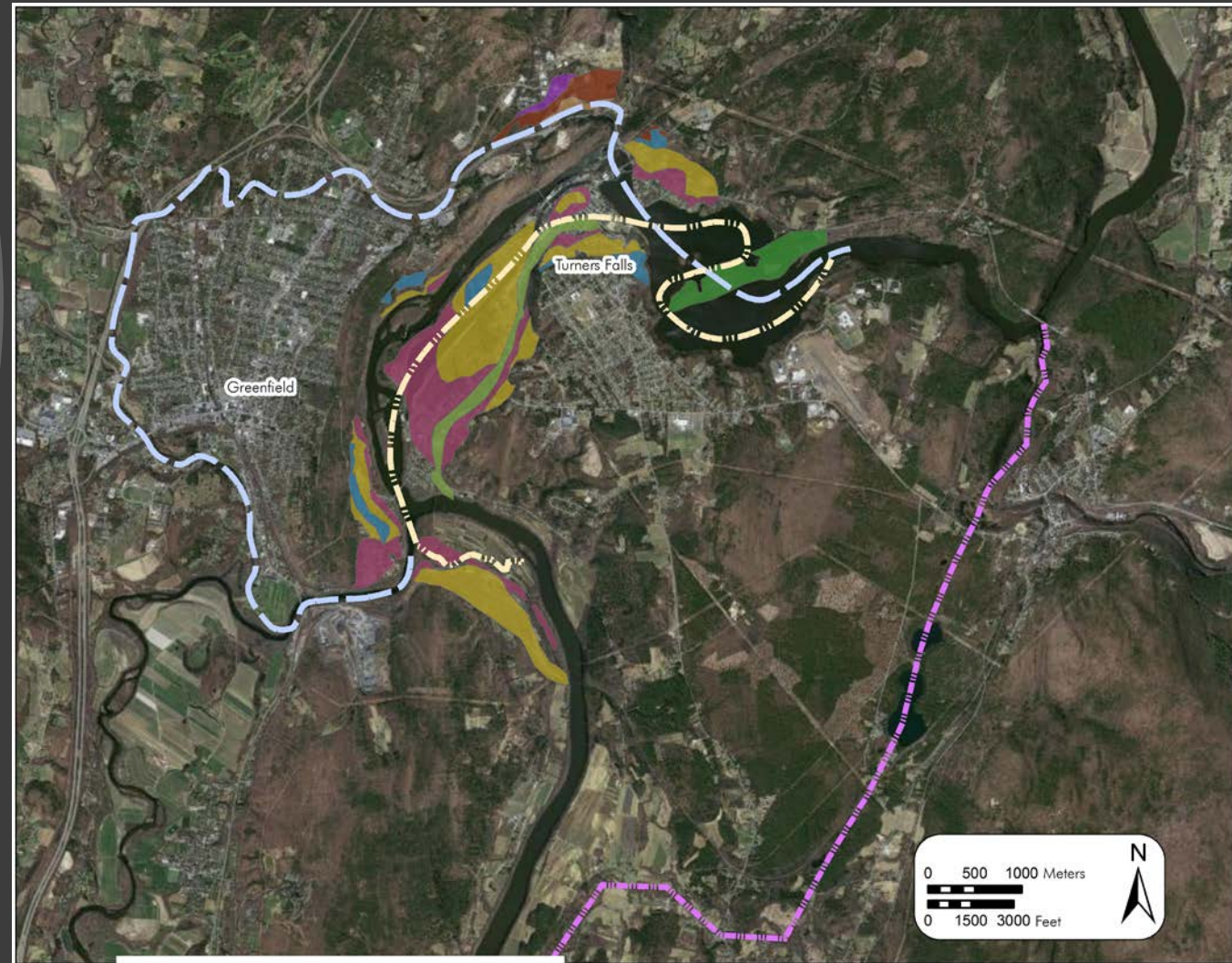
Turners Falls Gorge Landscape Reconstruction: 6

