

Japanese Knotweed Inventory of Selected Tributaries
of the Deerfield River

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Introduction

Japanese Knotweed or Japanese Bamboo (*Polygonum cuspidatum*) is a native of China, Japan and Korea (<http://webapps.lib.uconn.edu/ipane/>). It was introduced into the United States during the late 1800s. In its natural geographic area, knotweed is the dominant pioneer species on volcanic slopes and grows in other open and disturbed habitats (Seiger 1992).

In North America, Japanese Knotweed grows primarily along river banks, and in wetlands, disturbed areas (roadsides, rights of way), agricultural fields, and yards and gardens. This species thrives in a variety of soil types and moisture regimes, and tolerates low pH (Seiger 1992). The amount of sunlight available to plants appears to be an important limiting factor (Beerling 1991 *in* Seiger 1992). Plants in shady sites exhibit slower growth rates and smaller size.

Because of its rapid growth rate, ability to tolerate a wide range of environmental conditions, and difficulty removing it, Japanese Knotweed is considered an invasive species in the region (Benoit and Goettel 1999). *P. cuspidatum* was recently listed as an invasive species by the Plant Evaluation Subcommittee of the Massachusetts Invasive Plant Working Group in March, 2003.

The Deerfield River Watershed Association (DRWA) completed surveys for knotweed on eight tributaries of the Deerfield River between April and June, 2003. Knotweed plants were found growing on the stream banks of seven of eight streams. Tannery Brook, located in Savoy Mountain State Forest, was the only site that appeared free of this species. Several rivers and streams had severe infestations: Clesson Brook, and the Chickley, Green, and South Rivers. Fourteen volunteers participated in the project and Project Staff conducted surveys on sections of the Clesson Brook, Green River, and South River.

Methods

In April, eight tributaries of the Deerfield River were checked to determine suitability for the project: Avery Brook, Bear River, Chickley River, Clesson Brook, Green River, Sanders Brook, South River, and Tannery Brook. Suitability was based on ease of access (roadside or away from roads), ownership (private, state or town-owned; land posted, etc.), and safety (steep banks, degree of isolation from nearest roadway). After each tributary had been evaluated, we decided to include all eight, provided we were able to recruit an adequate number of volunteers. We added several sites to the minimum of two tributaries required by the RFR because of several factors. During preliminary field checks of rivers, we found knotweed at most sites. Knotweed stalks from the previous growing season were evident, even after the high snowfall during the previous winter. If additional streams were surveyed, we would have a better idea of the extent of the knotweed infestation in the watershed. However, we would have less coverage at each stream. In addition to volunteers, there were two staff members available to conduct surveys. We also found that access was easier than expected at many sites because roads or trails were located next to most rivers and streams.

After volunteers had signed up for the project, the Project Manager designed the training sessions. Each session lasted from 3-4 hours and consisted of an indoor and outdoor (or field) component. The indoor session included background on invasive plant identification and ecology, threats to native species from invasive plants, and an explanation of survey methods. Participants were then taken to a site on the Green River where knotweed had previously been found. Instructors explained survey methods in more detail and conducted a practice survey. Volunteers were then given their river or stream assignments.

Knotweed surveys were conducted on foot or by canoe. At most sites, surveyors walked along the stream bank and searched for knotweed. The area included in surveys was the stream channel and the area approximately 15 m (50 ft) from the channel edge (perpendicular to the channel). This width (15 m) was chosen because it includes the stream bank of most, if not all, rivers and streams in the area. When knotweed plants were found, the latitude and longitude was recorded using a GPS unit. If the knotweed was distributed in a continuous patch more than 30 m (100 ft) up or downstream, the surveyor took readings at both ends of the infestation.

Data collection was divided into two parts. One side of the data sheet contained a copy of the first page of the Invasive Plant Atlas of New England's (IPANE) Survey Form (Terrestrial Version 10/09/02). The second side was designed by the DRWA specifically for knotweed observations. Data collected for IPANE included: general location (state, county, town), date of observation, location of infestation, coordinates determined with a GPS unit, altitude, habitat type, canopy closure, aspect, and soil moisture. Data collected for the knotweed section included: name of river or stream, width of stream where infestation was observed, landowner (if known), approximate size of infestation, distribution of plants (e.g., single plants or patch, multiple patches, etc.), and other invasive plants observed. Appendix A contains a copy of both data sheets. Surveyors also recorded the location of the beginning and end of each survey so that we could determine the total length of stream bank that was searched for knotweed.

Results and Discussion

Data Collection and Quality Control

Fourteen volunteers and two biologists conducted surveys on all or portions of eight rivers and streams. Survey coverage varied from a low of 23 % for the Bear River to 100% for Tannery Brook (Table 1). At the majority of streams at least 45% of the stream bank was surveyed for knotweed. Lower coverage was usually the result of a lack of volunteers for the particular site (Chickley and Bear Rivers) or difficult access (Bear River, Sanders Brook).

We checked volunteers' data sheets for errors and omissions as soon as possible after we received them. Volunteers were contacted if a problem was found. Most volunteers had few or no problems with either survey techniques or data sheets. Project staff was available to answer questions and provide help with plant identification, equipment problems, etc. throughout the survey period (May and June).

We added four new habitats to the first page of the data sheet: (1) stream channel; (2) floodplain dominated by shrubs, herbaceous forbs, and/or saplings; (3) island within the river channel; and (4) disturbed area (included fill pile, rip-rap slope, dump site). These habitats were included only under Other habitat (34) on IPANE’s Survey Form and were identified as separate habitats in the knotweed spreadsheet.

TABLE 1: Total length of each river or stream and total length of area surveyed for Japanese Knotweed for eight tributaries of the Deerfield River, May and June, 2003.

Stream or river surveyed	Length of stream surveyed (km)	Total length of stream (km)	Proportion of stream surveyed
Avery Brook	7.9	8.5	93%
Bear River	3.4	15.1	23%
Chickley River	7	21.9	32%
Clesson Brook	13.7	19.6	70%
Green River	15.7	32.4	49%
Sanders Brook	2.9	6.2	47%
South River	13.7	29.7	46%
Tannery Brook*	2.1	1.3	100%
Total	66.4	134.7	49%

*Tannery Brook: Length of stream surveyed is greater than total length because part of Gulf Brook was included.

Spreadsheet Design and Map Production

The data collected during surveys was entered into an Excel spreadsheet. The spreadsheet contains all the information collected during surveys, including the latitude and longitude for knotweed locations, survey dates, characteristics of each infestation, reporter, etc. The location of each knotweed observation, using latitude and longitude, was also entered into a mapping program (Terrain Navigator 2003; www.maptech.com). These maps are contained in Appendix B. Some rivers and streams are represented on more than one map to ensure adequate resolution.

