Saint Lawrence/Champlain Valley Aquatic Community Working Group
Aquatic Community Classification and Portfolio
SUMMARY
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The Aquatic Community Working Group (David Hunt, Mark Anderson, and Eric Sorenson) led a multi-year effort to develop a classification of aquatic community types throughout the Saint Lawrence/Champlain Valley Ecoregion (STL) and design the first iteration of a portfolio of occurrences important in conserving the aquatic biodiversity of the ecoregion. This effort spanned from 1999 to 2002 and had two components. David took the lead in addressing community-level features, attempting to integrate heritage program methodology for aquatic communities with recent TNC efforts in aquatic biodiversity conservation; Mark took the lead in addressing system-level features to integrate community and species occurrences with landscape features. This summary addresses an approach to identify appropriate aquatic community occurrences for the first iteration of the STL plan, referred to throughout our efforts as the "heritage approach".

Our efforts were segregated into three steps: 1) formation of an ecoregion classification, 2) assessment of the viability of aquatic community occurrences, and 3) development of the portfolio. We attempted to carefully document our approach throughout our efforts, as a heritage approach towards aquatic communities, which was reportedly a novel idea in TNC ecoregional planning efforts. Separate documents were formed for each of the three major steps. Some documentation is more advanced than others. Having run out of time to complete documentation to our team's satisfaction, outstanding documentation needs are listed below.

We developed a classification system for both river and lake macrohabitats, intending to be comprehensive for the New York and Vermont portion of STL, and include much of the suspected community types in the Canada portion of STL. The basic classification was modelled after the coarse-scale names of the New York Natural Heritage Program classification, but borrowed from the holistic classifications of heritage programs in other states, the holistic regional heritage classification, TNC classification efforts, and classifications of species assemblages and holistic units in the general aquatic literature. Generally, the classification was intended to represent all major abiotic variation in aquatic macrohabitats ("basic macrohabitats"), then stratify each basic macrohabitat across geographic units where large breaks in biotic composition and structure were known or suspected into "specific macrohabitats", typically characteristic of one ecoregion or ecological drainage unit. The macrohabitat classification can be found in two documents: one for rivers entitled (Saint Lawrence/Champlain Valley Ecoregion [SLCV]. Known or Suspected, Extant or Extirpated Riverine Macrohabitats/Alliances; July 7, 2000) and one for lakes entitled (Saint Lawrence/Champlain Valley Ecoregion [SLCV]. Known or Suspected, Extant or Extirpated Lacustrine Macrohabitats/Alliances; February 23, 2001). Background documentation was prepared which classified known and suspected aquatic communities smaller than macrohabitats from which the macrohabitat classification was assembled: species assemblages for fishes, macroinvertebrates, aquatic macrophytes, and plankton. This documentation, is in earlier versions of the reports entitled as above follows: Riverine Species Assemblages: Part 1 of the March 22, 2000 draft; Lacustrine Species Assemblages: Part 1 of the April 27, 2000 draft. The justification for and explanation of the river and lake classifications are extensive and provided in two documents: one for rivers entitled (NAP/SLCV Riverine Crosswalk. Background Information, Explanation and Justification; March 14, 2000) and one for lakes entitled (NAP/SLCV Lacustrine Community Crosswalk. Background Information, Explanation and Justification; May 3, 2000). Several figures and tables accompanied these documents, including a dichotomous key to both riverine and lacustrine basic macrohabitat types entitled (Dichotomous Key to Basic Aquatic Macrohabitat Types; February 8, 2001).

The viability assessment procedure was detailed in a document entitled (Saint Lawrence/Champlain Valley Aquatic Working Group. Viability Assessment for Heritage-Assessed Occurrences; April 16, 2002), complete with several tables. Similarly, the portfolio development procedure was detailed in a document entitled (Saint Lawrence/Champlain Valley Aquatic Working Group. Portfolio Development for Heritage-Assessed Occurrences; April 16, 2002), complete with several tables. A final portfolio of community occurrences is being assembled by ECS staff. A map of the New York portion of the community portfolio was provided to ECS to include in the ecoregion plan. ECS staff plan to merge the community portfolio with an aquatic systems-level portfolio.

The aquatic community portfolio differed from typical terrestrial portfolios which use a heritage approach in that solid leads of community occurrences were allowed in the portfolio, unlike terrestrial portfolios which typically restrict inclusion to occurrences which are fully documented in heritage databases. The portfolio includes not only aquatic macrohabitats, but also some "embedded features" within the largest aquatic community types (Lake Champlain and the Saint Lawrence River). Embedded features include faunal concentration areas such as warmwater fish concentration area, morphometric features such as bays, and physiognomic features such as aquatic beds.
We chose 36 primary target types for the portfolio and sought to include up to 6 examples of each, stratified by geographic regions, typically ecoregion subsections. The final number of community occurrences suggested for the portfolio is 66, out of 246 EOs assessed. This number seems good for a first iteration portfolio in that it is not overwhelming, but provides sufficient representation. The occurrences selected represent a combination of those in aquatic networks of aggregated high quality

community examples and those that are isolated from other aquatic features or other known high quality aquatic features. We had the advantage in this ecoregion of having numerous BCD-documented aquatic EOs, numerous leads from prior background review throughout much of the New York portion of the ecoregion, a report presenting an integrated review of aquatic classification features and exemplary sites throughout Vermont, and input from Vermont experts on fishes, macroinvertebrates and aquatic macrophytes. The first iteration of the community portfolio includes examples not only for aquatic macrohabitats characteristic of STL, but also aquatic macrohabitats characteristic of the Northern Appalachians (NAP) and Great Lakes (GL) Ecoregions, thought to be peripheral in this ecoregion.

The team accomplished much given the limited funds and time available and we acknowledge that there is much more information that could be collected and analyzed to improve both the classification and portfolio. Accordingly, sections for "future recommendations" were added to the viability assessment and portfolio development documents to guide efforts in any second iteration of the ecoregion plan and this portfolio of aquatic communities.

Outstanding documentation needs:

While most of the viability assessment and portfolio development sections are deemed complete, we ran out of time to conduct additional work to clean up the classification documents. Plans to modify those documents included a) consolidation of the river and lake justification/explanation sections, b) updating of the language to reflect any changes that evolved over the course of our team's efforts, c) revision of the community descriptions to distinguish many of the peripheral community types (mostly NAP types but some GL types) that we suspect are in STL, once ELU maps were displayed and the group had a chance to review them, d) provision of a more satisfactory reference list, and e) addition of a future recommendations section.

Saint Lawrence/Champlain Valley Aquatic Community Working Group
Viability Assessment for Heritage-Assessed Occurrences

Draft 3, April 16, 2002

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Others: Mark Bryer, Sandy Bonanno, Bob Zaremba, Arlene Olivero, Liz Thompson, Bill Brown, Greg Edinger

1. Summary of Approach

This document details an approach for addressing occurrence viability using field-based data (heritage-documented occurrences) for aquatic communities (macrohabitats) in ecoregional plans. Because of the general sparse nature of aquatic community occurrences in heritage databases nationally at this date, other ecoregional plans have relied heavily or solely upon GIS-based data to predict the presence of, assess and select aquatic community occurrences for ecoregional portfolios. According to Mark Bryer of The Nature Conservancy's (TNC) Freshwater Institute, the very few aquatic communities documented outside of New York are globally rare and usually associated with rare species, such as the desert springs of Nevada. New York Heritage Program is reportedly exceptional among heritage programs in currently having many aquatic community occurrences (EOs) documented, with 20 riverine occurrences and 35 lacustrine occurrences documented statewide and about 30 more riverine occurrences in progress from Year 2000 and 2001 surveys. Only a few of these occurrences are from the Saint Lawrence/Champlain Valley Ecoregion (STL). However, as part of the 1995 to 1998 "Adirondack Exemplary Community Project", David conducted interviews with over 100 community experts to obtain information on the best examples of all community types throughout the Adirondack TNC area, which encompasses about 70% of New York STL and covered all aquatic community types present in New York STL. Additionally, the Vermont Aquatic Working Group had hypothesized best examples of several river and lake types throughout Vermont. Thus, between these two sources, information on numerous leads was available from which to build a solid preliminary portfolio.

Our team's vision for addressing heritage-documented information on aquatic communities was to set up an approach that would work in the long term for the STL Ecoregion and potentially other ecoregions as more aquatic community occurrences are documented throughout the ecoregion and the heritage network. David's belief has been that the two approaches being taken by 1) the heritage network, focused on applying standardized occurrence ranking methodology to heritage-documented occurrences, and 2) The Nature Conservancy ecoregion teams, using remote GIS analyses as a predictive tool for occurrence viability, are compatible, can mutually enhance one another, and may in the long term converge into one powerful unified approach. David has also been a strong advocate of hoping that heritage methodologies can be brought into ecoregional plans to strengthen them, especially for aquatic communities, especially at the community occurrence level, and especially as a supplement to system level targets. According to Mark Bryer, this was a novel approach and should be made available for consideration in planning efforts for other TNC ecoregions.

For the first iteration of the STL Ecoregion plan, the aquatic community team used an approach focused on heritage-documented occurrences in conjunction with a parallel GIS approach. Very few fully documented occurrences were applicable to the "heritage approach" in this iteration, although we did have preliminary information on numerous leads which we considered. The power of the approach lies hopefully in future iterations of the ecoregional plan, after more occurrences are fully documented through standard heritage methodology. For now, it was hoped that this iteration would more precisely steer inventory priorities towards increased heritage documentation as a field-tested examination of any important GIS-predicted sites.

In applying "more orthodox methods" of viability assessment of heritage-documented EOs, we took an approach similar to that used to evaluate viability for non-aquatic targets in NAP and link, where feasible and to the greatest degree possible, similar heritage network and TNC methods. While only about 3 macrohabit-level aquatic community EOs, but 36 total aquatic community EOs (when 31 embedded feature EOs are considered), were currently in the databases of NYHP and VTHP for STL ecoregion (all but 2 from New York, and the 2 Vermont EOs assessed as probably non-viable by VT DEC staff and apparently not assessed for the portfolio), we wanted to set up a long-term model for viability assessment that is expected and intended to become increasingly relevant to heritage program data in the long term as more EOs get in the databases, complete with overall occurrence ranks and partial ranking information that supports the ranks (including "subranks" for size, condition and landscape context). For the first iteration of the plan a surrogate GIS-derived viability assessment, comparing nested watersheds over biophysically similar areas, was used as a top down approach to selecting landscape-level conservation sites throughout the ecoregion. This approach was used both 1) as a comparison to the heritage approach for the selection of occurrences of large river types and 2) to assemble high quality occurrences of associated aquatic and riverside communities into connected stream networks. Mark Anderson and Arlene Olivero documented this approach separately.

2. Models from other Ecoregions

Models exist in both the heritage network and TNC for measures of the overall viability of community occurrences and its component size, condition and landscape context. Heritage and TNC approaches may differ in 1) the number of rank categories used to rank an occurrence or each ranking factor, 2) the thresholds for each rank or subrank, and 3) the parameters used to assess and generate each rank or subrank. As time permitted, we tried to review and assess existing heritage and TNC models to integrate into one approach for STL. Our approach was modelled upon that of 1) heritage network national EO data standards (The Nature Conservancy and Association for Biodiversity Information, 1999; Draft Element Occurrence Data Standard. September 20. 213 pp.), 2) New York Heritage Program (NYHP) "state" specifications for NYHP aquatic communities in STL as an applied version of the EO data standards, 3) the Northern Appalachians (NAP) Ecoregional Plan (Sept. 1998 draft version, p. 8-15), 4) Guidelines for Representing Ecological Communities (Mark Anderson et al., 1999, p. 14-17 in 1998 draft version), 5) Mark Anderson's Overview of Ecoregional Planning Methodology and Results for NAP (Nov. 1, 1997 version, p. 6-10), and 6) TNC's Geography of Hope (1997 version, p. 43). These approaches detail 1) the partitioning process of overall occurrence ranks into subranks or rank factors, 2) concise definitions of size, condition and landscape context, 3)justification for the use of the three rank factors, 4) synthesis of rank factors into an overall rank, and 5) criteria for viability thresholds for each rank factor. The details of these methods are not repeated in this document, except where potential confusion was anticipated or for clarity.

Rank specifications at NYHP for both generalized community systems (riverine and lacustrine systems) and specific community types (macrohabitat types) for nearly all riverine and lacustrine communities in STL ecoregion were used to guide this effort. Pennsylvania Heritage Program (PAHP) also has specifications for rivers according to Mark Anderson. A recommendation for the second iteration of the plan is to reconcile PAHP information and specifications of other heritage programs with NYHP specifications and the general viability assessment methods used to guide our approach here. Viability assessments for stream systems (aggregations of riverine communities) have been conducted for the Chesapeake Bay Ecoregion and possibly the Lower New England (LNE) Ecoregion. A recommendation for the second iteration of the plan is to compare and reconcile these information with our approach to individual community occurrences. Further development of the TNC GIS approach to viability assessment may come from the STL ecoregional plan or the national aquatics working group. Mark Anderson has taken the lead on this effort and we could also pull in these information to improve the heritage approach for STL in future iterations of the plan.

Heritage Documents:

The occurrence ranking model for communities and species is based on assigning ranks and subranks to occurrences using an A to D ranking scale, with A to C ranks representing viable occurrences, and D rank representing non-viable occurrences. The three standard ranking factors now being widely used by heritage programs are 1) size, 2) condition and 3) landscape context.

Ideally we seek viable occurrences for ecoregional plans. The heritage model for community ranking, at least that applied at NY Heritage Program since the start of the program (Carol Reschke, pers. com.), has not necessarily been one of "absolute viability", but rather of "relative viability" (i.e., viability of all the features present in the existing benchmark, or global exemplary, site). Attributes of absolute viability sought include: the ability of a community to support the life history of all biota characteristic of an idealized unaltered state of the community type, including both resident and migratory species. At the species level, historically present migratory species (e.g., Atlantic salmon) may be heavily impacted today in many aquatic communities and might be considered non-viable in many or all EOs tracked by heritage programs. Such issues may not be factored into assessments of relative community viability, unless the benchmark examples still maintain these species. Other features of absolute viability include intact aquatic processes such as water flow, water circulation, water level fluctuations, interchange of terrestrial and aquatic biota, and passive and active species dispersal. Relative viability is reflected by size, condition and landscape context subranks, each with its own threshold necessary for viability.

TNC Documents:

GIS-Derived Approach for Reaches, Systems, and Watersheds in the Chesapeake Bay Ecoregion:

TNC's Eastern Conservation Science (ECS) staff have been developing rigorous quantitative analyses for watershed and stream system viability analyses. "Stream systems" represent a combination of several physically-connected macrohabitats within one watershed. Landscape condition is modelled based on data layers for dams, point source pollution, roads and land cover. Parameters are normalized to stream mile. Watersheds are ranked relatively within the ecoregion, and reaches within one watershed are ranked relatively to all reaches in the watershed. Analyses of different data layers have shown a roughly inverse correlation of watershed condition based on dams versus watershed condition based on roads and land cover (dams are often established for water supply; less roads and less intensive land use often surround these water supplies to preserve water quality). GIS-generated landscape context measures are partitioned by quartile (i.e., into 4 rank categories). Several categories of data, mostly applicable to instream features and especially those relating to biological condition, are difficult to obtain and were not included in analyses of the Chesapeake Bay ecoregion. These include ditches, exotic aquatic species, fish stocking, and fish harvest.

3. General EO Ranking Methodology for STL.
The "Heritage Occurrence Ranking Model".

General Approach:

We used a standard rating system for size, condition and landscape context of aquatic macrohabitat occurrences which follows well established heritage network methods. We used a uniform ranking system (i.e., an A to D rank scale for both overall EO rank and subranks for the three ranking factors) that is ideally flexible and catered to macrohabitat types across their rangewide distribution. While we could have applied this system separately to each macrohabitat type, we found it simpler to use, as a surrogate, generalized groups of macrohabitats with similar rangewide size, community condition and landscape context patterns. TNC GIS-derived information could theoretically be used to supplement this effort, and would be especially helpful for the landscape context subrank. For the second iteration of the plan, we recommend collaborative review of the similarities and discrepancies between the heritage and TNC approaches to viability for 1) the number of rank categories, 2) parameters used to derive ranks, and 3) thresholds between rank categories, and we advocate for convergence of the two methodologies. A more careful comparison of these methods is recommended for the second iteration of the plan, after more adequate time for thought has been allowed. The purpose of our work in the first iteration was to 1) develop guidelines for determining the subranks for the size, condition and landscape context of occurrences, then 2) apply these guidelines at a minimum to the few existing heritage-documented EOs.

Justification for Approach:

Following the heritage occurrence ranking model, community size, condition and landscape context subranks were used to derive an overall occurrence rank. While official global rank specifications were not available for aquatic communities, lacking an official global classification as a starting point, our attempt was to use a combination of ecological intuition, field experience and literature review among a small group of state, regional and national heritage and TNC ecologists to suggest a rangewide classification and rangewide rank specifications that would cover all aquatic communities throughout the NY and VT portions of STL, hoping that this was sufficient for the first iteration of the ecoregion plan. This approach 1) parallels (and is thus consistent with) attempts at classification and rank specifications conducted for terrestrial communities during the early evolution of TNC ecoregional planning in the mid to late 1990s and 2) seems totally appropriate for aquatic communities in 2002 given the current status of our knowledge on aquatic systems within the heritage network.

Methodology:

The first step in assessing the viability of element occurrences (EOs) is to delineate the occurrence. Following specifications at NYHP, EOs are delineated based on 1) characteristic thresholds for distinguishing patches of each community type as distinct from related and/or associated community types, 2) lumping multiple patches of the same community into one occurrence using standardized patch separation distance criteria, and 3) factoring in any unnatural barriers to genetic exchange between patches. In practice, NYHP standardly lumps patches of the same community type within 1.0 mile in flowing water systems with no obstructions into a single occurrence, and patches of the same community type within about 0.1 to 0.2 miles in ponded water systems with no obstructions and connected by surface or groundwater into a single occurrence. Thus, for example, a single example of a rocky headwater stream EO may consist of a dendritic network of several connected stream segments of different order; similarly, a single example of a vernal pond EO may consist of a series of several pools in close proximity connected via groundwater. While these distance criteria have been in use for awhile at NYHP, they are not standardly used by other heritage programs, they are admittedly somewhat arbitrary, and VTHP has not had the opportunity to critically evaluate them.

For each of the three ranking factors (macrohabitat size, condition and landscape context), we provide below 1) the definition of the ranking factor, 2) a comparison of heritage and TNC approaches to deriving information about the ranking factor, and 3) recommendations for how to apply and reconcile information from these divergent methods for future iterations of the STL plan. We attempted to refine criteria to implement a viability assessment, using each of the three ranking factors by integrating parameters, ranking approaches and thresholds used by both the heritage network and TNC. For the second iteration, we also recommend reconciliation of this approach with viability thresholds outlined in other ecoregional plans (Chesapeake Bay, Lower New England, High Allegany Plateau/HAL).

We relied most heavily on the suspected most accurate and precise information available for each ranking factor at the time of our assessment in April 2002. Field data from heritage programs and GIS data are currently divergent enough to have different capabilities and power to accurately estimate subranks for the three ranking factors. An algorithm was suggested for reconciling heritage network and TNC approaches for each ranking factor based on these differences, and is intended to serve as a long-term model while heritage-documented occurrences are expected to increase in future years and TNC landscape and classification analyses become more refined and readily accessible. Integration of these two approaches is suggested for the second iteration as a way to have one procedure for assessing targets at the aquatic macrohabitat level, thus deciding whether to rely most heavily on heritage or GIS-derived data for a particular occurrence. For the first iteration of the STL plan, there was insufficient time to derive from GIS either occurrence size or landscape context from an ecoregion perspective. This is a strong recommendation for the second iteration of the plan. The occurrences selected for targets in the ecoregional portfolio thus represent a combination of typical heritage-assessed EOs and segments of large streams derived from GIS comparisons of landscape context within similar biophysical units smaller than ecoregions, representing watersheds of river classes that parallel the heritage classification's unconfined and confined rivers.

The power of GIS is limited by the availability of data. While good watershed-level data are probably comprehensively available throughout the northeast U.S., including those for dams, roads, and land cover, many currently available types of instream data are apparently piecemeal, inconsistent or not comprehensive throughout an ecoregion. Important instream data layers such as fish harvest, fish stocking, exotic species, water quality, integrity indices, and ditches may be available on a more local basis (e.g., state to state) and may be available for some parameters in NY or VT. We discussed the possibility of NYHP and VTHP staff tracking down such data layers for ECS to include in their GIS analyses. Information on biological condition, heavily factored into the overall occurrence rank in heritage methodology, has apparently been most difficult to obtain on GIS. We ran out of time to apply much GIS data to heritage-classified EOs, and compare GIS methods developed at ECS and the Great Lakes office to help refine our approach.

While the current model for ranking community occurrences within heritage programs can be simplified into three ranking factors, each with a corresponding subrank, the actual algorithm for synthesizing occurrence ranks is more complex. At NYHP, "diversity" is considered one of about 8 condition factors under the three-tiered ranking system. An alternate system used by TNC in some ecoregional planning efforts has been to treat diversity as a fourth category. We recommend exploring whether to segregate diversity as a fourth category in the second iteration of the STL plan. "Community Condition" explicitly addresses the current condition of features WITHIN a community occurrence, as opposed to "Landscape Context", which explicitly addresses the current condition of features OUTSIDE OF a community occurrence and likely to influence the condition WITHIN the community over the next 25 years.

