REPORT OF STREAM SALAMANDER INVESTIGATIONS-KARNER BROOK MOUNT WASHINGTON AND EGREMONT MASSACHUSETTS

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Introduction:

Michael W. Klemens LLC was contracted by Green Berkshires Inc. to conduct an intensive survey of the stream salamander fauna of Karner Brook and its tributary streams and seeps. Michael Klemens, PhD began his studies on the Karner Brook ecosystem in the mid-1980s. The collections he made and his detailed field notes are deposited at the American Museum of Natural History in NYC. He documented a diverse amphibian fauna on the Mount Washington Plateau in the headwaters of Karner Brook which are roughly at the junction of East and West streets in the Town of Mount Washington. These headwater streams and seepages coalesce to form Karner Brook, which flows northeastward from ca. elevation 1700 feet to the valley floor at ca. 800 feet passing through a densely forested steeply graded ravine located between Prospect Hill and Mount Fray to the west and Mount Sterling and Mount Whitbeck to the east. Karner Brook receives additional water from seeps and breakouts that occur on both sides of the ravine.

Karner Brook flows freely from its headwaters atop the Taconic Plateau in the Town of Mount Washington descending 1000 feet to Mill Pond (728 feet) located on the valley floor just west of the village of South Egremont. The limestone-underlain valley floor contains a diverse assemblage of vegetated wetlands, notably calcareous fens containing a wide diversity of plants and animals. Because of its rich diversity of rare species and its pristine state, Karner Brook was designated as an ACEC (Commonwealth recognized Area of Critical Environmental Concern). Unfortunately, certain documents relevant to the AC-EC designation including the nomination were not located and appear to be discarded, missing, or misfiled (E. Tillinghast *pers. comm*.).

A proposal to log large sections of the Karner Brook watershed, and the steep Karner Brook ravine, was the impetus to revisit the upper reaches of Karner Brook to determine the quality of the stream salamander habitat which has not been studied to my knowledge for nearly forty years. Stream salamanders are very sensitive to environmental perturbations, especially disruptions to the hydrological cycle that accompanies land disturbance.

Materials and Methods:

Salamander surveys were conducted by carefully lifting rocks and logs in or near streams and seepages. The number of salamanders was recorded. Great care was exercised to systematically survey individual reaches (tributaries) and seepages to avoid double counting salamanders. The figures and tables accompanying this report detail the results by stream segment. A total of 48 surveyor hours spread over two days was expended to comprehensively survey the entire stream system that contained water at the time of our inventory.

Survey Effort- Mt. Washington Stream Salamander Assessment

September 16, 2024

Surveyors (4): Quinn, Cavallaro, Togninalli, Ginacastro

Conditions: 54°F, Sunny, No Rain in Past 24hrs

Start Time: 8:30 AM **End Time** 3:30 PM

Total Survey Effort: 7 hours x 4 surveyors **=** 28 hours

September 23, 2024

Surveyors (4): Quinn, Cavallaro, Togninalli, Ginacastro

Conditions 51°F, Cloudy, No Rain in Past 24hrs

Start Time: 8:00 AM **End Time:** 1:00 PM

Total Survey Effort: 5 hours x 4 surveyors = 20 hours

Results:

A total of 1,567 stream salamanders were observed during 48 hours of field surveys as listed in Tables 1 and 2 and Figures 1 and 2.

Table 1. Stream Salamander Survey Results

	Spring Salamanders	Northern Dusky Salamander	Northern Two-lined Salamander
Karner Brook Mainstem	8	307	617
Headwater Stream Complex No. 1	2	41	84
Headwater Stream Complex No. 2	1	140	112
Headwater Stream No. 3	0	69	71
Headwater Stream No. 4	0	8	9
Headwater Stream No. 5	0	26	16
Headwater Stream No. 6	3	25	28
Karner Brook Drainage Totals	**14**	**616**	**937**

