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PROJECT-ORIENTED GEOSCIENCE SERVICE LEARNING: TANNERY BROOK AS URBAN LABORATORY AND SCIENCE-TEAM BUILDER

Outline

- What is service learning (SL)?
- My SL project—the “nuts & bolts”
  - The Search for Partners
  - Project-based/embedded themes
  - Scaffolding—the key to engagement
    - Question-asking
    - Field-work training
    - Presentation skills
    - Cooperative-learning
- Embedding SL entails making choices.
- What students learned/shared.
- Conclusions

What is service learning?

- "Service-learning is an experiential teaching method that combines community service with academic instruction as it focuses on critical, reflective thinking and civic responsibility. Service-learning programs involve students in organized community service that addresses local needs, while developing their academic skills, sense of civic responsibility and commitment to the community."
  - Campus Compact National Center for Community Colleges as cited in www.apa.org/eduction/undergrad/service-learning.aspx.

The elements of excellent geoscience service learning

- “100% science/100% service-learning”
- Project-oriented, embedded in the curriculum.
- Runs <u>throughout</u> the semester—not tacked on as a one- or two-time event disconnected from the themes of the course.
- Deep learning that is highly reflective.

How to imbed science-service learning into a project-oriented pedagogy is the subject of my presentation.

ESC 120: Introduction to Geology & Earth Processes

- Described as a general, first-year introduction to physical geology
- No prerequisites—most students liberal arts & science majors
- A “lab science”—general-education requirement needed for graduation & transfer
- Enrollment ~25; two labs of ~12 students each

HCC demographics (fall 2013)

- Enrollment
  - Headcount 6740
  - FTE 4560
- Gender
  - Female 60%
  - Male 40%
- Race/ethnicity
  - White 66%
  - Hispanic or Latino(a), any race 22%
  - African American 7%
  - Asian 2%

HCC demographics (fall 2013)

- Age
  - <20, 30%
  - 20-24, 36%
  - 25-29, 13%
  - 30-44, 15%
  - 45+, 6%
  - Median/mean: 21/25

ESC 120 majors (fall 2013)

- Liberal Arts, 50%
- Criminal Justice, 20%
- Business Admin., Education, ~2%

How ESC 120 embeds SL

- Made it inquiry-/problem-based around a major theme of the course.
- Added undergrad research components (my students are generally <u>not</u> science majors).
- Partnered early with community organizations around common interests.
- Constructed elaborate scaffolding with deadlines throughout the semester.
- Organize d an end-of-semester student research conference. Serve food!

Down-sides to embedding

- Takes time away from other Earth science topics
  - Requires shuffling your schedule
- “Fit” may not be precise
  - Often no coverage of SL curricula in textbook(s)
  - Hard to explain “uneven” science coverage to students
- Season-/weather-permitting

The Search for Partners

- Partnering organizations must have a common interest in the Earth science/geology curricula.
- My "Science Partner Infiltration" process
- Four partners available from the Holyoke community:
  - Connecticut River Watershed Council
  - The City of Holyoke
  - The Trustees of Reservations, "Land of Providence"
  - Sisters of St. Joseph/Sisters of Providence charities

SL curricula/partner common interests

- Urban hydrology
- Greenway/open-space vision/design
- Stream & Connecticut River pollution (total coliforms)

Embedded research themes that serve partners

- Tannery & Refuge Brooks as urban hydrology laboratories
  - “Tale of Two Watersheds”
  - Urban impacts, especially run-off & erosion
  - CSOs (combined sewer overflows) draining to the Connecticut River
- “Greenway Vision for Tannery Brook”
  - An exercise in creative urban planning

Scaffolding—the key to engagement

- Question-asking
  - Proposal
  - Outline
- Field-work training/data collection
  - On-campus (two lab sessions [per lab])
  - Off-campus (one lab session [per lab])
  - Off-campus all-day field trip (whole class)
- Cooperative learning teams
- Presentation skills
  - Dry-run & rubric of expectations
  - Final “whole-school” science conference

Framing the questions

- Tale of two watersheds
- Urban impacts
- CSOs
- Greenway vision for Tannery Brook

HOLYOKE COMMUNITY COLLEGE – EARTH SCEINCE
fa_12 -- ESC 120 -- student guidelines for geoscience research -- stream hydrology -- ver4
===

INTRODUCTION

<u>The *right* question for you</u>

All research begins with pure curiosity – that is, with a question or set of questions. As a matter of strategy, keep your question (or set of questions) <u>simple</u>: It's easier to collect data when the questions are simple (or basic). Easy data means more data; more data means more analysis and more interesting findings (that's the fun part).

ESC 120 surface-water hydrology research this semester will have <u>four</u> big goals or themes related to Tannery Brook (or "TB"):

1. **Tale of Two Watersheds:** How do Tannery Brook and its neighboring stream, the relatively pristine "Refuge Brook" (or *Paucatuck* Brook, as formally named on some maps), compare? Tale of Two Watersheds will involve both on- and off-campus physical comparison of these two radically different streams. Your data will be both quantitative (stream flow) and qualitative (photo's work well). Map-reading is a must. For example, using Google Earth with Massachusetts geology overlays. I will explain how to do this all in good time.
2. **Urban Impacts on Streams and Their Mitigation.** For example, urban streams, such as TB, are used for storm drains and, during periods of intense rainfall, sewers! Urban steams also tend to flood because they drain large impervious surfaces such as streets, parking lots, and malls. All this water must go somewhere. Often, it ends up eroding away soils, meadows, bridges, roads, and building foundations. Erosion is, in fact, <u>the</u> biggest problem TB faces.
3. **CSOs: the Connecticut River as Sewer?** How clean are our streams and rivers? Did you know sewers (called combined sewer overflows or CSOs), on some occasions, drain directly to TB and the Connecticut River? How can we detect sewer bacterial contamination (called fecal coliform) in the Connecticut River? This theme requires that you
    a) master the art of collecting/analyzing water samples for bacterial contamination(we'll teach you); and
    b) attend a Saturday-long field trip to the Connecticut River (November 10^{th}; details forthcoming).
4. **A Greenway Vision for Tannery Brook:** How could you turn TB, its tributaries and wetlands, into an urban greenway (that is, a foot-path/bike trail and city water-way park)? The key to doing well on the Greenway Vision theme is to think big, to be an environmental visionary. Are you up to it?

Drafting an outline

1. Introduction
2. Method
3. Data & analysis
4. Conclusions
5. References

HOLYOKE COMMUNITY COLLEGE – EARTH SCEINCE
fa_12 -- ESC 120 -- student guidelines for geoscience research -- outline ver2
==

HOW TO MAKE AN OUTLINE FROM YOUR PROPOSAL
Before your start, make sure you've read and understand all INSTRUCTOR COMMENTS on your proposal.

Use the five-part core organization below to reflect all the points of your proposal, including the INSTRUCTOR COMMENTS.

Your outline page count should be about 5 pages, double-spaced:

Deadline: **November 19, 2012**. <u>You outline will be graded</u>. Points in brackets.

1. ***INTRODUCTION*** [5 points]
Your introduction <u>must</u> include background on your theme. State what it is you're doing (or going to do) and why. Main point: the audience <u>must</u> know from your introduction why your research/report is important and why they should read or listen to it. Introductory material in your outline should be at least a ½ page typed or 45 second to 1 minute of presentation time. For example, if your writing about CSOs, your introduction must tell the audience what a CSO is, how it works, why CSOs are a problem, etc.

2. ***METHOD*** section [8 points]
State in <u>significant detail</u> how you will investigate/research (or have investigated/researched) your question(s). Are you using a method the instructor suggested, one you've researched, or one that you've developed? Feel free to describe the protocols as given in the handouts or that you've researched (be sure you understand them so you can answer questions, especially from invited experts). A description of your method in your outline should be between about 1 and 1 ½ pages, double spaced. Prepare slides and text to speak about 1 minute on method in your final presentation.

3. ***DATA & ANALYSIS*** section [**10** points]
Describe the data you've collected or intend to collect and how (in general) you'll interpret it (details about <u>what you found out</u> do not go here; those details must go in the *Conclusions* section, below). Data & Analsyis is the "meat" of your report/talk. Tell the audience, in general, <u>what does the data show</u>? Include tables, maps, photos, and graphs. Prepare to write 1 to 2 pages of description of your data. Plan to speak for 3 minutes about your data in your final presentation.

1/2

Collecting data

- Many protocols were constructed:
  - Field observations data forms (right)
  - Stream discharge (Q)
  - Riparian conditions
  - Chemical data (pH; specific conductance/temp.)
  - Total coliforms
- All data were pooled.

HOLYOKE COMMUNITY COLLEGE EARTH SCIENCE
Watershed Field Survey Data Form -- WD_p.52 -- protocol 2a -- data form, sw edit6

Watershed Field Survey Data Form – Protocol 2a

Name / team #________________________ Date ____________

1. Weather conditions: Temperature, wind, cloud conditions, rain within 12 hours?, etc.

____

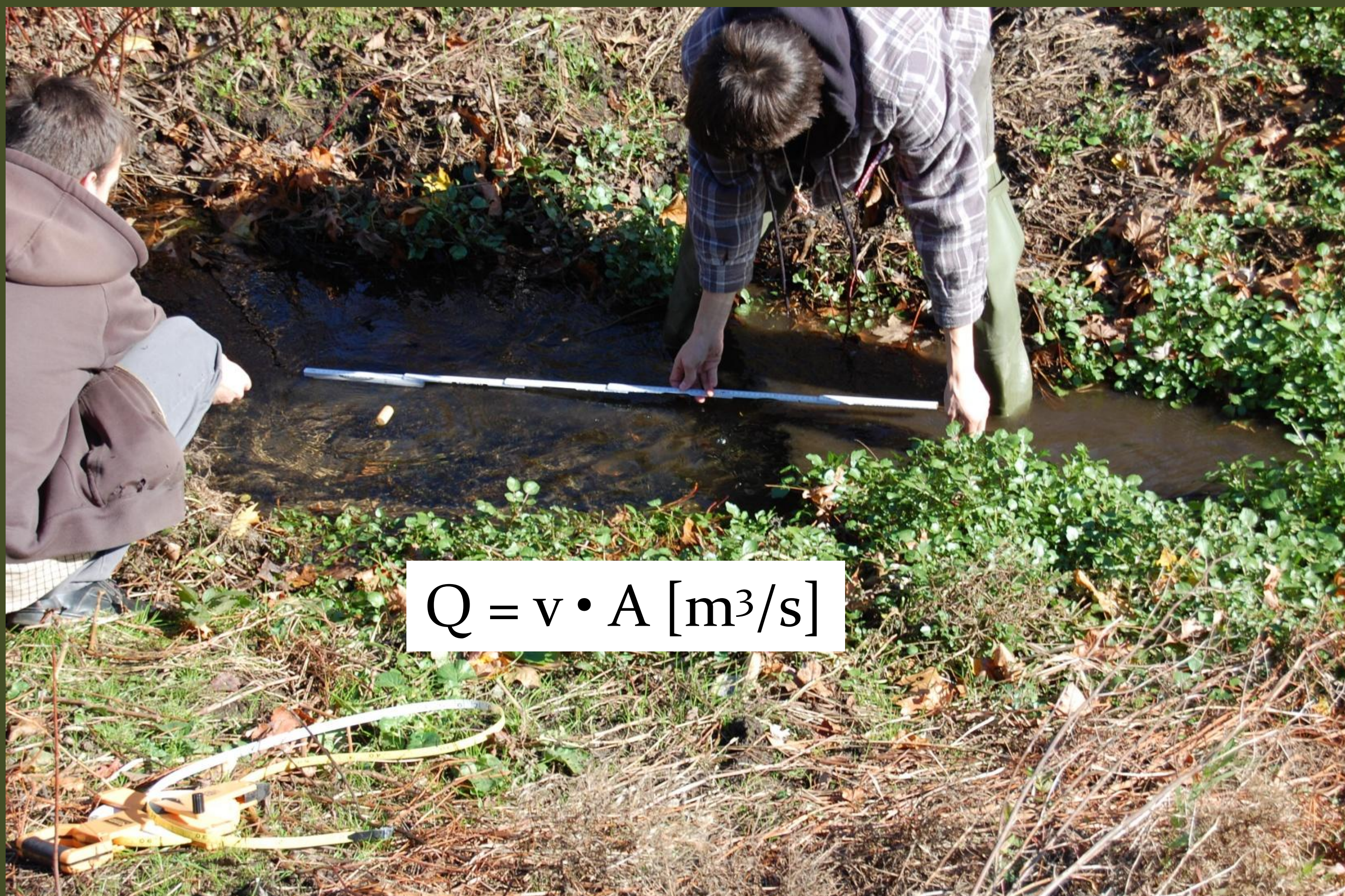
____

2. Detailed observations: Use the attached stream data codes. On the following table, make at least 3 observations across the channel or up and down the banks at each location (IDs **A**, **B**, **C**, **D**, etc.). Use additional data forms, if necessary.