Observations of knotweed were mapped in two ways. (1) A blue circle denoted patches or plants that occurred in less than 30 m (100 ft) of stream bank, channel area, or island. (2) If the knotweed infestation was spread over greater than 30 m of stream bank (channel, or island) the location was illustrated with a red line. A yellow line was used to illustrate the area surveyed on a river or stream. A pink “S” and “E” denoted “start of survey” and “end of survey”.

In most cases the representation of each knotweed infestation (in latitude and longitude) in the spreadsheet is identical to the map location. However, we found several inconsistencies

between the GPS readings on the datasheet and the actual location on the topographical maps. Corrections were made to the original GPS location in the following circumstances: (1) The volunteer wrote down the wrong GPS location. When this occurred, it was usually obvious which part of latitude and longitude was incorrect; therefore, we corrected the numbers on the datasheets, in the spreadsheet, and on the maps. (2) The GPS reading was off by a small margin, which resulted in knotweed locations outside of the stream bank area. When this occurred, we corrected the error manually on the map only. These errors were most likely due to dense canopy cover and/or the built-in error within GPS units. (3) Knotweed locations were too close together in the field to locate on maps because of scale. If two or more knotweed locations were too close to show on a map, one was deleted. However, the deleted location remained in the spreadsheet. If a strip of knotweed was not long enough to illustrate on the map, we showed it as a blue dot instead of a red line.

Survey Results

(1) Avery Brook:

Avery Brook is a small tributary of the Deerfield River that begins east of Heath Center and west of Burnt Hill and flows approximately 8.5 km to its confluence with the Deerfield River in Charlemont. For most of its length, the brook runs adjacent to Avery Road. Canopy closure is high along the majority of the stream bank, except where it enters the Deerfield River. The width of Avery Brook varies from 1.0 to 2.0 m, therefore the volunteer was able to survey both sides. Most of Avery Brook was surveyed for knotweed.

Japanese Knotweed was found at only two locations (Appendix B, Figure B-1). The upstream location consisted of a strip approximately 565.5 m long running between the road and stream. The second patch was found at the mouth of Avery Brook. This infestation was comprised of dense, thick patches of knotweed which were connected to the infestations on the Deerfield River.

(2) Bear River:

The Bear River begins north of the Buckland/Ashfield border, south of Mary Lyon Hill. It flows through both forested and open habitats for approximately 15.1 km before entering the Deerfield River in the South River State Forest in Conway. Approximately 3.4 km of the Bear River was surveyed (Figure B-2). Because this river flows mostly through private property and away from roads, access was not as easy as at other sites. The Bear begins as a small, first order stream, and widens to 6.0-9.0 m downstream of the Pfersick Road crossing. During an initial field check of the Bear River, no knotweed was observed in the section that runs parallel to Barnes Road in Ashfield. However, approximately 8.5 km downstream of the headwaters, several patches of knotweed were found. Both sides of the river were surveyed, but in most cases infestations were confined to one side. Within this 3.0 km section (from the Pfersick Road crossing to the Shelburne Falls Road crossing), several dense patches of knotweed were observed. These were confined primarily to a 645 m area east of

Pfersick Road. A second section was surveyed, starting at the confluence of the Bear River with the Deerfield and 400 m upstream. This area consisted of steep banks and heavily forested habitat. However, three separate infestations were found, all growing in greater than 50% canopy closure and ranging from patches to sparsely distributed plants.

(3) *Chickley River:*

The Chickley River begins in Savoy Mountain State Forest and flows approximately 22 km before entering the Deerfield River in Charlemont. For about half its length the Chickley runs adjacent to Rte. 8A. Knotweed was found growing abundantly in a section that flows along Rte. 8A, between West Hawley and southwest of Forge Hill (Figure B-3). However, no knotweed was observed in the section between West Hawley and the Brown Brook entrance. Approximately 7 km of the Chickley River was surveyed. The headwater area (upstream of Brown Brook) was not surveyed.

(4) *Clesson Brook:*

Clesson Brook flows for about 20 km through open and forested habitats before entering the Deerfield River in Buckland. For most of its length, the Clesson runs adjacent to or close to roads; Buckland Road (first section) and Rte. 112 (last section). Approximately 70% of Clesson Brook was surveyed (Figures B-4, 5). Little knotweed was found in the upper section, between Cox Pond and upstream of the Cooley Brook entrance. However, knotweed was observed growing in an almost continuous strip between Buckland Four Corners and the confluence with the Deerfield River.

(5) *Green River:*

The Green River, at almost 32.5 km (Massachusetts section only), was the longest river surveyed. Unlike most of the rivers surveyed for this project, the Green begins in Marlboro, Vermont, and flows approximately 29 km before entering Massachusetts in Colrain. For most of its length, the Green flows adjacent to paved and unpaved roads.

About 50% of the Green River's Massachusetts' section was surveyed (Figures B-6-8). Knotweed was found in all survey areas but the abundance varied with location. In general, upstream of West Leyden knotweed was found in small patches and single plants. Downstream of where Workman Brook enters the Green, knotweed patches increased in both number and density. Similar to what was observed on Clesson Brook, knotweed patches were almost continuous and dense between the Rte. 2A bridge, in Greenfield, and where the Green enters the Deerfield River.

(6) *Sanders Brook*:

Sanders Brook is located in H. O. Cook State Forest in Heath. The brook begins as a small wetland in southern Vermont and flows approximately 6.2 km to its confluence with the West Branch of the North River at the Adamsville Road crossing. The volunteers were unable to survey the lower section of the Sanders due to access issues. Sanders Brook runs through a very steep section of terrain that was difficult to access safely. The area at the brook's mouth is posted.

No infestations of knotweed were found in the upper section of the brook (Figure B-9). Surveyors located a small patch at the brook's confluence with the North River. It appears likely that this patch came from the West Branch of the North River, where many large infestations were observed along the river's banks and adjacent to Adamsville Road.

(7) *South River*:

Approximately 40% of the South River's 30 km length was surveyed (Figures B-10-12). The South drains Ashfield Lake and flows through Ashfield and Conway before entering the Deerfield River in the South River State Forest. Very little knotweed was found between where the river exits Ashfield Lake to the Bullitt Road crossing. Several kilometers of stream bank were surveyed in the mid-section of the river, upstream of Burkville, and several infestations were found. The third section surveyed, upstream of where the South River empties into the Deerfield River, had dense and abundant patches of knotweed.

(8) *Tannery Brook*:

Tannery Brook is located in Savoy Mountain State Forest. It enters the Gulf Brook (a tributary of the Cold River) after flowing 1.3 km. Tannery Brook is a small, first order stream that flows through forested habitat at approximately 450 m elevation. Most of the brook was surveyed, except the upper portion at Tannery Falls (Figure B-13). At the Falls area, the volunteer surveyed the Ross Brook tributary. A small portion of Gulf Brook, from its confluence with Tannery Brook and downstream about 600 m, was also surveyed. No knotweed was found at any of these sites.