Table 2. Spring Salamanders Observed and Photographed During Field Surveys

Map ID Number	Description	Latitude	Longitude
1	Spring salamanders (n=2) observed under shared rock in headwater stream complex No. 1	42.136400	-73.474930
2	Spring salamander observed in Karner Brook	42.138190	-73.474840
3	Two spring salamanders observed under shared rock in headwater stream No. 2	42.137840	-73.473590
4	Spring salamander observed in headwater stream No. 6 at the confluence with Karner Brook	42.141870	-73.476010
5	Spring salamander observed in headwater stream No. 6	42.141900	-73.475810
6	Spring salamander observed in headwater stream No. 6 at the confluence with Karner Brook	42.141900	-73.475900
7	Spring salamander observed in Karner Brook	42.144210	-73.477040
8	Spring salamander observed in Karner Brook	42.147000	-73.478730
9	Spring salamander observed in Karner Brook	42.149710	-73.477530
10	Spring salamander observed in Karner Brook	42.149660	-73.477140
11	Spring salamander observed in Karner Brook	42.149430	-73.476990
12	Spring salamander observed in Karner Brook	42.149990	-73.476940
13	Spring salamander observed in Karner Brook	42.151620	-73.475170

Table 3. Mt. Washington Massachusetts Headwater Stream/Forest Road Crossing Data

Headwater Stream ID	Forest Road Crossing ID	Hydrological Condition at Forest Road Crossing	Latitude	Longitude
1	No Crossing	n/a	n/a	n/a
2	1	Dry	42.137220	-73.470330
		Surface Water Begins	42.136710	-73.470990
3	2	Saturated East and West	42.139940	-73.472130
4	3	Dry	42.140520	-73.472560
		Surface Water Begins	42.140410	-73.472830
5	No Crossing	n/a	n/a	n/a
6	4	Dry	42.142180	-73.473890
		Surface Water Begins	42.141920	-73.747540

Table 4. Headwater Stream Forest Road Crossing Locations with Map Photo ID

Map Photo ID	Description	Latitude	Longitude
1	Headwater stream No. 2 at forest road crossing looking west	42.137220	-73.470330
2	Headwater stream No. 2 at forest road crossing looking east	42.137220	-73.470330
3	Headwater stream No. 3 at forest road crossing looking east	42.139940	-73.472130
4	Headwater stream No. 3 at forest road crossing looking west	42.139940	-73.472130
5	Headwater stream No. 4 at forest road crossing looking west	42.140520	-73.472560
6	Headwater stream No. 4 at forest road crossing looking east	42.140520	-73.472560
7	Headwater stream No. 6 at forest road crossing looking east	42.142130	-73.473890
8	Headwater stream No. 6 at forest road crossing looking west	42.142180	-73.473890

Discussion/Recommendations/Conclusions

This research has demonstrated that a vibrant stream salamander population is extant in Karner Brook. Despite the droughty conditions, salamanders were concentrated sympatrically in the more perennial portions of the watershed. In times of higher water levels, one could anticipate some migration of salamanders into the headwaters areas that are crossed by the forest road. I would anticipate that the most likely species to occur in these areas is the two-lined salamander, which is the most terrestrial of the three species recorded. I would also anticipate that spring salamanders, and the bulk of the dusky salamander populations, would remain concentrated in areas of more perennial water.

These vibrant salamander populations are indicative of the mature forested habitat, steeply graded and shaded ravine, stable cool water temperatures, and the presence of numerous tributary streams and seeps. The numbers of salamanders are unusual when compared to many other areas of Massachusetts and Connecticut. The size of the Taconic Plateau—and the prevalence of perched swamps and wetlands gives rise to optimal conditions to sustain these robust populations of stream salamanders. This is not a matter of conjecture but is based upon my nearly fifty years of stream salamander field research in New England, augmented by my knowledge of the specific area of the tri-State Taconic Plateau which gives rise to Karner Brook. As an aside, I lived in a cabin on Mount Washington Road in Egremont in the 1980s surrounded by hemlock forest. My drinking water was taken from a perennial spring which supported a small population of salamanders, including spring salamanders. That spring, and other similar springs along the uphill side of Mountain Washington Road were all tributaries to Karner Brook. That cabin served as my base camp for extensive herpetological field work in southern Berkshire County, including the discovery of all three of the known populations of the Federally listed bog turtle in Massachusetts.