Loc. ID	Obs. no.	LEFT BANK material (looking downstream)	CHANNEL: Substrate (streambed) material	CHANNEL: Channel modifications?	RIGHT BANK material (looking downstream)
A					
B					
C					

Page 1 of 4

Our stream discharge (Q) method



Sample Q calculation

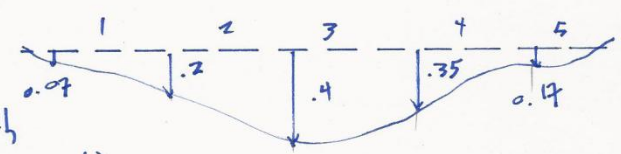
- Average stream velocity (m/s) is multiplied by cross-sectional area estimate (m):

$$Q = v \cdot A \; [m^3/s]$$

HOLYOKE COMMUNITY COLLEGE EARTH SCIENCE
protocol 8 -- measuring Q -- WD_p94-97 -- sw edit3

5. Multiply the depth by each segment width to get the segment area, and then total the segments' areas to get the Total Stream Cross Section Area.

Section #	Depth (m)	Stream Segment Width (m)	Stream Segment Area (m^2)
1	0.07	0.5	0.035
2	0.20	0.5	0.1
3	0.40	0.5	0.2
4	0.35	0.5	0.175
5	0.17	0.5	0.085
		Total Stream Cross-Sectional Area (m^2)	0.595 m^2



sketch (not to scale)

Planning field work

- Models their own work
- Check lists for on- & off-campus field work
- Itineraries
- All-day Saturday field session was "extra-credit," & very well attended!

ESC 120.02&.03 Saturday 11-19 combined off-campus field work destinations & itinerary ver2
==

Saturday, Nov. 19 -- 120.02&.03 off-campus field exercise – EXTRA CREDIT

EQUIPMENT/SUPPLIES
- Use tennis balls or corks (for very shallow streams); need ~6 objects; 1 per team; 4 teams per lab)
- Measuring tape (metric) (1 per team)
- Bottles for phosphate sample
- YSI model 30 for specific conductance, temperature
- Sharpie pens for phosphate bottle
- Meter stick (1 per team)
- Stop watch (1 per team)
- Tannery Brook base map(s) (instructor-supplied; 1 per team)
- Clip boards (1 per team)
- Copies of appropriate protocols (1 set per team; instructor-supplied)

SAMPLING PLAN (STOPS/sites linked to base map)
STOP 1 (site 3) – Upland Road Maintenance Garage, 870 Homestead Avenue
- Split into three groups (A, B, & C)
- Collect 3 or more specific conductance readings (protocol 9; "flashing °C") at 3 locations behind maintenance garage.
- Collect 1 phosphate per group

"Drive-by" observations
- ✓ STOP 2 (site 4) – Forested wetland south of Meadow Brook (stop in parking lot of site to proposed Big Y) – protocol 2 (stream observations)
- ✓ STOP 3 (site 5) – Sears Auto/Brightside Mall – protocol 2 (stream observations)

STOP 4 (site 6) – Sisters of Saint Joseph the Provider
- Split into three groups (A, B, & C)
- Collect all protocols (2a; 8; 9; see base maps)

STOP 5 (site 7) – Nuestras Raices Farm/ Land of Providence
- Split into three groups (A, B, & C)
- Collect 3 or more specific conductance readings (protocol 9; "flashing °C") at 3 locations.
- Collect 1 phosphate per group

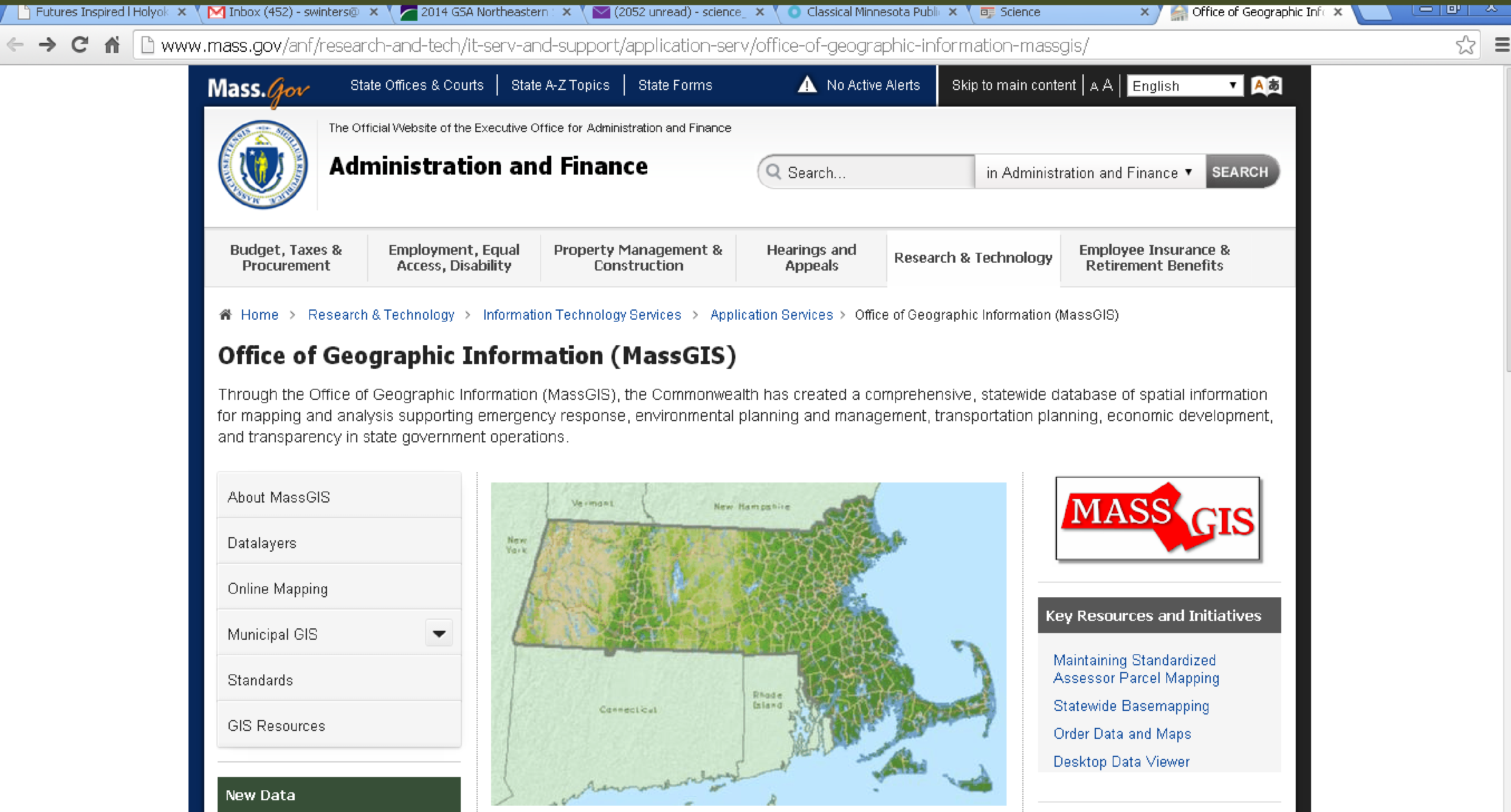
1/1

Easy-to-make base maps are critical.

- When possible, Google Earth/Google Maps & other public-access mapping software were used.
- I provided map templates to get them started.
- iPad GPS mapping particularly helpful.
- An especially useful MassGIS on-line mapping tool:

  http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/

"Snapshot" in PowerPoint 2010



Cooperative-learning teams

- Randomly selected teams maintained throughout semester. We were lucky!
- Goal: Make team-building training/skills intentional not hap-hazard.
- Cooperative assignments were progressively more complicated.
- Team tasks facilitate team work:
  - Communicator/leader
  - Equipment manager
  - Data manager