- Continued downward erosion of the Papacumtaquash Brook Connecticut River channel reached a level that flowed directly over the bedrock ridge that would become the Lily Pond Barrier (*SEEN IN GREEN*).
- When it eroded to an elevation of about 76 meters AMSL, it began to create waterfalls and plunge pools over this bedrock barrier.
- This elevation is just below that of the nearby Lily Pond Terrace, indicating that the waterfalls that formed here occurred after the river had incised to create that terrace and would have been depositing the floodplain that would become the Highest Terrace (*SEEN IN YELLOW*), at around 12,000 BP



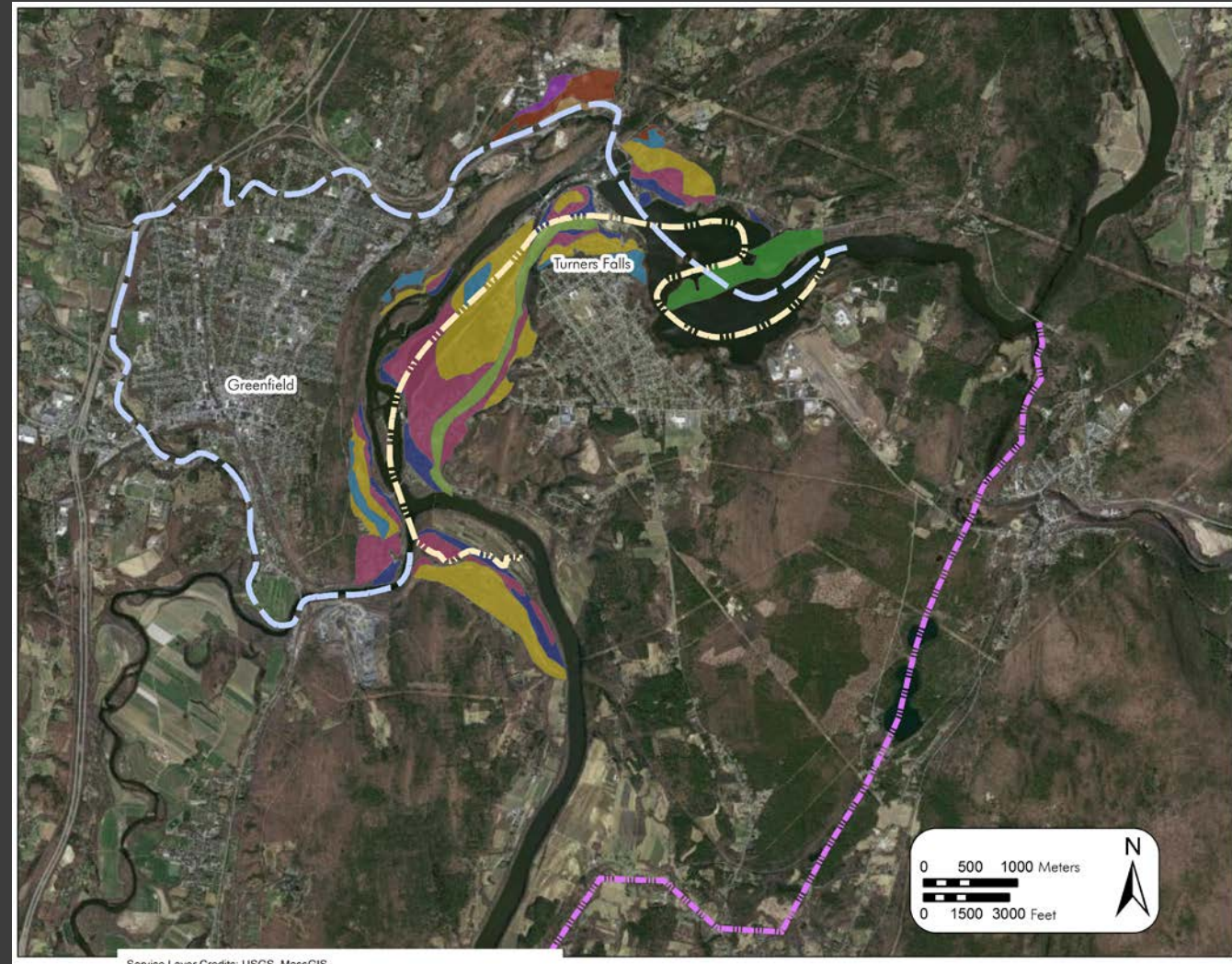
Turners Falls Gorge Landscape Reconstruction: 7

