

Overview of Aquatic Natural Communities Occurrences in the Lewis Creek Watershed

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The following overview is intended to give narrative to the Aquatic Natural Community Planning Map assembled by the Lewis Creek Watershed Association. This overview presents a narrative for the macroinvertebrate and fish assemblage **types** that are likely to be present within the mapped Aquatic Natural Community reaches. The associations are based on monitoring data collected by the VTDEC within the Lewis Creek watershed; and the report Classification of the Aquatic Communities of Vermont 1998 (CACV 1998) and updates.

Aquatic Natural Community Assemblage Types

Lewis Creek, despite its moderate watershed size (about 217 km²) compared to the other major rivers (700-2500 km²) entering Lake Champlain, has representative stream reaches from 6 of 7 fish, and 9 of 10 macroinvertebrate aquatic natural stream community **types** found in Vermont. By comparison the watershed is relatively low in both number of lakes and the natural lake community types represented (one of four types found in Vermont).

Lewis Creek Aquatic Natural Community Types:

The high diversity in stream natural community assemblage types present within the Lewis Creek watershed is due to:

- 1- The watershed landscape and geologic features span the range from those found in the steep, high elevation western Green Mountains to the gentle slopes and low elevations of the broad Champlain Valley floor. The most important of these physical and chemical attributes and the resulting aquatic community environments are elevation, canopy cover (influence stream temperature, primary food sources and biogeography), drainage area size (stream size and permanence, hydrology, primary food sources), gradient (substrate composition, and water velocity), and soil and bedrock geology (pH, alkalinity, calcium) and
- 2- The influence of biogeography. Champlain Valley waters support native fish and mussel species from *two* glacial refugia. Unlike the remainder of Vermont waters which were populated only by eastern species, the mid- and lower elevation waters in the Champlain drainage contain both eastern and western species resulting in streams that support greater numbers of species than streams of similar size streams elsewhere in Vermont.

Nine natural stream macroinvertebrate **types** and six fish assemblage **types** are found within the Lewis Creek watershed and are presented in Table 1. This table presents the macroinvertebrate and fish community assemblage **types** that likely occur within the broader mapped seven *Aquatic Natural Community stream reaches* presented on the Lewis Creek Aquatic Natural Communities Map.

It should be noted that the lower reach of Lewis Creek does not support the full array of species associated with Vermont's *Large Warm Water Low-Moderate Gradient* community type that is typified by the lower reaches of larger tributaries to Lake Champlain. Lewis Creek drains a much smaller watershed thereby provides less habitat volume (shallower and less diverse) than rivers such as the Winooski River and Otter Creek.

Table 1.

Aquatic Natural Communities found in Lewis Creek Watershed and depicted on the LCA Aquatic Natural Community Map- (last column); and the Bug (macroinvertebrate), and Fish assemblage types likely found within these aquatic natural communities.