Interactions between the size and condition of different patches within one occurrence, where the condition is not uniform throughout the occurrence or its landscape, typically complicate ranking synthesis. At NYHP it has been standard practice to use a complex algorithm to derive occurrence rank based on differential weighting of patches with different condition. To avoid such complications, for the first iteration of the STL plan we simplified this process by: 1) trusting that a more complex algorithm has been used at heritage programs to derive ranks and subranks for heritage-documented occurrences or, 2) lacking such existing ranks in heritage databases, we used an average condition across both the entire occurrence and its landscape to derive community condition and landscape context subranks. For the second iteration, we hope to derive average landscape condition ranks for each occurrence from GIS analyses. Arlene Olivero has good documentation on this approach.

A. Community Size Ranking Factor.

Definition:

A quantitative measure of the areal extent of an occurrence (heritage network's EO Data Standards, TNC's Geography of Hope). Size for ecological communities is typically measured in acres. Linear miles is typically used as a supplement for riverine communities. NYHP has also noted volume as an alternative measure of this parameter (especially for lacustrine communities), and it might be considered in future iterations of the plan. Size is known as a surrogate for inherent species diversity (following the predictions based on the species/area curve model) and is also related to minimum areas needed for functional ecosystem processes of different scales. Observed diversity is more directly addressed under the community condition ranking factor.

Methods of Derivation:

Heritage network: Documented EOs are quantitatively determined based on direct observations (field surveys), aerial photography, 1:24,000 topographic maps and digitization. Size for leads are usually roughly estimated, starting with 1:150,000 maps, then sometimes proceeding to 1:24,000 topographic maps.

TNC: quantitatively determined based on GIS data layers, provided that occurrences can be modelled accurately.

Algorithm:

Use the heritage-documented or estimated value (and subrank) for an occurrence first, if available and especially if derived from GIS digitization (as standardly done now at NYHP), otherwise use any GIS-estimated value from TNC, if available or if suspected to be more accurate than visual estimations using an acreage grid (as standardly done now at VTHP and formerly done prior to 2000 at NYHP; and especially for lakes), and apply rank specifications. To more accurately predict size: resolve major discrepancies by reviewing/revising 1) heritage occurrence boundaries, and/or 2) community occurrence and rank specifications, and/or 3) the GIS model (e.g., break points between macrohabitat types).

B. Community Condition Ranking Factor.

Definition:

An integrated measure of the quality of biotic and abiotic factors, structures and processes within the occurrence and the degree to which they affect the continued existence of the occurrence (heritage network's EO Data Standards, TNC's Geography of Hope). As discussed above, "community condition" reflects both 1) the degree of alteration of an occurrence from its baseline condition or a rangewide benchmark state, and 2) the inherent (i.e., unaltered by degradation of the condition) within-community diversity of physical and biological features. Diversity features can include underlying geology and substrate types, stream order, watershed size class, flow microhabitats, depth/stratification microhabitats, ecological associations, species assemblages, water chemistry, and more. We recommend exploring whether to segregate diversity from community condition as a fourth category in the second iteration of the STL plan. Community condition addresses features WITHIN an occurrence, in contrast to "landscape context" which addresses features OUTSIDE OF an occurrence. Arlene Olivero and ECS staff may have a more updated version of the applied definition of community condition.

Methods of Derivation:

Heritage network: mostly qualitatively to semi-quantitatively determined based on field surveys, literature review and semi-quantitative surrogate landscape context analyses. This factor includes diversity in fine-scale physical units ("habitats") thought to be correlated with species diversity including 1) underlying geology (for lakes and rivers), 2) connectivity (especially for lakes), and 3) stream order (especially for unconfined rivers and confined rivers). A list of parameters typically considered in deriving the condition subrank for aquatic communities at NYHP, used for estimating ranks of NY EOs for our STL approach, and recommended for use in future iterations of the plan is attached (Table 1). This list is extensive and is intended to represent the consolidation of parameters used for several purposes: 1) general specifications at NYHP for aquatic community systems, 2) Mark Anderson's April 12, 2000 memorandum on watershed analyses, 3) the Northeast aquatic working group's November 6, 2000 list of aquatic condition variables, and 4) landscape analyses for projects that David has overseen at NYHP including the Lake Erie Gorges and Tug Hill Stream projects. Such efforts are ongoing within NYHP, the heritage network and TNC working groups, and future refinements and evaluations of this list are recommended (e.g., comparison to a recent memorandum from George Schuler to NYHP staff). The condition of heritage-documented occurrences is often assigned by heritage ecologists using "ecological gestalt", and we tried to follow this method for the first iteration of the STL plan. A more complete application of condition rank to any remaining EOs is recommended for the second iteration. If a more rigorously quantified measure of condition is desired in the second iteration of the plan, we could apply algorithms which weight and synthesize different condition parameters such as those used at NYHP (NYHP's field forms, NYHP's Lake Erie Gorges project, NYHP's Tug Hill Stream project) or ECS (watershed analyses). Specifications for each community type at NYHP provide one means of more precisely applying differential prioritization of parameters in deriving a community condition subrank for occurrences.

TNC: in theory can be semi-quantitatively estimated based on GIS data layers for landscape context, assuming that there are strong correlations between community condition and landscape context. Several of the parameters applied to GIS landscape analyses are also applicable to individual community occurrences. However, many of the finer-scale condition parameters such as substrate types are not predictable from remote data layers and are not yet available in comprehensive GIS datasets compiled from field sampling. TNC typically uses a "quartile system", with sets of parameters for landscape attributes including land cover, roadedness, dams, and point source pollutants, to rank landscape integrity.

Algorithm:

Use the heritage-documented or estimated subrank for occurrence first, if available, otherwise use any GIS-estimated landscape context data from TNC as a surrogate to estimate a condition rank. It is known that condition and landscape context are not always correlated, but, as a general rule, there is often good correlation between the two factors, thus warranting the potential use of GIS-derived landscape context as a surrogate for community condition. GIS estimations of diversity below the level of discernment of macrohabitats (i.e., a) aquatic connectivity features such as lake outlets, and b) surficial geology/substrate diversity) may also be combined into a GIS prediction of condition. Expert interviews are useful to supplement community condition information derived from both heritage surveys and TNC GIS analyses and to potentially refine the condition subrank. To more accurately predict community condition: resolve major discrepancies by reviewing/revising 1) heritage ranking forms, and/or 2) community rank specifications, and/or 3) GIS model parameters and/or data layers, and/or 4) translation of expert opinions into a broader/rangewide or more holistic context.

C. Landscape Context Ranking Factor.

Definition:

An integrated measure of the quality of biotic and abiotic factors, structures and processes surrounding the occurrence and the degree to which they affect the continued existence of the occurrence (heritage network's EO Data Standards, TNC's Geography of Hope). "Landscape context" reflects both 1) the size of the functional landscape which influences an occurrence, and 2) its alteration from its baseline condition or a rangewide benchmark state. Landscape context addresses current features OUTSIDE OF an occurrence, in contrast to "community condition" which addresses current features WITHIN an occurrence. Landscape features are expected to influence the condition of features WITHIN the community over the next 25 years through ecological processes which function at a landscape-level scale. Arlene Olivero and ECS staff may have a more updated version of this definition.

Methods of Derivation:

Heritage network: mostly semi-quantitatively determined based on field surveys and analyses of aerial photographs, topography maps and land cover maps. A list of parameters typically used in deriving landscape context subrank for aquatic communities at NYHP is attached (Table 1). Many parameters applicable to community condition (discussed above) are also used to assess landscape context.

For aquatic communities, landscape can be proportioned into several parts. The "aquatic landscape" consists of any upstream and downstream aquatic communities hydrologically connected to the occurrence. From the aquatic community occurrence outward, the "terrestrial landscape" consists of banks, buffer, floodplain, watershed, and any additional natural community matrix outside of the watershed through which substantial amounts of genetic material are exchanged with the aquatic community occurrence. Although all of these aspects of landscape are important ranking factors at NYHP, a prioritization system has often been applied, giving more weight to features of the landscape which are thought to more strongly influence the condition of the aquatic community, especially its water quality and the biota. The general prioritization order is roughly:

1) upstream aquatic communities
2) bank terrestrial communities
3) buffer terrestrial communities
4) floodplain terrestrial communities
5) watershed terrestrial communities
6) downstream aquatic communities
7) additional terrestrial matrix communities

In application at NYHP, however, this generalized algorithm may vary from community type to community type. For example, while perhaps most appropriate for small to moderate-sized rivers, downstream aquatic communities may be more highly weighted for large rivers, and communities in the watershed may be more heavily weighted relative to the buffer. Also, while perhaps most appropriate for many rivers, terrestrial communities may be more heavily weighted for lakes, especially those with little or no connectivity to riverine communities.

The landscape context of heritage-documented occurrences is often assigned by heritage ecologists using "ecological gestalt", and we tried to follow this method for the first iteration of the STL plan. For the second iteration, we recommend a more complete application to all EOs. If a more rigorously quantified measure of condition is desired in the second iteration of the plan, we could apply algorithms which weight and synthesize different landscape context parameters such as those used at NYHP (NYHP's field forms, NYHP's Lake Erie Gorges project, NYHP's Tug Hill Stream project) or ECS (watershed analyses). In these algorithms, land cover features are often given more weight relative to road features and pollution sources (e.g., as more permanent disturbances), however many exceptions are known to this generalization. Specifications for each community type at NYHP provides one means for more precisely applying differential prioritization of parameters in deriving a landscape context subrank for occurrences.

TNC: quantitatively determined based on GIS data layers for dams, point source pollution, roads and land cover. TNC rankings are derived from within an ecoregion or watershed, not necessarily from the global perspective of a macrohabitat type. Landscape context analysis methods at ECS have been becoming increasingly stabilized. Parameters are generally similar to those applied in the heritage approach to ranking landscape context. Details are available elsewhere, in ECS documents: use of a quartile system (A to D ranks) for each category, over the entire ecoregion.

Algorithm:

Use any geographically comprehensive GIS-derived data from TNC, if available, to estimate subrank, otherwise use the heritage-documented or estimated subrank for occurrence, if available. To more accurately predict landscape context: resolve major discrepancies by reviewing/revising 1) heritage ranking forms, and/or 2) community rank specifications, and/or 3) GIS model parameters and/or data layers.

We attempted to explore the correlations between global landscape context subrank and the more local TNC landscape context ranking system, which is applied within an ecoregion. As a simplied guideline, we could assume for the second iteration that the global landscape context subrank is generally well approximated by that derived for the ecoregion by GIS analyses. The rationale behind this is that the global range of many heritage-defined aquatic communities, classified with a strong biotic component, may approximate ecoregion boundaries, thus, a 1:1 relationship is generally predicted. If the global range is suspected of being larger, based on detailed information, ecological intuition, or TNC analyses at broader scales (e.g., spanning two ecoregions), A to D ranks for the landscape context ranking factor could be adjusted accordingly. For example, although the TNC GIS approach for the Chesapeake Bay Ecoregion uses a spread of ranks by looking only at communities within that ecoregion, they may be readily translatable to rangewide heritage occurrence subranks for landscape context, because the global range of aquatic communities characteristic of that ecoregion may be roughly equivalent to that ecoregion. For STL, most aquatic communities were classified and defined following this same pattern. Known exceptions include some STL types extending peripherally into adjacent ecoregions such as NAP and types from adjacent ecoregions (e.g., NAP and Great Lakes (GL) aquatic community types) being peripheral in STL.

4. Setting Rank and Subrank Thresholds.

According to Mark Anderson, setting ranking thresholds for aquatic communities seems "trickier" than for terrestrial communities. Good information on absolute thresholds has not been found in the literature, and there is much debate among aquatic ecologists whether such thresholds actually exist or not. We recognized that a continuum of size, condition and landscape context values exist in nature, and opted to follow the more practical approach of ordering occurrences from best to worst. We also recognized that aquatic communities are generally more disturbed and influenced by their landscape than terrestrial communities, but that they may possess a greater capacity for restoration.

Our approach parallels that used in heritage programs, at least historically at NYHP, where "benchmark examples" are used to represent the state of a community as close as possible to its unaltered condition (i.e., "the high end"), and other occurrences are scaled relative to that example. "A" to "D" rank thresholds may thus be labelled as "relative thresholds". Benchmark examples represent either an existing occurrence, or the best restoration of existing occurrences expected after 25 years. Benchmark examples may not always represent the best historical occurrence, especially for communities characteristic of heavily degraded ecoregions such as STL. The team reached consensus on using relative thresholds in STL, especially given the heavily impacted landscapes of the ecoregion. In practice at heritage programs, rankings are assigned to produce a wide spread of EOs from A to D rank. The current benchmark example may not have all the features of the historical benchmark example, but in occurrences currently ranked A to C, all of most of the features of the current benchmark should be viable (i.e., restorable within 25 years), whereas in D-ranked occurrences these features are generally considered not viable (i.e., not restorable within 25 years). In this respect, like much of heritage methodology, this approach may be arbitrary, but at least it is intended to be consistently applied and provides a good frame of reference.

While the STL Aquatic Community Team realized that we do not know enough to set precise specific values for subrank thresholds, we offered our first attempt at generalized values as a best first guess. We recommended a closer examination of these values during the second iteration of the plan and further attempts to determine whether absolute thresholds can be set and how they compare to our more relative thresholds.

Because the primary goal of the viability assessment was to assign subranks and ranks to occurrences so that viable occurrences could be chosen for the portfolio, thresholds were proposed for each subrank for each community type, from which to guide determination of overall occurrence rank. Following the NAP terrestrial community model, aquatic community types were categorized into size and distribution classes in an attempt to aggregate groups of similar macrohabitats to which generalized size subrank thresholds could be applied, as opposed to applying thresholds uniquely to each community type. To arrive at size classes and subrank thresholds, David reviewed and updated NYHP rank specifications for all basic macrohabitat types present in STL, especially for size attributes. Greg Edinger and other NYHP ecologists were given the opportunity to review existing NYHP rank specifications for these aquatic communities.

After review of the general size patterns of riverine and lacustrine communities in STL from NYHP specifications and our team's riverine and lacustrine classifications for STL, four to five aquatic community size classes were proposed, borrowing from, but modifying the NAP terrestrial model of three to four patch size class: very small scale, very small scale/small scale, small scale, large scale and very large scale. Applying patch sizes to aquatic communities may be a "new concept" in ecoregional planning, however we attempted to follow the models of Karen Poiani and Brian Richter (1998. Draft. Functional Landscapes and the Conservation of Biodiversity) and its application to aquatic systems by the Eastern Region Aquatics Working Group (November 6, 2000). Because the terminology is not yet well established and the definitions may not be uniform, a brief description of features, modelled after the Poiani and Richter article and the Aquatics Working Group document, is noted here to clarify their application to aquatic communities. Characteristics of **"very large scale" aquatic communities** include 1) the potential for full development of aquatic features characteristic of an aquatic ecosystem (aquatic biota, habitat types and ecological processes) and 2) the potential to serve as a source or refugia of these features to connected smaller patch aquatic community types. Very large scale (i.e., matrix-like) aquatic communities have relatively large watersheds, water depth and water volume. Full development of biota include diverse fish and mollusk assemblages, including wide-ranging anadromous or migratory fish and planktonic organisms. Full development of habitat types include both benthic and pelagic features and faunal concentration areas (spawning, feeding, nursery and overwintering areas). The full development of ecological processes include large flood events. **"Large scale" (or "intermediate scale") aquatic communities** often support area-dependent, geomorphically-driven species that use multiple community types. For example, they may support fish which spawn in floodplains. Biota may include those with seasonal migrations and processes include a moderate flood regime. At the other extreme, **"small scale" aquatic communities** usually have more limited development of aquatic biota, habitat types and ecological processes. For example, small patch aquatic communities have no profundal zone and no hypolimnion. They often have fish and mollusk assemblages lacking or depauperate. Species are often habitat restricted and may be regionally or globally rare. Biota may be limited to insects and plants. Processes may include local flood pulses (e.g., flashy floods). The **"very small" scale** term has been applied primarily to ephemeral to intermittent aquatic communities which dry up (and thus may lack aquatic features) over significant portions of the year, and are transitional in nature to communities of other community systems (e.g., the palustrine system). A practical application of the very large scale to small scale concept to riverine and lacustrine communities is depicted in Table 2.

From an examination of the EO Specifications field of NYHP specifications, both minimum occurrence size and minimum size thresholds for each individual rank were roughly uniform for all aquatic communities within each of the size groups. The five sizes for riverine communities and four classes for lacustrine communities, all or primarily based on our STL classification document, are shown in Table 3 for each community type. Proposed size subrank thresholds are shown for each group in Table 4. Ranks typically follow a skewed distribution across a size gradient to produce a uniform spread of EOs across subranks. These thresholds should be perceived as "preliminary estimates", based as much or more on ecological intuition than on hard data. Sources are primarily from a 1998 table of numerous leads throughout the Adirondack TNC Chapter (ANC). A more critical evaluation of these thresholds is recommended during the second iteration of the plan, especially if more information becomes available.

Rangewide distribution was assigned for all aquatic community types in STL, all or primarily based on our classification document, using the standard TNC ecoregional approach with four distribution categories: widespread, limited, restricted and peripheral (See Table 3). For the STL portfolio selection, we placed less emphasis on community distribution than community size, because a) rangewide distribution is less well known for aquatic communities than terrestrial communities (corresponding to greater uncertainty in the aquatic community classification) and b) even the distribution categorization of terrestrial communities is sometimes viewed as being arbitrary or in flux depending on the concept of a community, and the distribution category can change from widespread to restricted with a small change in community concept.

The ranking of aquatic macrohabitat occurrences by heritage ecologists and cooperators was assisted by providing thresholds and typical characteristics for community condition and landscape context subranks (Table 4). Basic criteria and language was generally borrowed from TNC ecoregional documents and NAP terrestrial community methodology (e.g., the NAP ecoregional plan). David took the liberty to adapt and modify these criteria for STL aquatic communities to 1) ensure that both condition and landscape context had four rank categories of A to D, 2) addressed general condition and landscape context features of aquatic communities, 3) pulled in NYHP generalized rank specifications for aquatic community systems, and 4) attempted a spread of EOs for STL aquatic community types, characteristic of the STL landscape setting. Condition and landscape context applications to aquatic macrohabitat occurrences could be further refined during the second iteration of the STL plan if the review of thresholds in other ecoregional plans or by the aquatics working group suggests that there are better approaches.

Primary parameters noted in Table 4 were used to provide guidance at a "metric scale" in interpreting the language for condition and landscape context thresholds used in NAP. More detailed sets of metrics comprising these general categories are addressed under the factors used to derive condition rank at heritage programs (Table 1). The language for condition and landscape context thresholds is summarized here to guide synthesis of standard metrics into subranks, as used at NYHP. For the second iteration, a more detailed GIS-based approach to condition and landscape ranking, as done at ECS for the upper Connecticut River Valley or done at NYHP for the Lake Erie Gorges, is recommended: generating partial ranks for groups of metrics (e.g., flow parameters, water quality parameters, land cover parameters, road distribution parameters), then synthesizing these into one subrank each for condition and landscape context with or without algorithms which weight one parameter or set of parameters more heavily than others.

The "condition" of aquatic communities was interpreted similarly to the terrestrial approach taken for NAP, with fragmenting features interpreted broadly to include those that alter the community area and its shoreline and bottom surface). Considered as fragmentation events are included damming of rivers into lakes, channelization of rivers, and size changes due to diversions and draining. Diversity was added as a condition factor and could be modelled in future iterations using the aquatic ELU system developed on GIS by ECS. Suggested revisions to landscape context beyond the terrestrial NAP approach are more complex and the language has been supplemented more. Roads are added as an important landscape feature. The terrestrial (i.e., non-aquatic) landscape of aquatic macrohabitats is focused on the buffer of both the community occurrence and adjacent upstream aquatic communities (provided they are present and the occurrence is not an isolated aquatic feature). The aquatic landscape of aquatic macrohabitats is added and focused on the connectivity of the community occurrence (following hydrological connections) to both adjacent upstream and downstream aquatic communities (provided they are present and the occurrence is not an isolated aquatic feature). Thresholds depend on the distribution of natural features in the landscape. At NYHP, natural features have included not only relatively undisturbed climax forests, but also disclimax open canopy communities, selectively logged forest communities, and open canopy successional communities (see Table 1). Quantitative thresholds were added from NYHP specifications to assist with applications. These thresholds were derived from a combination of known occurrences and selected pieces of literature. They were confirmed by Mark Bryer to correspond well with thresholds also cited in literature which TNC's Freshwater Institute has reviewed. According to Mark Bryer, percent intact watershed agrees well with literature sources that suggest that 85 to 90% of a watershed needs to be intact to preserve its integrity.

It should be noted that much of the characteristics and thresholds of subranks are based on NAP terminology. In general, the current condition and landscape context of occurrences of aquatic community types characteristic of STL and GL have been compromised much more than those of NAP aquatic community types. We considered two options for lowering the thresholds/average characteristics to produce a greater "spread" of EOs for STL and GL. One option we considered was to base the spread on the current condition of STL, much as ECS may do in their GIS analyses of an ecoregion. For instance, the "A" rank condition for STL and GL macrohabitats characteristically contains a "few exotic species" instead of "no exotic species". David recommended basing the scale on recovery potential, which might suggest retaining the NAP thresholds, an approach that parallels community ranking at NYHP. For example, we have ranked some community occurrences as "AB" to represent ones that are in a current state of "B" rank but with the potential to naturally recovery to "A" rank if most disturbances were removed and the occurrence was left unaltered for 25 years. Alternative options presented in the TNC literature include the approach taken for the Great Lakes ecoregion. In their approach, they used different condition scales for rivers versus lakes and for each subsection. Viability assessment for the Great Lakes ecoregion used percent forest in the community buffer as a threshold for the better 50% of aquatic system occurrences in each geographic area: 36% for rivers in Section 212E (St. Lawrence/Champlain Valley), 76% for rivers in Section 222O (Mohawk/Black River Valley); 77% for lakes in Section 212E; 90% for lakes in Section 222O. Our decision for the first iteration was to keep our approach simple and have one set of condition and landscape context thresholds, or at most two sets, one for STL and GL aquatic community types and one for NAP aquatic community types that are peripheral in STL. The criteria for the NAP community types was more restrictive than those for the STL community types due to the more impacted landscape setting of STL over NAP. The suggested ranking scale for NAP versus STL community types is shown in Table 4. According to Eric Sorenson, from application of these metrics to Vermont EOS the community condition and landscape context metrics worked well, with many occurrences in STL having "B" subranks and few or none having "A" subranks.