Project Outreach

To provide information to the public on the identification of invasive plants and their effects on natural communities in the Deerfield River watershed, we designed articles for the DRWA website (www.deerfieldriver.org/invasives.html) and the newsletter, *Deerfield River Current*. The website article, *Invasive Plants: An Increasing Problem in the Deerfield River Watershed*, provides the reader with a general background on the ecology of invasive plants, contains a list of invasive plants that can be found in the watershed, and discusses what individuals can do to prevent the spread of non-native, invasive plants. This section of our website will be updated on a regular basis to keep the public aware of new threats and issues

related to this important subject. We are currently adding digital photographs of selected invasive plants to the website. We have also published an article in the Summer issue of the DRWA newsletter that contains the results of the Japanese Knotweed inventory.

Project Summary and Management Recommendations

Japanese Knotweed infestations were abundant and well-distributed in the riparian areas associated with several rivers and streams in the Deerfield River watershed. Sites with little or no knotweed, e.g., Sanders and Tannery Brooks, were located in isolated areas and away from roads. At several rivers and streams, upstream sections had few infestations (Clesson Brook, South River) or none (Chickley River, Avery Brook); whereas the downstream areas had severe or moderate infestations. This pattern was not unexpected.

The Green River was the only site that had infestations along its entire length. Knotweed infestations were common in the Massachusetts section because of colonization from upstream sources in Vermont. In addition, a majority of the river flows next to roads. We observed that knotweed infestations were more abundant on rivers and streams located adjacent to roads, probably because both the increased disturbance to the river bank and increase in light levels may favor the establishment of knotweed colonies.

Knotweed Removal Efforts

Knotweed removal is currently a time-consuming and expensive endeavor. Given these constraints, we recommend that removal efforts take place in areas that are more accessible and have smaller infestations. These areas would include sections of the following rivers and streams:

- Avery Brook: south of the Burrington Road/Avery Road intersection;
- Bear River: upstream of and including the Shelburne Falls Road crossing;
- Clesson Brook: upstream of the Cooley Brook confluence with the Clesson;
- Green River: upstream of West Leyden; and
- South River: upstream of the Bullitt Road crossing.

Another criterion for removal efforts would be at sites where the knotweed infestation threatens rare species. At present we are unaware of any site that meets this requirement in the survey area.

Preventing New Infestations

Because knotweed colonizes new sites quickly, especially in riparian areas, sections of river bank currently without infestations should be monitored regularly to prevent new ones from becoming established. Sites without knotweed that should be monitored regularly include:

- Tannery Brook: entire brook;
- Sanders Brook: upstream of the patch at the confluence with the North Branch of the Cold River;
- Chickley River: upstream of West Hawley.

Sites that are more likely to become infested include those with less canopy closure. For example, we found that most patches of knotweed, whether in discrete patches or along a strip, had canopy closures of less than 50%. Only 7% of knotweed strips and 10% of patches occurred in the shadiest sites.

Acknowledgments

The DRWA thanks the many people who made this project possible: Christine Duerring, the past Deerfield River Team Leader, for suggesting the project; Mike Gildesgame and Jim Straub at the Department of Environmental Management for supporting the project during tough budget times; the landowners who allowed us access to their property; and the volunteers who tromped and paddled and biked their way along many kilometers of stream bank. I would like to extend a special thanks to Alex Haro for his help and support for this and many other projects.

Literature Cited

Benoit, L., and B. Goettel. 1999. The Connecticut River Watershed/Long Island Sound Invasive Plant Control Initiative: Strategic Plan, Final. Silvio O. Conte National Fish and Wildlife Refuge, Turners Falls, Massachusetts.

Seiger, L. 1992. Element Stewardship Abstract for *Polygonum cuspidatum* Japanese knotweed. The Nature Conservancy, Arlington, Virginia.

Appendix A:

Invasive Plant Atlas of New England (IPANE) Survey Form (Terrestrial Version 10/09/02)

Deerfield River Watershed Association
Japanese Knotweed Survey Form (May 2003)

Invasive Plant Atlas of New England (IPANE) Survey Form
The New England Wild Flower Society
(Please refer to guidelines for the use of this form)
Terrestrial Version 10/09/02

Site Form _____ Plot Form _____

Assignment Area Site Code _____ Electronic Submission Number _____

Site Information: State _____ County _____ Town _____ Date observed: ___/___/___

Locality (Closest named entity on the topo quad. Attach photocopy of map)

Coordinates (please circle - decimal degrees, minute, sec) Latitude _____ Longitude _____
 Altitude(ft) _____ please circle - GPS or map estimate Datum (e.g. NAD 1927) _____

Habitat Types (please fill in number on back, spend no more than 30 sec to decide)

Edge	Forest continued	Wetlands	Miscellaneous	Miscellaneous
1) Upland/wetland	8) Oak	16) Herbaceous marsh	23) Dune	30) Rocky outcrops
2) Field/forest	9) Floodplain Forest	17) Bog	24) Open field	31) Beach
3) Lake edge	10) N. hardwood	18) Fen	25) Old field	32) Rocky coast
4) Roadside	11) Upland red maple	19) Shrub wetland	26) Stream bank	33) Abandoned lot/old home site
Forests	12) Oak/hickory	20) Cedar swamp	27) Yard/garden	
5) Aspen/birch	13) Pitch pine	21) Red maple swamp	28) Ag. Field	
6) White pine	14) Hemlock	22) Salt marsh	29) right-of- way	
7) Oak/pine	15) Spruce/fir			

34) Other habitat (Please explain, up to 254 characters) _____

Is this plot along a trailside? Yes _____ No _____

Canopy Closure	0-25%		26-50%		51-75%		76-100%		
Aspect	North	NE	NW	South	SE	SW	East	West	Flat
Soil Moisture	Xeric (dry)		Mesic (moist)		Saturated		Inundated		

Site Conditions (please circle)

Comments

Reporter:

Name _____ ID# _____

Funded by the United States Department of Agriculture

Please mail to: Bryan Connolly, Invasive Plant Survey Coordinator, 180 Hemenway Rd., Framingham, MA 01701-2699

**Deerfield River Watershed Association
Japanese Knotweed Survey Form
May 2003 Version (page 2)**

Name of River or Stream:

Landowner:

Width of River or Stream adjacent to Infestation:

Distribution: More than 1 descriptor may be used. Survey area includes a (50 ft.) line running perpendicular from the edge of the stream channel.