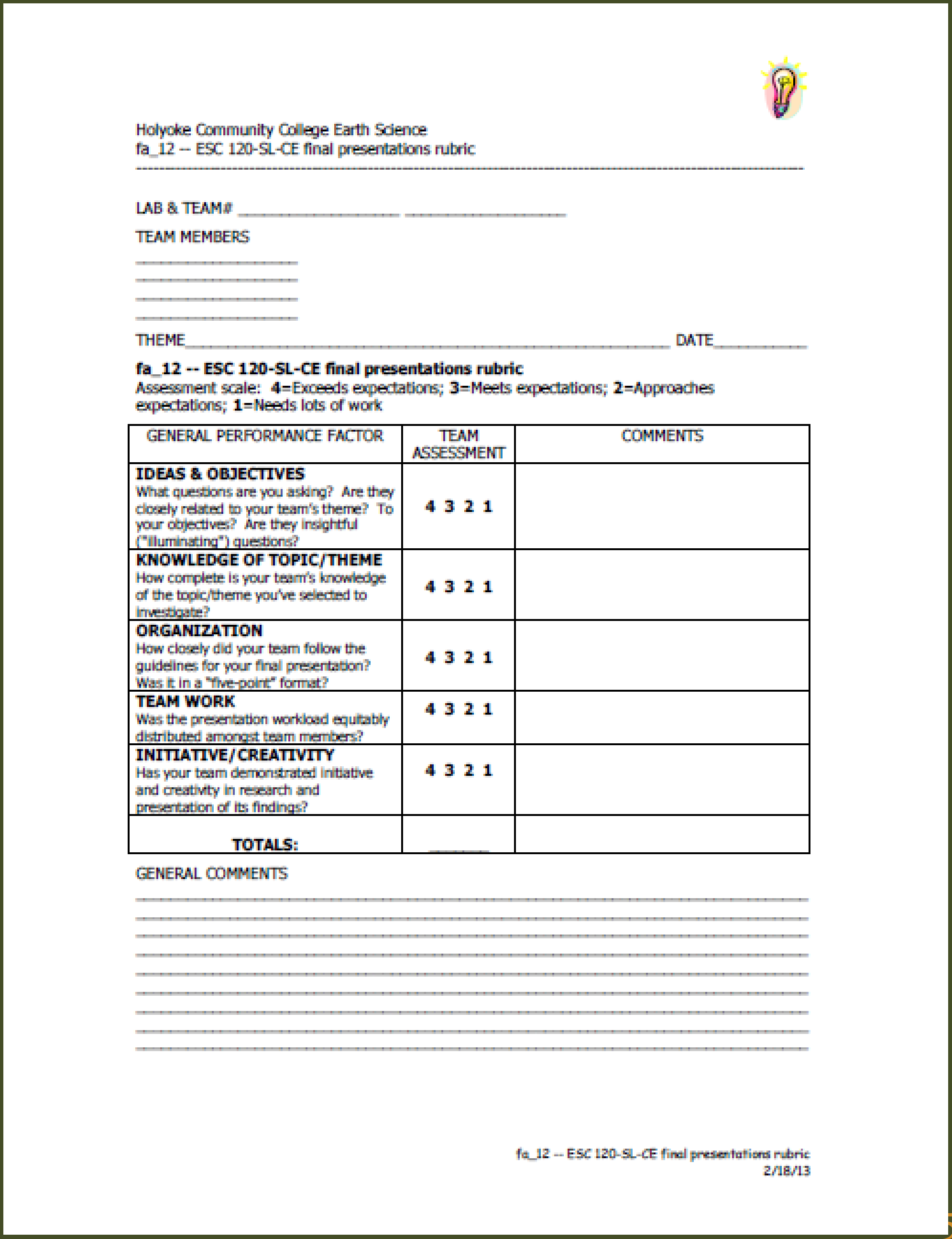
Cooperative-learning skills

- Three cooperative learning techniques (CoLTs*) were used in one of two lab sections (a pilot study) :
  1. "Think-pair-share"
  2. "Fish Bowl"
  3. "Pass the Problem On"
  4. "Graph-Your-Progress"
- Each CoLT was progressively more reflective.
- Pre- & post-testing
  - Friday lab was my "control."
  - Monday lab was my "treatment."

*_Collaborative Learning Techniques: A Handbook for College Faculty_, E.F. Barkley, K.P. Cross, C.H. Major, 2005, Jossey-Bass

Planning & practicing the final presentation

- Rubric of expectations (distribute early)
- Practice “dry-runs”



Holyoke Community College Earth Science
fa_12 -- ESC 120-SL-CE final presentations rubric

LAB & TEAM# ____________ ____________

TEAM MEMBERS

____
____
____
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THEME________________________________ DATE________

fa_12 -- ESC 120-SL-CE final presentations rubric
Assessment scale: **4**=Exceeds expectations; **3**=Meets expectations; **2**=Approaches expectations; **1**=Needs lots of work

GENERAL PERFORMANCE FACTOR	TEAM ASSESSMENT	COMMENTS
IDEAS & OBJECTIVES What questions are you asking? Are they closely related to your team's theme? To your objectives? Are they insightful ("illuminating") questions?	**4 3 2 1**	
KNOWLEDGE OF TOPIC/THEME How complete is your team's knowledge of the topic/theme you've selected to investigate?	**4 3 2 1**	
ORGANIZATION How closely did your team follow the guidelines for your final presentation? Was it in a "five-point" format?	**4 3 2 1**	
TEAM WORK Was the presentation workload equitably distributed amongst team members?	**4 3 2 1**	
INITIATIVE/CREATIVITY Has your team demonstrated initiative and creativity in research and presentation of its findings?	**4 3 2 1**	
TOTALS:	_____	

GENERAL COMMENTS

The Mini-Conference Invitation

- College-wide, including administrators
- All partners
- Serve food!

ESC 120 GEOSCIENCES MINI-CONFERENCE:
THE PAST, PRESENT, & FUTURE OF TANNERY BROOK

For the third year, Holyoke Community College students from Earth Science 120 (Introduction to Geology) will present their original research on the environmental health of Tannery Brook.

Working with our community partners in science, the Connecticut River Watershed Council, the Sisters of Saint Joseph, and the Sisters of Providence, students have spent their semester assessing the environmental and hydrologic conditions of Tannery Brook and its neighboring streams – and they are now ready and excited to present their findings.

Students will present in an event we call a Geosciences Mini-Conference on December 18, 10:30 a.m. to 12:30 p.m., in the Kittredge Center (room **KC 203**). Food will be served. The students and I love an audience. We hope to see you there!

ESC 120 Geosciences Mini-Conference: The Past, Present, & Future of Tannery Brook

Questions? swinters@hcc.edu

ESC 120 Geosciences Mini-conferences -- 2013 poster

Embedding SL entails making choices

- Significant rearrangement of traditional material/sequence
  - Hydrology lecture coverage ~2 weeks; stream labs & field exercise ranged over ~3 weeks.
  - Some later labs sacrificed so students could work on research projects.

HOLYOKE COMMUNITY COLLEGE
f_13 ESC 120.01 -- Intro. to Geology -- Syllabus & Schedule -- geoscience research ver2, 26 August 2013
===

Percent	Letter Grade
63-66	D
60-62	D-
0-59	F

COURSE/LAB/FIELD WORK TOPICS
The following is a list of topics anticipated to be covered in this course. List may change without notice at the instructor's discretion.

MONTH	WEEK	DATE/DAY	ANTICIPATED READING/LECTURE TOPIC	ANTICIPATED LAB/FIELD-WORK TOPIC
SEPT.	1	9-4, Wed.	Nature of Science/Ch. 1 An Intro. to Geology	
		9-6, Fri.		Campus loop part 1 (density lab rain back-up)
	2	9-9, Mon.	Ch. 2 Matter & Minerals	
		9-11, Wed.		
		9-13, Fri.		Intro. to minerals
	3	9-16, Mon.	Ch. 3 Igneous Rocks & Igneous Activity	
		9-18, Wed.		
		9-20, Fri.	Ch. 3 Igne Activity; Q	e rock cycle
	4	9-23, Mon.	Ch. 4 Volc	
		9-25, Wed.		
		9-27, Fri.		Topographic maps
	5	9-30, Mon.	Ch. 5 Weathering & Soils	
OCT.		10-2, Wed.		
		10-4, Fri.		Stream processes in the lab
	6	10-7, Mon.	Ch. 6 Sedimentary Rocks	
		10-9, Wed.		
		10-11, Fri.	Ch. 6 Sedimentary Rocks; QUIZ 2	Stream processes in the field part 1
	7	10-14, Mon.	HOLIDAY	
		10-15, Tue., follow Mon. schedule	Ch. 7 Metamorphic Rocks	Stream processes in the field part 1
		10-16, Wed.		
		10-18, Fri.		Stream processes in the field part 2
	8	10-21, Mon.	Ch. 8 Mass Wasting	
		10-23, Wed.		Field research proposal due (in lecture)
		10-25, Fri.		Stream processes in the field part 3 (off-campus)
	9	10-28, Mon.	Ch. 9 Running Water	

Five weeks devoted to hydrology lecture & labs/field work.

Page 7 of 8

- Significant rearrangement of traditional material/sequence
  - Hydrology lecture coverage ~2 weeks; stream labs & field exercise ranged over ~3 weeks.
  - Some later labs sacrificed so students could work on research projects.

HOLYOKE COMMUNITY COLLEGE
f_13 ESC 120.01 -- Intro. to Geology -- Syllabus & Schedule -- geoscience research ver2, 26 August 2013
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MONTH	WEEK	DATE/DAY	ANTICIPATED READING/LECTURE TOPIC	ANTICIPATED LAB/FIELD-WORK TOPIC
		10-30, Wed.		
NOV.		11-1, Fri.		Plate tectonics & the origin of magma
	10	11-4, Mon.		
		11-6, Wed.		
		11-8, Fri.	Ch. 9 Running Water; **QUIZ 3**	Igneous rock ID
	11	11-11, Mon.		
		11-13, Wed.		
		11-15, Fri.		edimentary rock ID
	12	11-18, Mon.		gneous rock ID
		11-20, Wed.		
		11-22, Fri.	Ch. 11 Glaciers & Glaciation	Metamorphic rock ID
	13	11-25, Mon.		Sedimentary rock ID
		11-27, Wed., follow Fri. schedule	Ch. 14 Earthquakes & Earth's Interior	No lab scheduled; work informally on field projects/prep. for conference
		11-29, Fri.	**HOLIDAY**	
DEC.	14	12-2, Mon.	Ch. 14 Earthquakes & Earth's Interior	Metamorphic rock ID
		12-4, Wed.		
		12-6, Fri.		No lab scheduled; work informally on field projects/prep. for conference
	15	12-9, Mon.	Ch. 15 Plate Tectonics	
		12-11, Wed.	Ch. 18 Geologic Time	
		12-13, Fri.	Ch. 18 Geologic Time; **QUIZ 4**	No lab scheduled; work informally on field projects/prep. for conference
	16	12-16, Mon.	Final exams week/geoscience mini-conference date & time TBD	
		12-17, Tue.		
		12-18, Wed.		
		12-19, Thur.		

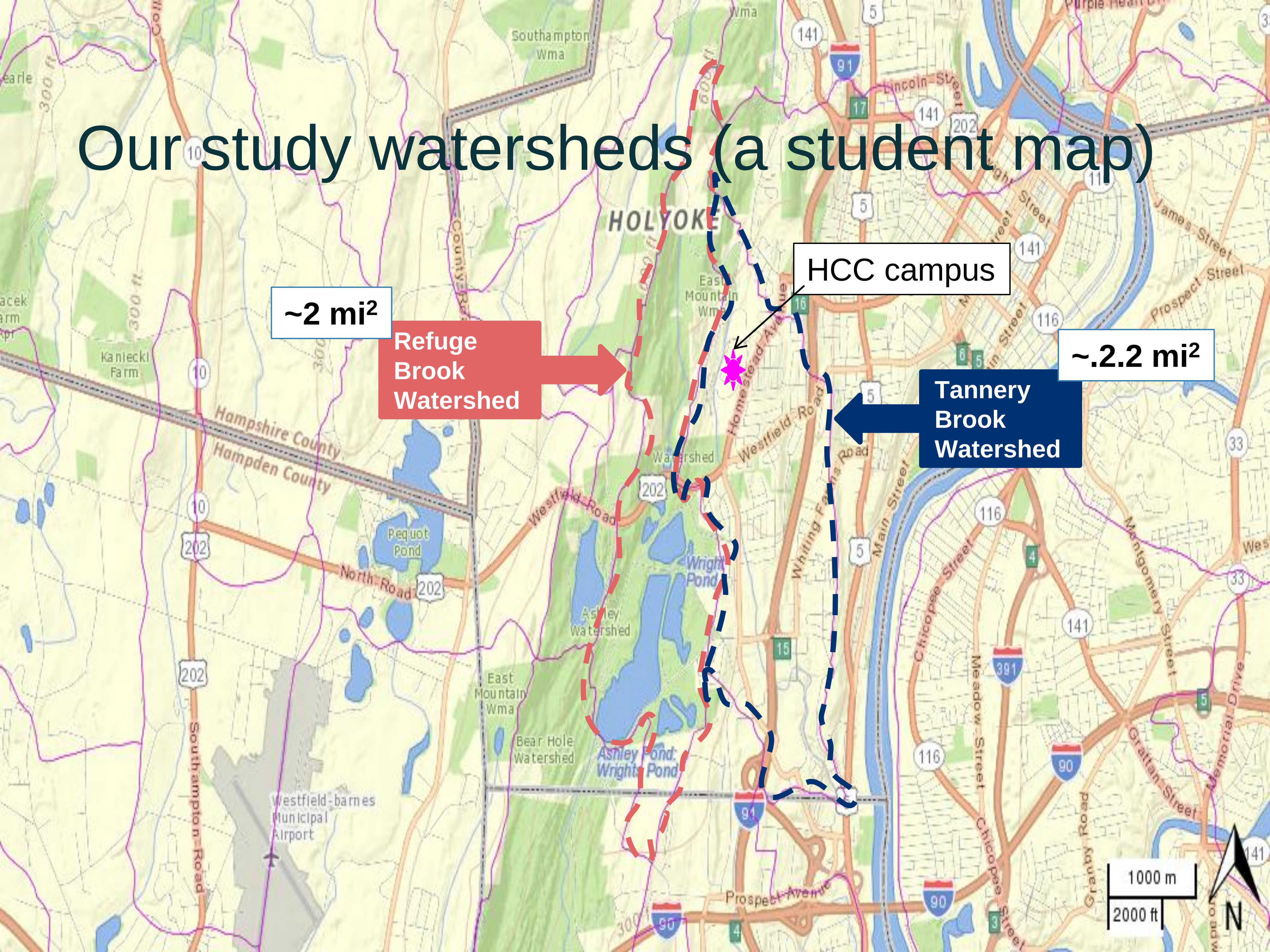
Three weeks devoted to data analysis & presentation prep.