Location in Watershed	Bug (B) and Fish (F) Assemblage Types	Indicator Species <i>Macroinvertebrate/Bug</i> <i>Fish</i>	MAP Aquatic Natural Community Descriptions
Upper Headwaters east of Rte 116, and Prindle (Pease) Brook in M10	B2,F1,F2,F3	<i>Ritrogenia</i> , <i>Ceratopsyche sparna</i> , <i>ventura</i> , <i>Dolophilodes</i> , <i>Simulium tuberosome grp</i> , <i>Oulimnius latisculus</i> , <i>Peltoperla</i> , <i>Malerekus</i> , <i>Polypedilum aviceps</i> , Brook Trout, Blacknose Dace, Slimy Sculpin	Small Cold Water High Gradient
Upper-Mid Hollow Brook adjacent to Hinesburg Hollow Road, Small N/S trib entering at Prison Hollow Road	B5, B6,F4	<i>Hydatophylax sp</i> <i>Polycentropus sp</i> , <i>Litobrancha sp</i> , <i>Cordulegaster sp</i> , <i>Hyallega sp</i> <i>Dubiraphia sp</i> , <i>Polypedilum scalaenum</i> , <i>Leptopblebidae</i> , <i>Pisidium spp</i> <i>Odonata - Aesbnidae</i> , <i>Calopterygidae</i> , <i>Coenargionidae</i> , <i>Gomphidae</i> . Blacknose Dace, Brook Trout, Common Shiner	Small - Moderate Mixed Water Low Gradient
Mid Below Rt 116 to Pond Brook confluence	B3,F3,F5	<i>Chloroperlidae1-4</i> ; <i>Dolophilodes1-5</i> ; <i>Hexatoma1-3</i> ; <i>Rhychophila1</i> <i>Lepidostoma</i> ; <i>Apatania</i> ; <i>Ceratopsyche slossonae</i> ; <i>Promoresia tardella</i> ; <i>Optioservous sp</i> ; <i>Eukiefferella brehmi</i> ; <i>Tretenia bavarica</i> ; <i>Microtendipes</i> ; <i>Epeorus</i> ; <i>Capniidae</i> ; <i>Leuctridae</i> ; <i>Agnetina</i> ; <i>Isogenoides</i> Bluntnose Minnow, Creek Chub, Brook Trout, Blacknose Dace	Moderate Mixed Water/Cool High Gradient
Mid Short reaches immediately below Outlets of Monkton Pond & Bristol Pond	B9,F4,F5	<i>Simulidae</i> , <i>Hydropsyche</i> , <i>Chematopsyche</i> , <i>Ceratopsyche</i> . <i>Tanytarsini</i> Blacknose Dace, Common Shiner, Brook Trout	Lake Marsh Outlet Streams
Mid-Lower Small streams directly entering Lewis Creek from Pond Brook outlet stream to Lake Champlain	B6,B7,F5	<i>Apsectrotrypus sp</i> , <i>Hyallega sp</i> , <i>Pisidium sp</i> <i>Dubiraphia sp</i> , <i>Polypedilum scalaenum</i> , <i>Leptopblebidae</i> , <i>Odonata - Aesbnidae</i> , <i>Calopterygidae</i> , <i>Coenargionidae</i> , <i>Gomphidae</i> . <i>Hydatophylax sp</i> Creek Chub, Blacknose Dace, Bluntnose Minnow	Small-Moderate Warm Water Low Gradient
Mid-Lower Below Pond Brook to Rte. 7/Greenbush	B4,F5	<i>Promeresia elegans</i> ; <i>Neoperla</i> ; <i>Chimara</i> ; <i>Stenelmis</i> ; <i>Isonychia</i> ; <i>Polypedilum convictum</i> ; <i>Dubiraphia</i> ; <i>Promeresia elegans</i> Bluntnose Minnow, Creek Chub	Large Warm Water Moderate Gradient
Lower Below Fall line, Rte. 7/ Greenbush to Lake Champlain	B8,F6,	<i>Potamilus alatus</i> , <i>Lampsilis ovata</i> , <i>Leptodea fragilis</i> , <i>Pyganodon grandis</i> , <i>Hexagenia limbata</i> , <i>Sphaerium spp</i> ; <i>Pisidium henslowanum</i> ; <i>Dubiraphia</i> , <i>Phylocentropus</i> , <i>Gammarus sp</i> <i>Polypedilum halterale</i> , <i>Spheromias</i> & <i>Culicoides</i> Redhorse, Lamprey, Pumpkinseed, Bluntnose Minnow	Large Warm Water Low-Moderate Gradient

Lewis Creek Aquatic Natural Community Assemblages (Vermont Streams CACV 1998)
Macroinvertebrate (B) and Fish (F) Assemblage Types

Lewis Creek Macroinvertebrate Assemblage Categories and Types

High and Moderate Gradient Categories - Coarse substrates of gravel-cobble-boulder

Type MA2: *Small Headwater Canopied Mountain Streams*, low-moderate alkalinity and pH

These are small full canopied heterotrophic headwater streams found all over Vermont that are not critically acidic. Taxa from the leaf shredder functional group are well represented. They are more common at elevations over 1000 feet, but can be found at lower elevations if the gradient right.

Indicator Taxa: *Rithrogenia* sp1,2,3; *Symphitopsyche sparna* 1-4; *Simulium tuberosum* 1-4; *Antocha* 1; *Glossosoma* 1-2

Preferential taxa: *Peltoperla*; *Chloroperlidae*; *Malirekus*; *Capniidae*; *Olimnius*; *Optioservus*; *Ectopria*; *Cricotopus*; *Agnatina*; *Ephemerella*; *Serratella*; *Polypedilum aviceps*; *Hexatoma*

Type MA3: *Moderate Sized Open Canopied Mountain Streams*, moderate alkalinity and pH.