- Single plant (1 plant growing within 50 ft. of stream channel)
- Evenly sparse (single plants growing in a scattered pattern)
- Single patch (several plants/stems growing close together in 1 patch or clump)
- Multiple patches (more than 1 patch, with at least 15 ft. between patches)
- Dense throughout (many plants/patches covering the majority of the survey area)

Approximate Size of Survey Area covered by Knotweed: If area covered is less than 100 ft. up or downstream, provide a visual estimate using ft x ft, or m x m and 1 GPS reading at center of patch/plant; if area is more than 100 ft., provide 2 GPS readings (1 at each end).

Stream bank where survey conducted: If stream is greater than 30 ft. wide, survey sections of both sides where possible; if less than 30 ft. survey one side and characterize, in general terms, the degree of infestation on the opposite side, if any. Don't forget to include, using cardinal directions, which side of the river or stream you are surveying.

Other Invasive Plants Observed:

Comments (cont.):

Please return both data sheets to: Pat Serrentino, Project Coordinator, 72 Hastings Street, Greenfield, MA 01301. For questions: (413) 772-0520; pserr@crocker.com

APPENDIX B

MAPS OF LOCATIONS OF KNOTWEED SURVEY SITES

LIST OF FIGURES

- Figure B-1. Avery Brook
- Figure B-2. Bear River
- Figure B-3. Chickley River
- Figure B-4. Clesson Brook - Lower
- Figure B-5. Clesson Brook - Upper
- Figure B-6. Green River - Lower
- Figure B-7. Green River - Middle
- Figure B-8. Green River - Upper
- Figure B-9. Sanders Brook
- Figure B-10. South River - Lower
- Figure B-11. South River - Middle
- Figure B-12. South River - Upper
- Figure B-13. Tannery Brook