Page 8 of 8

What students learned/shared

- Watershed characteristics
  - Background & setting
- Field work
  - Stream velocity
  - Discharge
  - Riparian conditions
  - Reconnaissance water-quality
  - Total coliforms
  - Significant erosion/mass wasting

Our study watersheds (a student map)

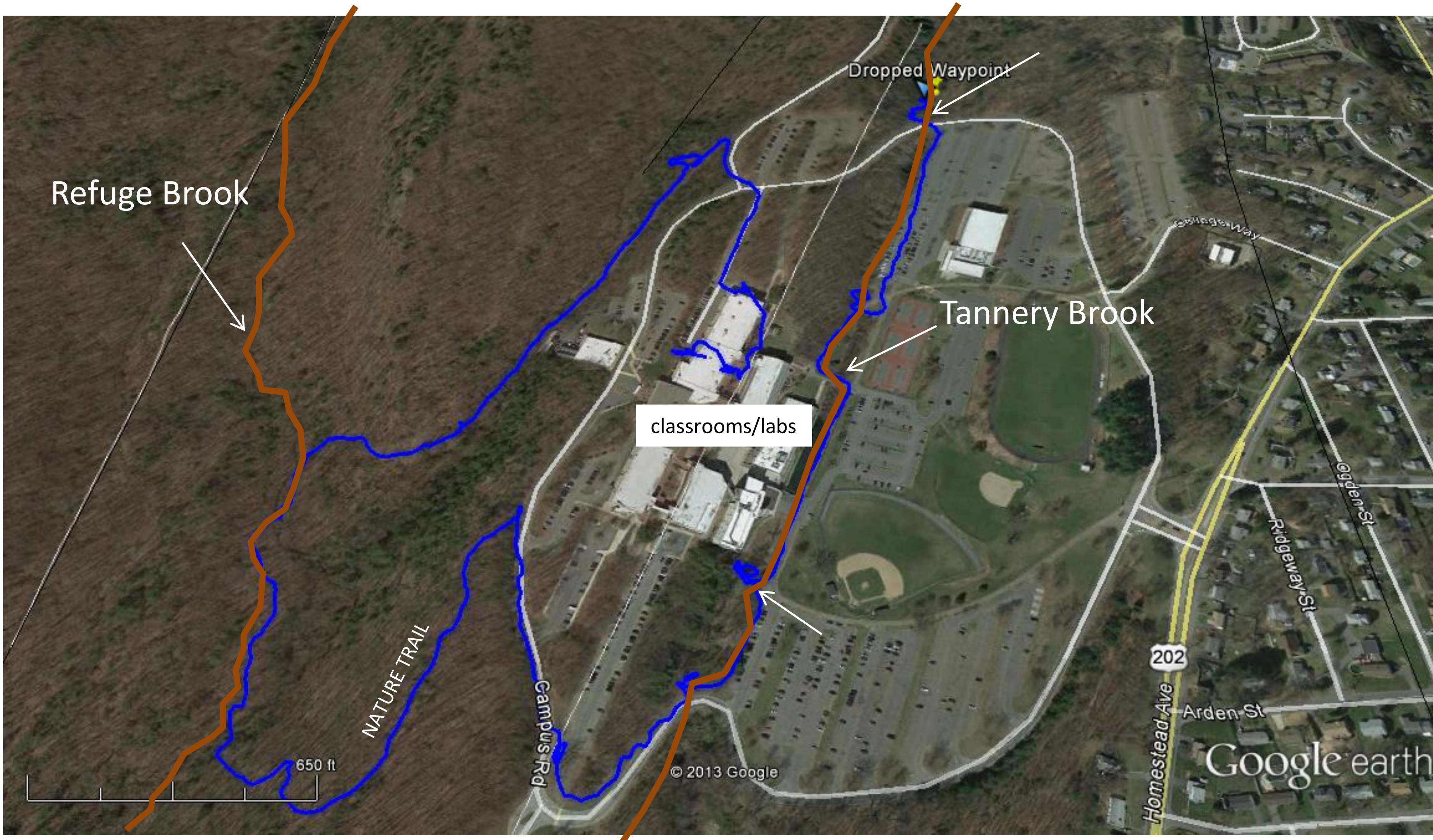


Study watersheds summary statistics

- Tannery Brook
  - Intensely developed/urbanized
  - Drains ~10% of the City of Holyoke
  - Headwaters on campus
  - Area ~2.2 mi^2
  - ~3.5 mi long; drains to the Connecticut River
- Refuge Brook
  - Undeveloped/wooded back-up water supply for the City of Holyoke
  - Headwaters in protected "refuge" adjacent to campus
  - Area ~2 mi^2
  - ~2.4 mi long; drains to an impoundment

A big plus: student easy-access

The **blue** line marks iPad/GIS track along nature trail in the Refuge Brook watershed & along Tannery Brook on campus.



Tannery Brook—on-campus

Tannery Brook—off-campus

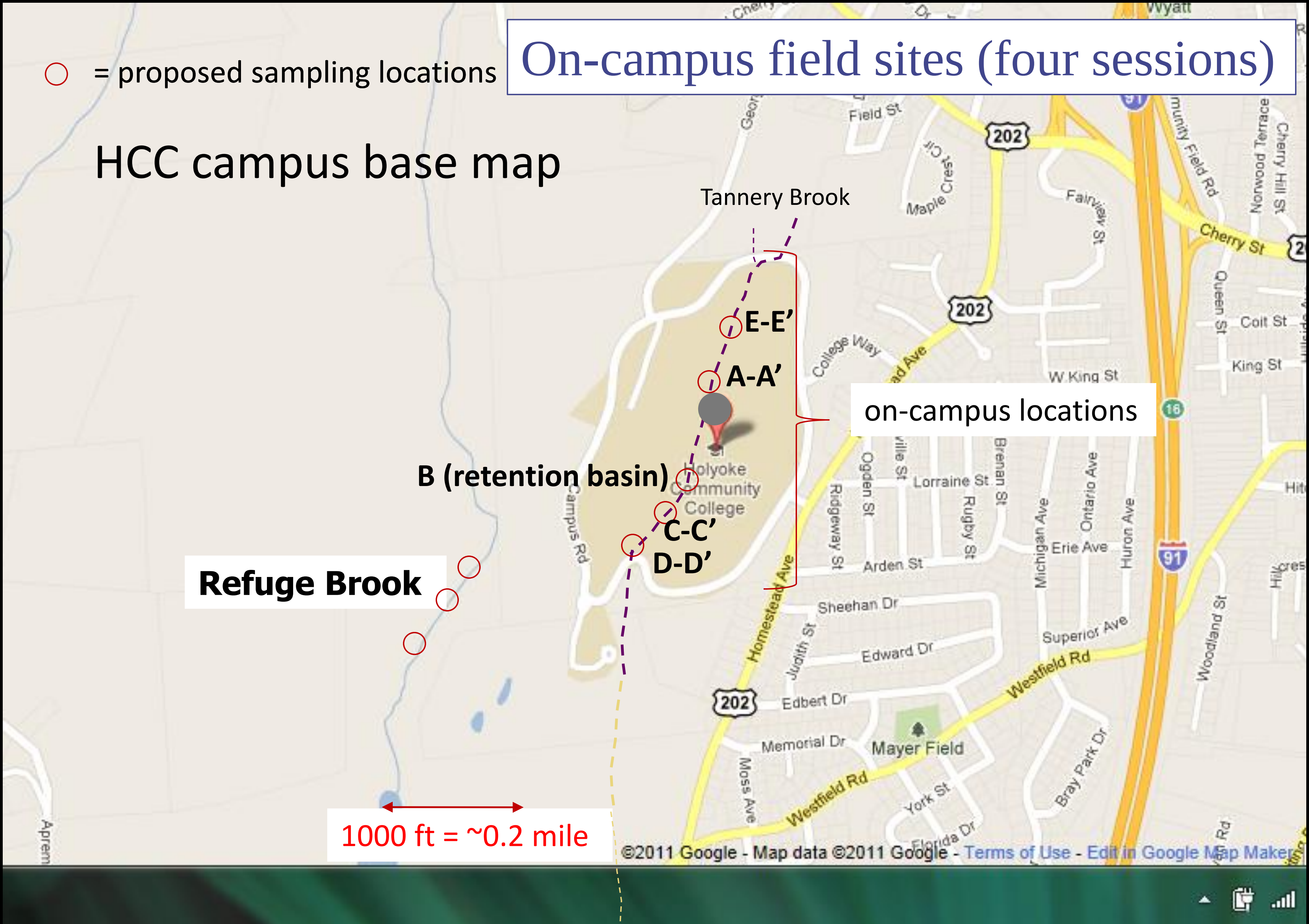
Tannery Brook—off-campus

Refuge Brook—on- & off-campus

Field work

- Maps, maps, & more maps (from itineraries)
  - Google Maps/Earth
- Student findings & trends

On-campus field sites (four sessions)



SOURCE: http://maps.google.com/maps?ie=UTF-8&hl=en&tab=wl

Off campus field sites (two sessions)