These are streams that are open to direct sunlight overhead often having on the average about 45% canopy cover. The pH is often over 7.0, and the alkalinity never limiting. Species that are functionally classified as algae shredders or scrapers are usually well represented taking advantage of the autotrophic stream productivity.

Indicator Taxa: *Chloroperlidae*1-4; *Dolophilodes*1-5; *Hexatoma*1-3; *Rhyacophila*1-3; *Olimnius*1

Preferential taxa: *Brachycentrus* sp; *Lepidostoma*; *Apatania*; *Symphitopsyche slosonae*; *Polycentropus*; *Promoresia tardella*; *Optioservus* sp; *Eukiefferella brehmi*; *Tvetenia bavarica*; *Parachaetocladius*; *Micropectra*; *Microtendipes*; *Polypedilum aviceps*; *Epeorus*; *Rithrogena*; *Gomphidae*; *Capniidae*; *Peltoperla*; *Leuctridae*; *Agnatina*; *Isogenoides*.

Type MA4: *Large Streams (small rivers)*, open canopy and warmer summer temperatures

A moderate to high alkalinity and pH.

These are large streams and as a result the canopy cover is often less than 35%. They are usually high in pH and alkalinity. In Vermont they are generally found in the lower valleys of the major watersheds.

Indicator Taxa: *Promeresia elegans*1-3 ; *Neoperla* 1-3; *Chimara* 1-6; *Stenelmis* 1-5;

Preferential Taxa: *Isonychia*4-5; *Polypedilum convictum* 1-2; *Dubiraphia* 1; *Promeresia elegans* 1-3

Low Gradient Categories - Clay-silt-sand dominated substrates

Type MA5: *Small Headwater Marsh Streams*

These streams are generally found in Green Mts at elevations over 500 ft. They tend to have more sand than silt and clay, and are often associated with springs, and therefore are cold. Wetland vegetation along the riparian zone is dense offering a complete canopy of the stream. The riparian zone vegetation is often alder, willow, red dogwood or cedar.

Indicator Taxa: *Pisidium* sp, *Polycentropus* sp, *Litobranchia* sp, *Cordulegaster* sp.

Type MA6: *Medium Sized Midreach Meandering Streams of Moderate to High Elevation*

These streams are located in the broader valleys of Vermont with low slopes of large drainage areas. They often are associated with a large well developed floodplain/marsh. The riparian vegetation again is often dominated by alders, willows, and poplars.

Indicator Taxa: *Dubiraphia* sp, *Polypedilum scalaenum*, *Leptophlebiae*, *Pisidium* spp

Odonata - *Aeshnidae*, *Calopterygidae*, *Coenagrionidae*, *Gomphidae*. *Hydatophylax* sp

Type MA7: *Small Streams in Lake Champlain Valley*, many enter directly into the lake.

These streams originate in the Champlain Valley and are always high in pH and alkalinity most do not contain large mussels. They are generally alder/willow lined and often have Beaver dams.

Indicator Taxa: *Tipula* sp, *Atherix* sp, *Simulium* grpA, *Apsectrotypus* sp, *Hyallela* sp, *Pisidium* sp, *Rheocricotopus* sp, *Stenonema* sp

Type MA8: *Moderate to Larger Rivers Immediate to Lake Champlain*

These streams are all located below the glacial lake Afall line@ located at about 250 foot elevation. The communities contain additional species of bivalves and gastropods that are only found in Vermont below this Afall line@ feature. The rivers are often dominated by sand gravel in midstream with silt/clay banks.

Indicator Taxa: *Potamilus alatus*, *Lampsilis ovata*, *Leptodea fragilis*, *Pyganodon grandis*, *Hexagenia limbata*, *Sphaerium* spp; *Pisidium henslowanum*; *Dubiraphia*, *Phylocentropus*, *Gammarus* sp *Polypedilum halterale*, *Spheromias* & *Culicoides*

Special Stream Habitats

Type MA9: *Lake/Marsh Outlet Streams*. A short stream reach immediately below the outlet of a lake or large wetland. These communities are dominated by filter collector species. They are often warm in the summer and carry a seston and high dissolved organic matter load from the upstream lake/wetland. They are often dominated by Blackflies in the spring/summer and caddisflies in the summer/fall. **Indicator Taxa:** *Simuliidae*, *Hydropsyche*, *Chematopsyche*, *Symphytopsyche*. *Tanytarsini*,

Lewis Creek Fish Assemblage Categories and Types

Assemblage 1: Brook Trout

This assemblage type is comprised of only brook trout. This species is most often the only species to be present in uppermost headwater areas of coldwater streams. This category can be found nearly anywhere in the state where waters are cool enough. The brook trout assemblage does not occur in the lower elevations of the Champlain Valley where warm water assemblages dominate.