- Once the Lily Pond Barrier Falls eroded to approximately 64 meters AMSL, the waterfalls were abandoned.
- This is the same elevation that the Highest Terrace floodplain was abandoned, indicating both were effected by the same river incision event.
- A radiocarbon date from archaeological deposits at Riverside, recovered from just above the next youngest floodplain's stream gravel deposits, indicates that the erroision that created the Highest Terrace occurred sometime around 10,000 BP. This new floodplain became the Intermediate Terrace (*SEEN IN LIGHT PURPLE*).



Turners Falls Gorge Landscape Reconstruction: 8

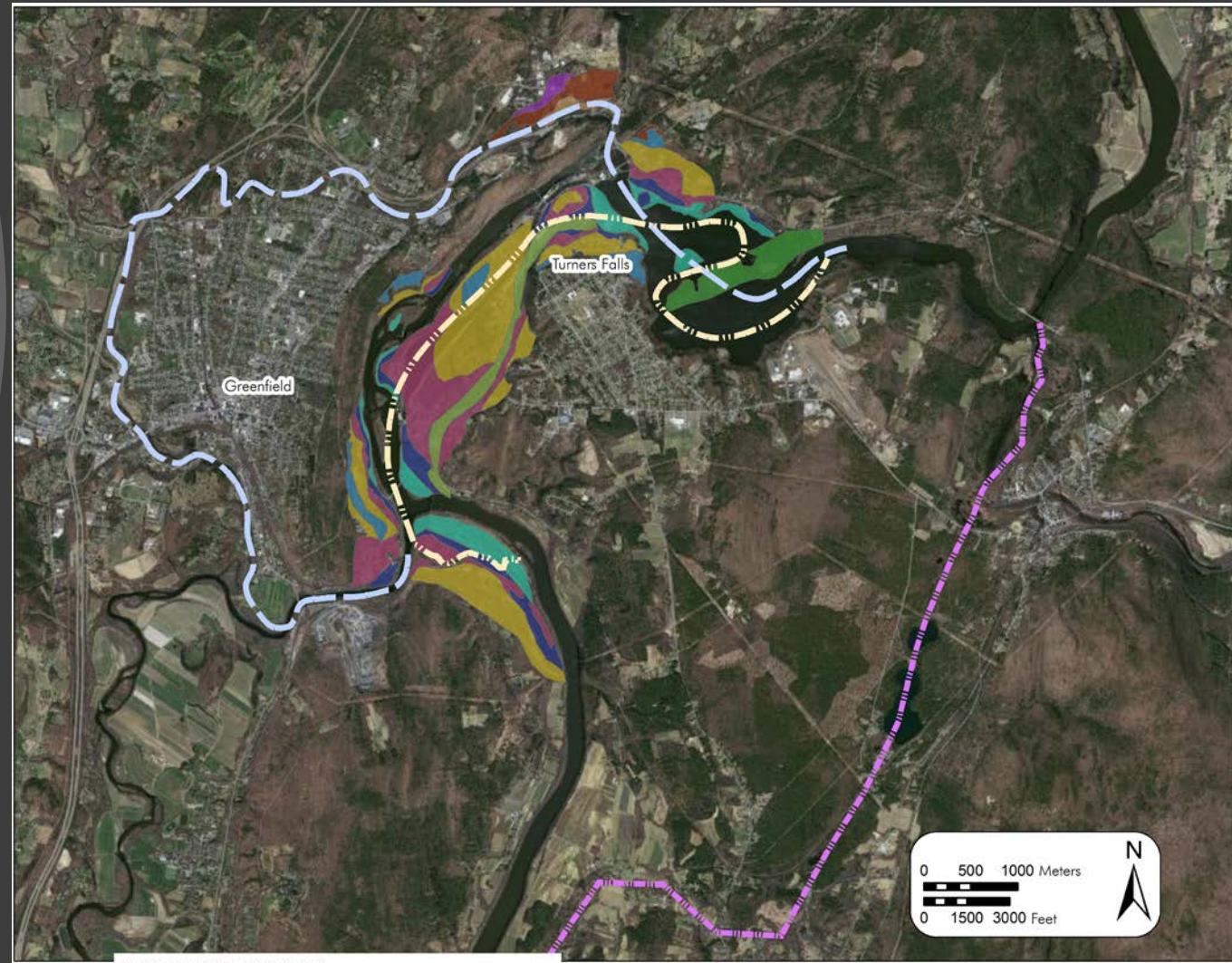
- The river eroded again around 7000 BP, creating the Intermediate Terrace, and depositing the Low Terrace floodplain (*SEEN IN DARK BLUE*), as indicated by archaeological dates at Kells Pasture.
- The river abandoned the Papacumtaquash Brook channel sometime between 7000 and 3000 BP, based on the locations of the Low Terrace and High Floodplain landform
- The new channel formed to the north and east of the Papacumtaquash Brook channel position in much the same location as the modern river.