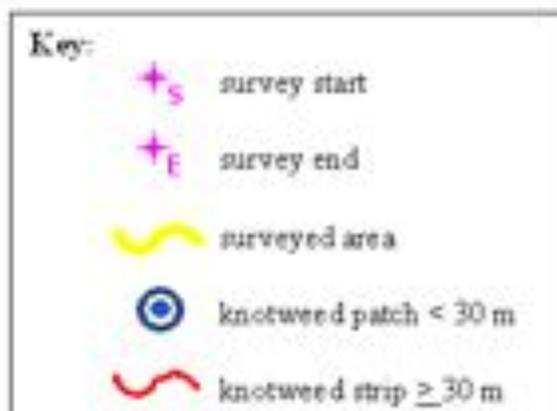


Figure B-1. Avery Brook

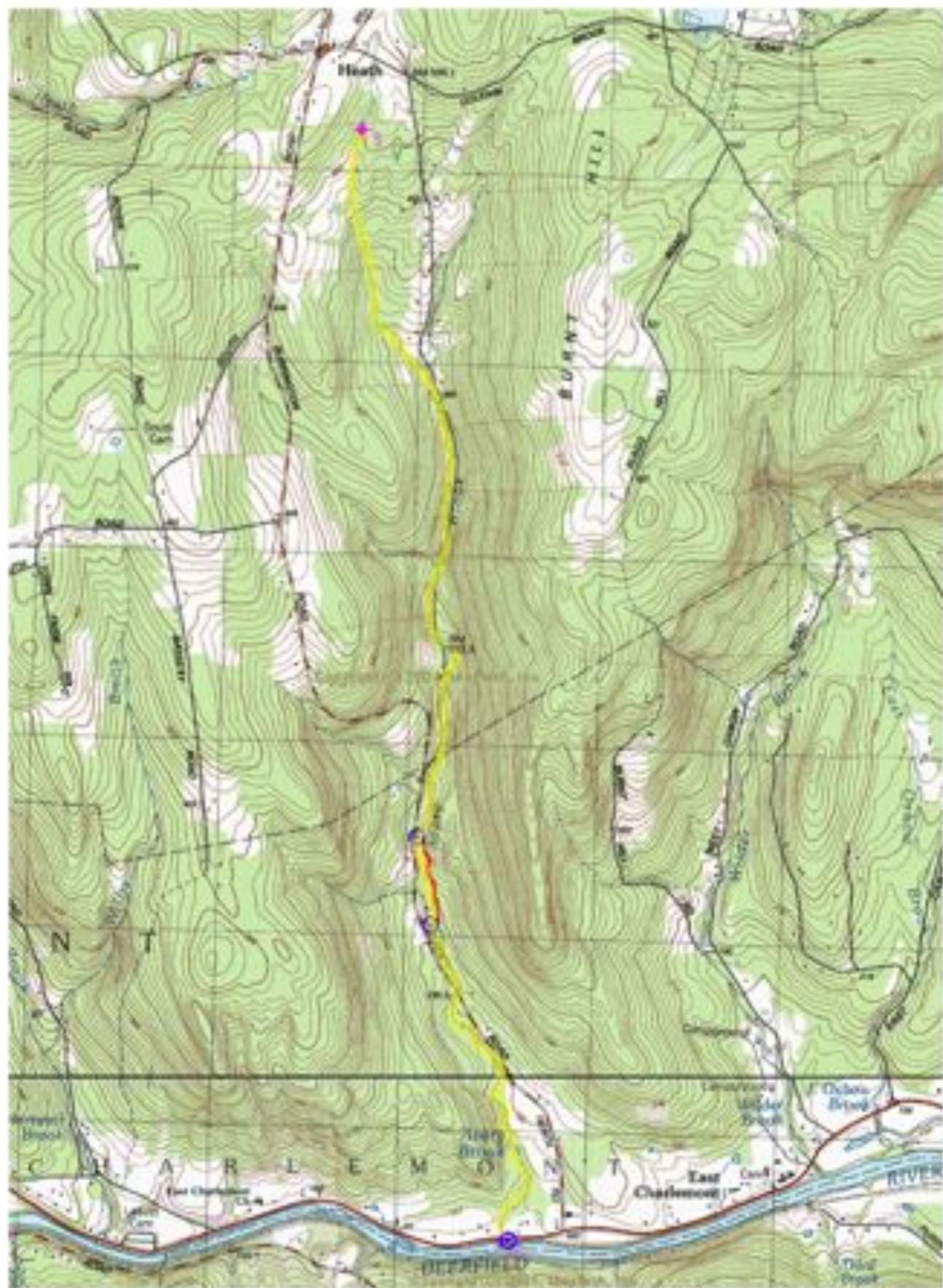


Figure B-2. Bear River



Figure B-3. Chickley River



Figure B-4. Clesson Brook - Lower