5. Applying Ranks and Subranks to Occurrences.

For the first iteration of the STL plan, about half of the occurrences selected for targets in the ecoregional portfolio were chosen from GIS data, either alone or in conjunction with standard secondary source data at heritage programs. The other half was derived soley from heritage-assessed examples, both documented EOs (NY) and "heritage leads". In contrast to the NAP and STL terrestrial portfolios, where we chose sites for the portfolio only if they were documented on BCD, we explored the use of "leads" for the STL aquatic community portfolio. Community leads are defined as occurrences not yet documented on BCD by heritage programs but strongly suspected of being high enough quality examples of their type that would be tracked by heritage programs. One rationale behind this approach is that there were so few aquatic community occurrences documented on BCD at the time of the portfolio assembly. Leads include putative state exemplary sites (VT and NY), expert information on suspected high quality examples (NY), and species assemblage data (VT). Lots of data from VT state agencies were readily available to help in our efforts. It is known that NY has similar sets of sampling data from agencies such as NYS DEC fisheries and NYS DEC water, yet these are apparently not as readily available and comparable to our classification as were the Vermont data. It has been a strong recommendation for the second iteration to compile, interpret and assess similar New York data.

Where heritage-documented or otherwise assessed occurrences were examined, we tried to repeat the process used for terrestrial community occurrences in NAP in both scale and level of detail. This process basically reexamines existing ranks and subranks for occurrences on BCD at heritage programs, to ensure that the ranks and subranks are accurate under the ecoregional classification, documented on BCD, and most importantly consistent between states. At NYHP we have tried to base ranks and subranks on "state" EO rank and subrank specifications which have been intended to represent rangewide specifications. Because of the presence of only about 3 aquatic macrohabitat EOs (or up to 34 EOs if embedded features are considered) from this ecoregion in the heritage databases of NYHP and VTHP, we had hoped to rely heavily on predicting the viability of any undocumented macrohabitat EOs from GIS analyses. Our goal was to hopefully align GIS procedures to the same ranking systems (with four categories of A to D) and similar rank thresholds. ECS did eventually derive a data set of landscape attributes that could be used to rank watersheds by quartiles for various categories of features that influence aquatic communities, however these data layers were readily available for use during the first iteration.

For the assessment of heritage-documented EOs (only New York), David summarized existing BCD data and applied refined occurrence rank specifications from Table 4 to the 3 (to 34) existing New York aquatic community EOs (Table 5). The three macrohabitat occurrences currently documented at NYHP include one summer-stratified monomictic lake (Lake Champlain), one winter-stratified monomictic lake and one sinkhole pond. One additional sinkhole pond may be documented. Other aquatic habitat occurrences documented at NYHP fall into two categories. Two "significant habitat" types: warmwater fish concentration areas (14 EOs) and waterfowl concentration areas (11 EOs), were treated as embedded primary targets, either as aquatic species assemblages or a higher level of diversity aggregation, and tentatively covered by the STL aquatic team. Many of these occurrences are on the periphery of STL and adjoin to the Great Lakes ecoregion (along the upper St. Lawrence River) and we decided to address them for the STL plan, as 1) we suspected that they were not included in the latter ecoregion and 2) we wanted to include the entire Saint Lawrence River in our portfolio. Additionally, six association-level aquatic EOs are documented at NYHP.

Four of these occurrences, currently classified as mesotrophic dimictic lake, are suggested to be best treated as part of the documented summer-stratified monomictic lake macrohabitat (Lake Champlain) and considered as potentially important embedded primary targets within this lake, with 3 representing bays and one a delta. One EO, a Great Lakes aquatic bed, represents an association typically found in bays, and is located in the upper St. Lawrence River on the periphery of STL and adjoining to the Great Lakes ecoregion and we decided to address this EO for the STL plan, rather than for the latter ecoregion. The last EO, a Great Lakes exposed shoal, represents an association typically found in rocky nearshore areas, and is also located in the upper St. Lawrence River on the periphery of STL and adjoining to the Great Lakes ecoregion and we also decided to address this EO for the STL plan, rather than for the latter ecoregion.

Vermont data for rivers and lakes have been added to Table 5. River data overseen by Steve Fiske of VT DEC, has been collected at about 900 sampling sites, with sampling biased towards riffles in high gradient (riffle-dominated) rivers. Three river categories have been assigned by VT DEC macroinvertebrate staff, one corresponding to rocky headwater stream, one to confined river, and one apparently intermediate between these two types. Apparently, little or no marsh headwater streams and unconfined rivers have been sampled, or else they have been artificially categorized into the three VT DEC types. Sampling sites categorized as the intermediate category are recommended to be reviewed by VTHP and VT DEC during the second iteration to crosswalk them to our classification. A five-parted condition assessment (IBI/Index of Biological Integrity) has been assigned to each sampling site (excellent, very good, good, fair and poor) by VT DEC. While the setup of these data does not exactly match our ranking system, we tried to apply our system to them to arrive at subranks and overall ranks for river occurrences. Different sampling sites of the same name and same VT DEC river type were assumed to represent a single occurrence. Condition assessments were treated as: excellent=A, very good=AB, good=B, fair=C, poor=D. Condition assessment ranks were roughly averaged across all sampling sites of an occurrence. Only those occurrences with overall occurrence ranks of A to B were added to Table 5 as potential candidates for the portfolio. A more critical evaluation of community identities and overall ranks inferred from all macroinvertebrate data is recommended for the second iteration. Fish data are also available from VT DEC, however, river types were not assigned, as it was too difficult to convert these data to our system at the time. Eric hoped that VTHP could explore crosswalking these data to our classification, with the help of Rich Langdon of VT DEC, for the second iteration of the plan. Apparently no plant data were available or had been synthesized to aid in the delineation and ranking of Vermont river occurrences. In total, data for Vermont rivers were available for two types: 8 occurrences of confined river, 18 occurrences of rocky headwater stream. An additional 26 occurrences were tentatively classified as intermediate between these types and await future assignment by VTHP and/or VT DEC staff. These include several A-ranked occurrences. Size and landscape context were not assessed for any of these VT rivers, and we recommend doing so during the second iteration of the plan. We also recommend re-examining condition ranks inferred from the macroinvertebrate samples for any EOs listed as an exemplary site according to the Vermont Aquatic Working Group (1998) reference.

For Vermont lakes, Susan Warren of VT DEC, crosswalked data for 21 lake EOs to our lake classification. VT DEC has good data on lake occurrences, including exotic plant species and nutrient conditions. Absolute acreage values were provided, as well as A to D condition and landscape context subranks based on application of our preliminary criteria in Table 4. These data are available for six lake types in Vermont STL: winter-stratified monomictic lake, eutrophic alkaline dimictic lake, oligotrophic alkaline dimictic lake, eutrophic alkaline pond, oxbow pond, and marl pond (see Table 5).

Table 5 was originally set up as a visual representation to assist in the reconciliation process between heritage-documented occurrences, the TNC GIS approach and our team decisions for STL planning efforts. Information from BCD-documented EOs includes EO size, overall rank and, if documented or inferable, the three subranks. At NYHP, no subranks had been explicitly assigned to the 3 to 4 macrohabitat EOs, although our old system of "partial ranks" (quality, condition, defensibility and viability ranks) are roughly translatable as reflected in the table. As of 2001, NYHP now allows entry onto BCD of all three subranks for newly documented or updated occurrences at NYHP. Subranks were added to BCD for the two NYHP occurrences of certain identity and 1:1 classification crosswalk: Lake Champlain and Perch Lake.

We had hoped that the GIS columns of Table 5 could be filled in for comparison to BCD information if similar information was generated at ECS on a 1:1 basis with mapped macrohabitat occurrences by our deadline for the first iteration. As we did not make this deadline, this remains a recommendation for the second iteration. The consensus field represents the ranks and subranks used for STL, intended to form the basis of portfolio selection. Although GIS columns are blank here, the table is kept as a model to be completed during future iterations. When the table is completed, if GIS-predicted ranks differ from those estimated by heritage ecologists or on BCD, it implies that 1) we would recommend a rank change for the EO, or 2) we may be applying ranks at a different taxonomic scale than the designated community type (e.g., a group of community types, instead of one individual type, or a macrohabitat differing in concept from the state tracked entity). The GIS contribution to the first iteration was limited to large river macrohabitats which formed stream networks desirable to include in the portfolio.

Occurrences added to Table 5 include 1) large rivers included in the GIS-derived portfolio, 2) heritage EOs documented on BCD, 3) NYHP-tracked high quality leads (including leads from both the 1995 to 1998 Adirondack exemplary community project and the 2001-2003 Tug Hill stream project), 4) VT state exemplary sites, and 5) a large, readily available, database of VT macrohabitats and stream segments sampled for species assemblages. Where size, condition and landscape context were not available from BCD or other databases, we tried to make rough estimates from examination of state gazetteer maps. We ran out of time to apply subrank estimations for all these occurrences, especially for VT occurrences, and this task is recommended for the second iteration. As with the NAP assessment of terrestrial EOS, David reviewed all 3 to 4 NYHP-documented EOs, as well as other leads in STL and suggested ranks to use in the STL assessment. Absolute size and estimated overall rank were available for both ANC and Tug Hill leads, comprehensively assessed during regional studies. Additionally, estimated size and landscape context subranks were available for the Tug Hill leads. Within New York, the only parts of STL that have not been regionally assessed in top-down analyses for high quality aquatic communities has been 1) the Black River Valley and 2) Jefferson County. Such analyses are recommended for the second iteration.

Additional expert interviews are recommended to refine and strengthen the portfolio for STL during the second iteration. One recommended approach for the second iteration is for the entire team to review the occurrence rank specifications, ensure they are applied to all macrohabitat EOs predicted through GIS prior to any experts meetings, then reevaluate occurrence ranks after feedback is received at the experts meetings.

For future iterations of the STL plan, VTHP is not expected to actively inventory and documented aquatic EOs for awhile (Eric Sorenson, pers. com.), although they do have long-term hopes to set up a system to better quality control occurrence-type information generated by other agencies and possibly enter size, condition and landscape context subranks onto BCD. Aquatic EOs in NY STL are expected or proposed to be inventoried and documented at a few selected sites (e.g., the Boquette River system, the Ausable River system, the Deer River system, the Indian River system), however, a regional study (e.g., to research and document benchmark occurrences for all aquatic community types present in STL) may not be undertaken for awhile.

6. Viability Thresholds

Minimum viability thresholds (for inclusion of occurrences in the portfolio) are discussed in more detail under the portfolio section of STL aquatic community team documents. In that document we note the definition of viability we use, then apply thresholds, relating them especially to the C-rank threshold of heritage network data standards. Additional guidance in the second iteration might come from ecoregional plans for LNE, HAL or other TNC ecoregions.

7. Future Recommendations for Viability Assessment.

The following recommendations are suggested as some of the ways to explore improvements to the viability assessment of occurrences during the second iteration:

1. Review the existing occurrence rank specifications.
2. Reconcile specifications of PAHP and other heritage programs with NYHP specifications and the general viability assessment methods used to guide our approach.
3. Compare and reconcile stream network viability assessment methods from LNE and Chesapeake Bay Ecoregions with our approach to individual community occurrences.
4. Reconcile occurrence subranking with viability thresholds outlined in other ecoregional plans (Chesapeake Bay, Lower New England).
5. Collaboratively review the similarities and discrepancies between the heritage and TNC approaches to viability assessment for 1) the number of rank categories, 2) parameters used to derive ranks, and 3) thresholds between rank categories.
6. Reconcile subrank information from heritage-documented EOs and TNC GIS analyses.
7. Integrate two approaches to subranking as a way to have one procedure for assessing targets at the aquatic macrohabitat level, thus deciding whether to rely most heavily on heritage or GIS-derived data for a particular occurrence.
8. Apply the list of parameters in Table 1 to derive condition subrank for all remaining aquatic community EOs.
9. Supplement and/or refine the parameter list in Table 1.
10. Quantify coarse-scale diversity within occurrences by modelling with the aquatic ELU system developed on GIS by ECS.
11. Explore whether to segregate diversity as a fourth ranking category.
12. Derive from GIS 1) occurrence size and 2) landscape

context from an ecoregion perspective.

13. Derive average landscape condition ranks for each occurrence.
14. Conduct a more complete derivation of size for all target EOs selected.
15. Conduct a more complete application of landscape analyses to all EOs.
16. Conduct a closer examination of subrank threshold values and further attempts to determine whether absolute thresholds can be set and how they compare to our more relative thresholds.
17. Conduct a more critical evaluation of the value for size rank thresholds for community types.
18. Review thresholds for condition and landscape context in other ecoregional plans and in the regional Aquatics Working Group to determine if there are better approaches.
19. Take a more detailed approach to condition and landscape ranking, as done at ECS for the upper Connecticut River Valley or done at NYHP for the Lake Erie Gorges: generating partial ranks for groups of metrics (e.g., flow parameters, water quality parameters, land cover parameters, road distribution parameters), then synthesizing these into one subrank each for condition and landscape context with or without algorithms which weight one parameter or set of parameters more heavily than others.
20. Crosswalk VT macroinvertebrate sampling sites categorized as the intermediate category to our classification.
21. Work with Rich Langdon of VT DEC to explore crosswalking VT fish data to our classification.
22. Assess size and landscape context for VT rivers with macroinvertebrate sample sites.
23. Compare the condition ranks for VT sites sampled for macroinvertebrates with the claims of exemplary community status cited in the Vermont Aquatic Working Group (1998) reference.
24. Conduct additional expert interviews (e.g., experts meetings) to refine and strengthen the portfolio selection process.
25. Apply occurrence rank specifications to all macrohabitat EOs predicted through GIS.
26. Reevaluate occurrence ranks after any feedback received at expert review meetings.
27. Fill in GIS columns of Table 5 for all mapped macrohabitat occurrences from information generated at ECS to allow comparisons to BCD information and heritage methods.
28. Apply subrank estimations for all remaining occurrences, especially for VT occurrences.
29. Conduct a regional assessment using a top-down analyses for high quality aquatic communities in parts of New York understudied by NYHP, especially 1) the Black River Valley and 2) Jefferson County.
30. Conduct a more critical evaluation of community identities

and overall ranks inferred from all macroinvertebrate data.

31. Compile, interpret and assess New York sampling data from agencies such as NYS DEC fisheries and NYS DEC water.

Table 1. Aquatic Community Occurrence Ranking: Parameter list.

Community Condition

1. Biological Condition
   - Indices of Biological Integrity (IBI)[1]
     - "Combined IBIs"[1]
     - "Fish IBI"[1]
     - "Benthic IBI"[1]
     - Plankton assemblages as ecological indicators.
   - Exotic species
     - Presence and abundance of exotic species[1]
     - Presence and abundance of invasive exotic species[1]
     - Fish stocking data[1]
   - Species Harvest
     - Fish harvest[1]
2. Diversity (Relative to Other Occurrences of Same Community Type)
   - Fine-scale habitat diversity
     - Flow microhabitats[1]
     - Depth microhabitats[1]
   - Association diversity[1]
   - Species assemblage diversity[1]
   - Species diversity[1]
   - Bedrock diversity[2]
   - Landform diversity[2]
3. Flow Alteration
   - General
     - Physical Habitat Index[1]
     - Indicators of Hydrological Alterations (Richter et al., 1996)[1]
     - Total and relative size of occurrence without upstream flow alterations[1]
     - Total and relative size of occurrence without flow alterations[1]
   - Dams
     - Changes in flow rate above/below dam.[1]
     - Changes in discharge above/below dam.[1]
     - Changes in temperature above/below dam.[1]
     - Changes in periodicity and intensity of flooding before and after construction of the dam (or possibly above/below existing dam)[1]
     - Dam height or presence of fish ladders. (especially in relation to fish movement).[1]
     - Artificial water level fluctuations.[1]
     - Total number of dams[2]
     - Total capacity of dams[2]
     - Density of larger dams per stream mile[2]
     - Dam capacity per stream mile[2]
     - Average dam capacity per stream mile[2]
     - Minimum normal storage[3]
     - Maximum normal storage[3]
     - Total length of stream without flow alterations[4]
   - Diversions
     - Percent of discharge diverted from occurrence[1]
     - Groundwater extraction/consumption usage (relative to recharge rates).[1]

Channelization
- Percent of shoreline length reconfigured[1]
- Percent of shoreline length anthropogenically hardened[1]

4. Transportation Corridor Impacts

Roads
- Percent or length of occurrence bordered by roads[1]
- Number of road crossings[1]
- Number of road crossings per shoreline mile[3]
- Largest embedded roadless suboccurrence[1]
- Percent of occurrence with large roadless suboccurrences[1]
- Road Categories
  - Primary highways[3]
  - Secondary highways[3]
  - County roads[3]
  - Local roads[3]

Boats
- Presence/allowance of motorized boats[1]
- Heavily travelled boat routes[1]
- Other boat route metrics paralleling road metrics.[1]

5. Benthic Fragmentation
- Percent of occurrence with anthropogenically fragmented bottom[1]
- Hardened areas (e.g., cement)[1]
- Dredged areas[1]
- Aquaculture areas[1]
- Mined areas[1]
- Dumping grounds[1]

6. Water Quality

General
- Water quality indices[4]
- Number of point source pollution discharge points[1]
- Number of point source pollution discharge points per shoreline mile[3]
- Miles of EPA 303d impacted water[3]
- Percent EPA 303d impacted water[3]
- Point source pollution categories
  - Industrial facilities discharge[2]
  - Superfund sites[2]
  - Toxic release sites[2]
  - EPA regulated discharges[3]

Acidification
- Rainwater acidity[1]
- Buffering capacity of the bedrock [1]

Eutrophication
- Point source pollution data[1]
- Non-point source pollution data[1]
- Phosphorous, nitrogen and carbon concentrations over standard threshold[1,4]

Fecal Coliform
- Sewage discharge[1]
- Septic impacts[1]
- Coliform bacteria counts over standard threshold[1,4]

Toxins
- Toxicity ratings[4]

- Chemical Applications
  - General Metrics
    - Application Points[1]
    - Application amount[1]
    - Application frequency[1]
    - Application recency[1]
  - Liming[1]
  - Pesticides[1]
    - Rotenone[1]
    - BTI[1]
    - Lampricides[1]
    - Sonar[1]
    - Algicides[1]
- Turbidity Alterations[1]
- Dissolved Oxygen Alterations[1]
- Sediment Load Alterations[1]

Landscape Context

1. Community condition metrics
   (applied to watershed and aquatic systems)
2. Land Cover
   - Buffer Metrics
     - Length of community with no bordering land use alterations.[1]
     - Length of community with no bordering land use alterations upstream.[1]
     - Mean road to shoreline distance[2]
     - Percent of buffer with adjacent road[2]
     - Percent of buffer with developed land[2]
     - Percent of buffer with agricultural land[2]
     - Percent of buffer with natural land[2]
   - Watershed Metrics
     - Largest embedded subwatershed with 100% natural land.[1]
     - Percent of watershed with large subwatersheds having 100% natural land.[1]
     - Percent of watershed with natural land[2]
     - Percent of watershed with developed land[2]
     - Percent of watershed with agricultural land[2]
     - Total drainage area of dams[2]
     - Road density per watershed[2]
     - Average block size[2]

   - Land Cover Categories
     - Natural land
       - Forests
         - Old growth forests[1]
         - Second growth mature types[1]
         - Successional forest types[1]
       - Open Canopy Communities
         - Disclimax types
         - Successional types
     - Developed land
       - Various porosity categories[1]
         - Anthropogenic impervious surfaces[1]
       - Deforested areas
         - Clear cuts[1]
         - Agricultural land[1]
         - Urban land

Sources:

[1] David Hunt's June 20, 2000 memo to Mark Anderson. See memo for more explanatory detail on each parameter.

[2] Mark Anderson's April 12, 2000 memo: A proposed approach to ecoregional site selection for aquatic features.

[3] Mark Anderson's November 6, 2000 list of parameters as Aquatic Condition Variables.

[4] David Hunt's February 2001 list of parameters researched for watershed analyses for NYHP's Lake Erie Gorges project.

Table 2. General Quanititative Guidelines For Assigning Aquatic Community Patch Size.