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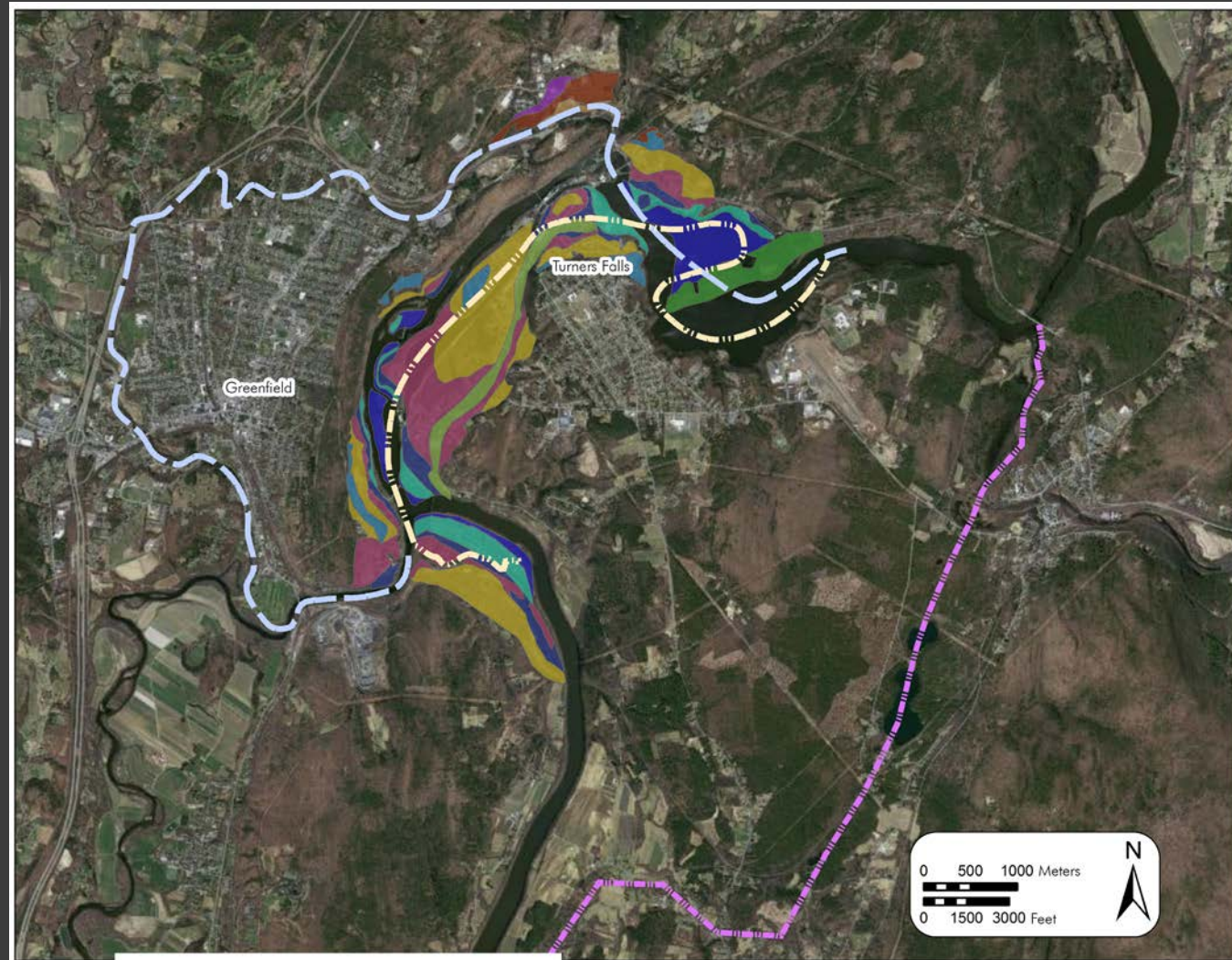
Turners Falls Gorge Landscape Reconstruction: 9