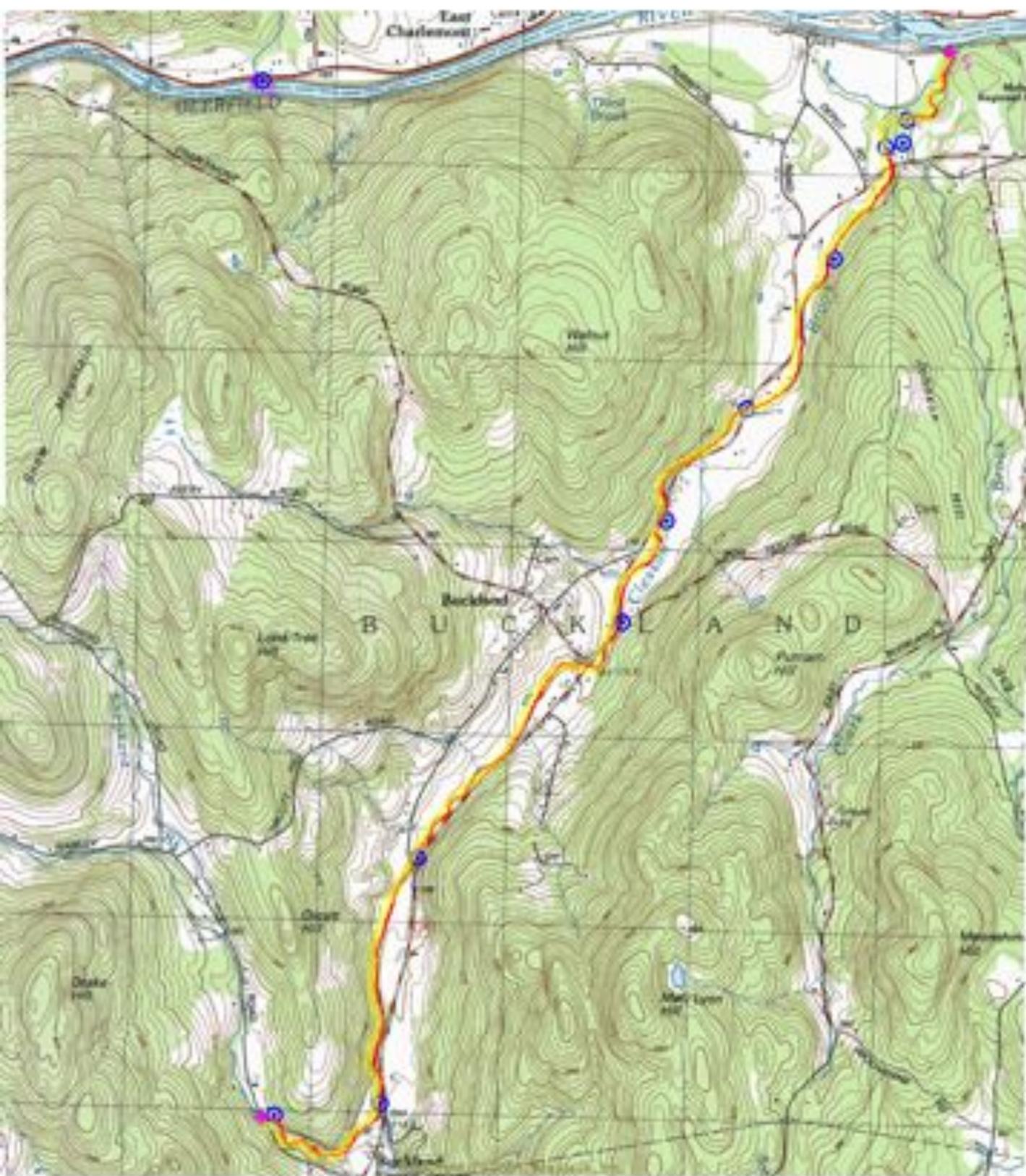


Figure B-5. Clesson Brook - Upper



Figure B-6. Green River - Lower

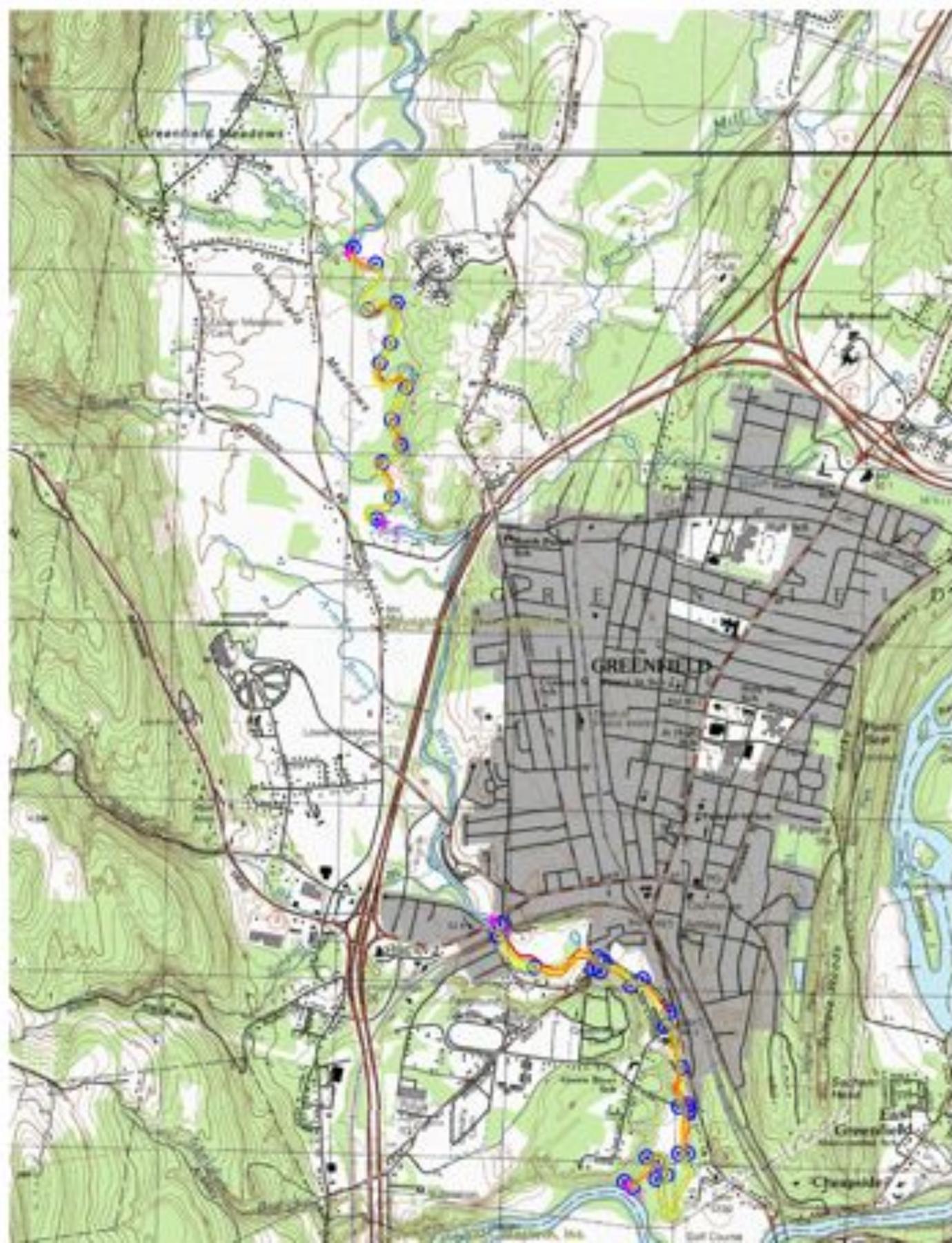


Figure B-7. Green River - Middle