TANNERY BROOK – 10-25- & 10-28-13 SITES – base map

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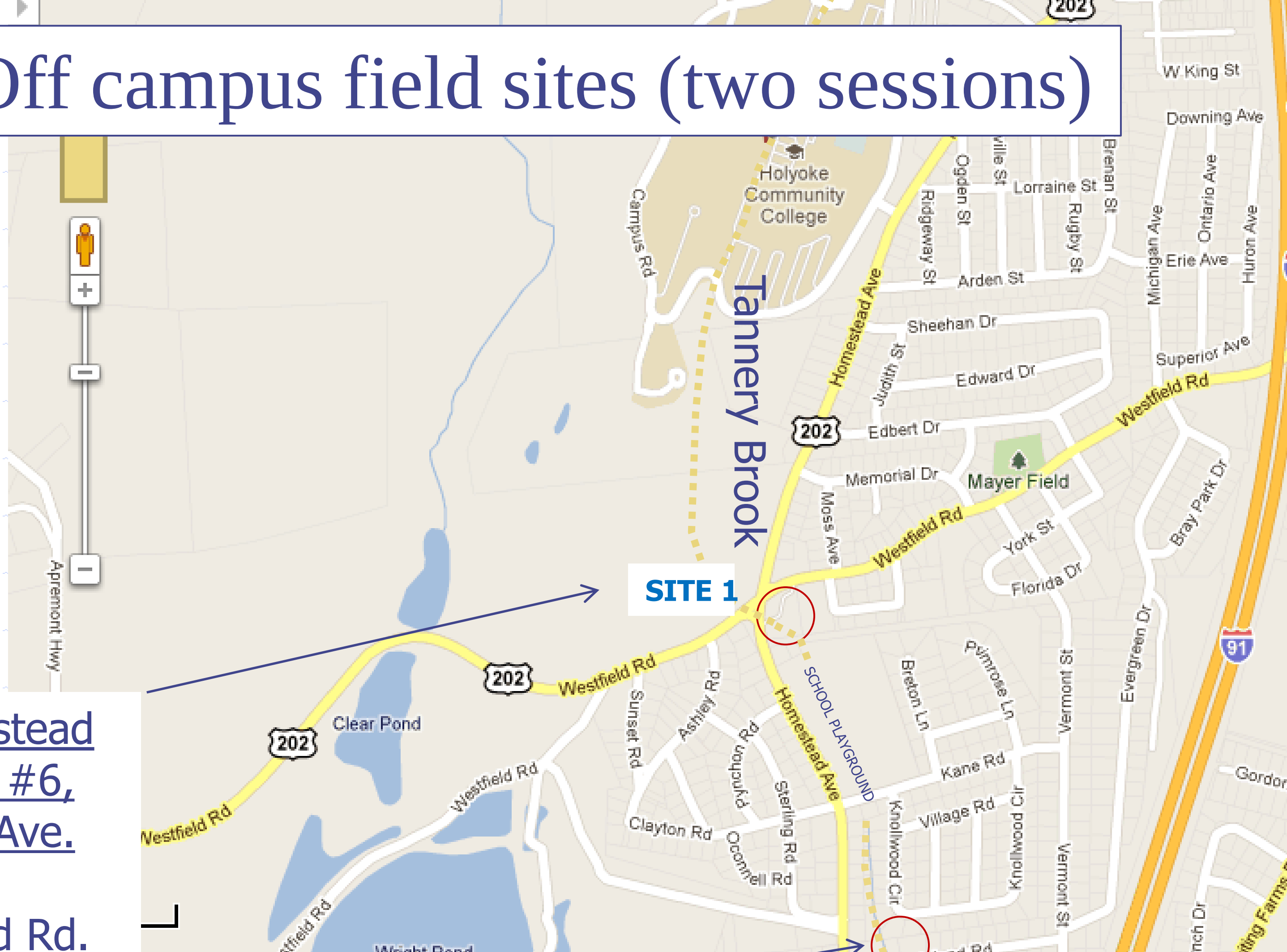


1) **SITE 1** -- Homestead Ave. Fire Station #6, 667 Homestead Ave. (2a, 8, 9, 10)

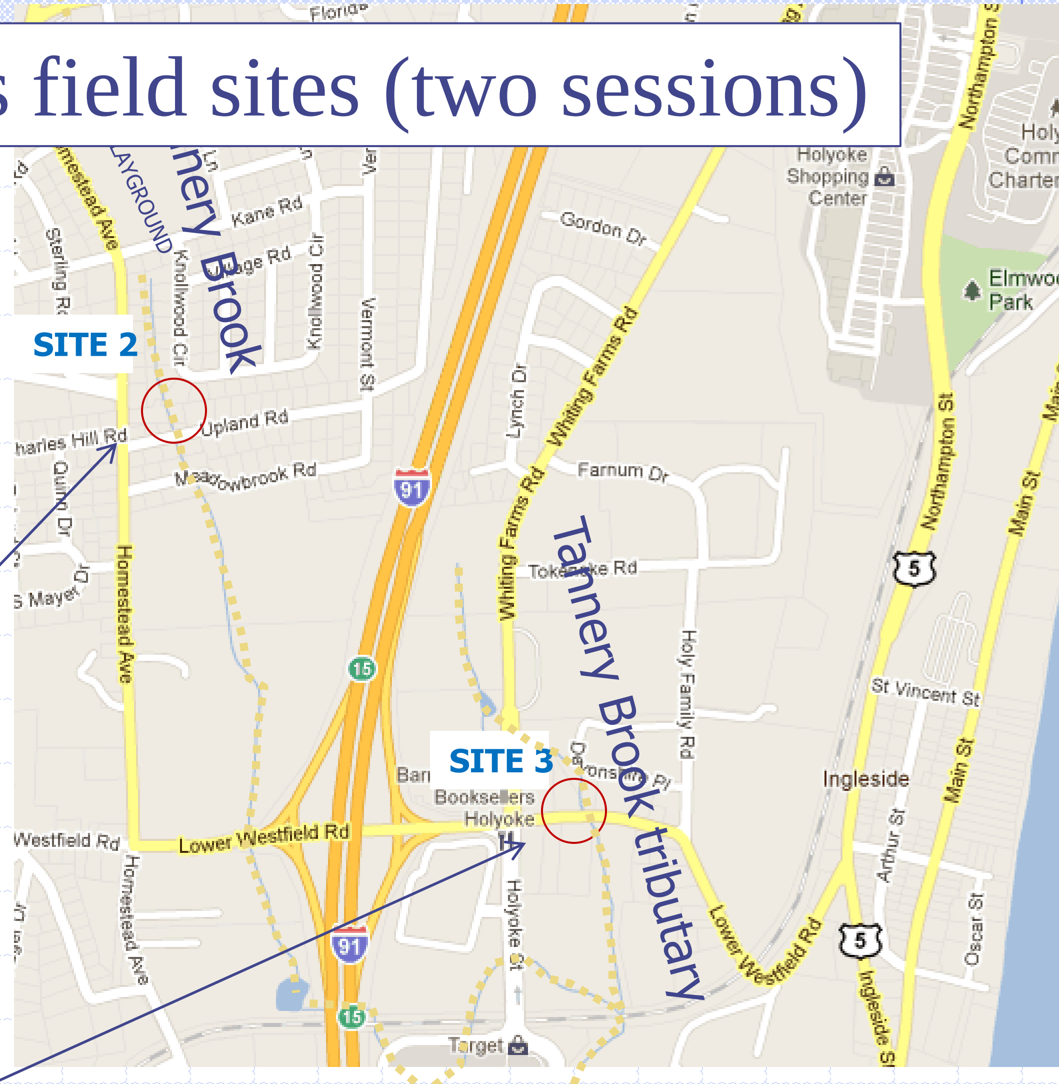
2) **SITE 2** -- Upland Rd. City of Holyoke Maintenance Garage (2a, 8, 9, 10)

1000 ft

TANNERY BROOK – 10-25- & 10-28-13 SITES – base map

Off campus field sites (two sessions)

NOTES



1000 ft

2) **SITE 2** -- Upland Rd. City of Holyoke Maintenance Garage (2a, 8, 9, 10)

3) **SITE 3 (tributary to TB)** -- Sears Auto/Brightside Mall (2a, 8 [one team only], 9, 10)

Off campus field sites (one Saturday extra-credit session)

TANNERY BROOK – 11-2-13 SITES – base map

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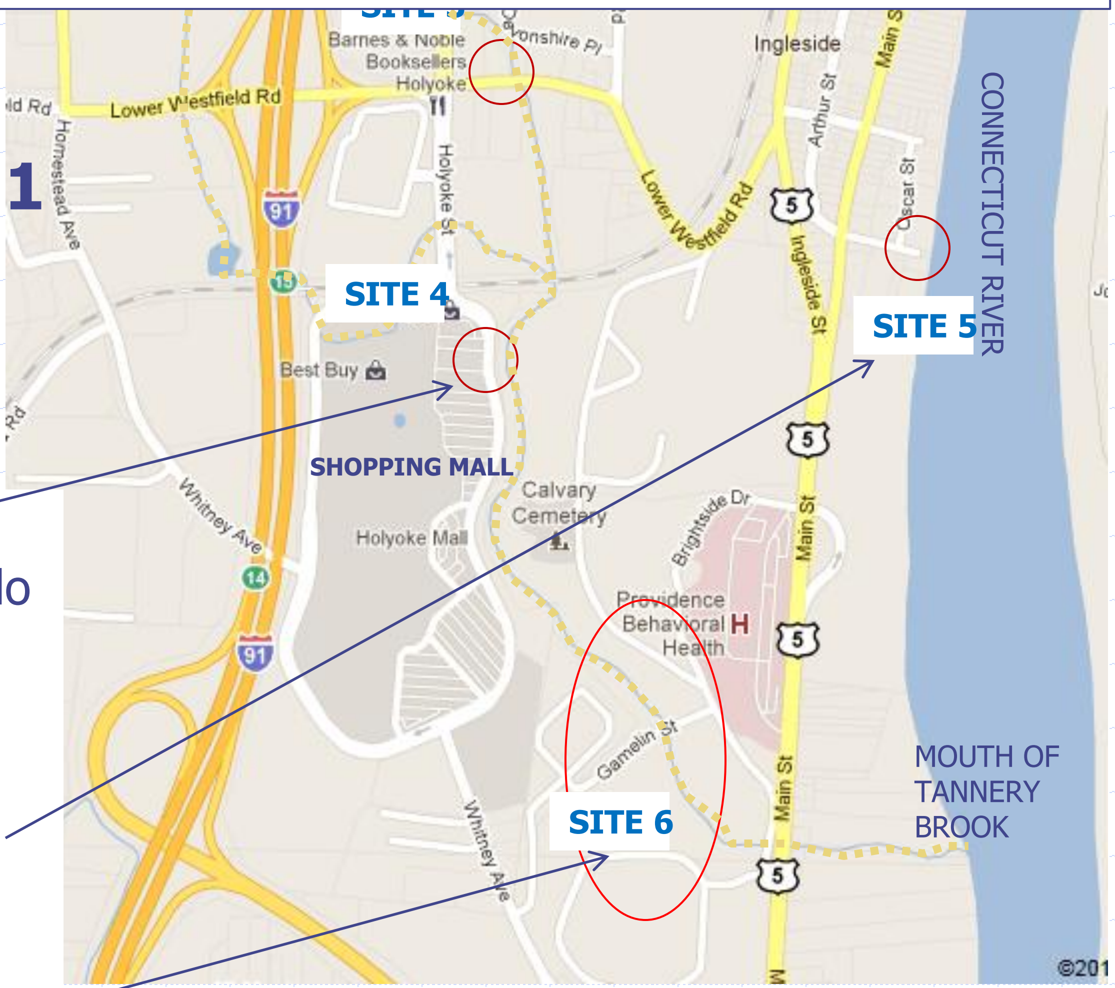
FIGURE 1