Assemblage 2: Brook Trout-Slimy Sculpin

This cold water assemblage is found in nearly identical habitats as assemblage 1 but situated slightly farther downstream. Brook trout are joined in this assemblage type by slimy sculpin and blacknose dace. The slimy sculpin is also a cold, headwater species not found in the lower elevation warmer streams of the Champlain Valley. The blacknose dace is a hearty, widespread minnow found in a range of stream conditions from near pristine to degraded.

Assemblage 3: Brook Trout - Blacknose Dace

This cool mixed water group is characterized by those species from assemblages 1 and 2 plus additional species. Some of the species are also found in warm water assemblages. In addition to those of the first two categories, prominent species of this group are longnose dace, creek chub, longnose and white sucker. Also common are the exotic rainbow and brown trout. Sites from this group have slightly larger drainage areas and are present at most elevations above the Champlain Valley floor.

Assemblage 4: Common Shiner– Brook Trout

This is a transition cold-warm water community. More warmwater species enter into this assemblage type which is dominated by black and longnose dace, white sucker and creek chub. Common shiners first appear in this assemblage. Tolerant forms from the genus *Pimephales* (fathead and bluntnose minnow) become more common in this group. Locations supporting this assemblage type are low to mid elevation, with intermediately-sized drainage areas.

Assemblage 5: Bluntnose Minnow-Creek Chub

This assemblage is essentially a warm water community type, dominated by bluntnose minnow, creek chub, blacknose dace, tessellated darter and white sucker. The three principle coldwater stenotherms are essentially absent. Most of these sites will be located in the lower elevation Champlain valley in the proximity of Lake Champlain. A majority of these sites are intermediate to large size.

Assemblage 6: Pumpkinseed- Bluntnose Minnow

This group can be described as a warm water collection of species in moderate to large tributaries of Lake Champlain. These sites are located at or near lake level and include the lower Poultney River, Otter and Lewis Creek, and the Winooski, Lamoille and Mississquoi Rivers. Assemblages of these areas are the most diverse in Vermont owing in part to their close connection to Lake Champlain which supports about 80 of the 91 fish species that occur in Vermont.

Table 2 -
Lewis Creek Fish Assemblage Categories and Types

General temperature categories are indicated for each fish assemblage type. Each assemblage type includes a list of species present in order of frequency encountered at sites in the category.
Bolded species include native and exotic species documented in Lewis Creek. Exotic species are marked with double asterisks. Fish Community Type 6 is below the “Fall Line”.