We recorded three species of stream salamanders during the 2024 survey.

The **northern spring salamander** (*Gyrinophilus p. porphyriticus*) is an apex stream predator, and as with most predators occurs at much lower population numbers than its prey species which include two-lined and dusky salamanders as well as small fish and invertebrates. Cannibalism in spring salamanders has been documented. Larger spring salamanders eat larval and juvenile spring salamanders. Of the three species of salamanders, the spring salamander is the most ecologically sensitive requiring cool spring fed stream habitats. In New England the prevalence of spring salamanders is tied to both elevation and latitude.

Spring salamanders are listed as a threatened species in Connecticut. Their distribution is tied to the southward extensions of the uplands that are part of the Green and White mountains of Vermont and New Hampshire. As this species requires cool water and appropriate habitat which is found at higher elevations and latitudes, populations of this species have historically always been more widespread in northern New England and the Adirondack Mountains of New York. Massachusetts lies between these two northern New England states and Connecticut and has more recorded populations of this species than does Connecticut, but far fewer than Vermont and New Hampshire. Populations in Connecticut and Massachusetts are far more vulnerable to the effects of climate change than those found farther north.

Spring salamanders were recently delisted in Massachusetts. This delisting may have been premature as climate change modeling by Klemens et al (2021: Conservation of Amphibians and Reptiles in Connecticut) predicts that spring salamanders will undergo a large range retraction in Connecticut and adjacent Massachusetts due to climate change and the loss of hemlock forest. So, while the number of spring salamander populations NOW may have been considered sufficiently robust to warrant delisting in the Commonwealth, that situation will likely change over the next decades. While hemlock is scarce in the Karner Brook ravine, some of the upslope seepages that feed Karner Brook originate (or originated) within hemlock groves. If climate change data had been considered in the delisting of the spring salamander in Massachusetts, the precautionary principle, a central tenant of resiliency planning, may well have warranted their retention on the Commonwealth's list of endangered, threatened, and special concern species. Suffice to say Karner Brook in its present state provides excellent habitat for this species. Klemens et al (2021) also state that the Taconic Plateau of the tri-State region, because of its size and number of perched swamps, could serve as a refuge for this species as the planet warms. The high elevation perched wetlands in the Town of Mount Washington are integral to maintaining the cold groundwater fed seepages that coalesce and form the headwaters of Karner Brook.

The **northern dusky salamander** (*Desmognathus fuscus*) was extremely abundant in the Karner Brook drainage. Dusky salamanders have undergone a dramatic retraction in range in southern New England over the last 100 years. Using museum specimen data Klemens (1993: Amphibians and Reptiles of Connecticut and Adjacent Regions) found that dusky salamanders had disappeared from most streams in southern Connecticut and adjacent New York. While the streams he surveyed had robust populations of the two-lined salamanders, dusky salamanders were absent or confined to small springs and seepages. He correlated these declines with urbanization; particularly changes in stream hydro-geomorphology caused by flashiness as well as by thermal spikes, caused by runoff from roads, parking lots, roofs, as well as cleared and disturbed land. Flashiness results in stream scouring caused by rapid input of waters that are not detained by naturally vegetated areas, which in turn changes the geomorphology of the stream profile, while stripping out the invertebrate-rich layer of detritus deposited in these streams, and causing rapid fluctuations in stream temperatures.

Only the **northern two-lined salamander** (*Eurycea bislineata*) is able to flourish in these degraded stream conditions. In streams that are not impacted in this manner, robust populations of dusky and two-lined salamander co-exist micro-sympatrically (under the same cover objects and using the same in stream resources). The current condition of Karner Brook is a well-balanced stream ecosystem, relatively free from impacts, as it is surrounded by minimal development and heavily forested terrain. Karner Brook has remained largely unaltered since my studies there in the mid-1980s. These current stream studies documented robust populations of all three salamander species. This is a testament to the value of a densely forested watershed in maintaining stream quality.