RIVERINE COMMUNITIES

Community Patch Size	Stream Order	Low Flow Discharge (m3/sec)	Channel Width (ft)	Channel Depth (m)	Watershed Size (mi2)
Very Large Scale Communities	8+	>>10	>500	>10	>4000
Large Scale Communities	4-7	0.5-10	50-500	1-10	30-4000
Small Scale Communities	1-3	0.01-0.5	10-50	0.1-1	2-30
Very Small Scale Communities	(0)-1	<0.01	<10	<0.1	<2

LACUSTRINE COMMUNITIES

Community Patch Size	Area (acres)	Maximum Depth (ft)	Profundal Zone?	Winter Stratified?	Watershed Size (mi2)
Very Large Scale Communities	>>500	>200	Y	N	>4000
Large Scale Communities	50-500	20-200	Y	Y	30-4000
Small Scale Communities	5-50	5-20	N	Y	2-30
Very Small Scale Communities	<5	<5	N	Y	<2

Table 3. STL Aquatic Community Characteristics and Thresholds

Community name	Patch Size	Dist.	Viability Threshold Size
RIVERINE COMMUNITIES			length
STL Spring	VSS	R/L	0.01 mi
NAP Spring	VSS	R/L	0.01 mi
GL Spring	VSS	R/L	0.01 mi
STL Subterranean Stream	VSS	R/L	0.01 mi
STL Backwater Slough	VSS/SS	R/L	0.2 mi
NAP Backwater Slough	VSS/SS	R/L	0.2 mi
GL Backwater Slough	VSS/SS	R/L	0.2 mi
STL Intermittent Stream	VSS/SS	R/L	0.2 mi
NAP Intermittent Stream	VSS/SS	R/L	0.2 mi
GL Intermittent Stream	VSS/SS	R/L	0.2 mi
STL Rocky Headwater Stream	SS	R/L	1 mi
NAP Rocky Headwater Stream	SS	R/L	1 mi
GL Rocky Headwater Stream	SS	R/L	1 mi
STL Marsh Headwater Stream	SS	R/L	1 mi
NAP Marsh Headwater Stream	SS	R/L	1 mi
GL Marsh Headwater Stream	SS	R/L	1 mi
STL Confined River	LS	R/L	2 mi
NAP Confined River	LS	R/L	2 mi
GL Confined River	LS	R/L	2 mi
STL Unconfined River	LS	R/L	2 mi
NAP Unconfined River	LS	R/L	2 mi
GL Unconfined River	LS	R/L	2 mi
GL Deepwater River	VLS	L	10 mi
(additional communities suggested for Quebec)			
Acadian Freshwater Tidal River	VLS	L	10 mi
Acadian Brackish Tidal River	VLS	L	10 mi
Acadian Saline Tidal River	VLS	L	10 mi
Acadian Freshwater Tidal Creek	VSS/SS	L	0.2 mi
Acadian Brackish Tidal Creek	VSS/SS	L	0.2 mi
Acadian Saline Tidal Creek	VSS/SS	L	0.2 mi
LACUSTRINE COMMUNITIES			area
STL Subterranean Lake	VSS/SS	R/L	0.5 ac
STL Vernal Pool	VSS/SS	R/L	0.5 ac
NAP Pine Barrens Vernal Pond	VSS/SS	P	0.5 ac
STL Sinkhole Pond	VSS/SS	R/L	0.5 ac
STL Oxbow Pond	SS	R/L	1 ac
NAP Oxbow Pond	SS	R/L	1 ac
GL Oxbow Pond	SS	R/L	1 ac
STL Flow-Through Pond	SS	R/L	1 ac
STL Alkaline Pond	SS	R/L	1 ac
NAP Bog Lake	SS	P	1 ac
GL Marl Pond	SS	P	1 ac
STL Eutrophic Alkaline Dimictic Lake	LS	R/L	5 ac
STL Oligotrophic Alkaline Dimictic Lake	LS	R/L	5 ac
STL Winter-Stratified Monomictic Lake	LS/VLA	R/L	100 ac
STL Summer-Stratified Monomictic Lake	VLS	R/L	200 ac

Patch Size: VSP = very small scale, SP = small scale, LP = large scale, VLS = very large scale.
Distribution: R = restricted, L = limited, P = peripheral

Table 4. STL Aquatic Community Subrank Thresholds

COMMUNITY SIZE

Community Group	Rank Thresholds			
	A Rank	B Rank	C Rank	D Rank
RIVERINE COMMUNITIES				
Patch Size				
VSS	0.1 mi	0.02 mi	0.01 mi	0.002 mi
VSS/SS	2 mi	0.5 mi	0.2 mi	0.002 mi
SS	7 mi	3 mi	1 mi	0.2 mi
LS	10 mi	5 mi	2 mi	0.5 mi
VLS	information not available or necessary, only 1 EO in STL			
LACUSTRINE COMMUNITIES				
Patch Size				
VSS/SS	10 ac	3 ac	0.5 ac	0 ac
SS	20 ac	5 ac	1 ac	0.5 ac
LS	100 ac	40 ac	5 ac	1 ac
LS/VLS	5000 ac	1000 ac	500 ac	100 ac
VLS	10000 ac	5000 ac	1000 ac	200 ac

Patch Size: VSP = very small scale, SP = small scale, LP = large scale, VLS = very large scale.

COMMUNITY CONDITION

A = excellent, no signs of anthropogenic disturbance, no exotic species, no obvious fragmenting features. Excellent natural habitat diversity. High viability (of all features characteristic of the benchmark example). (NAP: A)

B = good, minor signs of anthropogenic disturbance, minor levels of exotic species, minor fragmenting features. Good natural habitat diversity. Viable (for all features characteristic of the benchmark example). (NAP: B; STL: AB)

C = fair, moderate signs of anthropogenic disturbance, moderate levels of exotic species, moderate levels of fragmenting features. Fair natural habitat diversity. Viable (for all features characteristic of the benchmark example). (NAP: C; STL: BC)

D = poor, numerous obvious signs of anthropogenic disturbance, lots of exotic species, numerous and obvious fragmenting features. Poor natural habitat diversity. Probably not viable (for all features characteristic of the benchmark example). (NAP: D; STL: D)

Primary parameters:
- Disturbances
  - Water Quality Alterations
- Exotic Species
  - Invasive Species
  - Fish Stocking
- Fragmenting Features
  - Shoreline Alterations
  - Benthic Alterations
  - Dams
- Habitat Diversity
  - Microhabitats
  - Associations

LANDSCAPE CONTEXT

A = excellent, with the community and any nearby upstream aquatic communities surrounded by (with a buffer of and ideally a watershed of) relatively large and intact terrestrial (non-aquatic) matrix or large patch communities with no developed or clearcut lands (threshold = 90% natural) or large (primary and secondary) roads; with any adjacent/connected aquatic landscape (downstream, and especialy upstream) intact over relatively long distances (threshold = 95% natural). High viability (of all features characteristic of the benchmark example). (NAP: A)

B = good, with the community and any nearby upstream aquatic communities surrounded by intact terrestrial (non-aquatic) landscape, but may have small patches of developed land or clearcut lands, including secondary road crossings, nearby (threshold = 70% natural); with any adjacent/connected aquatic landscape of intact stretches, but may have small patches of displaced or degraded waters nearby (threshold = 80% natural). Viable (for all features characteristic of the benchmark example). (NAP: B; STL: AB)

C = fair, with the community and any nearby upstream aquatic communities surrounded by fragmented terrestrial (non-aquatic) landscape, mixed with a mosaic of low intensity land use of agricultural land or rural development (threshold = 50% natural) including paralleling and crossing secondary roads; with any adjacent/connected aquatic landscape fragmented and representing a mixed mosaic of intact aquatic features (threshold = 50% natural) and large areas of low intensity water uses. Viable (for all features characteristic of the benchmark example). (NAP: C; STL: BC)

D = poor, with the community and any nearby upstream aquatic communities surrounded by intensively developed terrestrial (non-aquatic) landscape including parallel and crossing primary roads; with any adjacent/connected aquatic landscape intensively altered. Probably not viable (for all features characteristic of the benchmark example). (NAP: D; STL: D)

Primary parameters:

- Water Quality Alterations
- Shoreline Alterations
- Dams (especially upstream; downstream is secondary parameter)
- Diversions

Table 5. STL Aquatic Community Occurrences Documented at NYHP. Ranks and Subranks.
NOTE: THIS TABLE WAS PLANNED TO BE COMPLETED TO COMPARE HERITAGE ASSESSMENTS WITH GIS ANALYSES.
AS GIS ANALYSIS WAS NOT AVAILABLE IN TIME, THE TABLE WAS NOT FINISHED.
IT IS KEPT HERE AS A MODEL FOR THE SECOND ITERATION.
SEE TABLE 5 OF THE PORTFOLIO DEVELOPMENT DOCUMENT FOR HERITAGE ASSESSMENTS OF ALL ASSESSED EOs.

Community name/Survey Site	Size			Ranks											Notes
				Size			Condition			Landscape Context			Overall		
	BCD	GIS	Consensus	BCD	GIS	Consensus	BCD	GIS	Consensus	BCD	GIS	Consensus	BCD	Consensus	Notes
RIVERINE COMMUNITIES (miles)															
STL Confined River (large patch)															**size rank per Table 4.**
Lamoille River (VT)	..	..	..	.	.	.	**A**	.	**A**	.	.	.	.	**A**	
Lewis Creek (VT)	..	..	..	.	.	.	**A**	.	**A**	.	.	.	.	**A**	
Missisquoi River (VT)	..	..	..	.	.	.	**AB**	.	**AB**	.	.	.	.	**AB**	
Tyler Branch (VT)	..	..	..	.	.	.	**B**	.	**B**	.	.	.	.	**B**	
Malletts Creek (VT)	..	..	..	.	.	.	**B**	.	**B**	.	.	.	.	**B**	
Winooski River (VT)	..	..	..	.	.	.	**B**	.	**B**	.	.	.	.	**B**	
Hubbardton River (VT)	..	..	..	.	.	.	**B**	.	**B**	.	.	.	.	**B**	
Allen Brook (VT)	..	..	..	.	.	.	**B**	.	**B**	.	.	.	.	**B**	
STL Rocky Headwater Stream (small patch)															**size rank per Table 4.**
Crossett Brook (VT)	..	..	..	.	.	.	**A**	.	**A**	.	.	.	.	**A**	
Stevensville Brook (VT)	..	..	..	.	.	.	**AB**	.	**AB**	.	.	.	.	**AB**	
Baker Brook (VT)	..	..	..	.	.	.	**AB**	.	**AB**	.	.	.	.	**AB**	
Dowsville Brook (VT)	..	..	..	.	.	.	**AB**	.	**AB**	.	.	.	.	**AB**	
Bradley Brook (VT)	..	..	..	.	.	.	**AB**	.	**AB**	.	.	.	.	**AB**	
Austin Brook (VT)	..	..	..	.	.	.	**AB**	.	**AB**	.	.	.	.	**AB**	
Bear Wallow Brook (VT)	..	..	..	.	.	.	**AB**	.	**AB**	.	.	.	.	**AB**	
Crook Brook (VT)	..	..	..	.	.	.	**B**	.	**B**	.	.	.	.	**B**	
John Brook (VT)	..	..	..	.	.	.	**B**	.	**B**	.	.	.	.	**B**	
Lily Brook (VT)	..	..	..	.	.	.	**B**	.	**B**	.	.	.	.	**B**	
Dowsville Brook, Tributary 5 (VT)	..	..	..	.	.	.	**B**	.	**B**	.	.	.	.	**B**	**are these 3 tribs 1 EO?**
Dowsville Brook, Tributary 7 (VT)	..	..	..	.	.	.	**B**	.	**B**	.	.	.	.	**B**	**are these 3 tribs 1 EO?**
Dowsville Brook, Trib. 11 (VT)	..	..	..	.	.	.	**B**	.	**B**	.	.	.	.	**B**	**are these 3 tribs 1 EO?**
Mad River, Tributary 46 (VT)	..	..	..	.	.	.	**B**	.	**B**	.	.	.	.	**B**	
Slide Brook (VT)	..	..	..	.	.	.	**B**	.	**B**	.	.	.	.	**B**	
Moon Brook (VT)	..	..	..	.	.	.	**B**	.	**B**	.	.	.	.	**B**	
Sargent Brook (VT)	..	..	..	.	.	.	**B**	.	**B**	.	.	.	.	**B**	
Jay Branch, Tributary 7 (VT)	..	..	..	.	.	.	**B**	.	**B**	.	.	.	.	**B**	

Community name/Survey Site	Size BCD	Size GIS	Size Consensus	Ranks: Size BCD	Size GIS	Size Consensus	Condition BCD	Condition GIS	Condition Consensus	Landscape Context BCD	Landscape Context GIS	Landscape Context Consensus	Overall BCD	Overall Consensus	Notes
RIVERINE COMMUNITIES (miles) (continued)															
STL Confined River or Rocky Headwater Stream (needs decision from Eric S.)															
North Branch Lamoille (VT)	..	..	..	.	.	.	**A**	.	**A**	.	.	.	.	**A**	**confined river?**
Lewis Creek (VT)	..	..	..	.	.	.	**A**	.	**A**	.	.	.	.	**A**	
Middlebury River (VT)	..	..	..	.	.	.	**A**	.	**A**	.	.	.	.	**A**	**confined river?**
Beetle Brook (VT)	..	..	..	.	.	.	**A**	.	**A**	.	.	.	.	**A**	**rocky headwater stream?**
Mendon Brook (VT)	..	..	..	.	.	.	**A**	.	**A**	.	.	.	.	**A**	**rocky headwater stream?**
Mill Brook (VT)	..	..	..	.	.	.	**A**	.	**A**	.	.	.	.	**A**	**rocky headwater stream?**
Berry Brook (VT)	..	..	..	.	.	.	**AB**	.	**AB**	.	.	.	.	**AB**	**rocky headwater stream?**
Halnon Brook (VT)	..	..	..	.	.	.	**AB**	.	**AB**	.	.	.	.	**AB**	**rocky headwater stream?**
Furnace Brook (VT)	..	..	..	.	.	.	**AB**	.	**AB**	.	.	.	.	**AB**	**rocky headwater stream?**
Teney Brook (VT)	..	..	..	.	.	.	**AB**	.	**AB**	.	.	.	.	**AB**	**rocky headwater stream?**
Pekin Brook (VT)	..	..	..	.	.	.	**AB**	.	**AB**	.	.	.	.	**AB**	**rocky headwater stream?**
Mad River (VT)	..	..	..	.	.	.	**AB**	.	**AB**	.	.	.	.	**AB**	**confined river?**
Castleton River (VT)	..	..	..	.	.	.	**AB**	.	**AB**	.	.	.	.	**AB**	**confined river?**
Dowsville Brook (VT)	..	..	..	.	.	.	**AB**	.	**AB**	.	.	.	.	**AB**	**confined river missing.**
West Branch Little River (VT)	..	..	..	.	.	.	**AB**	.	**AB**	.	.	.	.	**AB**	**confined river?**
Lamoille River (VT)	..	..	..	.	.	.	**AB**	.	**AB**	.	.	.	.	**AB**	**rocky hdwtr stream missing**
Winooski River (VT)	..	..	..	.	.	.	**AB**	.	**AB**	.	.	.	.	**AB**	**rocky hdwtr stream missing**
Pike Brook (VT)	..	..	..	.	.	.	**B**	.	**B**	.	.	.	.	**B**	**rocky headwater stream?**
East Creek (VT)	..	..	..	.	.	.	**B**	.	**B**	.	.	.	.	**B**	
Great Brook (VT)	..	..	..	.	.	.	**B**	.	**B**	.	.	.	.	**B**	**rocky headwater stream?**
Little River (VT)	..	..	..	.	.	.	**B**	.	**B**	.	.	.	.	**B**	**confined river?**
Cold River (VT)	..	..	..	.	.	.	**B**	.	**B**	.	.	.	.	**B**	**confined river?**
Thatcher Brook (VT)	..	..	..	.	.	.	**B**	.	**B**	.	.	.	.	**B**	**rocky headwater stream?**
Missisquoi River (VT)	..	..	..	.	.	.	**B**	.	**B**	.	.	.	.	**B**	**rocky hdwtr stream missing**
Trout River (VT)	..	..	..	.	.	.	**B**	.	**B**	.	.	.	.	**B**	**confined river?**
Browns River (VT)	..	..	..	.	.	.	**B**	.	**B**	.	.	.	.	**B**	**confined river?**

Community name/Survey Site	Size			Ranks											Notes
				Size			Condition			Landscape Context			Overall		
	BCD	GIS	Consensus	BCD	GIS	Consensus	BCD	GIS	Consensus	BCD	GIS	Consensus	BCD	Consensus	
LACUSTRINE COMMUNITIES (acres)															
STL Summer-Stratified Monomictic Lake (matrix)															
Lake Champlain **(NY/VT)**	41750	.....	41750+	B	.	B (A?)	B	.	B	B	.	B	B	B	size rank per Table 4.
STL Winter-Stratified Monomictic Lake (matrix/large patch)															**size rank per Table 4.**
Perch Lake **(NY)**	550	...	550	-	.	**C**	-	.	AB?	-	.	AB?	B	B	
Shelburne Pond (VT)	**450**	..	**450**	.	.	**D**	**C**	.	**C**	**B**	.	**B**	.	**C**	
STL Eutrophic Alkaline Dimictic Lake (large patch)														**size rank per Table 4.**	
Lake Iroquois (VT)	**229**	..	**229**	.	.	**A**	**B**	.	**B**	**B**	.	**B**	.	**AB**	
Fairfield Pond (VT)	**464**	..	**464**	.	.	**A**	**B**	.	**B**	**C**	.	**C**	.	**B**	
Long Pond (VT)	**47**	..	**47**	.	.	**B**	**B**	.	**B**	**B**	.	**B**	.	**B**	
Lake Carmi (VT)	**1375**	..	**1375**	.	.	**A**	**C**	.	**C**	**C**	.	**C**	.	**BC**	
Colchester Pond (VT)	**167**	..	**167**	.	.	**A**	**C**	.	**C**	**C**	.	**C**	.	**BC**	
Fern Lake (VT)	**61**	..	**61**	.	.	**B**	**B**	.	**B**	**C**	.	**C**	.	**BC**	
STL Oligotrophic Alkaline Dimictic Lake (large patch)															**size rank per Table 4.**
Lake Dunmore (VT)	**985**	..	**985**	.	.	**A**	**B**	.	**B**	**C**	.	**C**	.	**B**	
STL Eutrophic Alkaline Pond (small patch)															**size rank per Table 4.**
Winona Lake (VT)	**234**	..	**234**	.	.	**A**	**B**	.	**B**	**B**	.	**B**	.	**AB**	
Metcalf Pond (VT)	**71**	..	**71**	.	.	**A**	**B**	.	**B**	**B**	.	**B**	.	**AB**	
Cedar Lake (VT)	**114**	..	**114**	.	.	**A**	**B**	.	**B**	**C**	.	**C**	.	**B**	
Round Pond (VT)	**22**	..	**22**	.	.	**AB**	**B**	.	**B**	**C**	.	**C**	.	**B**	
Halfmoon Pond (VT)	**21**	..	**21**	.	.	**AB**	**C**	.	**C**	**B**	.	**B**	.	**B**	
Coggman Pond (VT)	**20**	..	**20**	.	.	**AB**	**C**	.	**C**	**C**	.	**C**	.	**BC**	
STL Oxbow Pond (small patch)														**size rank per Table 4.**	
Unnamed Pond # 52 (VT)	**27**	..	**27**	.	.	**A**	**B**	.	**B**	**B**	.	**B**	.	**AB**	
GL Marl Pond (very small patch)														**size rank per Table 4.**	
Root Pond (VT)	**0**	..	**0**	.	.	**D**	**B**	.	**B**	**B**	.	**B**	.	**BC**	
STL Sinkhole Pond (very small patch/small patch)															
Spile Bridge Road Wetland **(NY)**	23	..	1	A	.	C	A	.	A	AB	.	AB	A	B	EO="sinkhole wetland"; info adjusted for pond.
Johnny Cake Road Sinkhole Wetlands **(NY)**	50	..	0?	AB	.	F?	B	.	B	AB	.	AB	AB	BC	EO="sinkhole wetland"; unsure if pond present.

Community name/Survey Site	Size BCD	Size GIS	Size Consensus	Ranks: Size BCD	Size GIS	Size Consensus	Condition BCD	Condition GIS	Condition Consensus	Landscape Context BCD	Landscape Context GIS	Landscape Context Consensus	Overall BCD	Overall Consensus	Notes
EMBEDDED FEATURES															
Great Lakes Aquatic Bed															**recommended primary target**
(size thresholds: A: 1000-5000 ac; B: 50-1000 ac; C:10-50 ac; D: 1-10 ac)															
embedded as "Mesotrophic Dimictic Lakes" within Lake Champlain															
Kings Bay **(NY)**	1500	....	1500	**A**	.	**A**	B	.	B	A	.	A (B?)	A	**AB**	
Ausble Delta **(NY)**	190	...	190	**B**	.	**B**	A	.	A	AB	.	AB (B?)	AB	**AB**	
Point Au Roche Swamp **(NY)**	70	..	70	**B**	.	**B**	C	.	C	BC	.	BC	B	**BC**	
Valcour Island **(NY)**	20	..	20	**C**	.	**C**	B	.	B	B	.	B	B	**BC**	
embedded within Lake Ontario/upper Saint Lawrence River															
Chippewa Bay Marsh **(NY)**	**2300**	.	**2300**	**A**	.	**A**	**B**	.	**B**	**AB**	.	**AB**	**AB**	**-**	in GL ecoregion?
Warmwater Fish Concentration Area															**recommended primary target**
(recommended size thresholds: A: 1000-5000 ac; B: 50-1000 ac; C:10-50 ac; D: 1-10 ac)															
Dexter Marsh **(NY)**	2090	.	2090	.	.	**A**	.	.	.	.	.	.	E	**A**	in GL ecoregion?
Goose Bay and Cranberry Creek **(NY)**	1970	.	1970	.	.	**A**	.	.	.	.	.	.	E	**A**	in GL ecoregion?
Crooked Creek Marsh **(NY)**	1170	.	1170	.	.	**A**	.	.	.	.	.	.	E	**A**	in GL ecoregion?
Wilson Bay Marsh **(NY)**	473	.	473	.	.	**B**	.	.	.	.	.	.	E	**B**	in GL ecoregion?
Oswegatchie River Ogdensburg **(NY)**	380	.	380	.	.	**B**	.	.	.	.	.	.	E	**B**	in GL ecoregion?
Grass Point Bay and Cobb Shoal Bay **(NY)**	230	.	230	.	.	**B**	.	.	.	.	.	.	E	**B**	in GL ecoregion?
Carrier Bay **(NY)**	160	.	160	.	.	**B**	.	.	.	.	.	.	E	**B**	in GL ecoregion?
Swan Bay **(NY)**	140	.	140	.	.	**B**	.	.	.	.	.	.	E	**B**	in GL ecoregion?
Blind Bay Marsh **(NY)**	125	.	125	.	.	**B**	.	.	.	.	.	.	E	**B**	in GL ecoregion?
Point Vivian Marsh **(NY)**	75	.	75	.	.	**B**	.	.	.	.	.	.	E	**B**	in GL ecoregion?
Indian River Rossie **(NY)**	6	.	6	.	.	**D**	.	.	.	.	.	.	E	**D**	in GL ecoregion?
Waterfowl Concentration Area															**recommended primary target**
(recommended size thresholds: A: 1000-5000 ac; B: 50-1000 ac; C:10-50 ac; D: 1-10 ac)															
Fox Island Grenadier Island Shoals **(NY)**	3950	.	3950	.	.	**A**	.	.	.	.	.	.	E	**A**	in GL ecoregion?
Dexter Marsh **(NY)**	2090	.	2090	.	.	**A**	.	.	.	.	.	.	E	**A**	in GL ecoregion?
Chippewa Creek Marsh **(NY)**	950	.	950	.	.	**B**	.	.	.	.	.	.	E	**B**	in GL ecoregion?
Saint Lawrence River Massena **(NY)**	457	.	457	.	.	**B**	.	.	.	.	.	.	E	**B**	
American Island Pools **(NY)**	400	.	400	.	.	**B**	.	.	.	.	.	.	E	**B**	in GL ecoregion?