COLD WATER		TRANSITION/MIXED		WARM WATER	
Type 1	Type 2	Type 3	Type 4	Type 5	Type 6
BROOK TROUT	BROOK TROUT SLIMY SCULPIN	BROOK TROUT BLACKNOSE DACE	COMMON SHINER BROOK TROUT	BLUNTNOSE MINNOW CREEK CHUB	PUMPKINSEED BLUNTNOSE MINNOW
Brook Trout	Blacknose Dace Slimy Sculpin Brook Trout	Blacknose Dace Slimy Sculpin Brook Trout Longnose Dace **Brown Trout Creek Chub Longnose Sucker White Sucker **Rainbow Trout Fathead Minnow Common Shiner Redbelly Dace Lake Chub Tessellated Darter Bluntnose Minnow Brown Bullhead	Blacknose Dace Longnose Dace White Sucker Slimy Sculpin Common Shiner Creek Chub Fallfish Brook Trout **Brown Trout Longnose Sucker **Rainbow Trout Burbot Bluntnose Minnow Fathead Minnow Rock bass Cutlips Minnow Finescale Dace Fantail Darter Smallmouth Bass Golden Shiner Mimic Shiner Chain Pickerel *Pearl dace *Brassy Minnow	Creek Chub Blacknose Dace Bluntnose Minnow White Sucker Common Shiner Tessellated Darter Log Perch Longnose Dace Banded Killifish Rock Bass Redbelly Dace Cutlips Minnow Brown Bullhead Pumpkinseed Smallmouth Bass Spotfin Shiner Rosyface Shiner Yellow Perch Golden Shiner Brook Stickleback Mottled Sculpin Brook Trout Finescale Dace Fantail Darter Mimic Shiner Chain Pickerel Fathead Minnow **Brown Trout * Troutperch Sea Lamprey	Pumpkinseed Bluntnose Minnow Yellow Perch Silvery Minnow White Sucker Creek Chub Tessellated Darter Golden Shiner Mimic Shiner Log Perch Fallfish Spotfin Shiner Rosyface Shiner Blackchin Shiner Blacknose Dace Bluegill Bridle Shiner Brown Bullhead Emerald Shiner Rock Bass Sea Lamprey Cutlips Minnow Smallmouth Bass Longnose Dace Fathead Minnow Chain Pickerel Common Shiner *E. Sand Darter *Channel Darter *Redhorse sp. *Blacknose Shiner *Longnose Gar *Northern Pike *Walleye *White Perch *American Eel

Rare and Endangered species of Lewis Creek

Table 3 below lists the rare and Vermont listed (threatened and endangered) species found within the Lewis Creek watershed. Lewis Creek currently supports populations of six listed animal species, four endangered mussels and two threatened mussels. Five of these are found in the lower reaches of Lewis Creek within the natural community macroinvertebrate type B8. The sixth *Margaritifera margaritifera* Eastern Pearlshell found within mid-reaches of Lewis Creek as part of macroinvertebrate natural community type B3.

Several additional mussel species, the common mudpuppy, and two fish species are considered rare to uncommon in Vermont by the VTFW Natural Heritage Program and receive an S2 or S3 ranking. All of these species are found in habitats that are found in the main branch from Scott Pond to the Lake. Six aquatic plant species are also ranked as S1, S2, or S3 – very rare, rare, or uncommon by VTFW Natural Heritage program. All these plants are found in one or both of Cedar or Winona Lakes.

Table 3.

Vermont listed Endangered, Threatened, and Rare S1, S2 ranked aquatic species within stream reaches or lakes of the Lewis Creek watershed. These species are associated with certain macroinvertebrate assemblage types described in Table 1.

Animal	Scientific Name	Status	MA/B ANC Type	General Location
Pocketbook	<i>Lampsilis ovata</i>	E	B8	Below Rt 7 to Lake
Fluted Shell	<i>Lasmigona costata</i>	E	B8	Below Scott Pd to Lake
Pink heelsplitter	<i>Potamilus alatus</i>	E	B8	Below Rt 7 to Lake
Fragile papershell	<i>Leptodea fragilis</i>	E	B8	Near mouth
Giant Floater	<i>Pyganodon grandis</i>	T	B8	Near mouth
Eastern Pearlshell	<i>Margaritifera margaritifera</i>	T	B3	Mid main stem
Creek Heelsplitter	<i>Lasmigona compressa</i>	S2	B6,B8	Ab Scott Pd, Pond Brk
Triangle Floater	<i>Alasmidonta undulata</i>	S3	B3, B8	Mid Main stem and Below Rt 7 to Lake
Common mudpuppy	<i>Necturus maculosus</i>	S2		Lower Lewis Creek
E.Silvery Minnow	<i>Hybognathus regius</i>	S2		Below Ferrisburg falls
Rosyface shiner	<i>Notropus rubellus</i>	S2S3		Scott Pd-Lake
Plant				
Straight-leaf pondweed	<i>Potamogeton strictifolius</i>	S2		Cedar Lake, Winona Lake
Nuttall waterweed	<i>Elodea nuttali</i>	S2		Cedar Lake
Common water-nymph	<i>Najas guadalupensis</i>	S1		Winona Lake
Arrowleaf	<i>Peltandra virginica</i>	S1		Winona Lake
Humped bladderwort	<i>Utricularia gibba</i>	S3		Winona Lake
Hidden-fruited bladderwort	<i>Utricularia geminiscapa</i>	S3		Cedar Lake, Winona Lake