# Important Aquatic Habitats and Species Assemblages

This dataset is the combination of two different sources, Rivers & Streams as well as Lakes & Ponds. The two are described separately below.

## Rivers and Streams

### Description

These are set of river and stream reaches with known concentrations of rare species or high species diversity, or which are good examples of aquatic habitat conditions. Collectively, they are representative of the full range of stream sizes, gradients, and temperature conditions in Vermont, as identified by Anderson et al (2013).

### Ecological Function

Rivers and streams are a fundamental component of an ecologically functional landscape, and provide essential habitat for aquatic species, including fish, amphibians, reptiles, invertebrates, and plants. Particular river and stream reaches make exceptional contributions to Vermont's biological diversity, because of their unique physical characteristics arising from geology or topography, or because they are good examples of aquatic habitats. These places support many species and are crucial parts of Surface Waters and Riparian Areas network, but they also depend on the successful functioning of the entire aquatic network.

Representing elements of physical diversity increases the likelihood that species can shift on the landscape – or in this case, within the aquatic network – to find suitable habitat in response to climate change (Anderson and Ferree 2010; Beier and Brost 2010; Beier et al. 2015). Conserving the physical diversity of rivers and streams helps aquatic systems adapt and be resilient to climate change.

### Priority Target for an Ecologically Functional Landscape

The following river and stream reaches:

- Lake Champlain tributaries upstream to the fall line
    - Large rivers: Missisquoi River, Lamoille River, Winooski River, Mallets Creek, LaPlatte River, Lewis Creek, Otter Creek, Poultney River, East Creek
    - All other small rivers and streams that drain directly into Lake Champlain
- Large coldwater streams
    - Batten Kill from New York-Vermont border upstream on the main stem Batten Kill to elevation 798 feet (East Dorset) and on the West Branch to elevation 926 feet (Dorset Marsh in Dorset).
    - Castleton River from Whipple Hollow Road in West Rutland Marsh (West Rutland) to confluence with Poultney River (Fair Haven).
- High elevation coldwater streams

    - All streams above 1,400 feet elevation
- Connecticut River
    - Upper Connecticut River: this reach is delineated to the north by the state line (River Mile 319.0) and just upstream of Moore Reservoir (River Mile 247.0).
    - Lower Connecticut River below River Mile 120.0 to the state line.
- Connecticut River tributaries that are part of important wetland complexes
    - Nulhegan River complex; Manchester Brook/Symes Pond complex; Jewett Brook complex; Moose River/Victory Bog complex; Wheeler Stream/Dennis Pond Brook complex
- High-quality reaches with representative physical diversity
    - As mapped, including but not limited to reaches of: Barton River, Black River (Memphremagog), Clyde River, Furnace Brook, Hubbardton River, Huntington River, Lamoille River, Mettawee River, Middlebury River, Missisquoi River, Moose River, Neshobe River, New Haven River, Nulhegan River, Otter Creek, West River, White River, and Winhall River.

*Highest Priority*: All the river and stream reaches described above.

## Guidelines for Maintaining Ecological Function

River and stream reaches with important aquatic habitats and species assemblages must be part of a fully functioning network of surface waters and riparian areas. Although reaches with exceptional biological contributions can be identified, they cannot function independent of this larger network.

The ecological integrity of an aquatic system is dependent on the condition of the watershed in which it occurs but is also critically tied to the condition of the adjacent riparian area. River channel equilibriums need to be maintained or restored. Artificial barriers to aquatic organism movement (culverts, dams, etc.) should be removed or mitigated. Natural riparian vegetation should be maintained or restored to protect water quality, stabilize shorelines, and provide shade and the recruitment of downed wood and other natural organic matter. For full ecological function, this naturally vegetated area should encompass the entire mapped valley bottom riparian area. When this is not possible, a minimum 100-foot wide vegetated area adjacent to the stream or river will protect many, but not all, riparian functions. Aquatic vegetation should be maintained. The underwater physical substrate should be maintained or restored to provide suitable habitat conditions for foraging, shelter, and reproduction of aquatic organisms.

## Restoration Needs

Removal of artificial barriers and restoration of natural riparian vegetation is needed to reach full ecological function.