1000 ft

SITE 4 – Sisters of Saint Joseph

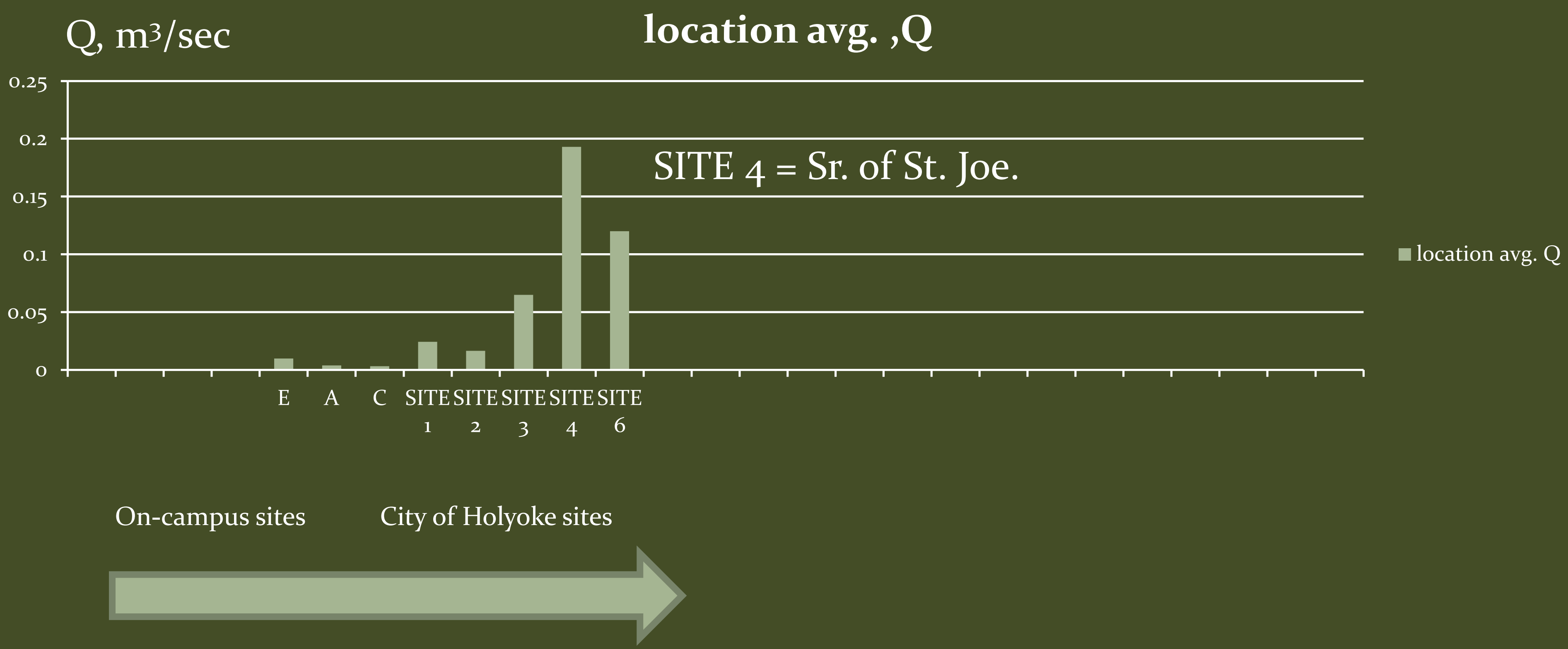
Pick one of the SUB-SITES a-d and do protocols **2a**, **8**, **9**, **10** (Figure 2) – include sub-site name on data sheets!

SITE 5 – Jones Ferry (protocol **9**) & lunch

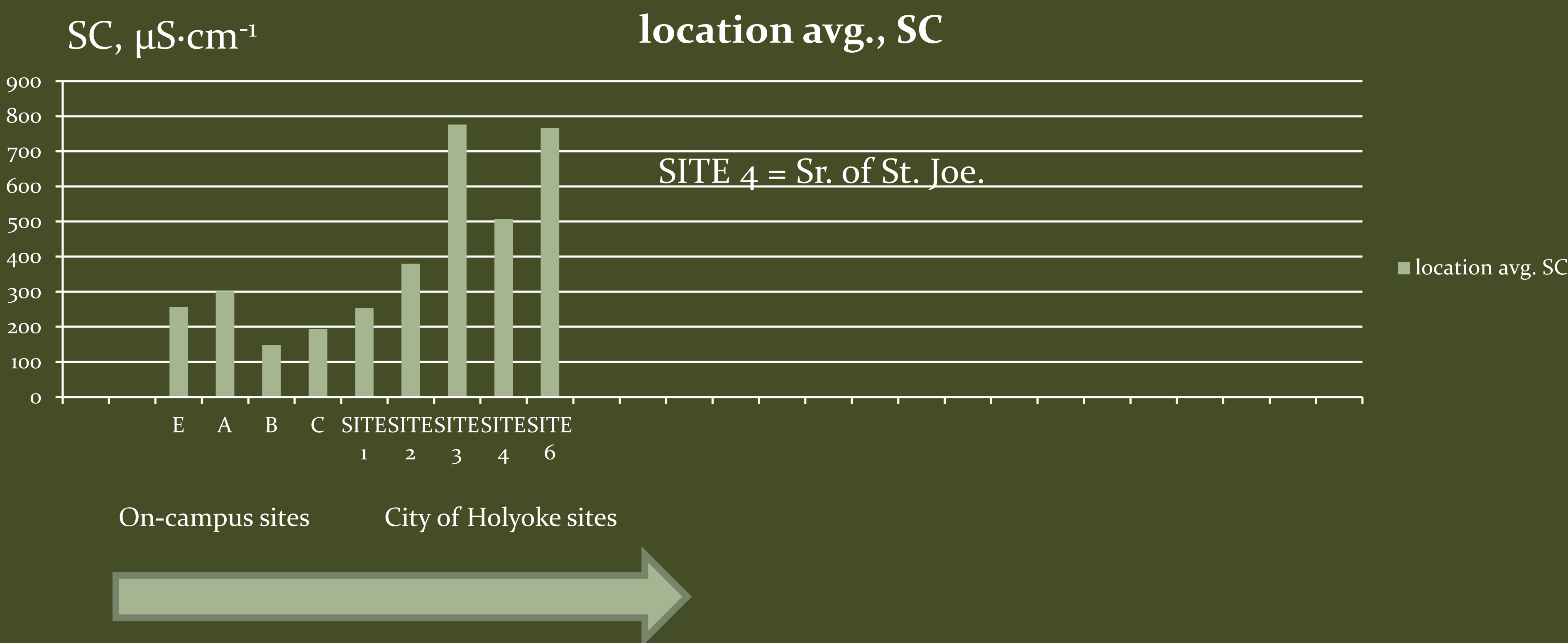
SITE 6 – Sisters of Providence

Pick two of the eight SUB-SITES (a-h) and do protocols **2a**, **8**, **9**, & **10** (Figure 3) – include sub-site name on data sheets!

Some data trends—discharge



Some data trends—specific conductance



Some data trends—total coliforms

*Too Numerous To Count

TANNERY BROOK – 11-2-13 SITES – base map

NORTH

FIGURE 1

NOTES

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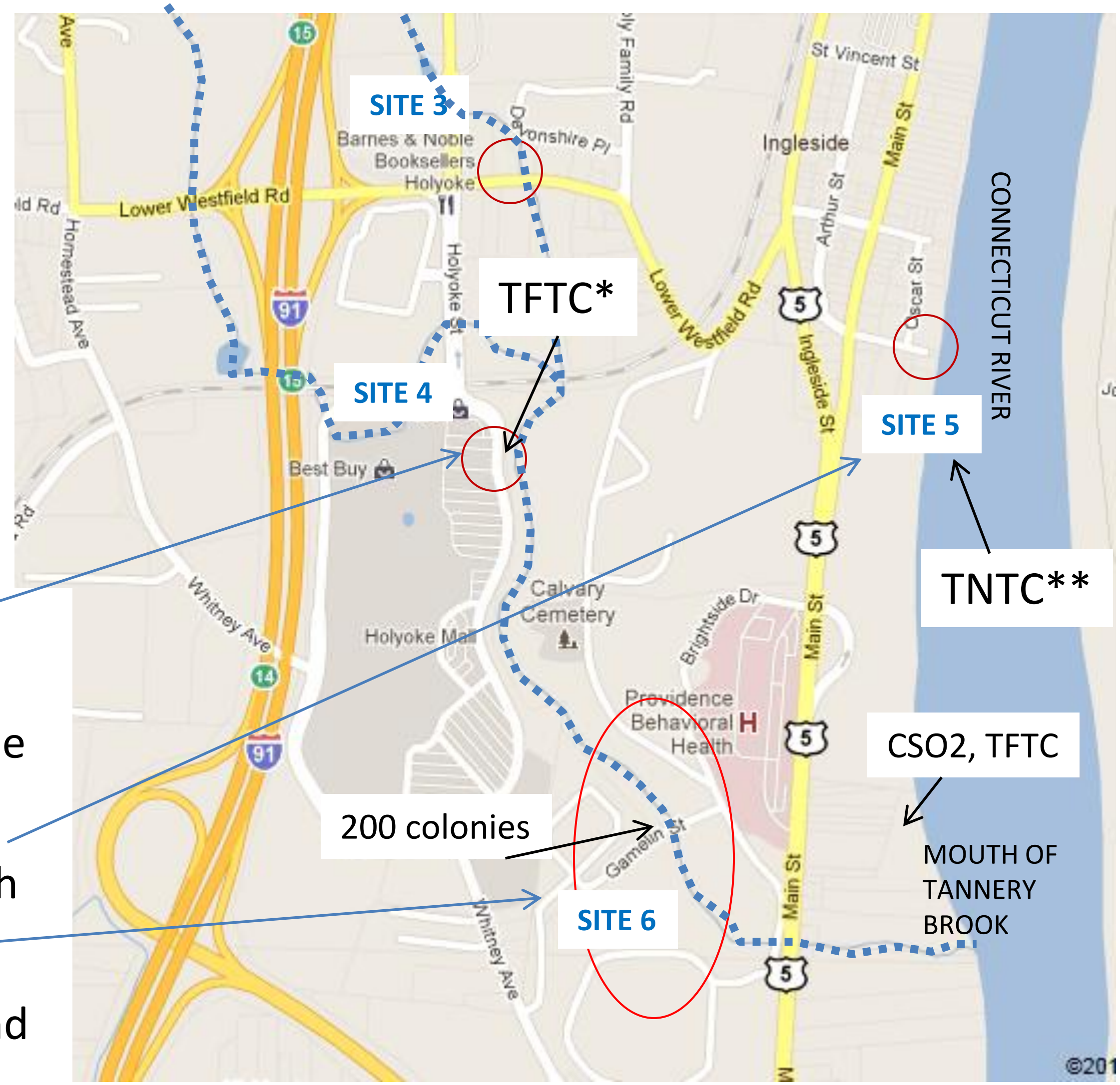


<u>SITE 4</u> <u>– Sisters of Saint Joseph</u>
Pick <u>one</u> of the SUB-SITES a-d and do protocols **2a**, **8**, **9**, **10** (Figure 2) – include sub-site name on data sheets!