Saint Lawrence/Champlain Valley Aquatic Community Working Group
Portfolio Development for Heritage-Assessed Occurrences
Draft 3, April 16, 2002

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1. Summary of Approach.

David and Mark Anderson shared the lead in compiling a portfolio of aquatic community targets for the Saint Lawrence/Champlain Valley Ecoregion (STL) at varying geographic and taxonomic scales. For the portfolio design, we sought an integrated and cooperative approach. David took the lead on selection of aquatic macrohabitats and smaller scale features such as biotic associations/ecological associations; Mark Anderson and ECS staff took the lead on larger scale aquatic features such as aquatic ELUs and landscape-level units: aquatic systems and watersheds. This document is intended to focus on macrohabitats and smaller scale features, theoretically tracked by heritage programs. The larger riverine macrohabitat units overlap somewhat with the riverine ELUs modelled by ECS. This document suggests an approach for addressing portfolio selection of heritage-documented or tracked occurrences of aquatic communities (macrohabitats) in ecoregional plans. According to Mark Bryer of TNC's Freshwater Institute, the focus on heritage-documented occurrences (EOs) is a novel approach and should serve as a foundation for consideration in planning efforts for other TNC ecoregions as more heritage EOs become documented in other states.

Because of the general sparse nature of aquatic community occurrences in heritage databases nationally at this date, other ecoregional plans have relied heavily or solely upon GIS-based data to predict the presence of, assess and select aquatic community occurrences for ecoregional portfolios. According to Mark Bryer, the very few aquatic communities documented outside of New York are globally rare and usually associated with rare species, such as the desert springs of Nevada. New York Heritage Program is reportedly exceptional among heritage programs in currently having many aquatic community EOs documented, with 20 riverine occurrences and 35 lacustrine occurrences documented statewide and about 30 more riverine occurrences in progress from Year 2000 and 2001 surveys. Only a few of these occurrences are from STL.

Our vision for addressing heritage-documented information on aquatic communities, stated in the earliest documents of our working group, was to set up an approach that would work in the long term for STL and potentially other ecoregions as more aquatic community occurrences become documented throughout the ecoregion and the heritage network. For the first iteration of the STL ecoregion plan, the Aquatic Community Team used a joint approach to portfolio development focused on heritage-documented occurrences in conjunction with a parallel GIS approach which focused on biophysical units (watershed aggregates) revolving around larger rivers (size classes 2 and 3). Of aquatic community occurrences included in this iteration, very few were heritage-documented EOs, but the power of the approach lies hopefully in future iterations of the ecoregional plan. For now, it was hoped that the first iteration would more precisely steer inventory priorities towards increased heritage documentation in the near future as a field-tested examination of any GIS-predicted sites and heritage leads that represent inventory gaps.

Our plan for heritage-documented aquatic macrohabitat occurrences and important embedded associations was to set up a long-term procedure for target selection modelled after the methodology used for non-aquatic (i.e., "terrestrial") community targets in NAP and other ecoregions in both scale and level of detail and borrowing from supplementary methods more applicable to aquatic communities that are being developed in other ecoregions. The process involved 1) designation of targets of various taxonomic scales, 2) determination of community goals including target numbers, stratification regime and viability thresholds, and 3) selection of occurrences to fulfill target goals.

2. Developing a List of Targets.

Aquatic community targets include "primary", "secondary" and "tertiary" targets. Primary targets are defined as those for which sites will be selected for the portfolio. All aquatic macrohabitats in our comprehensive classification, which was developed in the efforts of the STL Aquatic Community Team, are primary targets. A few additional smaller scale targets are recommended as primary targets: "special" areas within very large scale aquatic community types (Lake Champlain and the Saint Lawrence River). These are termed "embedded" primary targets; they are intended to focus more intensive conservation efforts on smaller geographic areas within these very large "matrix-like" sites. Conservation goals and strategies are expected to be different for aquatic macrohabitats and associated embedded targets within the same very large scale aquatic site; those for the former being coarse scale and focused more on water quality, pelagic features and watershed quality, and those for the latter being fine scale and focused more on habitat alteration, benthic features and shoreline and buffer quality. Secondary targets are features of aggregate diversity that are assumed to be sufficiently captured by the coarser scale primary targets and for which we hoped in the first iteration to check this assumption. Sites were not chosen for the portfolio for secondary targets, however, if in future iterations we find that these features are overlooked by selection of sites for primary targets, we might elevate some of these secondary targets to primary targets. Tertiary targets were addressed separately by ECS staff, representing aquatic features larger than aquatic macrohabitats, and limited to riverine networks revolving around size class 3 streams (size 3 stream main stems and associated watersheds of selected associated size 2 streams, generally one watershed per size 2 biophysical unit within the size 3 watershed).

Primary Targets. We decided to have as "primary targets" for the STL aquatic portfolio all 40 specific aquatic macrohabitat types (See Table 1), representing 25 basic aquatic macrohabitat types, known or suspected from the ecoregion, in the spirit of the goals of Conservation by Design: to protect all elements of biodiversity. The 23 specific STL river macrohabitats, representing 9 basic types, and 17 specific STL lake macrohabitats, representing 14 basic types, were hypothesized to serve as coarse filter surrogates for all aquatic microhabitats, associations, species assemblages and species in the ecoregion. While the classification had been limited to the New York and Vermont portion of the ecoregion, we added six estuarine aquatic communities as potential portfolio targets which are definitely or likely to be present in Canada along the lower reaches of the Saint Lawrence River (see Table 1). For small macrohabitats, for which sites are apparently not easily predicted from GIS analyses, we hoped to rely on GIS analysis of watersheds and/or aquatic ELUs as a surrogate to capture diversity otherwise represented at the macrohabitat level. Ideally, we hoped to conduct a watershed integrity analysis and produce maps which would allow comparisons of watersheds of about 14-digit HUC size across the ecoregion. Instead, we relied on the selection of size 2 stream watersheds (the only watershed integrity comparisons available at the time of the portfolio selection) as a surrogate for very small to small scale macrohabitats.

In addition, we considered any and/or all "embedded features" that we felt deserve extra focus and might not be sufficiently conserved through the more "diluted" targeting or conservation of their much larger associated very large scale macrohabitat primary target. For the first iteration, embedded features chosen as primary targets are limited to large nearshore morphometric features and "aquatic faunal concentration areas". These include elements tracked by heritage programs as natural communities that do not represent entire macrohabitats. Our recommendation was to target only those EOs of these features that occur within very large scale (matrix-like) aquatic communities, not those within smaller scale communities, of which there were several (6 warmwater fish concentration areas and 1 waterfowl concentration area in smaller rivers and lakes). Six such element types were recommended as embedded feature primary targets: three physical-based microhabitats, each varying in their physiognomy and component associations, and three faunal concentration area types (see Table 1). Vascular plant-dominated associations are characteristic of each of the three microhabitats. Two associations, Great Lakes Aquatic Bed, characteristic of bays, and Great Lakes Exposed Shoal, characteristic of rocky nearshore areas, are tracked as community elements at NYHP. NYHP has several EORs of four of the six embedded feature types on BCD from within the St. Lawrence River and Lake Champlain: Great Lakes aquatic bed (1), Great Lakes exposed shoal (1), warmwater fish concentration areas (15) and waterfowl concentration areas (12) (see Table 1). NYHP also has several leads of raptor concentration areas from throughout the St. Lawrence River. The final team decision was to allow tracking of these six features, after we confirmed that 1) faunal concentration areas were best tracked as a community feature rather than a zoological feature to be addressed by the zoology team, and 2) faunal concentration areas are fairly homogenous in species composition across their ecoregion range, followed by the choice of tentative sites for the portfolio. Because of the relative scarcity of information available to our team on these special features, in comparison to macrohabitats, we recommended careful refinement of selected sites via expert meetings during the second iteration of the plan.

Aquatic macrohabitats and embedded features chosen as primary targets are restricted to NATURAL community types and exclude CULTURAL community types. Following general specifications at NYHP for riverine and lacustrine communities, cultural communities are defined as those that have been modified by human influence to an extent that has produced substantial changes in the biota and physical structure of the community. Generally, this is interpreted to mean that 50% or more of the biotic and/or abiotic features of the community have been altered (e.g., > 50% relative cover or density of exotic species; >50% of the way towards an altered trophic state; >50% alteration of the original volume of lakes). Thus, lakes with only slightly altered water levels will be classified as natural communities, whereas those with substantially-raised water levels may be termed a "reservoir", a cultural community.

Secondary Targets. Secondary targets are defined as features of aggregate aquatic diversity (i.e., more than just a single species) that were not chosen for the community portfolio, the assumption being that they are well captured by one or more surrogate primary targets. For secondary targets in the STL aquatic portfolio, we considered any and/or all remaining microhabitats, associations and species assemblages and other units such as cultural macrohabitats and special physical features that we felt might not be sufficiently conserved through the more "diluted" targeting or conservation of their much larger associated macrohabitat primary target.

Secondary targets for the community portfolio do not include single species, which, in our opinion, are best addressed under the plant and animal species portfolios.

A list of secondary targets is presented in Table 1. This working list was a cooperative venture among many staff on the general ecoregion team: David Hunt, Mark Bryer, Mark Anderson, Eric Sorenson, Sandy Bonanno and Bob Zaremba. If in future iterations we find that these features are overlooked by selection of sites for primary targets (especially via experts meetings), we might elevate some of these secondary targets to primary targets. It is recommended that wider review of this list and supplementation to it be solicited (e.g., by VT DEC staff and other regional aquatic experts) during the second iteration of the plan.

Secondary targets include species associations and assemblages which we expected to be captured by primary targets as a coarse filter and reflected in the definition and typification of these targets (e.g., aquatic macrohabitats), but for which we wanted to eventually test this coarse filter assumption. If any of these assemblages are not well captured by the macrohabitat approach, then we would explore in future iterations 1) elevating them to a primary target or 2) refining the macrohabitat classification to capture them either directly or indirectly. For example, we might target small quillwort meadows which are suspected to be a regionally rare association typically found within large STL oligotrophic alkaline dimictic lakes.

Our decision to allow inclusion of cultural aquatic communities in an ecoregional portfolio is reportedly a novel approach, according to Mark Bryer. Elevation of cultural community types to a primary target would probably be justified only if 1) a suite of characteristics of the cultural community type were representative of or unique to a natural aquatic community type that has been essentially extirpated from the ecoregion or 2) not enough examples of the equivalent natural community type remain to fill the portfolio target number and a cultural community would be restored to this natural community type. In the latter case, if elevated to a primary target, the goal would be to restore the cultural aquatic community type back to its former state of a natural community, assuming that the features that caused us to elevate this to a primary target would remain intact through the restoration process. An example would be restoration of a eutrophied lake back to its unpolluted state. In contrast, if we target a reservoir as a primary target for its resemblance to a natural lake type now extirpated from the ecoregion, but if restoration of a specific reservoir occurrence to its former stream state might involve loss of its lacustrine features, this would be counterproductive to our goal of maintaining those features. Also, we wouldn't elevate a "reservoir" (a cultural community type) to a primary target only because it generally contained one native fish species that was lacking from remaining examples of natural communities in the ecoregion; instead the fish species would probably be targeted under the fine filter species portfolio.

Cultural aquatic community types proposed as secondary targets (see Table 1) were taken from Ecological Communities of New York State (Reschke, 1990). Included are primarily cultural aquatic macrohabitats with altered flow. Our suggestion was to consider only community types and occurrences with good water quality. Macrohabitats with suspected poor water quality (on top of having altered flow) were not included as suggested targets (e.g., sewage treatment ponds, industrial effluent ponds).

Tertiary Targets. During the first iteration of the STL plan, landscape-level units (watersheds and stream networks) were addressed under GIS analyses by ECS for the portfolio development as surrogate large-scale features and molded as closely as possible to our riverine macrohabitat classification to allow more rigorous comparison to heritage-assessed EOs. High quality watersheds were hoped to serve as good surrogates for very small and small scale macrohabitats, especially for lacustrine communities, that were hard to predict from GIS and for which we had few to no known or suspected high quality examples from heritage program data. Stream networks were evaluated as a tertiary target and are expected to serve as a good surrogate for aquatic macrohabitats, especially for small scale riverine communities. Mark Anderson proceeded independently with protocols and documentation for identification of both watersheds and stream networks as tertiary targets. Because during the first iteration of the STL plan we anticipated having few or no documented occurrences or "leads" of small scale macrohabitats identified as primary targets (except perhaps for one or two documented sinkhole pond occurrences), these landscape-level aquatic features were thought to be important in forming a more comprehensive portfolio. However, we hoped that more occurrences would be documented by the second iteration of the plan as primary targets in response to inventory gaps revealed from the first iteration.

3. Setting Community Goals (Stratification Regime, Target Numbers and Viability Criteria).

We used a flexible, adaptive approach (see Comer, 2001: Observations and Recommendations for Setting Conservation Goals in Ecoregional Plans. The Nature Conservancy, Boulder, CO, January 8, 2001 memorandum.) in arriving at methods for goals for primary targets (macrohabitats and special embedded features): stratifying targets, designating target numbers and setting viability criteria/thresholds. We wanted such an approach, especially given that in the first iteration of the plan, few examples of these targets are expected to be from occurrences documented by the heritage network and most examples are expected to be from GIS-predicted analyses and expert meetings. The STL Aquatic Community Team decided to have David take the lead on a procedure to set community goals for primary targets, with guidance from Mark Anderson. Most team members agreed that as an organization, we have the least expertise and certainty for this part of the portfolio building process, and that we should adopt an adaptive approach as a best first guess. We planned to follow the methodology used in other ecoregions in this respect, which typically involves monitoring the effectiveness of the portfolio after its implementation and making necessary revisions to future iterations of the ecoregion plan to improve our assumptions. Our approach for the first iteration is summarized below.

Stratification Regime.

Our goal was to capture all diversity, at multiple scales, in the portfolio while minimizing redundancy of diversity. Our applied approach was to use a combination of primary target types to capture coarse-scale diversity and a stratification regime to capture finer-scale diversity, representing distinct variation within macrohabitat types and other primary target types. We decided to geographically stratify across the ecoregion examples of targets chosen for the portfolio, especially to ensure that sufficient variation in each aquatic community type is captured in the portfolio. We had many discussions on which parameters to use for stratifying primary targets. The stratification of tertiary targets is beyond the intentions of this document, but in our application we chose selected size 3 streams and size 2 stream watersheds within each of a set of biophysically similar watersheds.

Primary Targets. We stratified occurrences of primary targets for STL as a surrogate attempt to capture broad patterns of biological variation more subtle than the 41 specific aquatic macrohabitat units we designated in NY and VT. In arriving at a "stratification regime" we considered one or more "stratification factors" or "stratification parameters", each with a number of "stratified values". Both the parameters and values chosen were based both on ecology (e.g., the hypothesized largest apparent breaks in the spectrum of biological variation) and practicality (e.g., the number of units for which data management time was available; the availability of GIS data layers), as was apparently done for NAP planning efforts.

Our goal was to determine which stratification factors and parameters best represent additional biological variation beyond that captured by the macrohabitat classification. A list of potential stratification parameters for macrohabitats was reviewed by the STL Aquatic Community Team and other interested staff (Eric, Mark A., Mark B., Sandy Bonanno). All parameters considered during the course of our team efforts are summarized in Table 3. A discussion of the one stratification factor eventually chosen for stratification (large-scale geophysical regions) is presented here. A discussion of the two other parameters which were considered in most detail is presented in Appendix 1. Other parameters mentioned in previous documents as potential stratification factors, primarily hydrological features (see Table 3) were not evaluated in detail because biotic variation was expected to be at an even finer scale than the other potential stratification factors evaluated in detail. These include: water color, temperature, trophic state, alkalinity and stream order.

After many discussions, we reached consensus among team members in choosing stratification factors for the first iteration of the ecoregion plan. We agreed to adopt a simple stratification regime and use only one stratification parameter, large-scale geophysical units/regions, as a feature which is hypothesized to capture the largest amount of variation not addressed in the classification, thus having the ease of a target number which corresponds to the number of geographic units. Because our approach differs from that of other ecoregions, such as the Great Lakes ecoregion, in having much fewer target types (e.g., fewer aquatic macrohabitats), to produce a portfolio of comparable numbers of occurrences or sites, we opted to have fine-scale stratification values, striving generally for 3 to 6 per target type for the combined New York and Vermont portion of STL. Many other factors were evaluated for potential use, but these seem well correlated with either our classification and/or these large-scale regions. Leftover variation was planned to be addressed by 1) considering within-occurrence variation/diversity as a condition parameter to give preference to selecting diverse occurrences (see the viability assessment document) and 2) checking for the ability of our primary targets to work as coarse filters for all important secondary targets during the second iteration after the portfolio is assembled.

We had hoped to make a critical evaluation of the variation within selected primary targets and assessment of a more complex stratification regime by ECS staff through GIS analyses. After selection of the occurrences for each primary target using large-scale physical units, we had hoped to assess remaining variation in topography/connectivity and soils/geology to evaluate their utility as a stratification factor. These analyses were deferred to the second iteration. After such analyses are performed, we might want to use these factors to supplement the occurrences chosen on a case by case basis for each of the 41 specific macrohabitat target types of NY and VT STL. For the first iteration, GIS-derived biophysical units were considered to approximate this variation.

Stratification Factor: Large-Scale Geophysical Units/Regions.

The factor that was thought to be most useful in stratification of aquatic macrohabitat targets is large-scale geophysical units/regions, primarily either ecological drainage units (EDUs) or ecoregion subsections or similar units that combine both watershed and ecoregional features. As a general rule, species composition and especially abundance is known to vary at least slightly within an aquatic macrohabitat type as one moves from region to region. Because of the strong correlation between the boundary of EDUs and ecoregional subsections in STL (see discussion below), we decided to remain flexible to choose between these two systems.

In general, the choice between subsections versus EDUs is challenging for STL because of strong correlations between the two systems. In New York and Vermont, STL has 6 subsections and 3 EDUs. The Northeastern Lake Ontario EDU (041501) contains all of the Black River Valley (Subsection 222Ob) and about 50% of the Saint Lawrence Glacial Lake Plains (Subsection 212Ee). The Richelieu EDU (020100) contains all of the Champlain Glacial Lake and Marine Plains (Subsection 212Ec) and Champlain Hills (Subsection 212Ed). The Saint Lawrence EDU (041503) contains most of the Saint Lawrence Glacial Moraine Plain (Subsection 212Ea) and the Saint Lawrence Till Plain (Subsection 212Eb) and about 50% of the Saint Lawrence Glacial Lake Plains (Subsection 212Ee). Because of the strong correlation between the boundaries of EDUs and most subsections, it was considered a moot point in STL as to which of the two approaches were taken for stratification, and thus target number.

To avoid having to make difficult decisions as to which occurrences to choose among wide-ranging aquatic macrohabitat types spanning multiple physical regions, we opted for one of two alternatives: 1) choose 3 occurrences, 1 per EDU for those types where variation was hypothesized to be most closely correlated with EDUs or 2) choose 6 occurrences, 1 per subsection for those types where variation was hypothesized to be most closely correlated with subsections. Once Quebec aquatic occurrences are considered, hopefully in the second iteration of the STL plan, we recommend adding more EDUs and/or subsections into our stratification regime. For example, we suspect that examples of bog lake characteristic of the Quebec part of STL might be separated out as a unique type of bog lake that differs from those of the NY and VT part of STL, which are thought to be peripheral examples of a NAP type.