Steeply graded forested slopes are extremely vulnerable to the effects of timber harvesting. Harvesting, even if it is selective, on slopes of 25-40% grade cannot be accomplished without compaction of the litter and soils and the concomitant destruction of the slopes including the breakage and compaction of the brittle layers of underlying talus. This talus is composed of thin overlapping (imbricate) layers of loose Taconic schist, embedded in fluffy layers of organic material known as duff. This loose surface layer serves as the reservoir for water and the pockets between the talus are inhabited by small vertebrates and invertebrates. Once cleared and compacted, even with best intentions and forestry BMPs, run-off will enter Karner Brook. That run off will be warmer and carry silt and will be flashy in nature as the natural ability of the slopes to detain water will be compromised. The proposed and ongoing invasive plant control may further destabilize and pollute the Karner Brook watershed. Amphibians are extremely vulnerable to the effects of chemical pollution. The end result of these habitat disturbances will be that the stable ecosystem of Karner Brook will become damaged, and its recovery, if even possible, to the mature second forest that presently exists will take close to a century, if not more. Parts of the upper portion of the area to be logged lie within the summer foraging area of the State-listed **timber rattlesnake** (*Crotalus horridus*). Males easily move three miles or more from their dens which are in the vicinity of Mount Whitbeck. Incidental take of foraging rattlesnakes by mechanized vehicles and equipment is possible, dependent on the time of year of that forestry occurs.

Why is this proposed forestry harvest considered beneficial to the public trust in natural resources administered by the Commonwealth? From the perspective of a conservation professional, I cannot see any reason that this will benefit the ecology of the Karner Brook watershed. Quite to the contrary, opening up the forest canopy may benefit a few game species, but it will decidedly not benefit the stream ecosystem. The dense forest and logs and litter are large carbon sinks. Logging the area will release that stored carbon. It will alter the stream ecology through disruption of the processes that have kept it stable for decades. Flashiness and thermal spikes will occur, despite the very best BMPs.

Finally, the upper reach of Karner Brook does not exist in isolation from the diverse ecosystem on the valley floor between Jug End Road and Mill Pond. That diverse calcareous wetland system is home to a variety of rare and endangered wetland species which depend upon the clean waters of Karner Brook, the major contributing stream to that mosaic of fens, shrub and forested swamps, cryptic vernal pools, and wet meadows.

Federal and state efforts have focused a great deal of effort and resources to maintain the large tracts of contiguous forest in the Highlands of western Connecticut and Massachusetts, and the contiguous areas of eastern New York. The proposal to log the headwaters and upper reach of Karner Brook is counter-productive to regional conservation goals being administered by various states, in partnership with the Federal government, and NGOs, notably the Housatonic Valley Association. The concept that this portion of the Mount Washington State Forest should be managed as a “working forest” ignores the ecological value of this old second growth forest ecosystem. It makes good sense that this parcel be incorporated in the Mount Washington Forest Reserve where the ecological values that have been discussed are protected and allowed to evolve naturally, without human interference.