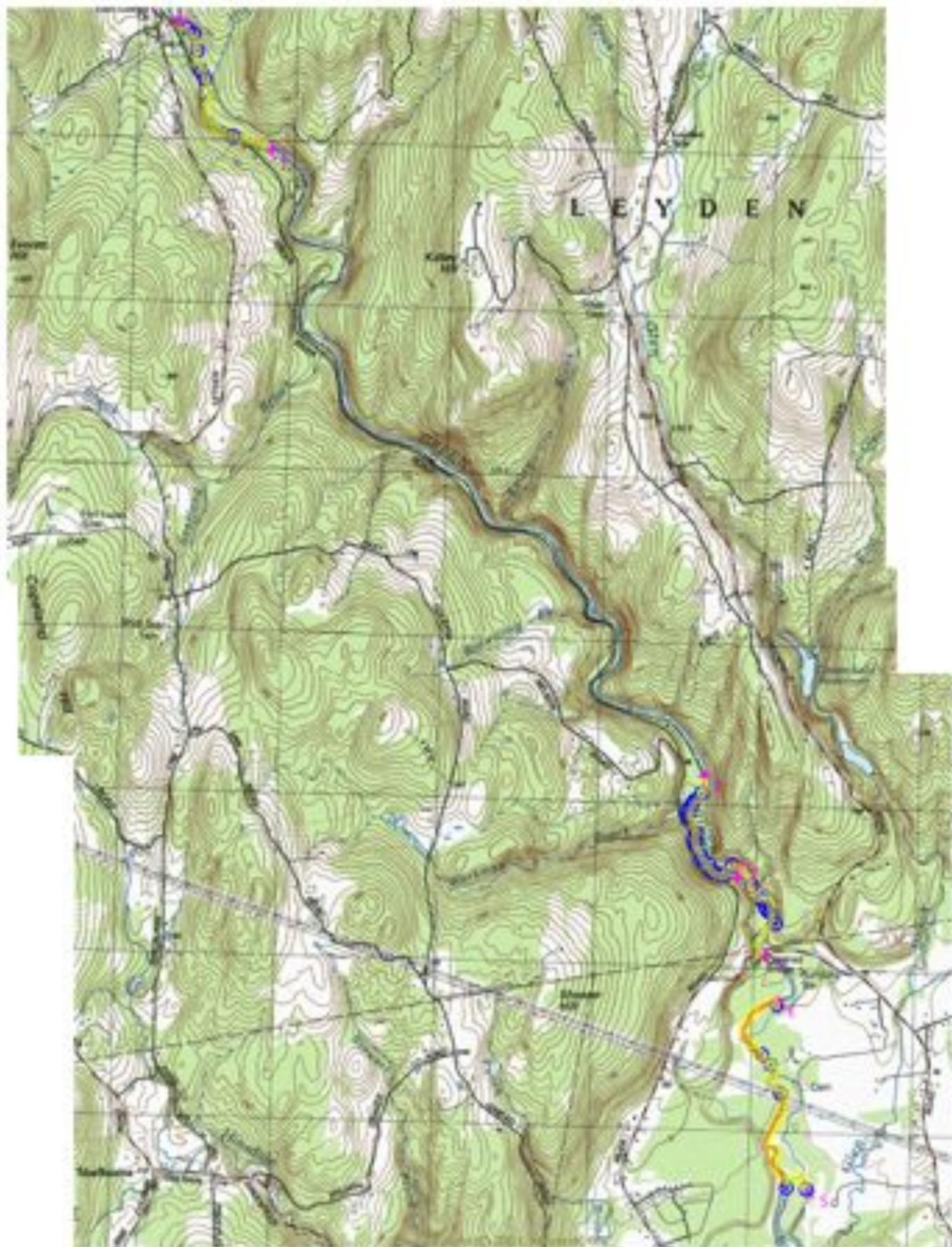


Figure B-8. Green River - Upper

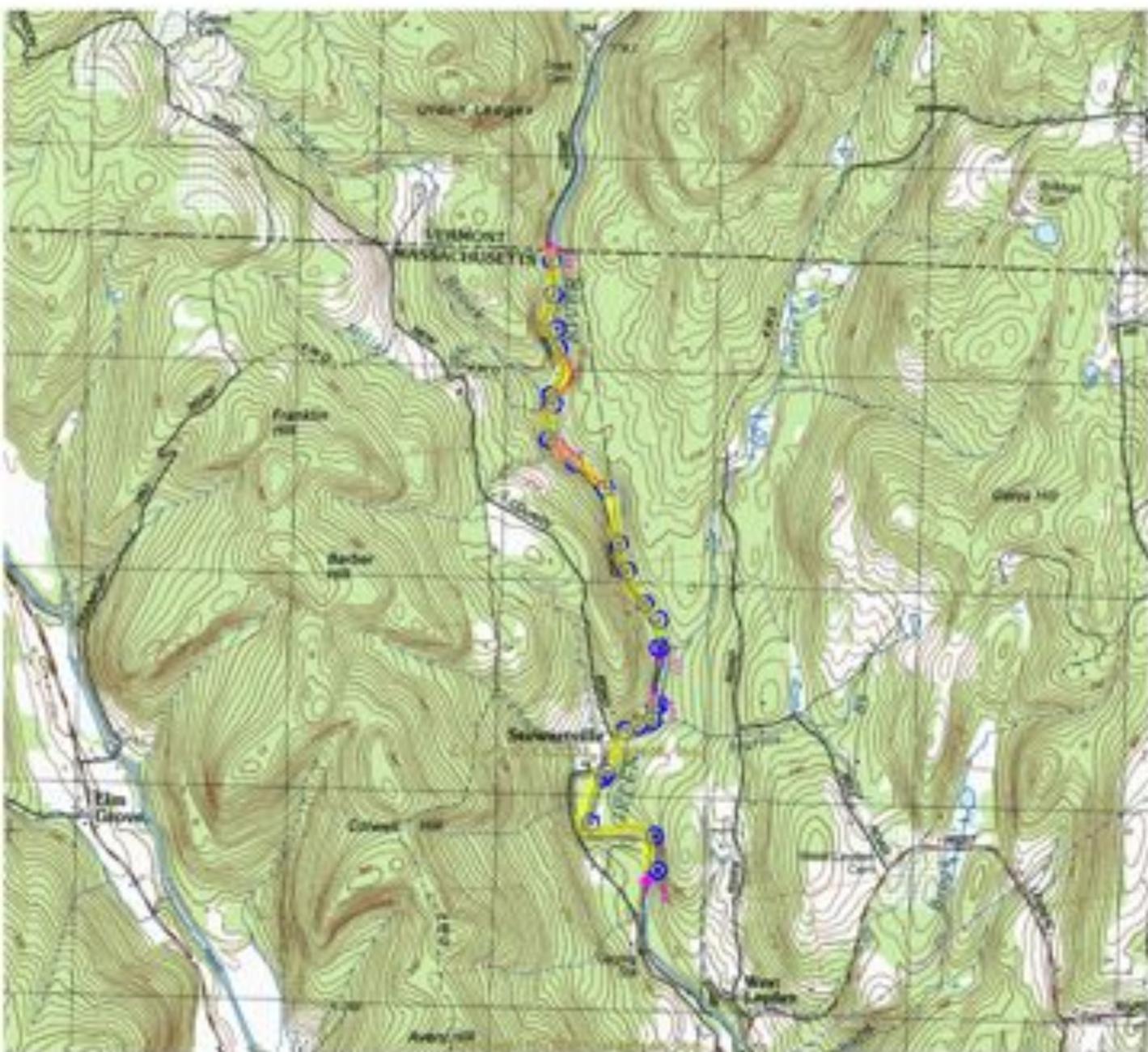


Figure B-9. Sanders Brook



Figure B-10. South River - Lower

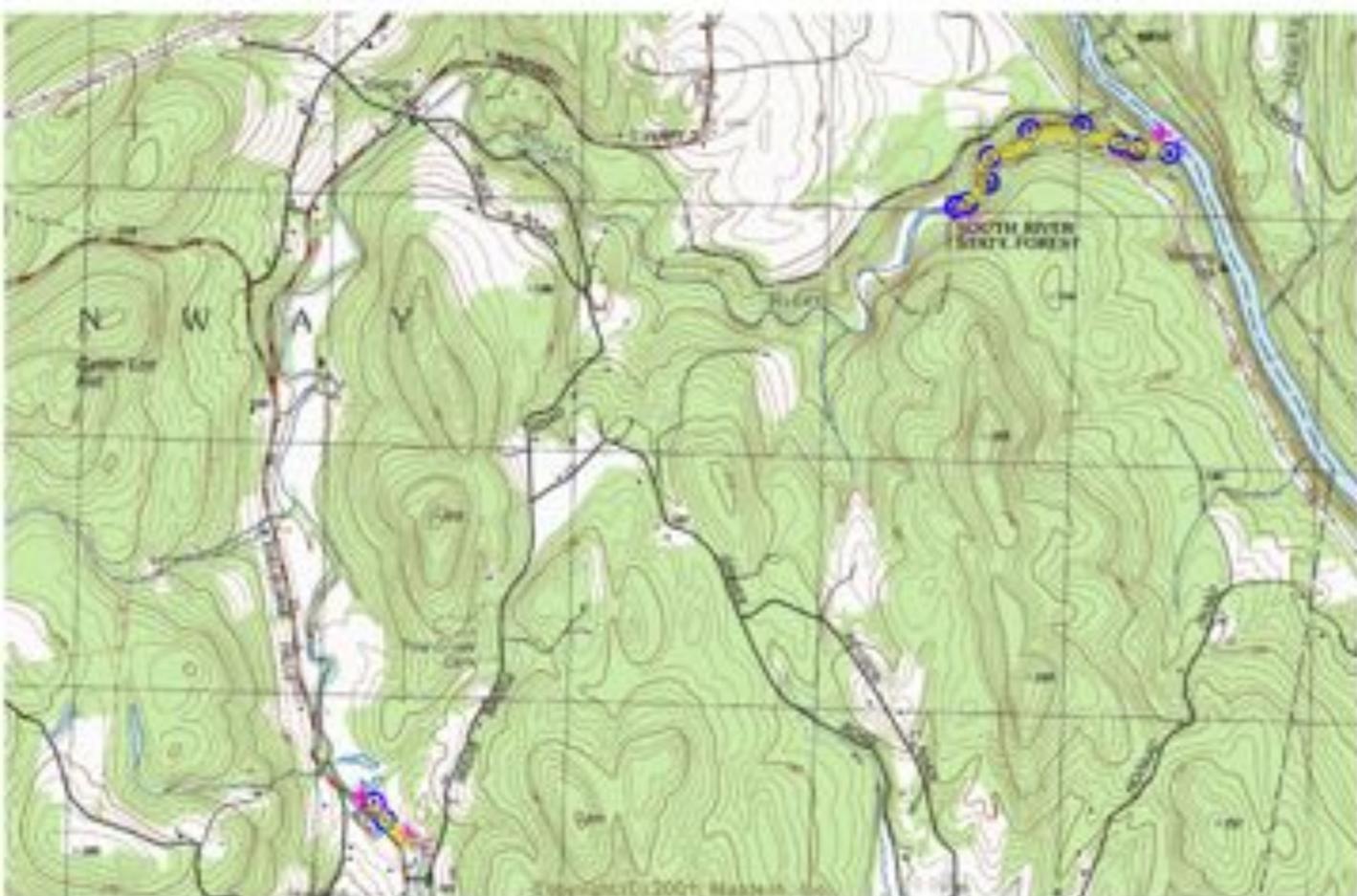