An alternate possibility would be to use other classifications focusing on geographic units of physical diversity. Omernick's classification of landscape-level "aquatic ecoregions" was deemed not as useful as Bailey's classification of subsections, because it is based on current land use attributes, rather than potential ecological associations. Mark Anderson developed a map of "watershed aggregates" that was deemed to have much potential as a stratification tool. Ten stream size class 3 biophysical units were identified throughout the ecoregion, having relatively homogeneous physical features that may approximate a combination of those features used to delineate subsections and major drainage units. Approximately 25 watershed aggregates across the ecoregion were categorized as one of these 10 units, about 8 in Vermont and 17 in New York. We recommend a more comprehensive evaluation of these aggregates for use in stratifying primary targets during the second iteration. Not enough time was available during the first iteration to apply these units to primary targets as a stratification factor, and if they were used comprehensively, we might have had to raise the target number from 6 (for the 6 subsections) to 10 (for the 10 biophysical units), thus creating a larger portfolio.

Parameter: <u>Ecological Drainage Units (EDUs).</u> Some riverine and lacustrine communities are known or suspected to vary in biotic composition between the Lake Champlain versus the Saint Lawrence Valley/ Northeastern Lake Ontario drainages, especially in fish and mollusk diversity (based on well-documented historical migration routes), and especially for communities in the lower portions of the drainage units and very large scale to large patch communities. There is also evidence that besides biological differences, the Lake Champlain Valley examples of STL confined river and STL unconfined river represent occurrences with stream bottoms of deep sands with mollusks burrowing deep into the sand; while the more diverse St. Lawrence River Valley examples of these stream types represent occurrences with rocky stream bottoms supporting mollusks in shallow sands in bedrock cracks. In the Great Lakes Basin aquatic community portfolio (Higgins et al., 2000), the drainage units of Eastern Lake Ontario vs. Saint Lawrence vs. Lake Champlain were used to classify communities.

Parameter: <u>Ecoregion Subsections.</u> This geographic unit was used in the NAP terrestrial community site stratification process and presents a different alternative to EDUs. Some riverine and lacustrine communities are known or suspected to vary in biotic composition between subsections. The influence of subsection on diversity is expected to exceed that of EDU in most very small scale to large scale communities, especially where aquatic connectivity and upstream migration of biota are naturally impeded: including isolated lacustrine communities and communities higher in the drainage basin. For such communities, it is suspected and hypothesized that the underlying physical characteristics of the stream influence the biota more than aquatic connectivity factors.

Parameter: Local Watersheds. We decided that watersheds smaller than the 6-digit EDUs (e.g., 8- to 11-digit HUCs) are too fine in scale to be used for stratification purposes in our efforts, given the limited number of occurrences of each community type desired for targeting per ecoregion and the large number of these smaller units (e.g., thirteen 8-digit HUCs for the New York portion of STL). If 8-digit HUCs were chosen as stratification units and one EO was targeted per HUC for each community type, then the 13 EOs from New York, approximately 5 EOs from Vermont (or 18 EOs total for New York/Vermont combined per target) and approximately 35 EOs from the entire ecoregion seem too high. Mark Anderson's experimentation led to designating biophysical geographic units which combine several stratification parameters (including terrestrial ELUs, landforms, surficial and bedrock geology, and drainage network position). The ten stream class size 3 biophysical units covering the combined NY and VT portion of STL represents an intermediate approach for stratification, between the 6 EOs targeted stratifying by subsection and 18 EOs stratifying by 8-digit HUCs. Still, high target numbers would be expected if one EO were targeted per biophysical unit type.

Secondary Targets. Because sites were not be chosen for secondary targets, we did not address their stratification. If we determine during future iterations that they are not well captured in the portfolio by the existing primary targets, we recommend elevating them to primary targets and generally stratifying them by subsection.

Tertiary Targets (Watersheds and Stream Networks). Arlene and Mark Anderson independently determined the role of factors such as elevation, connectivity, geology and EDUs for larger scale portfolio targets and chose 11 stream networks for the portfolio. Their methods are documented elsewhere.

Target Numbers.

Primary Targets (Aquatic Macrohabitat Occurrences and Smaller-Scale Features Embedded in Very Large Scale Aquatic Community Types). Approaches at designating target numbers in other ecoregions have ranged from absolute target numbers to a percentage (i.e., a relative number) of the original (historic) or current extent of a community type in the ecoregion (Comer 2001). In an approach that relies on absolute numbers, rare community types usually become overrepresented. Percentages attempted in different efforts have ranged from 12% of the ecoregion area (which is reported to preserve 50 to 70% of its component species) to 30% of the area (which results in numerous sites being chosen for the portfolio).

For STL, Mark Anderson first suggested having a minimum of two to ten occurrences of each primary target selected per ecoregion. This is the number recommended for ecoregional plans when little or no additional information on community diversity and distribution patterns is available. If we used this suggestion for the New York-Vermont portion of STL (roughly 40% of the ecoregion), that translates to 1 to 4 EOs per target. Based mostly on gestalt of aquatic community diversity and distribution patterns in STL and poor availability of data for the remaining 60% of the ecoregion in Canada, we hypothesized that this number is slightly too low. After reviewing the Comer article and team discussions, we decided to choose more than 2 to 10 examples of each community target for STL during the first iteration. Four main reasons support this higher target number: 1) the Comer article suggests that if the appropriate stratification regime and target numbers for an element are uncertain, then it is better to err on the side of redundancy, 2) the Comer article suggests that greater redundancy is desirable for ecoregions that are more vulnerable and have greater disturbances (which describes STL), 3) because we addressed diversity within aquatic community occurrences under condition ranking rather than creating a finer-scale classification (e.g., one that splits within-EO variation in stream order or watershed size class [especially within larger streams], surficial geology variation, and aquatic connectivity), we wanted to make sure that we captured this variation in the portfolio by having larger target numbers and using diversity to prioritize the selection of EOs within one geographic unit (e.g., a subsection), and 4) we wanted a simple system where the higher target number corresponds with the number of stratification units (3 EDUs and 6 subsections per New York and Vermont combined) so we could target one EO per unit.

The long-term methodology we suggested for determining the number of each aquatic macrohabitat primary target to be chosen for the STL portfolio was to make it dependent upon the distributional patterns of community variation. We decided to base the target number for each target type upon the strongest correlation between within-type biotic variation and large-scale physiographic units (see Table 2). For those primary targets that are suspected to have biotic variation most strongly correlated with ecological drainage units (EDUs), we suggested selecting one example of each macrohabitat in each of the 3 EDUs in the New York and Vermont portion of the ecoregion, with the ultimate long-term goal being to target one example from each EDU (if available), or about 6 (?) examples for the entire ecoregion. We need an exact figure from ECS of the number of EDUs for STL once Canada is included. For those primary targets that are suspected to have biotic variation most strongly correlated with TNC ecoregions and their subsections, we plan to select six examples of each macrohabitat from among the 6 subsections in the combined New York and Vermont portion of the ecoregion, with the ultimate long-term goal being to target for each macrohabitat one example from each subsection (if available), or about 15 (?) examples for the entire ecoregion. We need an exact figure from ECS of the number of subsections in STL once Canada is included. Other suggestions from Comer (2001) include adjusting the target number for community rarity and its distribution pattern relative to the ecoregion; for example, targeting a lower number for peripheral community types. We opted to make no changes based on community rarity, or peripheral types (see Table 2). Based on examination of terrestrial ELU maps, we noted the following pattern of ecoregion subsections and likely aquatic community type: Subsections 212Ea, 212Ec, 212Ee (western 50%): calcareous to circumneutral substrates typical of STL; Subsections 212Eb, 212Ed, 212Ee (eastern 50%), 222Ob (eastern 50%): acidic to circumneutral substrates typical of NAP; Subsection 222Ob (western 50%): shale substrates typical of GL.

Despite all these standard decisions for assigning specific target numbers to a given macrohabitat during the first iteration of the STL plan, because we had limited documented occurrences from which to choose and limited on-the-ground knowledge of occurrences, we decided to remain flexible on the number of each target chosen. We kept open to rely more heavily on viability. Also, we relied on building a portfolio of tertiary targets from "watershed aggregates", as discussed above. Exceptions to the general rules were made freely. Common decisions included: 1) allowing the choice of 1 VT EO and 1 NY EO for Subsection 212Ec, the only subsection to span the two states, 2) allowing the choice of 2 EOs of similar overall value, or having one as an "alternate choice", and 3) adding part of Subsection 221Bc from the Lower New England Ecoregion to the portfolio to capture the lower portion of the Poultney River and the southern extreme of Lake Champlain, thus being consistent with the formation of the STL terrestrial community portfolio.

To apply target numbers to each primary target under this scheme, we compiled suspected correlations between STL aquatic macrohabitat types and large-scale physical regions (see Table 2). From David's estimates and ecological intuition, the distribution of most aquatic macrohabitats in STL were hypothesized to be slightly more to much more strongly correlated with subsection and ecoregion than with ecological drainage unit (EDU), except for the largest macrohabitat types lowest in the drainage basin (e.g., Great Lakes deepwater river, summer-stratified monomictic lake) which may span multiple subsections. Large scale riverine communities are thought to span the transition from stronger subsection influence to stronger EDU influence (perhaps with closer subsection correlations above the fall line, representing the first major barrier to upstream migration, and closer EDU correlations below this point). Thus for a target number, David suggested erring on the side of redundancy (per Comer, 2001), stratifying them by subsections and using the higher number of subsections (6) over EDUs (3).

Running through the 47 specific aquatic macrohabitat types, representing 31 basic types, currently known or suspected throughout the U.S. and Canada portion of STL, 39 specific types were hypothesized to be most strongly correlated with subsection boundaries, and thus 6 occurrences were sought for the portfolio, and 8 basic/specific types were hypothesized to be most strongly correlated with EDU boundaries, and thus 3 occurrences were be sought for the portfolio. Among the latter 8 community types, for the only two in NY and VT (Great Lakes deepwater river and summer-stratified monomictic lake), there is only one occurrence each known from the ecoregion and both are within 1 EDU and essentially 1 subsection, so the two approaches to target number and stratification regime become indistinguishable. Lake Champlain is in the Richelieu EDU, the St. Lawrence River is in the St. Lawrence EDU, and Lake Champlain is in subsection 212Ec, the St. Lawrence River is mostly in subsection 212Ea, although it is unclear if the boundary between 212Ea and 212Ee extends into the river. For the other 39 specific community types, from one to hundreds of occurrences each are expected from Vermont and NY STL (See Table 2), thus targeting 6 occurrences seemed appropriate. Three of these 25 basic types known or suspected from the U.S. portion of STL (bog lake, marl pond, pine barrens vernal pond) are peripheral to STL and the target number of 6 was expected not to be filled because they are not suspected from all subsections of STL. Similarly, many specific macrohabitat types characteristic of NAP or GL ecoregions were also thought to be peripheral in STL, representing basic types which also have a characteristic STL specific macrohabitat variant present throughout the STL ecoregion. Rangewide diversity in these peripheral types is hypothesized to be better covered in other ecoregions, but STL examples are desirable to capture the variation present at range edges and in disjunct areas.

For embedded features within very large scale aquatic communities, where we had less certainty about diversity and distribution patterns than those for aquatic macrohabitats, we followed Mark Anderson's approach of targeting 10 occurrences per ecoregion, and thus targeting 4 occurrences for the New York-Vermont portion of STL (about 40% of the ecoregion). Here, the target number was not based so much on a geophysical region stratification regime (as both very large scale aquatic communities are within 1 EDU and essentially 1 subsection), but rather on the target number needed to represent the diversity when all associated coarse-scale physical features are essentially homogeneous. Thus, we opted for a target number of 4, with 2 occurrences chosen from within the Saint Lawrence River, a deepwater river, and 2 chosen from within Lake Champlain, a summer-stratified monomictic lake, assuming that the embedded feature target occurs in both. This is probably a good assumption for most of these features. A precedent for applying target numbers to such features from other ecoregions was not readily available. The shorebird concentration areas of the Chesapeake Bay Lowlands Ecoregion may come the closest to our approach.

Secondary Targets. Occurrences of secondary targets were not chosen for the portfolio. If it is suspected in future iterations that secondary targets are overlooked by targeting only primary targets, we recommend assessing the inclusion of these secondary targets within primary targets; if they are not well included, we recommend elevating them to a primary target and designating target numbers at 10 per ecoregion, or 4 for the New York-Vermont portion of STL, as a start.

Tertiary Targets (Watersheds and Stream Networks). Mark Anderson and ECS staff led a meeting to make the initial selection of stream networks in the combined VT and NY portion of STL. A minimum of one stream network per each of the ten stream class size 3 biophysical units was selected. A minimum of one watershed surrounding a class size 2 stream of the 22 stream class size 2 biophysical units was also chosen, ideally one watershed of each type found within the watershed aggregate corresponding to the drainage unit of the size 3 streams selected above. In this manner, one to four size 2 class stream watersheds were chosen within each stream network selected for the portfolio. The total number of stream networks/size 3 stream segments chosen was 11, with only one unit represented by more than one network: the Grass River and St. Regis River networks were considered to be of similar value. The total number of size 2 stream watersheds chosen was higher and is available from ECS staff.

Viability Criteria.

Our initial plan was to come up with minimum viability criteria for size, condition and landscape context for occurrences of each targeted macrohabitat type or primary target to be included in the portfolio. We relied heavily on suggestions from Mark Anderson and Mark Bryer for guidance on this issue.

Because occurrences of "C" overall rank or higher are used to designate viable occurrences at NYHP, we decided to use this threshold for inclusion in the portfolio during the first iteration 1) for consistency with heritage methodology, 2) for simplicity sake, 3) to have a low threshold to compensate for the scarcity of heritage-documented aquatic community EOs and heritage-assessed high quality leads in STL, 4) to lower the thresholds below the more restrictive ones used for NAP because of the much more impacted landscape context of STL relative to NAP, and 5) the lack of good information in the literature and from field studies on absolute viability. Extrapolating from the EO Data Standards model, we ideally suggested a slightly more restrictive approach and limit occurrences selected not only to having an overall rank of "C" (i.e., the viability threshold for occurrences) or higher, but also to having what might be termed "viable size", "viable condition" and "viable landscape context", thus with each of the three subranks at "C" rank or higher (See Table 4). If we didn't have enough occurrences for the portfolio because of the scarcity of heritage-documented occurrences in the ecoregion, we lowered the viability threshold below "C" subranks and overall rank on a case by case basis, especially if 1) only low-ranked examples are known or suspected for a given aquatic macrohabitat type, 2) that type is characteristic or indicative of the ecoregion, and 3) our overriding goal is to capture the full diversity of aquatic communities in the portfolio (thus suggesting restoration as a strong need for such specific targets). In contrast, if we had good information on certain community types and many occurrences from which to select, we set our standards higher on a target by target basis. We may want to compare our criteria for assessing viability with that of other ecoregions for future iterations of the plan.

4. Assemble the Aquatic Community Portfolio.

ECS staff took the lead in assembling an "aquatic portfolio", which represents a combination of aquatic community features, the "community portfolio", and a landscape-level aquatic portfolio that transcends these aquatic community occurrences to include aggregations of rare aquatic species, associated riverside community features and connected aquatic networks, the "aquatic systems portfolio". Our goal was to derive an overall aquatic portfolio that is diverse, balanced and nested. The hope for assembling this aquatic portfolio was to 1) select aquatic community occurrences for all primary targets: target macrohabitats and smaller scale embedded features, 2) cross check our selection of primary target sites with secondary target types to decide whether or not to elevate any secondary targets to primary targets, 3) select a portfolio of watersheds and stream networks (tertiary targets), 4) get expert review of the sites selected for each of these targets, and 5) integrate aquatic features into a "site portfolio". Due to time constraints, we were unable to achieve our goals to critically evaluate secondary targets and hold expert review meetings. We hoped that the 1995 to 1998 interviews of NY aquatic experts by David, the involvement of VT DEC aquatic staff during the portfolio development process, and the review of other secondary sources suffices for the portfolio developed for this iteration.

Mark Anderson took the lead on integrating various features into an aquatic site portfolio. Desired sites included entire stream networks, aquatic landscapes, or combined aquatic-terrestrial landscapes with multiple connected targeted community elements. Where we had a choice to select sites for the community portfolio among different occurrences of a community target with comparable value, we gave preference to the one which better integrates into large-scale conservation sites (e.g., choosing a headwater stream in the same stream system as a larger river which has already been chosen for the portfolio). We envisioned the complete aquatic site portfolio to consist of a combination of large integrated sites with multiple communities and rare species supplemented with smaller, less integrated disjunct sites including some isolated community occurrences.

Primary Targets (Aquatic Macrohabitats & Small-Scale Features Embedded within Very Large Scale Communities). With the choice of ecoregion subsections and ecological drainage units as stratification factors for selecting occurrences for the portfolio, we applied these stratification factors to the appropriate targets via visual examination of maps, as in the approach for terrestrial communities. Use of GIS analyses to map and assign subsections and EDUs to occurrences is an alternative recommended for the second iteration. Whether aquatic community occurrences were documented in the heritage databases or assessed for viability from other sources (e.g., via heritage-tracked leads or expert information), they were compared to the viability criteria for inclusion in the portfolio. For communities where no occurrences of relatively certain identity were documented or known at the time, no sites were selected for these targets in the portfolio, unless sites could be predicted via GIS and treated as ELU surrogates to aquatic macrohabitats and other primary targets.

In cases where the number of documented and otherwise assessed occurrences of primary targets meeting viability criteria exceeded the target number for the first iteration of the STL plan, we arrayed occurrences to allow for prioritization of site selections (e.g., via TNC scorecard-like meetings or expert review meetings) by simply listing all the occurrences examined. We followed Mark Anderson's recommendation to rank the occurrences from best to worst (overall EO rank) and then assemble the portfolio. This should allow conservation practitioners to choose among alternate examples, as has been done for other ecoregions.

Mark Bryer suggested that if the number of occurrences from which to select exceeds the target number, we consider prioritizing our selection by giving higher weight to condition and landscape context over occurrence size. Overall ranks were generally arrived at by equally weighting size, condition and landscape subranks. For New York, many of these ranks had been previously estimated during preliminary analyses of leads. In cases of equal rank (e.g., two EOs with A overall rank from the same subsection), the choice was made from factors such as knowledge of the occurrences, especially extensive notes in the Adirondack and Tug Hill "leads tables" which summarize expert and literature information and claims of exemplary status and which may be available upon request from NYHP or David. In cases of equal overall rank, one of David's recommendation was to consider implementing a priority scheme as we encountered each situation; NYHP uses an algorithm which may give differential weight between occurrence size, condition and landscape context. This algorithm varies from community to community type, but a general pattern may be evident. For community types where difficult choices were presented and we decided to choose multiple examples for the first iteration, we could adopt, for the second iteration, algorithms specific to each community type, come up with a generalized algorithm, or reach a better consensus among team members.

During NAP ecoregional planning and the formulation by TNC of general ecoregional guidelines for terrestrial communities, David advocated for making sure that "exemplary occurrences" be included in ecoregional plans as "irreplaceable benchmarks". We tried to elevate knowledge of the importance of these occurrences by addressing this concept in our aquatic community portfolio for STL. We acknowledged that while we may not be able to be sure that we are using "absolute ecological thresholds", we can attempt to indicate existing benchmark occurrences for each target. We decided to, at a minimum, "tag" exemplary EOs to guide people making selections for the portfolio. We wanted to ensure that suspected or putative global and/or state exemplary EOs of community types (fields tracked by heritage programs on BCD) were indicated on lists of occurrences from which to choose portfolio sites. One long-term goal is: at a minimum, to get benchmark occurrences for all types into the portfolio and have these documented on BCD. Many such occurrences may currently exist as leads at heritage programs (especially in NYHP files) or have not yet undergone translation into heritage EO language (especially those in the databases of VT DEC). The current status of efforts to identify benchmarks of aquatic occurrences in STL is as follows. In New York, state and global exemplary occurrences of all basic macrohabitat types (e.g., a rocky headwater stream) have been hypothesized, however exemplary occurrences of "ecoregional", "biophysical", or "specific" macrohabitat types (e.g. a STL rocky headwater stream) have not yet been systematically proposed. David has much of the raw information in the form of "leads tables" to derive preliminary claims upon further analyses. In Vermont, the 1998 Aquatic Working Group reference lists exemplary occurrences of aquatic community types using separate classifications for fishes, macroinvertebrates and macrophytes. A preliminary translation of these Vermont exemplary occurrences into our STL macrohabitat classification was started, but not done systematically. Progress on identifying benchmark occurrences from existing literature and expert review meetings is a strong recommendation for the second iteration.

Additionally, Mark Bryer suggested that it will be desirable in the long term to describe the reference conditions reflected by these benchmark occurrences, especially to quantify the relative abundances and absolute densities of species (especially algae, fishes and macroinvertebrates) and determine the correct indices for the community type (especially its IBI). The goal of the STL classification was to use benchmark occurrences to describe community types, but we realized that better descriptions can be obtained with more time invested, more research and analysis. We also realized that even after these efforts, the lack of good existing benchmarks, especially in this ecoregion and especially with the alteration of historic fish assemblages, may prevent ever knowing if a "restoration benchmark" for a community type would ever approximate its "historic benchmark".

The first comprehensive portfolio of aquatic community occurrences for the first iteration of the STL plan is presented in Table 5. All known heritage-documented EOs or heritage-assessed/compatible data in STL are shown, with associated viability thresholds, exemplary status, and recommendations for inclusion in the portfolio.

The community portfolio includes all 23 specific river macrohabitats, representing 9 basic types, and all 18 specific lacustrine macrohabitats, representing 14 basic types, known or suspected from the combined NY and VT portion of STL. Sites for four embedded features are also presented.