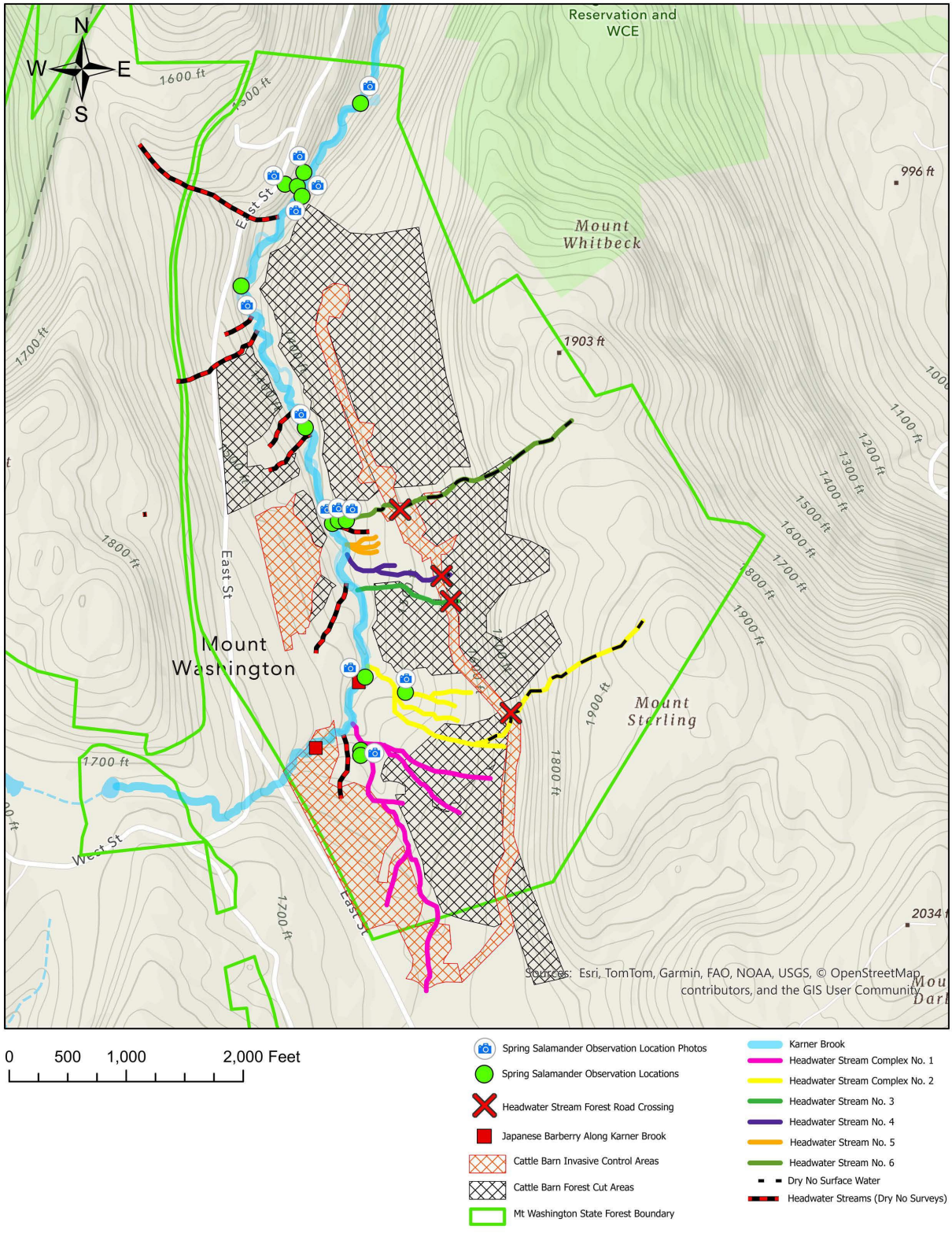


Figure 1. Site map showing Karner brook and its tributary streams, spring salamander observation locations, habitat photos, proposed areas for forestry activities, and invasive plant controls.

Map ID No. 1: Spring salamanders observed under a shared rock and surrounding habitat photographed in headwater stream complex No. 1:42.136400, -73.474930

Map ID No. 2: Spring salamander observed in Karner Brook and surrounding habitat photographed (note Japanese barberry on stream bank: 42.138190, -73.474840

Map ID No. 3: Spring salamander observed in headwater stream No. 2 and surrounding habitat photographed: 42.137840, -73.473590

Figure 2. Spring salamanders observed and corresponding habitat at observation location.