## Methods and Rationale

River and stream reaches that are targeted as Important Aquatic Habitats and Species Assemblages were selected using professional judgement. Specific reasoning behind each selection is listed below:

- Lake Champlain tributaries upstream to the fall line: Due to the influence of biogeography, these 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 elsewhere in Vermont. Due to the direct connection with Lake Champlain, these waters also provide habitats necessary for the support of Lake Champlain populations.
- Large coldwater streams: Large streams with specific geologic and hydrologic features that support coldwater species assemblages due to the combination of high alkalinity and abundant cold baseflow from groundwater inputs.
- High elevation coldwater streams: Streams characterized by simple, cold water obligate aquatic communities dominated by native species, especially brook trout and sculpin. These streams will be the refugia for cold water obligate taxa under predicted climate change warming in the next century.
- Upper Connecticut River: supports burbot, round whitefish, and coldwater fish communities.
- Lower Connecticut River: the historic upper limit of American shad in the river, and habitat for American eel, anadromous sea lamprey, blueback herring and alewife floater (mussel).
- Connecticut River tributaries that are part of important wetland complexes: good examples of wetland-influenced aquatic habitats and known occurrences of rare species
- Reaches representing the range of physical conditions in aquatic features, as categorized by stream size, gradient, and temperature setting, providing a coarse filter for capturing the habitat and needs of many aquatic species including invertebrates and aquatic plants.