Occurrences were chosen for the portfolio for 6 of the 9 basic river macrohabitat types known or suspected from the ecoregion, with no certain leads for spring and subterranean stream, and only poor information on intermittent streams. Of the 19 specific riverine macrohabitat types known for the ecoregion, sites were chosen from 18 types. Among the 36 riverine occurrences chosen for the portfolio, 30 are from New York and 6 are from Vermont. River occurrences represent a combination of 1) VT DEC condition data for macroinvertebrate sampling in confined rivers and rocky headwater streams (47 occurrences, 14 of which were assessed from supplementary information, with the remainder lacking good location data and community identity), 2) NYHP leads (42 occurrences), 3) Vermont's Aquatic Working Group state exemplary sites (15 occurrences), 4) NYHP's state exemplary sites (8 occurrences, all of which were "second tier" examples), 5) rivers evaluated for the year 2000 GL basin portfolio (at least 17 occurrences), and 6) segments within the 11 stream networks fulfilling the requirements of ten stream size class 3 biophysical units (39 occurrences). Of the 36 riverine occurrences chosen for the portfolio, 26 were within the 11 chosen stream networks and 10 were outside.

Occurrences were chosen for the portfolio for 11 of the 15 basic lake macrohabitat types known or suspected from the ecoregion, with no certain leads for vernal pool, pine barrens vernal pond and acidic pond. Of the 11 specific lacustrine macrohabitat types known for the ecoregion, sites were chosen from all 11 types. Among the 19 lacustrine occurrences chosen for the portfolio, 11 are from New York and 8 are from Vermont. Lake occurrences consist of a mix of 1) NYHP documented EOs (4 occurrences of 3 lake types), 2) VT macrophyte data (16 occurrences of 6 lake types), 3) NYHP leads (21 occurrences), 4) Vermont's Aquatic Working Group state exemplary sites (2 occurrences), and 5) NYHP's state exemplary sites (2 occurrences). Of the 10 NY lake occurrences assessed from the 11 chosen stream networks, 3 were chosen for the portfolio. Vermont lake occurrences were not assessed for their inclusion within the 11 chosen stream networks.

Occurrences of the six embedded features are primarily from New York, with some from adjacent Ontario. Occurrences were chosen for the portfolio for all 6 embedded feature types known from the ecoregion. Among the 37 occurrences assessed for the portfolio, 11 were chosen. Embedded feature occurrences consist of a mix of 1) NYHP documented EOs (31 occurrences of 5 feature types) and 2) NYHP leads (6 occurrences of putative raptor concentration area).

Of the four BCD-documented aquatic macrohabitat occurrences (all from NY), three are recommended for inclusion in the portfolio, none are putative global exemplary occurrences, and up to three are potential state exemplary occurrences for NY. In total, occurrences suggested for the aquatic community portfolio include 36 riverine macrohabitat occurrences, 19 lacustrine macrohabitat occurrences, and 11 embedded feature occurrences, totalling 66 community occurrences. These were selected of a total of 246 assessed community occurrences: 165 riverine macrohabitat occurrences, 44 lacustrine macrohabitat occurrences, and 37 embedded feature occurrences. A summary of the number of occurrences selected for the portfolio for each macrohabitat type is presented in Table 6 and includes an assessment of gaps for subsections and target numbers.

5. Future Recommendations for Portfolio Development.

The following recommendations are suggested as some of the ways to explore improvements to the portfoliio during the second iteration:

1. Assess the sufficiency of the coarser scale primary targets to capture secondary target features.
2. Evaluate the elevation of any secondary targets overlooked by selection of sites for primary targets to a primary target, followed by assignment of target number, choice of a stratification regime, then choice of occurrences for the portfolio.
3. Conduct a wider review of the secondary target list and supplement it via input from VT DEC staff and other regional aquatic experts.
3. Gather information on and refine site selections for special embedded features via expert interviews.
4. Document more occurrences, especially in response to inventory gaps revealed from the first iteration.
5. Consider aquatic occurrences in Quebec and Ontario.
6. Add more EDUs and/or subsections into our stratification regime from Canada.
7. Conduct a more comprehensive evaluation of the stream size class 3 watershed aggregates as an alternate way to stratify primary targets.
8. Compare our approach to minimum viability standards with that of other ecoregions.
9. Use GIS analyses to map and assign subsections and EDUs to occurrences.
10. Identify state and global benchmark occurrences more systematically for all specific macrohabitat types from existing literature, especially from NYHP element records and leads tables and the 1998 Vermont Aquatic Working Group reference.
11. Survey and document on BCD benchmark occurrences for all macrohabitat types.

Table 1. List of Aquatic Community Targets for STL

1. **Primary Targets (Aquatic Macrohabitats & Embedded Features) (examples to be included in the Portfolio)**

A) Riverine Macrohabitats (all 23 specific macrohabitats)

STL Spring*
NAP Spring*
GL Spring*
STL Subterranean Stream*
STL Backwater Slough
NAP Backwater Slough
GL Backwater Slough
STL Intermittent Stream*
NAP Intermittent Stream*
GL Intermittent Stream*
STL Rocky Headwater Stream
NAP Rocky Headwater Stream
GL Rocky Headwater Stream
STL Marsh Headwater Stream
NAP Marsh Headwater Stream
GL Marsh Headwater Stream
STL Confined River
NAP Confined River
GL Confined River
STL Unconfined River
NAP Unconfined River
GL Unconfined River
GL Deepwater River

Additional macrohabitats likely from Quebec

Acadian Freshwater Tidal River
Acadian Brackish Tidal River
Acadian Marine Tidal River
Acadian Freshwater Tidal Creek
Acadian Brackish Tidal Creek
Acadian Marine Tidal Creek

B) Lacustrine Macrohabitats (all 18 specific macrohabitats)

- STL Subterranean Lake*
- STL Vernal Pool*
- NAP Vernal Pool*
- GL Vernal Pool*
- NAP Pine Barrens Vernal Pond*
- STL Sinkhole Pond*
- STL Oxbow Pond
- NAP Oxbow Pond
- GL Oxbow Pond
- STL Flow-Through Pond
- NAP Flow-Through Pond
- NAP Bog Lake
- STL Alkaline Pond
- GL Marl Pond
- STL Eutrophic Alkaline Dimictic Lake
- STL Oligotrophic Alkaline Dimictic Lake
- STL Winter-Stratified Monomictic Lake
- STL Summer-Stratified Monomictic Lake

(* = difficult to predict from GIS)

C) Embedded Features (only within aquatic matrix communities)

C1) Microhabitats

Bays/Great Lakes Aquatic Bed

NYHP tracks Great Lakes Aquatic Bed as an element. Strong correlation with Tapegrass-Pondweed bed association, warmwater fish concentration areas and waterfowl concentration areas.

Deltas

Strong correlation with Benthic littoral sand flats association.

Rocky Nearshore Areas/Great Lakes Exposed Shoal

NYHP tracks Great Lakes Exposed Shoal as an element. Strong correlation with Benthic littoral cliff association, Benthic littoral pavement association, Benthic littoral talus association, Benthic littoral boulder field association.

Note: "Nearshore Areas" is considered a broadly-defined term and includes silty bays, sandy deltas and rocky nearshore areas. It is not considered to include non-aquatic shoreline features (part of the terrestrial and palustrine community systems), which will hopefully be addressed in the terrestrial community section of the STL plan. Targets for STL in the Great Lakes Basin 2000 plan included: limestone and sandstone nearshore areas.

C2) Faunal Concentration Areas

Waterfowl Concentration Areas

NYHP tracks as an element. Overlaps with both aquatic macrohabitats and deep emergent marsh.

Warmwater Fish Concentration Areas

NYHP tracks as an element. Potentially characterized by common goldeneye and common merganser. Overlaps with both aquatic macrohabitats and deep emergent marsh. Expect a strong correlation with Tapegrass-Pondweed Association.

Raptor Overwintering Concentration Areas

NYHP may track as an element, or part of an element: "Raptor concentration areas". Found near islands and points within aquatic matrix community, characterized by bald eagle and possibly other raptors which feed on fish and waterfowl which concentrate/overwinter in open water areas caused by eddies and turbulence and serve to concentrate organic matter which attracts the fish and birds.

2. **Secondary Targets (Small-Scale Aquatic Features)**
(for Monitoring and Correlation Assessment)

A) Associations
- Quillwort meadow association
- Nitella meadow association
- Tapegrass-Pondweed bed association
  - (correlated with Bay Microhabitat)
  - (Great Lakes Basin 2000 target for STL?: "clay nearshore areas")
- Benthic littoral sand flats association
  - (correlated with Delta Microhabitat)
  - (Great Lakes Basin 2000 target for STL: "sand nearshore areas")
- Benthic littoral cliff association
  - (correlated with Rocky Nearshore Area Microhabitat)
- Benthic littoral pavement association
  - (correlated with Rocky Nearshore Area Microhabitat)
- Benthic littoral talus association
  - (correlated with Rocky Nearshore Area Microhabitat)
- Benthic littoral boulder field association
  - (correlated with Rocky Nearshore Area Microhabitat)
- Pelagic winter/spring-unstratified epilimnion

B) Faunal Concentration Areas
- Mussel Beds
- Fish Spawning Areas
  - NYS DEC has information on occurrences, but not tracked as an element by NYHP.
- Fish Nursery Areas?
  - NYS DEC has information on occurrences, but not tracked as an element by NYHP.
- Wildlife Feeding Areas?
- Wildlife Overwintering Areas?

C) Species Assemblages
- Fish assemblages
  - All assemblages
- Macroinvertebrate assemblages
  - All assemblages
- Macrophyte assemblages
  - All assemblages
- Plankton assemblages
  - May be poorly known

D) Special Physical Features
- Shoreline Complexity
- Major Bedrock and Surficial Geology Types
- Unique Water Chemistry

E) Cultural Aquatic Communities
- Reservoir/Impoundments
- Artificially Created/Farm Pond
- Quarry Pond
- Eutrophied Lakes
- Acidified Lakes
- Canal
- Ditch/Artificial Stream

3. **Tertiary Targets (Large-Scale Aquatic Features)**

A) Intact Watersheds
Surrogate for the following Aquatic Macrohabitats, all difficult to predict from GIS:
- STL Spring
- STL Subterranean Stream
  (w/ karst topography GIS signature?)
- STL Intermittent Stream
- STL Subterranean Lake
  (w/ karst topography GIS signature?)
- STL Vernal Pool
- NAP Pine Barrens Vernal Pond
  (w/ sandy outwash GIS signature?)
- STL Sinkhole Pond
  (w/ karst topography GIS signature?)

B) Intact Stream Networks

Table 2. STL Aquatic Community Target Distribution and Numbers. Primary Targets: Macrohabitats.

Community name	Geophysical Correlation Unit	# Occurrences Targeted per NY-VT	per Ecoregion	Total Expected Per NY-VT (Rarity)	Per Ecoregion
RIVERINE COMMUNITIES					
STL Spring	Subsect	6	15?	100s	1000s
NAP Spring	Subsect	6	15?	100s	1000s
GL Spring**	Subsect	6	15?	10s	10s
STL Subterranean Stream	Subsect>EDU	6	15?	10s	10s
STL Backwater Slough	Subsect>=EDU	6	15?	10s-100s	100s
NAP Backwater Slough	Subsect	6	15?	10s-100s	100s
GL Backwater Slough**	Subsect>=EDU	6	15?	10s	10s
STL Intermittent Stream	Subsect	6	15?	100s	1000s
NAP Intermittent Stream	Subsect	6	15?	100s	1000s
GL Intermittent Stream**	Subsect	6	15?	100s	100s
STL Rocky Headwater Stream	Subsect	6	15?	10s-100s	100s
NAP Rocky Headwater Stream	Subsect	6	15?	10s-100s	100s
GL Rocky Headwater Stream**	Subsect	6	15?	10s	10s
STL Marsh Headwater Stream	Subsect	6	15?	10s-100s	100s
NAP Marsh Headwater Stream	Subsect	6	15?	10s-100s	100s
GL Marsh Headwater Stream**	Subsect	6	15?	10s	10s
STL Confined River	Subsect>EDU	6	15?	10s	10s
NAP Confined River	Subsect>EDU	6	15?	10s	10s
GL Confined River**	Subsect>EDU	6	15?	1-5	1-10
STL Unconfined River	Subsect>EDU	6	15?	10s	10s
NAP Unconfined River	Subsect>EDU	6	15?	10s	10s
GL Unconfined River**	Subsect>=EDU	6	15?	1-5	1-10
GL Deepwater River	EDU	3 (1*)	6?	1	1
Acadian Freshwater Tidal River	EDU	3 (1*)	6?	0	1
Acadian Brackish Tidal River	EDU	3 (1*)	6?	0	1
Acadian Saline Tidal River	EDU	3 (1*)	6?	0	1
Acadian Freshwater Tidal Creek	EDU	3	6?	0	10s
Acadian Brackish Tidal Creek	EDU	3	6?	0	10s
Acadian Saline Tidal Creek	EDU	3	6?	0	10s
LACUSTRINE COMMUNITIES					
STL Subterranean Lake	Subsect>=EDU	6	15?	ca. 10	ca. 10
STL Vernal Pool	Subsect	6	15?	100s	100s-1000s
NAP Vernal Pool	Subsect	6	15?	10s	10s-100s
GL Vernal Pool**	Subsect	6	15?	10s	10s
NAP Pine Barrens Vernal Pond**	Subsect	6	15?	ca. 10	ca. 10
STL Sinkhole Pond	Subsect	6	15?	5-10s	10s
STL Oxbow Pond	Subsect>EDU	6	15?	10s	10s-100s
NAP Oxbow Pond	Subsect>EDU	6	15?	10s	10s-100s
GL Oxbow Pond**	Subsect>EDU	6	15?	1-10	10s
STL Flow-Through Pond	Subsect	6	15?	10s	10s-100s
NAP Flow-Through Pond	Subsect	6	15?	10s	10s-100s
NAP Bog Lake**	Subsect	6	15?	ca. 10	10s
GL Marl Pond**	Subsect	6	15?	1-5	1-10
STL Alkaline Pond	Subsect	6	15?	10s	10s-100s
NAP Acidic Pond**	Subsect	6	15?	ca. 10	10s
STL Eutrophic Alkaline Dimictic Lake	Subsect>EDU	6	15?	10s	10s
STL Oligotrophic Alkaline Dimictic Lake	Subsect>EDU	6	15?	10-30	10s
STL Winter-Stratified Monomictic Lake	Subsect>EDU	6	15?	ca. 10	ca. 10-20
STL Summer-Stratified Monomictic Lake	EDU	3 (1*)	6?	1	1

Geophysical Correlation Unit:

Subsect= subsections (6 in NY & VT STL).

222O Mohawk/Black River Valley Section
- 222Ob Black River Valley

212E Saint Lawrence/Champlain Valley Section
- 212Ea Saint Lawrence Glacial Moraine Plain
- 212Eb Saint Lawrence Till Plain

212Ec Champlain Glacial Lake and Marine Plains
212Ed Champlain Hills
212Ee Saint Lawrence Glacial Lake Plains

EDU = ecological drainage units (3 in NY & VT STL).
020100 Richelieu
041501 Northeastern Lake Ontario
041503 Saint Lawrence

* = target number exceeds indicated known total number of occurrences in ecoregion.

** = community peripheral to STL.

Table 3. **List of Potential Stratification Factors & Parameters Considered for STL Aquatic Communities.**

A. **Parameters Chosen for Stratification.**

1. Broad Geographic Variation
    - Ecological Drainage Units (EDUs)
    - Ecoregion Subsections
    - **Watershed Aggregates**

B. **Parameters Not Chosen, But to be Treated as Condition Diversity Factors in Prioritizing Occurrences to Select.**

1. Soils and Geology
    - Surficial/Bedrock Geology
    - Substrate
2. Topography & Connectivity
    - Elevation
    - Drainage Network Position
    - Aquatic Connectivity
3. Hydrology
    - Water Color
    - Stream Order/Discharge
    - Temperature
    - Trophy/Productivity +/- Acidity/Alkalinity
    - Thermal Stratification
4. Physical Setting
    - Geomorphology
    - Landscape Setting

Table 4. STL Aquatic Community Viability Thresholds (For Portfolio Inclusion).

Community Name	Patch Size	Size Length	Condition Subrank	Landscape Context Subrank	Subrank	Overall Rank
RIVERINE COMMUNITIES						
STL Spring	VSS	0.01 mi	C	C	C	C
NAP Spring	VSS	0.01 mi	C	C	C	C
GL Spring	VSS	0.01 mi	C	C	C	C
STL Subterranean Stream	VSS	0.01 mi	C	C	C	C
STL Backwater Slough	VSS/SS	0.2 mi	C	C	C	C
NAP Backwater Slough	VSS/SS	0.2 mi	C	C	C	C
GL Backwater Slough	VSS/SS	0.2 mi	C	C	C	C
STL Intermittent Stream	VSS/SS	0.2 mi	C	C	C	C
NAP Intermittent Stream	VSS/SS	0.2 mi	C	C	C	C
GL Intermittent Stream	VSS/SS	0.2 mi	C	C	C	C
STL Rocky Headwater Stream	SS	1 mi	C	C	C	C
NAP Rocky Headwater Stream	SS	1 mi	C	C	C	C
GL Rocky Headwater Stream	SS	1 mi	C	C	C	C
STL Marsh Headwater Stream	SS	1 mi	C	C	C	C
NAP Marsh Headwater Stream	SS	1 mi	C	C	C	C
GL Marsh Headwater Stream	SS	1 mi	C	C	C	C
STL Confined River	LS	2 mi	C	C	C	C
NAP Confined River	LS	2 mi	C	C	C	C
GL Confined River	LS	2 mi	C	C	C	C
STL Unconfined River	LS	2 mi	C	C	C	C
NAP Unconfined River	LS	2 mi	C	C	C	C
GL Unconfined River	LS	2 mi	C	C	C	C
GL Deepwater River	VLS	10 mi	C	C	C	C
Acadian Freshwater Tidal Creek	VSS/SS	0.2 mi	C	C	C	C
Acadian Brackish Tidal Creek	VSS/SS	0.2 mi	C	C	C	C
Acadian Saline Tidal Creek	VSS/SS	0.2 mi	C	C	C	C
Acadian Freshwater Tidal River	VLS	10 mi	C	C	C	C
Acadian Brackish Tidal River	VLS	10 mi	C	C	C	C
Acadian Saline Tidal River	VLS	10 mi	C	C	C	C
LACUSTRINE COMMUNITIES		Area				
STL Subterranean Lake	VSS	0.5 ac	C	C	C	C
STL Vernal Pool	VSS	0.5 ac	C	C	C	C
NAP Vernal Pool	VSS	0.5 ac	C	C	C	C
GL Vernal Pool	VSS	0.5 ac	C	C	C	C
NAP Pine Barrens Vernal Pond	VSS	0.5 ac	C	C	C	C
STL Sinkhole Pond	VSS	0.5 ac	C	C	C	C
STL Oxbow Pond	SS	1 ac	C	C	C	C
NAP Oxbow Pond	SS	1 ac	C	C	C	C
GL Oxbow Pond	SS	1 ac	C	C	C	C
STL Flow-Through Pond	SS	1 ac	C	C	C	C
NAP Flow-Through Pond	SS	1 ac	C	C	C	C
NAP Bog Lake	SS	1 ac	C	C	C	C
STL Alkaline Pond	SS	1 ac	C	C	C	C
STL Eutrophic Alkaline Dimictic Lake	LS	5 ac	C	C	C	C
STL Oligotrophic Alkaline Dimictic Lake	LS	5 ac	C	C	C	C
STL Winter-Stratified Monomictic Lake	LS/VLS	100 ac	C	C	C	C
STL Summer-Stratified Monomictic Lake	VLS	200 ac	C	C	C	C

Patch Size: VSS = very small scale, SS = small scale, LS = large scale, VLS = very large scale.

Generalized Occurrence Size Thresholds:

Riverine: VSS = 0.01 mile, VSS/SS = 0.2 mile, SS = 1 mile, LS = 2 miles, VLS = 10 miles

Lacustrine: VSS/SS = 0.5 acres, SS = 1 acre, LS = 5 acres, LS/VLS = 100 acres, M = 200 acres

Table 5. STL Aquatic Community Occurrences Assessed and Chosen for Portfolio. Primary Targets/Part 3: **EMBEDDED FEATURES**.

Community name/Survey Site	Size Value	Size Rank	Size Thr	Condition Rank	Condition Thr	Landscape Context Rank	Landscape Context Thr	Overall Rank	Overall Thr	EDU	Subsect	Port	Notes
Great Lakes Aquatic Bed/Bay (target number = 4, 2 per EDU)													
Richelieu EDU													
Embedded within Summer-Stratified Monomictic Lake/Lake Champlain													
EOs currently tracked as "Mesotrophic Dimictic Lakes"													
Suggest allowing two sites per state (VT, NY), choices for VT sites not yet available.													
Kings Bay (NY)*	1500	A	Y	B	Y	A	Y	AB	Y	020100	212Ec	Y	SITE E1.
Point Au Roche Swamp (NY)*	70	B	Y	C	Y	BC	Y	BC	Y	020100	212Ec	Y	SITE E2.
Valcour Island (NY)*	20	C	Y	B	Y	B	Y	BC	Y	020100	212Ec	N	
Saint Lawrence EDU													
Embedded within GL Deepwater River/Saint Lawrence River													
Suggest allowing two sites per state/province (NY, Quebec/Ontario), choices for Quebec/Ontario sites not yet available.													
Chippewa Bay (NY)*	2300	A	Y	.	Y	.	Y	AB	Y	041503	212Ea?	Y	tentative choice. only one documented from ecoregion. many more expected including several of suspected slightly higher rank/value. see warmwater fish concentration areas and waterfowl concentration areas below for other probable sites. SITE E3.
Great Lakes Exposed Shoals/Rocky Nearshore (target number = 4, 2 per EDU)													
Richelieu EDU													
Embedded within Summer-Stratified Monomictic Lake/Lake Champlain													
Suggest allowing two sites per state (VT, NY), choices for VT sites not yet available.													
No expert leads yet.													
Saint Lawrence EDU													
Embedded within GL Deepwater River/Saint Lawrence River													
Suggest allowing two sites per state/province (NY, Quebec/Ontario), choices for Quebec/Ontario sites not yet available.													
Indian Chief Shoals (NY)*	870	.	Y	.	Y	.	Y	AB	Y	041503	212Ea	Y	tentative choice. other shoals likely larger and more highly ranked. SITE E9.
Delta (target number = 4, 2 per EDU)													
Richelieu EDU													
Embedded within Summer-Stratified Monomictic Lake/Lake Champlain													
Suggest allowing two sites per state (VT, NY), choices for VT sites not yet available.													
Few identified from EDU.													
EOs currently tracked as "Mesotrophic Dimictic Lakes"													
Ausable Delta (NY)*	190	B	Y	A	Y	AB	Y	AB	Y	020100	212Ec	Y	SITE E4.
Saint Lawrence EDU													
Embedded within GL Deepwater River/Saint Lawrence River													
Suggest allowing two sites per state/province (NY, Quebec/Ontario), choices for Quebec/Ontario sites not yet available.													
None identified yet from EDU.													