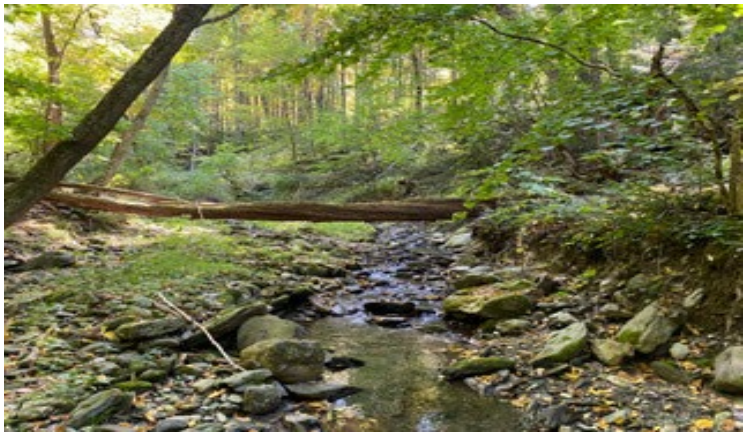
Map ID No. 4: Spring salamanders observed Map ID No. 6: 42.141900, -73.475900 and surrounding habitat photographed.

Map ID No. 5: Spring salamander observed in headwater stream No. 6 and photograph of surrounding habitat: 42.141900, -73.475810

Figure 2 Continued. Spring salamanders observed and corresponding habitat at observation location.

Map ID No. 7: Spring salamander observed in Karner Brook and photograph of surrounding habitat.: 42.144210, -73.477040

Map ID No. 8: Spring salamander observed in Karner Brook and photograph of surrounding habitat: 42.147000, -73.478730



Map ID No. 9: Spring salamander observed in Karner Brook and photograph of surrounding habitat: 42.149710, -73.477530

Figure 2 Continued. Spring salamanders observed and corresponding habitat at observation location.

Map ID No. 10: Spring salamander observed in Karner Brook and photograph of surrounding habitat: 42.149660, -73.477140

Map ID No. 11: Spring salamander observed in Karner Brook and photograph of surrounding habitat: 42.149430, -73.476990

Map ID No. 12: Spring salamander observed in Karner Brook and photograph of surrounding habitat: 42.149990, -73.476940

Figure 2 Continued. Spring salamanders observed and corresponding habitat at observation location.

Map ID No. 13: Spring salamander observed in Karner Brook and photograph of surrounding habitat: 42.151620, -73.475170

Figure 2 Continued. Spring salamanders observed and corresponding habitat at observation location.

Photo ID 1: Headwater stream No. 2 at forest road crossing looking west: 42.137220, -73.470330

Photo ID 2: Headwater stream No. 2 at forest road crossing looking east: 42.137220, -73.470330

Headwater stream No. 2 beginning of surface water flow: 42.136710, -73.470990

Figure 3. Photos of headwater streams Nos. 2, 3. 4, and 6 at forest road crossings.

Photo ID 3: Headwater stream No. 3 at forest road crossing looking east: 42.139940, -73.472130

Photo ID 4: Headwater stream No. 3 at forest road crossing looking west: 42.139940, -73.472130

Photo ID 5: Headwater stream No. 4 at forest road crossing looking west: 42.140520, -73.472560

Figure 3 Continued. Photos of headwater streams Nos. 2, 3. 4, and 6 at forest road crossings.

Photo ID 6: Headwater stream No. 4 at forest road crossing looking east: 42.140520, -73.472560

Headwater stream No. 4 beginning of surface water flow: 42.140410, -73.472830

Photo ID 7: Headwater stream No. 6 at forest road crossing looking east: 42.142130, -73.473890

Figure 3 Continued. Photos of headwater streams Nos. 2, 3. 4, and 6 at forest road crossings.

Photo ID 8: Headwater stream No. 6 at forest road crossing looking west: 42.142180, -73.473890

Headwater stream No. 6 beginning of surface water flow: 42.142120, -73.474520

Figure 3 Continued. Photos of headwater streams Nos. 2, 3. 4, and 6 at forest road crossings.

Photo 1: Japanese Barberry (*Berberis thunbergia*) along Karner Brook: 42.138050, -73.475000

Photo 2: Japanese Barberry (*Berberis thunbergia*) along Karner Brook: 42.136500, -73.476410

Figure 4. Photos of Japanese barberry along the banks of Karner Brook.