- Sometime before 3000 BP, the Connecticut River eroded again forming the Low Terrace and depositing the new floodplain that would become the High Floodplain landform (*SEEN IN AQUA*).
- The modern islands seen below Turners Falls start to form at this time.
- Further erosion of the modern Connecticut River created the High Floodplain terrace, the timing of which is unclear, but which likely happened around 2000–1000 BP, as cultural occupations dating to that time frame are not well represented on the terrace surfaces above.



Turners Falls Gorge Landscape Reconstruction: 10

- The Low Floodplain (*SEEN IN DARK BLUE*) then began to form.
- This is the form of the valley that was present when the river was dammed at Turners Falls in the historical period.



Landform Reconstruction Conclusions

- Landforms in the Turners Falls Gorge area can now be better dated within the late Pleistocene to late Holocene epochs (as depicted in Table 5).

Turners Falls Gorge Alluvial Terraces	Years B.P.	Cultural Period, Buried	Cultural Period, Surface
Lily Pond Terrace (T5)	?–12,000	-	Paleoindian, Archaic, Woodland
Highest Terrace (T4)	12,000–10,000	Paleoindian	Archaic & Woodland
Intermediate Terrace (T3)	10,000–7,000	Early–Mid Archaic	Mid-Archaic - Woodland
Low Terrace (T2)	7,000–3,000	Mid-Archaic– Late Archiac	Late Archaic - Woodland
High Floodplain (T1)	3,000–1,000?	Early–Mid- Woodland	Mid-Late Woodland
Low Floodplain (T0)	1,000?–Present	Late Woodland–Historical	Late Woodland–Historical

Geoarchaeological Conclusions

- **Archaeologically:**
- *The Lilly Pond Terrace* is unlikely to contain deeply buried archaeological deposits, but may have all cultural periods at the surface;
- *The Highest Terrace* may contain buried Paleoindian sites, with all younger cultures at the surface;
- *The Intermediate Terrace* may contain buried Early to Middle Archaic sites, with all younger cultures at the surface;
- *The Low Terrace* may contain buried Middle to Late Archaic deposits, with all younger cultures at the surface;
- *The High Floodplain* may contain buried Early to Middle Woodland deposits , with all younger cultures at the surface;
- *The Low Floodplain* may contain Late Woodland to historic period deposits buried and or at the surface