<u>SITE 5</u> <u>– Jones Ferry</u> (protocol **9**) & lunch

<u>SITE 6</u> <u>– Sisters of Providence</u>
Pick <u>two</u> of the <u>eight</u> SUB-SITES (a-h) and do protocols **2a**, **8**, **9**, & **10** (Figure 3) – include sub-site name on data sheets!

1000 ft

*Too Few To Count

**To Numerous To Count

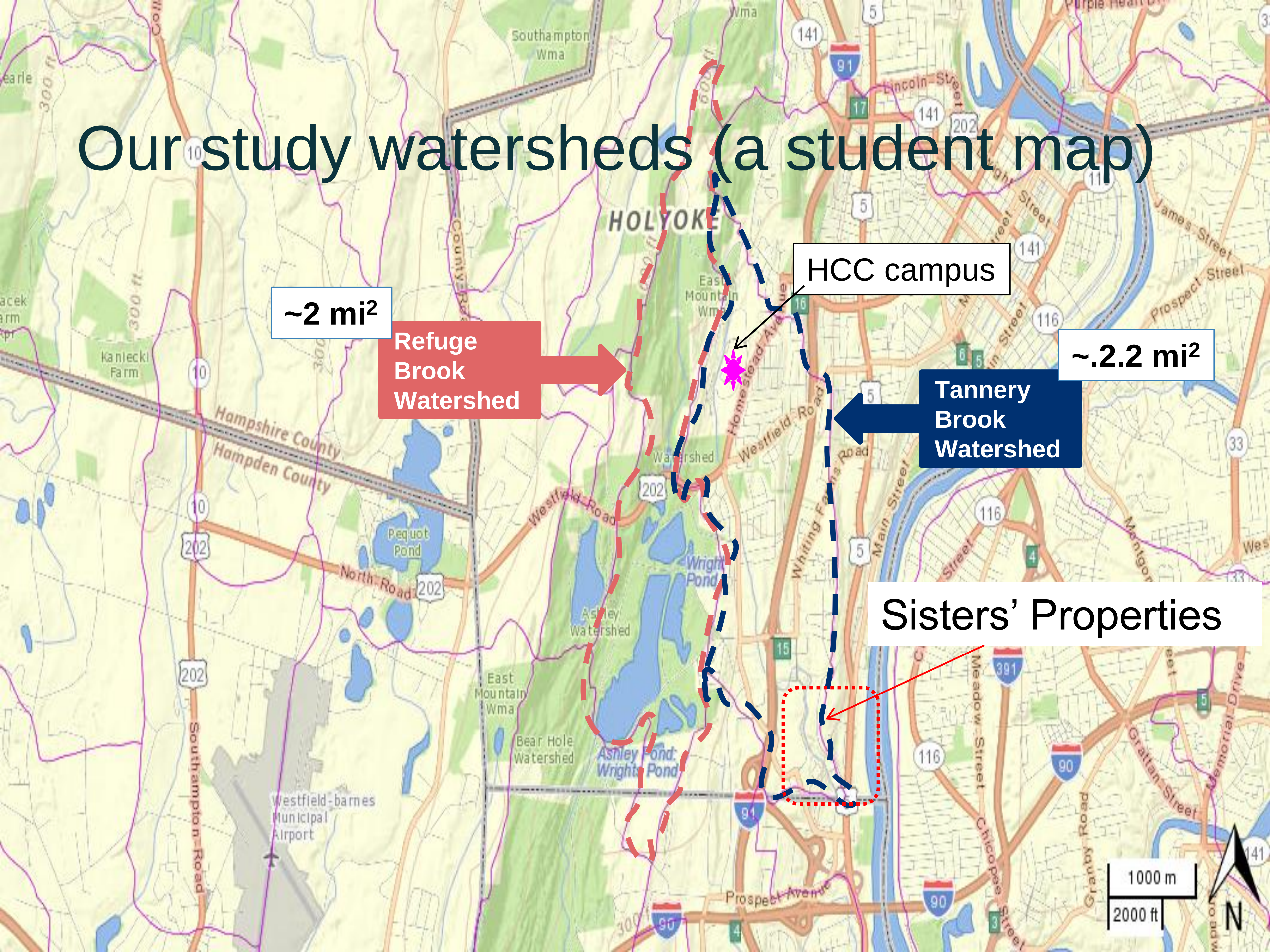
Some data trends—total coliforms

- Despite seeing large concentrations of total coliforms on campus, urban sites down-gradient of campus were less contaminated.
- The exception: Total coliforms colonies in the Connecticut River were TNTC (Too Numerous To Count).
  - CSOs? Yes, but we sampled on a dry day.

Erosion issues near the Sisters

- Erosion has been documented the #1 problem associated with Tannery Brook (*An Assessment of Urban Stream Restoration—Tannery Brook*, Nov. 1999)
- Sisters' Properties down-gradient of the shopping mall are the most impacted—the focus of my students service research.

Our study watersheds (a student map)



Erosion issues near the Sisters

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Holyoke Mall & the Sisters of St. Joseph

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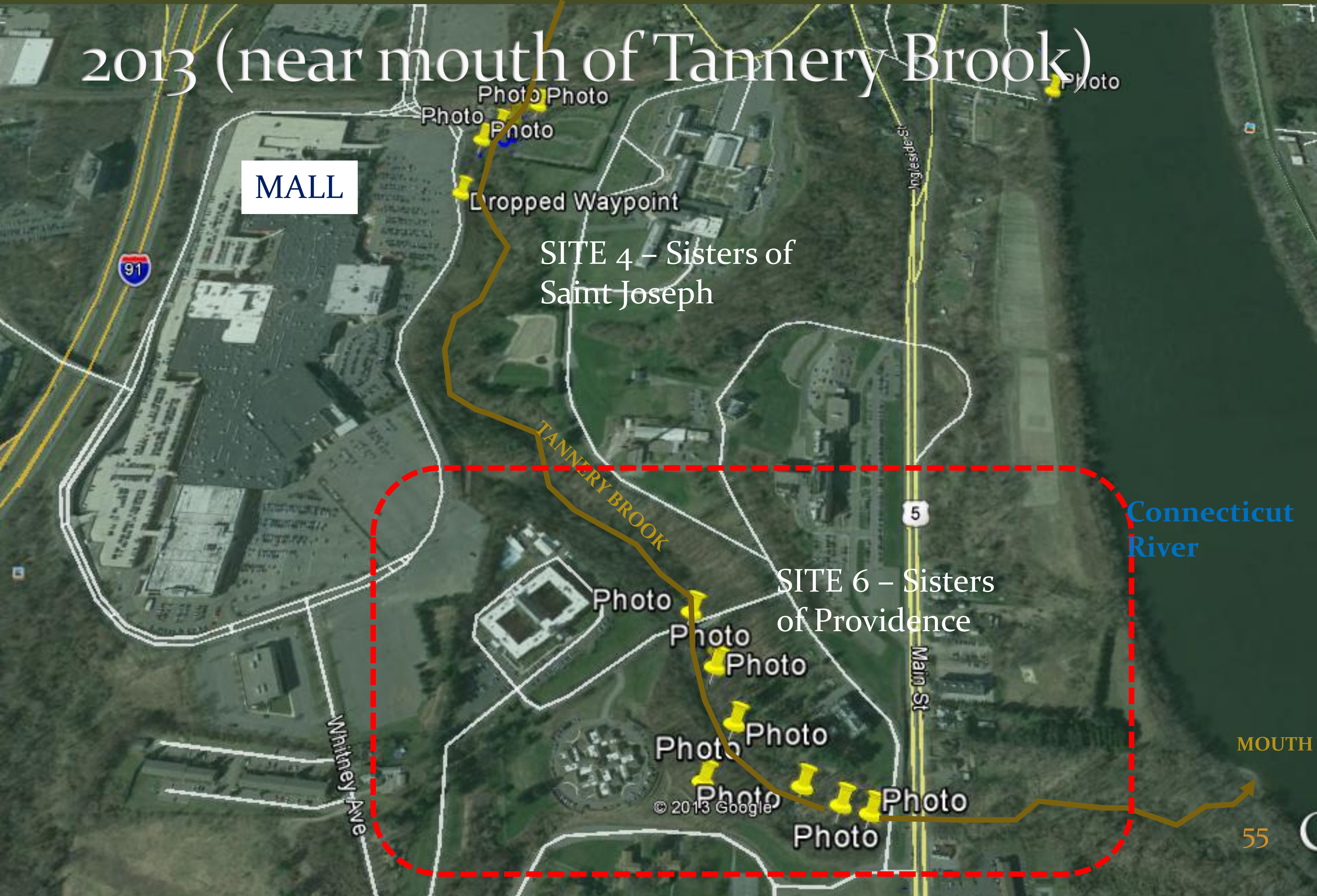
Severe erosion at Sisters of Providence 2013 (near mouth of Tannery Brook)



Some background … from MassGIS

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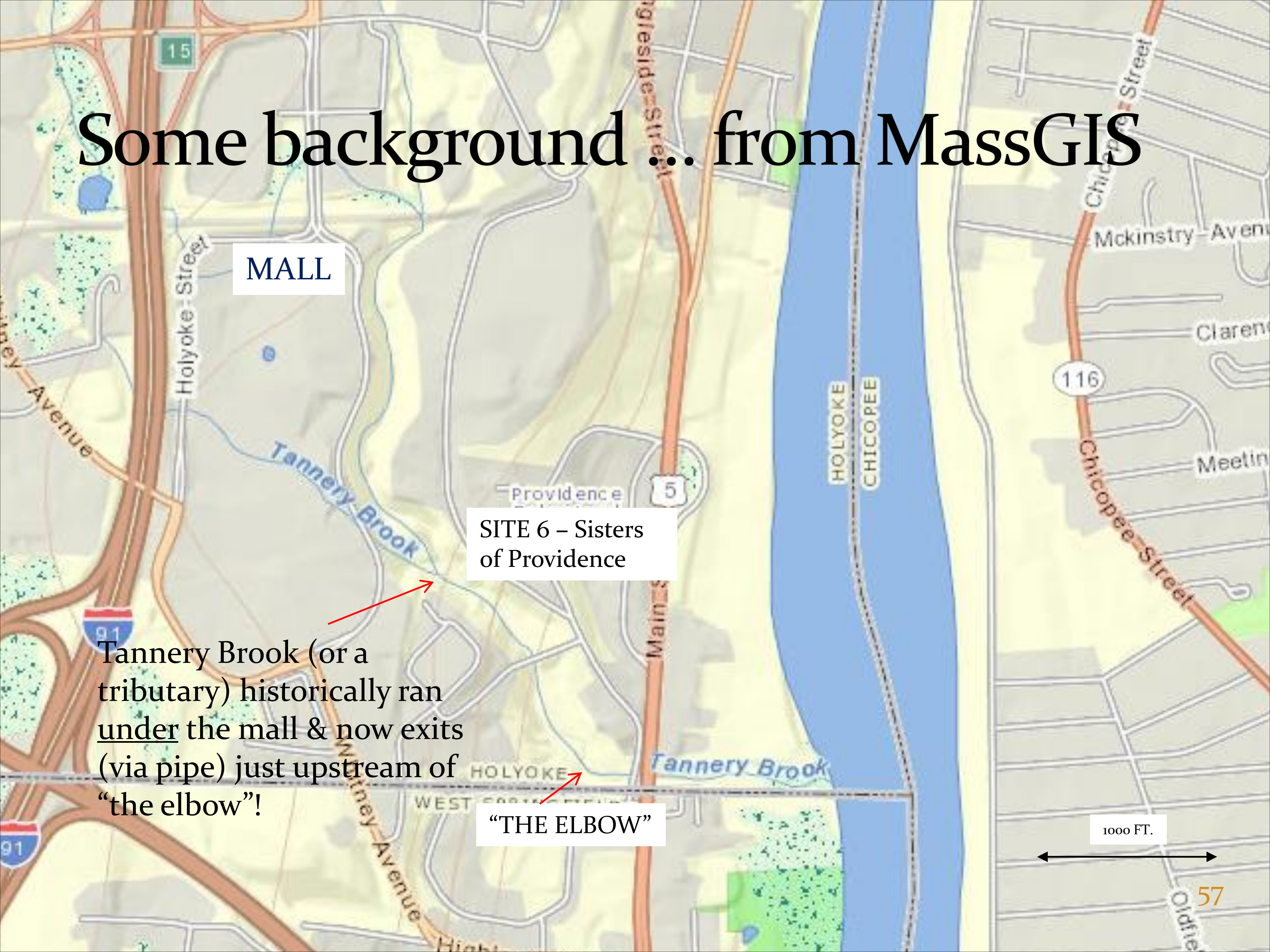

Tannery Brook (or a tributary) historically ran under the mall & now exits (via pipe) just upstream of “the elbow”!

