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# The Potential for Restoration of Tan Brook, an Urban Headwater stream in Amherst, Massachusetts

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# The potential for restoration of Tan Brook, an urban headwater stream in Amherst, Massachusetts

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## The Tan Brook Student Conservation Group

**MISSION:** The goal of the Tan Brook Student Conservation Group is to educate undergraduate students at the University of Massachusetts-Amherst about freshwater sustainability. To accomplish this, the group will act to provide opportunities in original research, applied field and laboratory methods, and outreach. The initial goal for the group will be a collaborative project describing the ecological, historical, and social significance of the Tan Brook, which will result in an informative website and educational signage located at several locations in the town of Amherst and on University property where the Tan Brook enters campus. Ultimately, the group will contribute to multidisciplinary projects on applied and basic research about the sustainability of freshwater resources using the Tan Brook as the focus.



Figure 1. Map of Tan Brook watershed, including Tan Brook's current flowpath

### LONG-TERM GOALS:

- Sustainability education/outreach
  - Promote the Tan Brook watershed as an outdoor classroom
  - Students will provide open source data and other materials about the Tan Brook watershed to be used in class exercises
  - Outreach activities will engage the local community about freshwater sustainability
- Original research conducted by faculty, postdoctoral researchers, graduate and undergraduate students

### Current Projects:

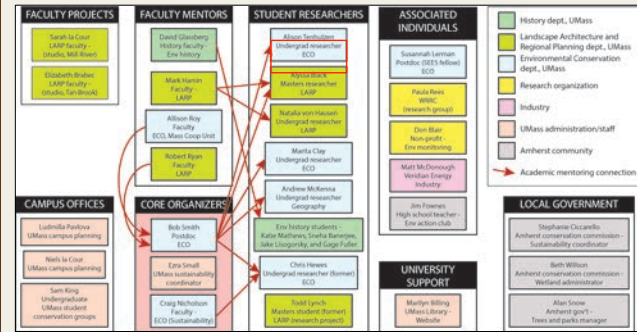


Figure 2. Participants in the Tan Brook Student Conservation Group

## Current State of Tan Brook

- Tan Brook runs through the UMass-Amherst campus and the town of Amherst
- Like most headwater streams (Elmore and Kaushel, 2008), the Tan Brook is primarily underground (73%)
- Discharges into the UMass-Amherst campus pond
- Storm water overflow diverted to soccer fields west of campus, causing erosion (see Figure 3)
- Total watershed area = 3,190,839 m<sup>2</sup>
- 45.5% of the watershed is impervious
- 83% of the watershed is developed



Figure 3. Erosion caused by flooding Tan Brook

## Objectives

- To determine the feasibility of daylighting the Tan Brook by examining the riparian land to assess what areas of the piped stream can realistically be daylighted.
- To determine if restoring the stream would result in recolonization by stream fauna by assessing the land use and locations of neighboring watersheds to the Tan Brook.

## Methods

- Used ArcGIS 10.1 to perform all land use analysis of the Tan Brook.
- Determined potential sections for daylighting by using a flow accumulation raster created from a 1/3 arc second DEM from the USGS National Elevation Dataset.

## Results and Conclusions

### 1) Standard Riparian Assessment

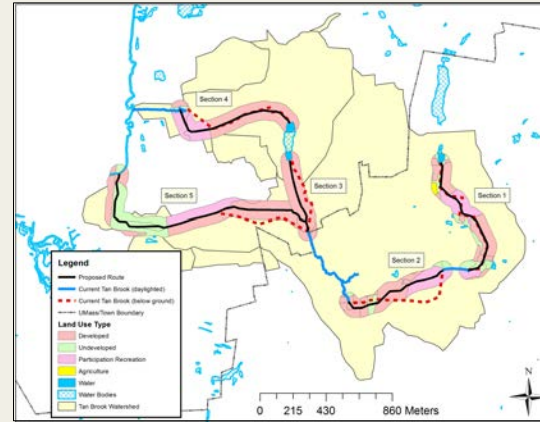


Figure 4. Land use within 200 ft. buffer of potential sections for daylighting the Tan Brook. Undeveloped land is ideal for restoring the Tan Brook, but as seen in the image, it is scarce within the buffers.

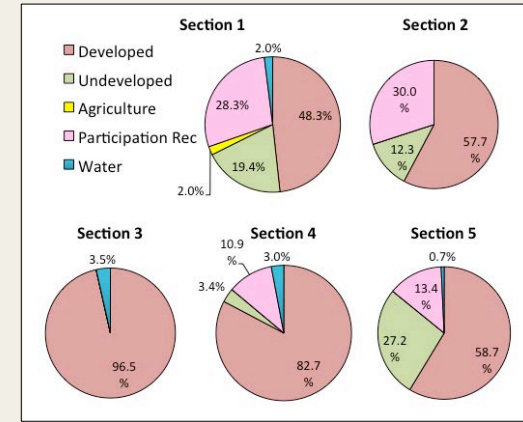


Figure 5. Land use composition of the five sections of Tan Brook that could potentially be daylighted. Section 5 is the best for restoration, but still not ideal due to the high percentage of development.

### 2) Extended Landscape Assessment

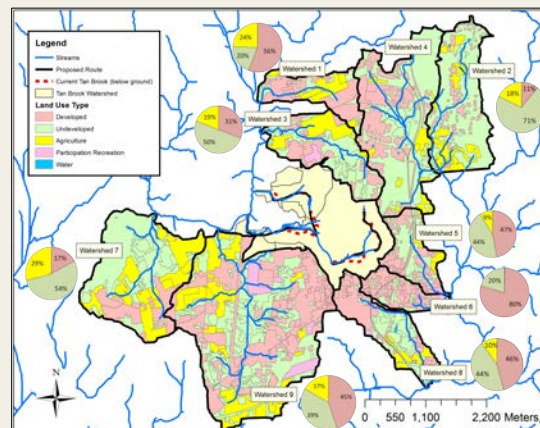


Figure 6. Land use composition of surrounding watersheds within a 2 km buffer. Watersheds of comparable size to the Tan Brook watershed were chosen for analysis. Unlike in Figure 5, participation recreation was combined with developed land for display in the pie charts.

### 1) Standard Riparian Assessment (Figures 4 and 5)

- Developed land >50% of the riparian area for 4 of the 5 underground sections.
- Participation recreation is also very common, especially on UMass's campus.
- Undeveloped land, which is ideal for daylighting the stream, ranges from 0% to 27.2%.
- Section 5 is the best for daylighting the Tan Brook, followed by Section 1.
- However, all sections will encounter substantial difficulties in daylighting.

### 2) Extended Landscape Assessment (Figure 6)

- Surrounding watersheds will act as sources for potential colonists.
- We assumed that water and habitat quality decreases in watersheds with a lot of land use development.
- Watershed 2 is the least developed (71.4% undeveloped) and likely has the best water quality.
- Watershed 6 is the most developed (83.5% developed) and potentially poor water quality.
- Watersheds 2, 4, 5, 6, and 8 are not hydraulically connected to the Tan Brook watershed, which would limit fish and swimming macroinvertebrate colonization.

### Overall Conclusion

- Restoration is infeasible for buried headwaters
- We believe that a multidisciplinary approach examining conservation strategies that combine academic, local government, and local community interests is required to sustain urban headwater streams like the Tan Brook.

### Acknowledgements

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