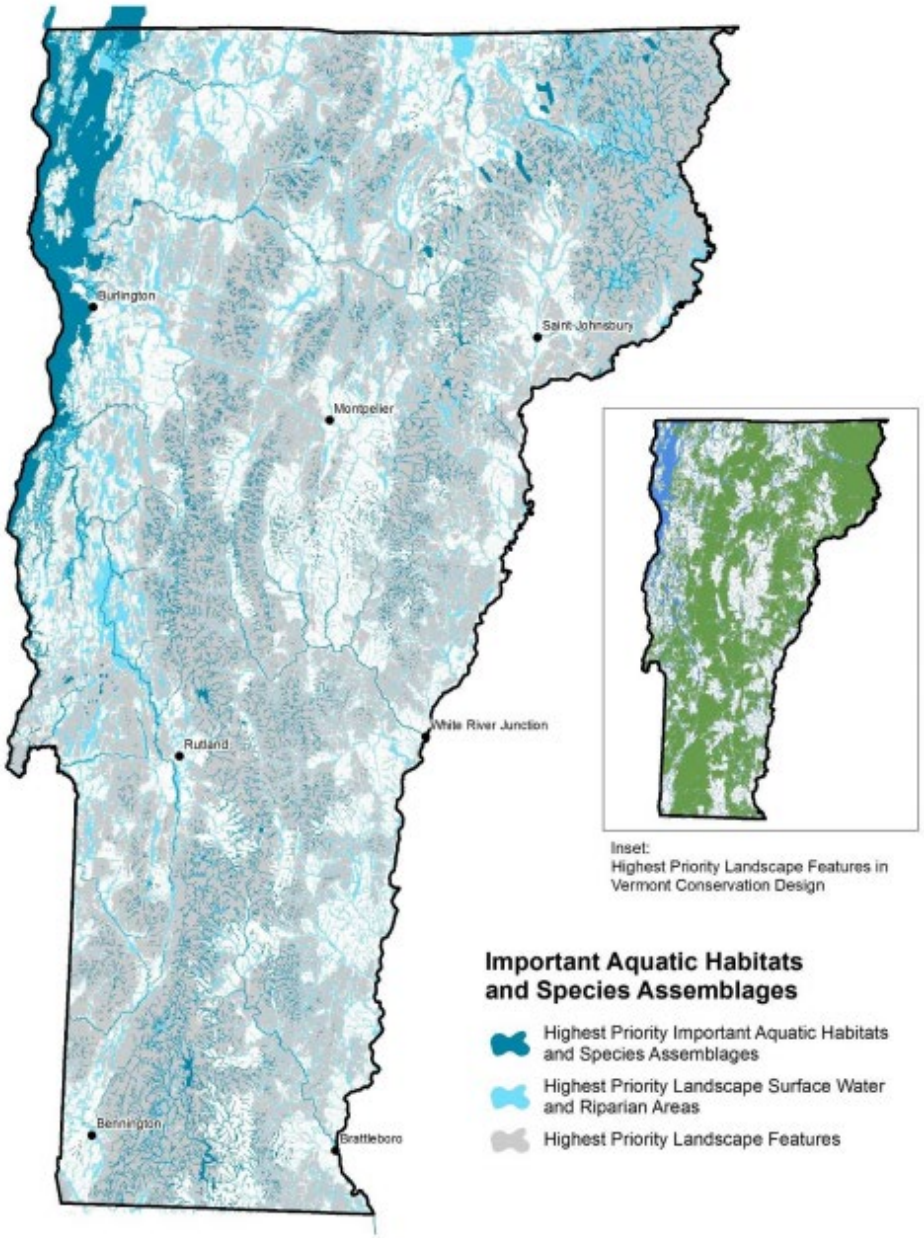
## Mapping Comments

The map layer is a complete representation of the priority and highest priority targets, except it does not show all streams above 1,400 feet in elevation. These streams, regardless of mapping, are considered highest priority at this scale. Otherwise, all highest priority river and stream reaches with important aquatic habitats and species assemblages are mapped as part of the "Important Aquatic Habitats and Species Assemblages" layer. This layer also includes lakes and ponds with equivalent contributions to biological diversity.

## Map: Important Aquatic Habitats and Species Assemblages

River and stream, and lake and pond targets for Important Aquatic Habitats and Species Assemblages are mapped together.

## Map 4: Important Aquatic Habitats and Species Assemblages




Important Aquatic Habitats and Species Assemblages targets, including both lakes and ponds as well as rivers and streams.

## Lakes and Ponds

### Definition

These are lakes and ponds with known concentrations of rare species, exceptional species diversity, or which are examples of high-quality aquatic habitat.

### Ecological Function

Lakes and ponds are essential habitat for many of Vermont's aquatic species, including fish, amphibians, reptiles, invertebrates, and plants. Some lakes and ponds make exceptional contributions to Vermont's biological diversity, because of their unique physical characteristics arising from their water chemistry and physical setting, or because they support concentrations of rare or uncommon species. These lakes and ponds are crucial parts of Surface Waters and Riparian Areas network, but they also depend on the successful functioning of the entire aquatic network.

### Priority Target for an Ecologically Functional Landscape

The following lakes and ponds:

- Lake Champlain
- Lakes and ponds supporting round whitefish and/or naturally reproducing lake trout: Great Averill, Little Averill, Beaver, Caspian, Crystal, Echo (Charleston), Elligo, Seymour, Willoughby
- Rutland County Lakes: Austin, Beebe, Black, Breese, Burr, Choate, Doughty, Echo, Halfmoon, High, Hinkum, Hough, Huff, Johnson, Mill (Benson), Mud (Benson), Mudd (Hubbardton), Perch, Roach, Spruce, Sunrise, Sunset, Walker
- High elevation ponds: Bourn and Branch (Sunderland), Stratton (Stratton), Lake Pleiad (Hancock), North Pond (Chittenden), Griffith Lake (Mount Tabor), Big Mud (Mount Tabor), and Little Rock (Wallingford)
- Wild Brook Trout ponds: Beck Pond, Cow Mountain Pond, Hidden Pond, Jobs Pond, Lake Pleiad (Hancock), Martins Pond, North Pond (Chittenden), Unknown Pond (Avery's Gore), West Mountain Pond

*Highest Priority*: All the lakes and ponds listed above.

### Guidelines for Maintaining Ecological Function

Lakes and ponds with important aquatic habitats and species assemblages must be part of a fully functioning network of surface waters and riparian areas.

The ecological integrity of an aquatic system is dependent on the condition of the watershed in which it occurs but is also critically tied to the condition of the adjacent riparian area. Natural riparian vegetation should be maintained or restored to protect water quality, stabilize shorelines, and provide shade and the recruitment of downed wood and other natural organic matter. For full ecological function, this naturally vegetated area should encompass the entire mapped valley bottom

riparian area. When this is not possible, a minimum 250-foot wide vegetated area adjacent to the lake or pond will protect many, but not all, riparian functions.

Developed shorelines that cannot be fully restored should minimize runoff, erosion, and other negative impacts to water quality and shoreline stability. Aquatic vegetation should be maintained, and invasive species controlled. The underwater physical substrate should be maintained or restored to provide suitable habitat conditions for foraging, shelter, and reproduction of aquatic organisms.

## Restoration Needs

Restoration of natural riparian vegetation is needed to reach full ecological function.