Figure B-11. South River - Middle

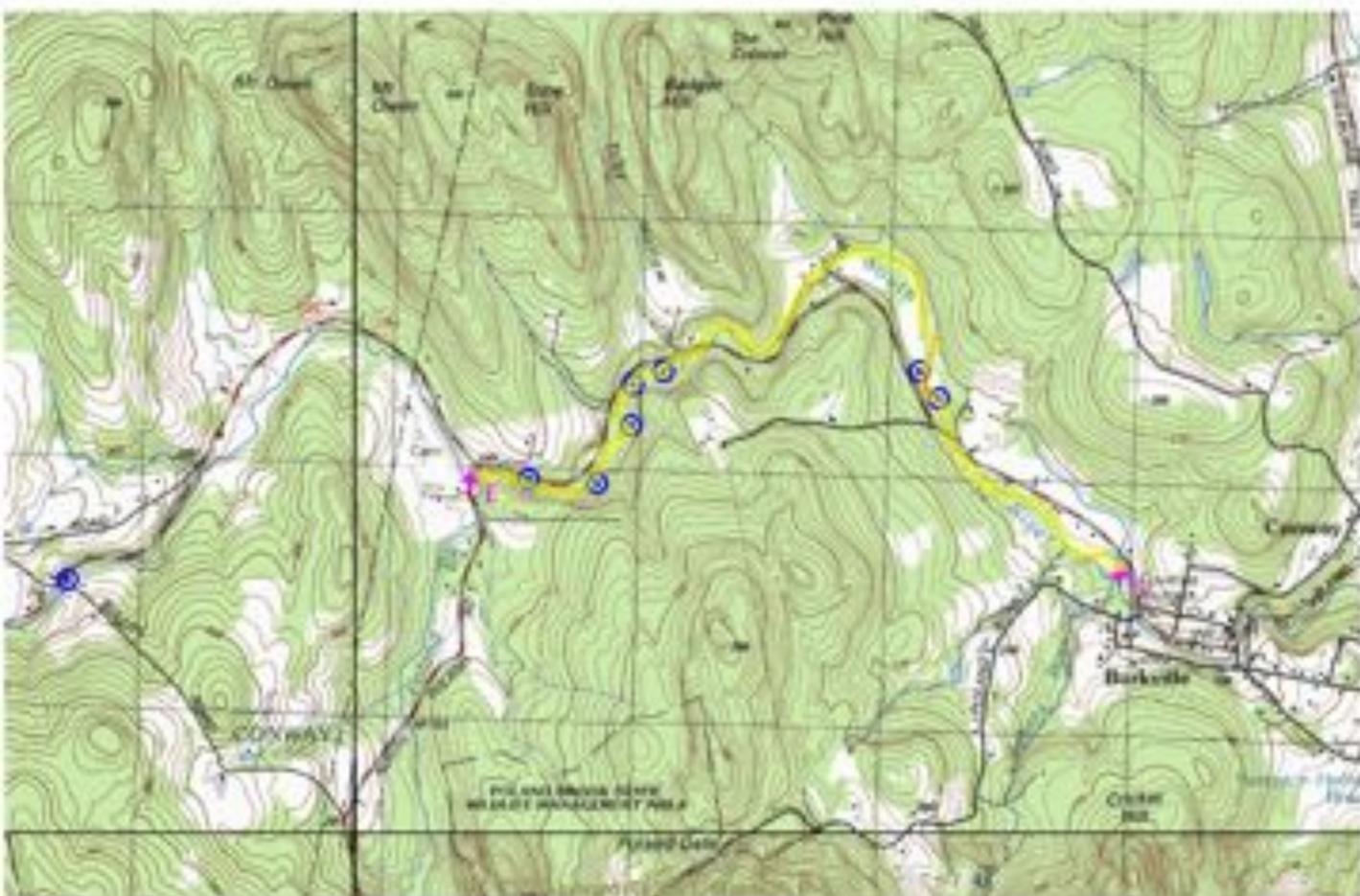


Figure B-12. South River - Upper

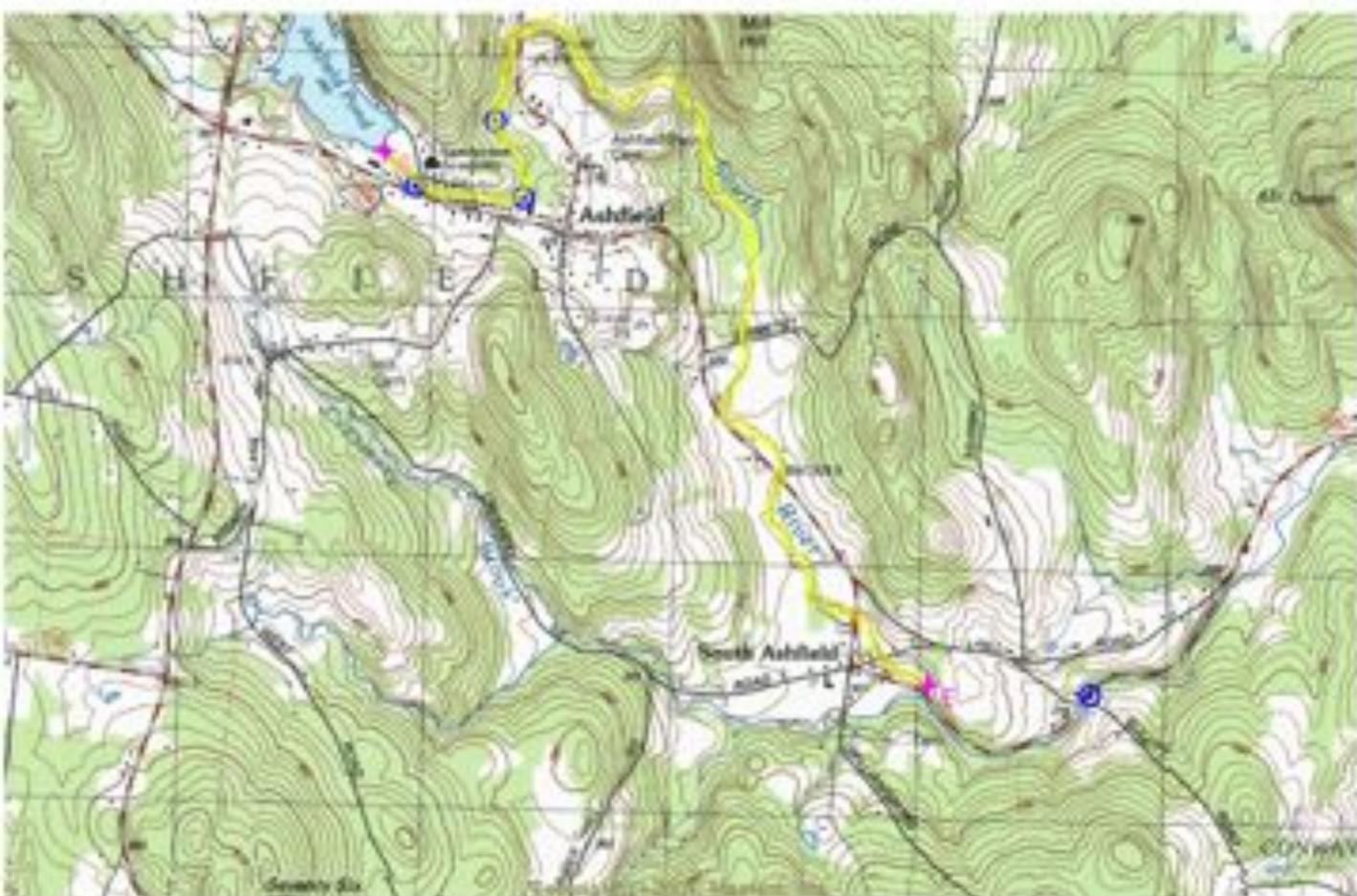


Figure B-13. Tannery Brook