Some background … from MassGIS

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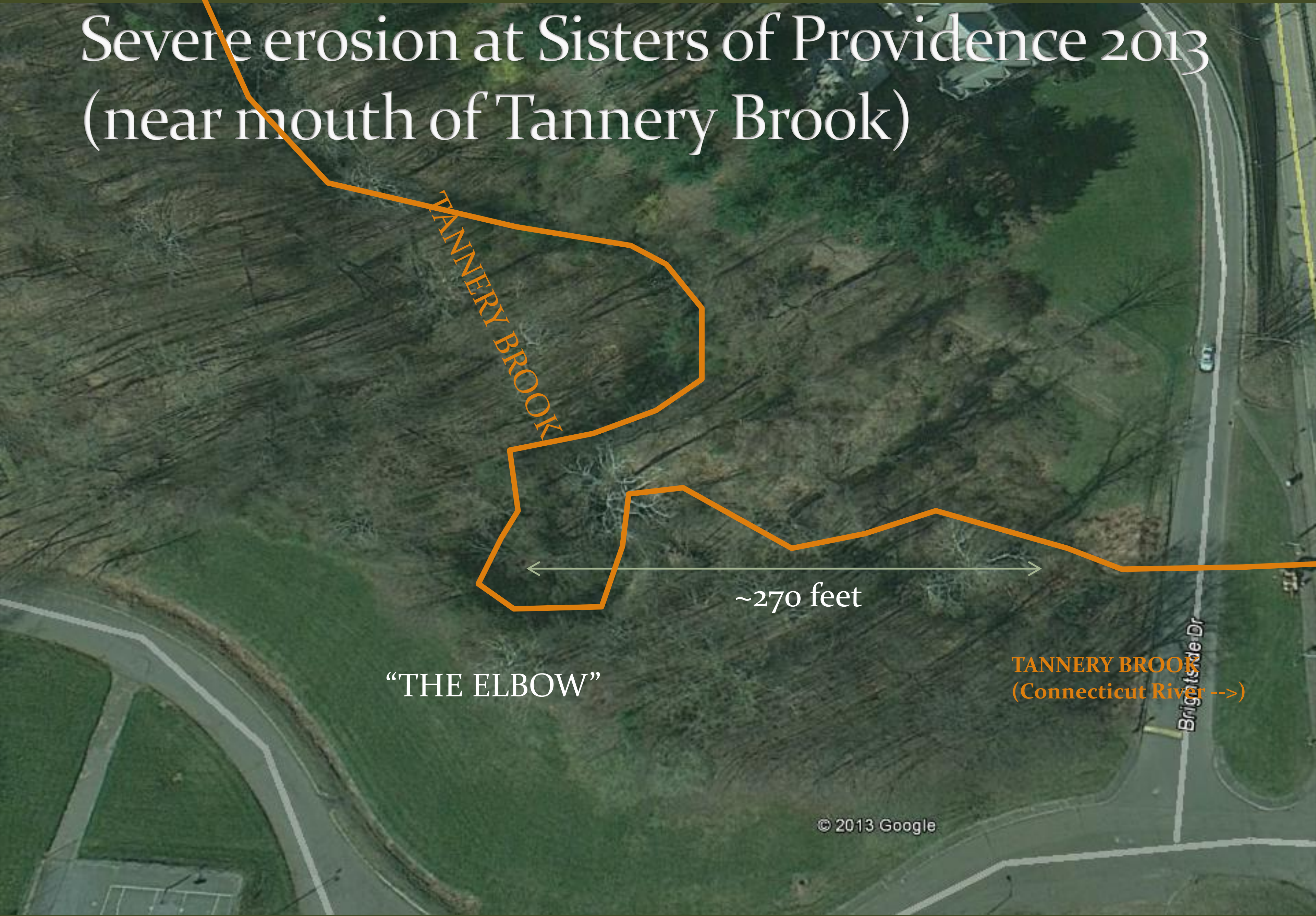
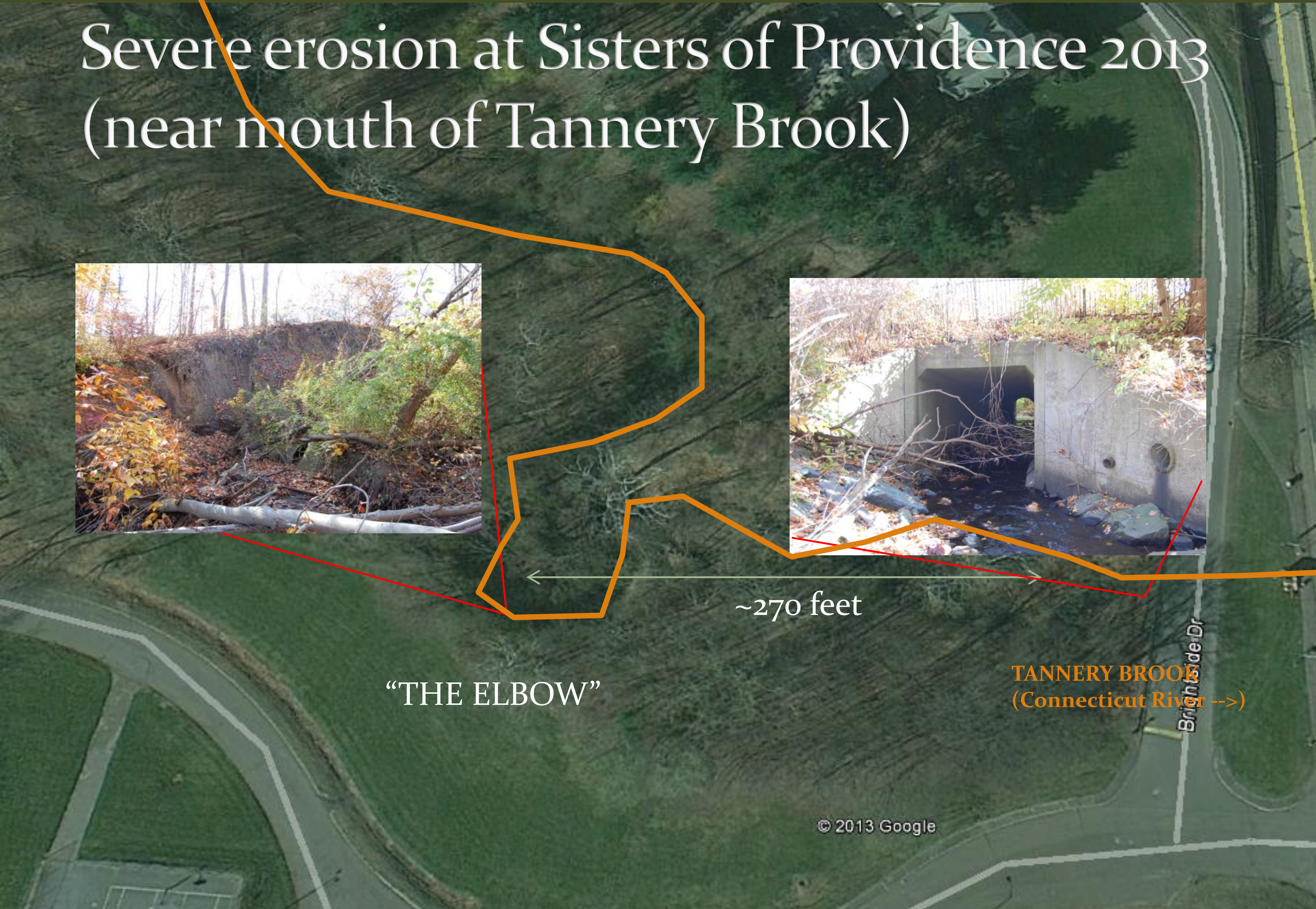


Sisters of Providence property 2012

Significant—even dangerous—erosion/mass wasting at “the elbow”

Severe erosion at Sisters of Providence 2013 (near mouth of Tannery Brook)




2013
2013
~270 feet
“THE ELBOW”
~800 lb. drainage
tile moved ~300 ft.
Brightside Dr
© 2013 Google

End-of-semester HCC SL Program survey/feedback results

Gained a lot (18 or 24%)—gain closely related to embedded geoscience curriculum

- Capacity & commitment to work collectively with diverse others to address common problems (24%)
- Desire to work in a diverse society & world to improve the quality of people's lives & the sustainability of the planet (18%)
- Find & examine research related to a social issue (18%)
- Read, write, speak, listen, or communicate effectively (18%)
- Responsibility that I contribute to solutions of social problems (18%)
- See a situation from other viewpoints (18%)
- Use critical inquiry (such as evaluating assumptions, multiple points of view, & evidence) to identify a problem, research solutions, analyze results, & make decisions (18%)
- Use quantitative reasoning to identify a problem, research solutions, analyze results, evaluate choices, & make decisions (18%)

Cooperative-learning pilot study conclusions

- I saw no obvious differences between my “control” & “treatment” groups.
- Both groups seemed to learn as much with or without targeted CoLTs.
- Further studies with CoLTs:
  - Start earlier; raise expectations; use in every lab/field session.
  - Reward more reflection.
  - Use focus groups/interviewing?

Overall conclusions

- Real-world science focused on benefits to local partners is always engaging to students & reinforces geoscience learning.
- Finding the right partner can be time-consuming.
- Embedding service learning into curriculum means making choices.
- Scaffolding is critical. Do more of it.
- Focus on cooperative learning *plus* reflection.
- Follow-up studies of "the elbow" may be of interest to not just the Sisters but the City of Holyoke.
  - How can students visualize/quantify this hazard?

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PROJECT-ORIENTED GEOSCIENCE SERVICE LEARNING: TANNERY BROOK AS URBAN LABORATORY AND SCIENCE-TEAM BUILDER