## Methods and Rationale

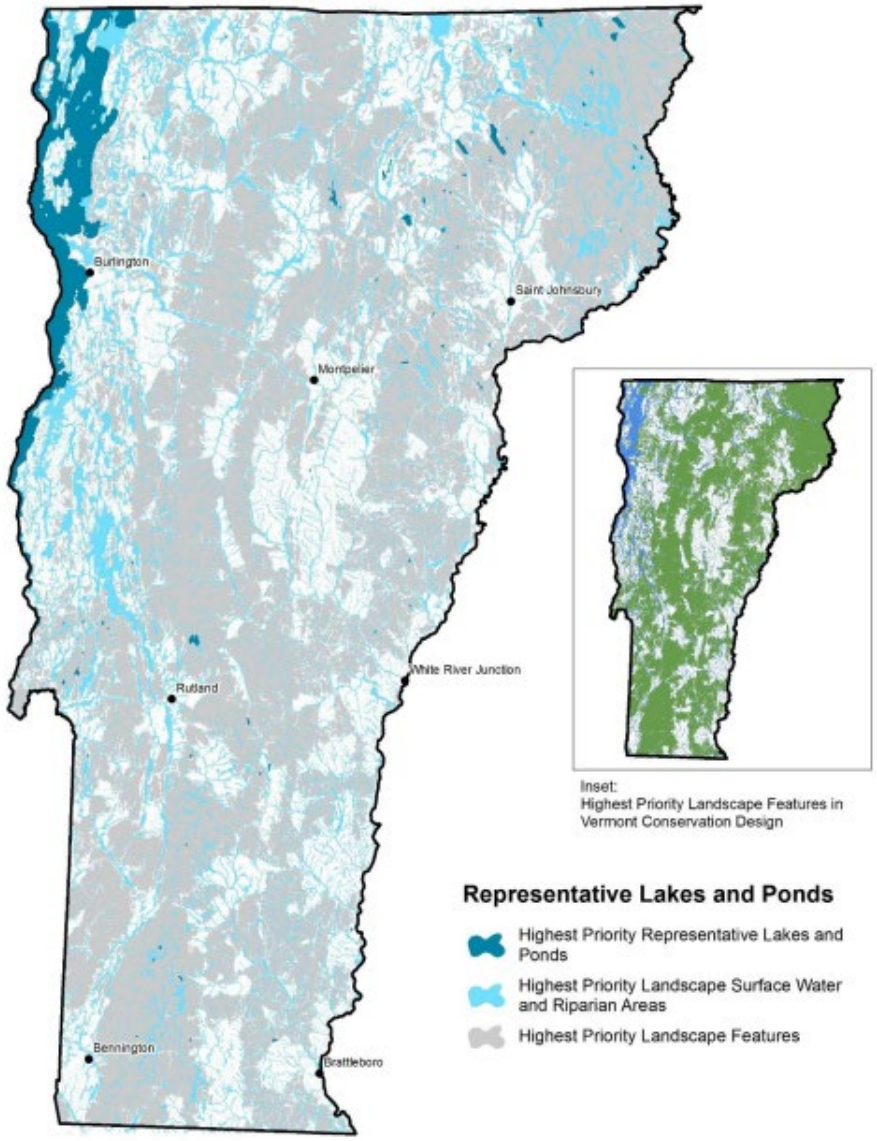
Conserving lakes and ponds with known contributions to biological diversity helps ensure that all aquatic species are maintained as part of the ecologically functional landscape. Lakes and ponds that are targeted as Important Aquatic Habitats and Species Assemblages were selected using professional judgement. Specific reasoning behind each selection is listed below:

- Lake Champlain: due to the influence of biogeography, Lake Champlain supports native fish and mussel species from two glacial refugia.
- Lakes and ponds supporting round whitefish and/or naturally reproducing lake trout are limited in the state and conserve these rare and uncommon species
- Rutland County Lakes: supporting or expected to support species assemblages including blackchin shiner, bridle shiner, blacknose shiner, and redfin pickerel.
- High elevation ponds: habitats characterized by simple, cold water obligate aquatic communities.
- Wild brook trout ponds: the presence of self-sustaining wild brook trout populations in ponds indicates good water quality and habitat conditions expected to benefit many aquatic species.

## Mapping Comments

The map layer is a complete representation of the priority and highest priority targets. All highest priority lakes and ponds with important aquatic habitats and species assemblages are mapped as part of the “Important Aquatic Habitats and Species Assemblages” layer. This layer also includes river and stream reaches with equivalent contributions to biological diversity.

## Map 5: Representative Lakes and Ponds Targets



## For more information

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