Warmwater Fish Concentration Area (target number = 4, 2 per EDU)

Richelieu EDU
Embedded within Summer-Stratified Monomictic Lake/Lake Champlain
Suggest allowing two sites per state (VT, NY), choices for VT sites not yet available.
None documented thus far in NY.

Saint Lawrence EDU
Embedded within GL Deepwater River/Saint Lawrence River
Suggest allowing two sites per state/province (NY, Quebec/Ontario), choices for Quebec/Ontario sites not yet available.

Community name/Survey Site	Size Value	Size Rank	Size Thr	Condition Rank	Condition Thr	Landscape Context Rank	Landscape Context Thr	Overall Rank	Overall Thr	EDU	Subsect	Port	Notes
Goose Bay/Cranberry Creek (NY)*	1655	.	Y	.	Y	.	Y	.	Y	041503	212Ea	Y	SITE E5.
Lake of the Isles (NY)*	1344	.	Y	.	Y	.	Y	.	Y	041503	212Ee?	Y	SITE E6.
Eel Bay (NY)*	1243	.	Y	.	Y	.	Y	.	Y	041503	212Ee?	N	good alternate choice.
Crooked Creek Marsh (NY)*	1170	.	Y	.	Y	.	Y	.	Y	041503	212Ea	N	good alternate choice.
Chippewa Creek Marsh (NY)*	950	.	Y	.	Y	.	Y	.	Y	041503	212Ea	N	good alternate choice.
Coles Creek (NY)*	450	.	Y	.	Y	.	Y	.	Y	041503	212Ea	N	
McRae Bay Marsh (NY)*	283	.	Y	.	Y	.	Y	.	Y	041503	212Ee?	N	
Flynn Bay Marsh (NY)*	236	.	Y	.	Y	.	Y	.	Y	041503	212Ee?	N	
Grass Pt/Cobb Shoal Bays (NY)*	230	.	Y	.	Y	.	Y	.	Y	041503	212Ee?	N	
Delaney Bay Marsh (NY)*	210	.	Y	.	Y	.	Y	.	Y	041503	212Ee?	N	
Carrier Bay (NY)*	160	.	Y	.	Y	.	Y	.	Y	041503	212Ee?	N	
Swan Bay (NY)*	140	.	Y	.	Y	.	Y	.	Y	041503	212Ee?	N	
Blind Bay Marsh (NY)*	125	.	Y	.	Y	.	Y	.	Y	041503	212Ee?	N	
Point Vivian Marsh (NY)*	75	.	Y	.	Y	.	Y	.	Y	041503	212Ee?	N	

Waterfowl Concentration Area (target number = 4, 2 per EDU)

Richelieu EDU
Embedded within Summer-Stratified Monomictic Lake/Lake Champlain
Suggest allowing two sites per state (VT, NY), choices for VT sites not yet available.
None documented thus far in NY.

Saint Lawrence EDU
Embedded within GL Deepwater River/Saint Lawrence River
Suggest allowing two sites per state/province (NY, Quebec/Ontario), choices for Quebec/Ontario sites not yet available.

Community name/Survey Site	Size Value	Size Rank	Size Thr	Condition Rank	Condition Thr	Landscape Context Rank	Landscape Context Thr	Overall Rank	Overall Thr	EDU	Subsect	Port	Notes
Goose Bay/Cranberry Creek (NY)*	1655	.	Y	.	Y	.	Y	.	Y	041503	212Ea	Y	SITE E5.
Lake of the Isles (NY)*	1344	.	Y	.	Y	.	Y	.	Y	041503	212Ee?	Y	SITE E6.
Eel Bay (NY)*	1243	.	Y	.	Y	.	Y	.	Y	041503	212Ee?	N	good alternate choice.
Crooked Creek Marsh (NY)*	1170	.	Y	.	Y	.	Y	.	Y	041503	212Ea	N	good alternate choice.
Chippewa Creek Marsh (NY)*	950	.	Y	.	Y	.	Y	.	Y	041503	212Ea	N	good alternate choice.
St Lawrence River Massena (NY)*	437	.	Y	.	Y	.	Y	.	Y	041503	212Ea	N	
American Island Pools (NY)*	400	.	Y	.	Y	.	Y	.	Y	041503	212Ea	N	
McRae Bay Marsh (NY)*	283	.	Y	.	Y	.	Y	.	Y	041503	212Ee?	N	
Flynn Bay Marsh (NY)*	236	.	Y	.	Y	.	Y	.	Y	041503	212Ee?	N	
Grass Pt/Cobb Shoal Bays(NY)*	230	.	Y	.	Y	.	Y	.	Y	041503	212Ee?	N	
Delaney Bay Marsh (NY)*	210	.	Y	.	Y	.	Y	.	Y	041503	212Ee?	N	

Raptor Concentration Area (target number = 4, 2 per EDU)

Richelieu EDU
Embedded within Summer-Stratified Monomictic Lake/Lake Champlain
Suggest allowing two sites per state (VT, NY), choices for VT sites not yet available.
None documented thus far in NY.

Saint Lawrence EDU
Embedded within GL Deepwater River/Saint Lawrence River
Suggest allowing two sites per state/province (NY, Quebec/Ontario), choices for Quebec/Ontario sites not yet available.

American Narrows (NY)	.	.	Y	.	Y	.	Y	.	Y	041503	212Ee?	Y	Marshall (1978)/G. Smith choice #1. SITE E8.
Brockville (Ontario)	.	.	Y	.	Y	.	Y	.	Y	041503	212Ea	Y	Marshall (1978)/G. Smith choice #2. SITE E7.
Wilson Hill Island (NY/Ontario)	.	.	Y	.	Y	.	Y	.	Y	041503	212Ea	N?	Marshall (1978)/G. Smith choice #3. alternate site.
Cornwall (Ontario)	.	.	Y	.	Y	.	Y	.	Y	041503	212Ea	N?	Marshall (1978)/G. Smith choice #4. alternate site.
Rockport (Ontario)	.	.	Y	.	Y	.	Y	.	Y	041503	212Ee?	N	Marshall (1978)/G. Smith lead.
Morrisburg (NY)	.	.	Y	.	Y	.	Y	.	Y	041503	212Ea	N	Marshall (1978)/G. Smith lead.

Legend:

* = BCD-documented occurrence
Thr: Meeting or surpassing viability threshold for ranking factor or overall rank? Y = Yes, N = No.
Port: Should we include in the portfolio? Y = Yes, N = No.
Notes:
Exemplary Status:
GE = global exemplary occurrence (per NYHP element global record).
SE = global exemplary occurrence (per NYHP element state record for NY EOs; per VT Aquatic Working Group reference for VT EOs).
fish = designated as exemplary river for fish in VT;
mi = designated as exemplary river for macroinvertebrates in VT;
mp = designated as exemplary lake for macrophytes in VT;
Tier 2 = Not designated among the one to few best in NY, but designated as among a broader group of exemplary sites (often A ranked EOs)
GIS = presence of basic macrohabitat type predicted from ECS GIS model, unless otherwise specified.
ECS = ECS aquatic portfolio choices:
1n: chosen as focus main stem or focus size class 2 watershed within best one (or one of two) stream network for ten size class 3 biophysical units.
2: chosen as one of one to many best examples of type (A to AB ranked leads for NY; among VT exemplary lakes and rivers designated in 1998 reference), and disjunct from chosen stream networks.
xn: not chosen as focus main stem or size class 2 watershed, but within best one (or one of two) stream network for ten size class 3 biophysical units.

Table 5. STL Aquatic Community Occurrences Assessed and Chosen for Portfolio. Primary Targets/Part 2: **AQUATIC MACROHABITATS / LACUSTRINE COMMUNITIES**

Community name/Survey Site	Size (acres) Value	Size (acres) Rank	Size (acres) Thr	Condition Rank	Condition Thr	Landscape Context Rank	Landscape Context Thr	Overall Rank	Overall Thr	EDU	Subsect	Port	Notes
STL Summer-Stratified Monomictic Lake (very large scale; target number = 3; 1 per EDU; 1 EO chosen from 1 EDU)													
Only one example known, in only 1 EDU													
Richelieu EDU													
Lake Champlain (NY/VT)*	41750+	B (A?)	Y	B	Y	B	Y	B	Y	020100	212Ec	Y	SE-VT (mp), size needs adjusting to entire lake. SITE L1.
STL Winter-Stratified Monomictic Lake (very large-large scale; target number = 6; 1 per subsection; 3 EOs chosen from 2 subsections)													
Subsections 212Ea, 212Eb, 212Ed, 222Ob: no examples known or suspected.													
Subsection 212Ec													
Shelburne Pond (VT)	450	D	N	C	Y	B	Y	C	Y	020100	212Ec	Y	Included because 1) community rarity, 2) condition weighted more heavily than size, 3) only example known and suspected from subsection.
Subsection 212Ee													
Perch Lake (NY)*	550	C	Y	AB?	Y	AB?	Y	B	Y	041501	212Ee	Y	SE? Listed as "possibly among state exemplary sites". SITE L2.
Black Lake (NY)	10000	A	Y	BC?	Y	C	Y	B?	Y	041503	212Ee	Y	ECS-xn, literature lead, rank roughly estimated. included because 1) community rarity, 2) probably largest and most typical example in ecoregion, 3) still less than 6 EOs targeted for ecoregion. SITE L3.
SITE L3.													
STL Eutrophic Alkaline Dimictic Lake (large scale; target number = 6; 1 per subsection; 3 EOs chosen from 3 subsections)													
Subsections 212Eb, 222Ob: no examples known, few or none suspected.													
Subsection 212Ea													
No examples known, some suspected.													
Subsection 212Ec													
Long Pond (VT)	47	B	Y	B	Y	B	Y	B	Y	020100	212Ec	Y	Susan Warren/VTHP choice among 3 examples.
Colchester Pond (VT)	167	A	Y	C	Y	C	Y	BC	Y	020100	212Ec	N	
Fern Lake (VT)	61	B	Y	B	Y	C	Y	BC	Y	020100	212Ec	N	
Subsection 212Ed													
Lake Iroquois (VT)	229	A	Y	B	Y	B	Y	AB	Y	020100	212Ed	Y	SE-VT (mp), NAP type?
Fairfield Pond (VT)	464	A	Y	B	Y	C	Y	B	Y	020100	212Ed	N	NAP type?
Lake Carmi (VT)	1375	A	Y	C	Y	C	Y	BC	Y	020100	212Ed	N	NAP type?
Subsection 212Ee													
Yellow Lake (NY)	400	A	Y	?	?	B	Y	AB?	Y	041503	212Ee	Y	expert lead/estimated rank. SITE L4.
Mud Lake (NY)	700	A	Y	?	?	BC	Y	AB?	Y	041503	212Ee	N	ECS-xn, expert lead/estimated rank.
Trout Lake (NY)	500	A	Y	?	?	AB	Y	AB?	Y	041503	212Ee	N	expert lead/estimated rank.
Hickory Lake (NY)	500	A	Y	?	?	B	Y	AB?	Y	041503	212Ee	N	ECS-xn, expert lead/estimated rank.
Grass Lake (NY)	400	A	Y	?	?	B	Y	AB?	Y	041503	212Ee	N	ECS-xn, no expert data yet.
STL Oligotrophic Alkaline Dimictic Lake (large scale; target number = 6; 1 per subsection; 2 EOs chosen from 2 subsections)													
Subsections 212Ea, 212Ed, 222Ob: no examples known, few or none suspected.													
Subsection 212Eb													
No examples known, some suspected.													
Subsection 212Ec													
Lake Dunmore (VT)	985	A	Y	B	Y	C	Y	B	Y	020100	212Ec	Y	
Subsection 212Ee													
Cedar Lake (NY)	200	A	Y	?	?	AB	Y	AB?	Y	041503	212Ee	Y	expert lead/estimated rank. SITE L5.
Millsite Lake (NY)	600	A	Y	?	?	BC	Y	B?	Y	041503	212Ee	N	ECS-xn, no expert data yet.
Chubb Lake (NY)	120	A	Y	?	?	AB	Y	B?	Y	041503	212Ee	N	expert lead/estimated rank.

Community name/Survey Site	Size (acres) Value	Size Rank	Size Thr	Condition Rank	Condition Thr	Landscape Context Rank	Landscape Context Thr	Overall Rank	Overall Thr	EDU	Subsect	Port	Notes
STL Eutrophic Alkaline Pond (small scale; target number = 6; 1 per subsection; 2 EOs chosen from 2 subsections)													
Subsections 212Eb, 212Ed, 222Ob: no examples known, few or none suspected.													
Subsection 212Ea													
No examples known, some suspected.													
Subsection 212Ec													
Round Pond (VT)	22	AB	Y	B	Y	C	Y	B	Y	020100	212Ec	Y	Susan W./VTHP choice among 2 VT examples.
Coggman Pond (VT)	20	AB	Y	C	Y	C	Y	BC	Y	020100	212Ec	N	
Rogers Pond (NY)	1?	CD?	N	?	?	AB	Y	B?	Y	020100	212Ec	N?	expert lead/estimated rank, identity uncertain.
Webb Royce Swamp (NY)	50?	A?	Y	?	?	C	Y	BC?	Y	020100	212Ec	N	ECS-xn, expert lead/estimated rank, identity uncertain.
Subsection 212Ed													
Winona Lake (VT)	234	A	Y	B	Y	B	Y	AB	Y	020100	212Ed	Y	NAP type?
Metcalf Pond (VT)	71	A	Y	B	Y	B	Y	AB	Y	020100	212Ed	N	NAP type?
Cedar Lake (VT)	114	A	Y	B	Y	C	Y	B	Y	020100	212Ed	N	NAP type?
Halfmoon Pond (VT)	21	AB	Y	C	Y	B	Y	B	Y	020100	212Ed?	N	NAP type?
Subsection 212Ee													
Yellow Lake Beaver Flow (NY)	5	B	Y	?	?	B	Y	BC?	Y	041503	212Ee	N?	expert lead/estimated rank, identity uncertain.
NAP Acidic Pond (small scale; target number = 6; 1 per subsection)													
Subsections 212Ea, 212Ec: no examples known, few or none suspected.													
Subsections 212Eb, 212Ed, 212Ee, 222Ob: no examples known, some suspected.													
STL Oxbow Pond (small scale; target number = 6; 1 per subsection; 3 EOs chosen from 2 subsections)													
Subsections 212Eb, 212Ed, 222Ob: no examples known, few or none suspected.													
Subsection 212Ea													
Little River Canton (NY)	3	C	Y	?	?	CD	N	BC?	Y	041503	212Ea	Y?	ECS-1n, expert lead/estimated rank, tentative choice, better examples suspected. SITE L6.
Subsection 212Ec													
Ausable Delta (NY)	30	A	Y	?	?	B	Y	AB?	Y	020100	212Ec	Y	expert leads/estimated rank; one of two examples chosen: one in VT, one in NY. SITE L7.
Swanton Oxbow (VT)	27	A	Y	B	Y	B	Y	AB	Y	020100	212Ec	Y	okay as choice, but poor inventory/large gap, better examples suspected. One of two examples chosen: one in VT, one in NY. (=Unknown Pond #52)
Subsection 212Ee													
No examples known, some suspected.													
NAP Oxbow Pond (small scale; target number = 6; 1 per subsection; 0 EOs chosen, none known yet).													
Subsections 212Ea, 212Ec: no examples known, few or none suspected.													
Subsections 212Eb, 212Ed, 212Ee, 222Ob: no examples known, some suspected.													
STL Flow-Through Pond (small scale; target number = 6; 1 per subsection; 1 EO chosen from 1 subsection)													
Subsections 212Ea, 212Ec: no examples known, few or none suspected.													
Subsections 212Eb, 212Ed, 222Ob: no examples known, some suspected.													
Subsection 212Ee													
Twin Ponds West (NY)	16	A	Y	?	?	A	Y	AB?	Y	041503	212Ee	Y	expert lead/estimated rank. ecoregion type uncertain. SITE L8.
NAP Flow-Through Pond (small scale; target number = 6; 1 per subsection; 0 EOs chosen, none known yet).													
Subsections 212Ea, 212Ec: no examples known, few or none suspected.													
Subsections 212Eb, 212Ed, 212Ee, 222Ob: no examples known, some suspected.													
GL Marl Pond (very small scale; target number = 6; 1 per subsection; 1 EO potentially chosen from 1 subsection)													
Only up to one example suspected for ecoregion.													
Subsection 221Bc													
Root Pond (VT)	19	A	Y	B	Y	B	Y	AB	Y	020100	221Bc	Y?	Probably the only example in the ecoregion, if actually within the ecoregion area.

Community name/Survey Site	Size (acres) Value	Size (acres) Rank	Size (acres) Thr	Condition Rank	Condition Thr	Landscape Context Rank	Landscape Context Thr	Overall Rank	Overall Thr	EDU	Subsect	Port	Notes
STL Sinkhole Pond (very small scale/small scale; target number = 6; 1 per subsection; 1 EO chosen from 1 subsection)													
Subsections 212Ea, 212Ee, 212Ec: suspected to be restricted to these.													
Subsections 212Eb, 212Ed, 222Ob: no examples known, some suspected.													
Subsection 212Ec													
Chazy Barrens (NY)	<1?	D?	N	?	?	BC	Y	C?	Y?	020100	212Ec	N	expert lead, identity uncertain.
Subsection 212Ee													
Spile Bridge Road Wetland (NY)	1	C	Y	A	Y	AB	Y	B	Y	041503	212Ee	Y	SE? EO="sinkhole wetland"; info adjusted for pond. Listed as among state exemplary sites for wetland community, but has not been assessed for pond. SITE L9.
Johnny Cake Road Sinkhole Wetlands (NY)	0?	F?	N	B	Y	AB	Y	F?	N?	041501	212Ee	N	SE? EO="sinkhole wetland"; unsure if pond present. Listed as among state exemplary sites for wetland community, but has not been assessed for pond.
Beaver Creek Dekalb (NY)	.	?	?	?	?	AB	Y	?	?	041503	212Ee	N	expert lead, identity uncertain.
Beaver Creek Macomb (NY)	.	?	?	?	?	C	Y	?	?	041503	212Ee	N	expert lead, identity uncertain.
Indian Creek Dekalb (NY)	.	?	?	?	?	C	Y	?	?	041503	212Ee	N	expert lead, identity uncertain.
Chippewa Creek (NY)	.	?	?	?	?	C	Y	?	?	041503	212Ee	N	expert lead, identity uncertain.
Black Creek Hammond (NY)	.	?	?	?	?	C	Y	?	?	041503	212Ee	N	ECS-xn, expert lead, identity uncertain.
Bostwick Creek (NY)	.	?	?	?	?	C	Y	?	?	041503	212Ee	N	ECS-xn, expert lead, identity uncertain.
NAP Pine Barrens Vernal Pond (very small scale/small scale; target number = 6; 1 per subsection; 0 EOs chosen, none known yet)													
Subsections 212Ec, 222Ob: suspected to be restricted to these.													
Subsections 212Ea, 212Eb, 2212Ed, 212Ee: no examples known, none suspected.													
Subsection 212Ec: 1 potential lead in VT, no data readily available.													
NAP Bog Lake (very small scale/small scale; target number = 6; 1 per subsection; 1 EO chosen from 1 subsection)													
Subsections 212Eb, 212Ec, 212Ed, 212Ee, 222Ob: few examples known, few suspected.													
Subsections 212Ea: no examples known, few or none suspected.													
Subsection 212Ee													
Mud Lake Diana (NY)	100	A	Y	?	?	AB	Y	B?	Y	041503	212Ee	Y	ECS-xn, expert lead, only example currently known from ecoregion. SITE L10.
STL Vernal Pool (very small scale/small scale; target number = 6; 1 per subsection; 0 EOs chosen, none known yet)													
Subsections 212Ea, 212Ec, 212Ee, 222Ob: no examples known, many suspected.													
Subsections 212Eb, 212Ed: no examples known, few suspected.													
NAP Vernal Pool (very small scale/small scale; target number = 6; 1 per subsection; 0 EOs chosen, none known yet)													
Subsections 212Eb, 212Ec, 212Ed, 212Ee, 222Ob: no examples known, many suspected.													
Subsection 212Ea: no examples known, few suspected.													
GL Vernal Pool (very small scale/small scale; target number = 6; 1 per subsection; 0 EOs chosen, none known yet)													
Possibly restricted to Subsection 222Ob: no examples known, several suspected.													
STL Subterranean Lake (very small scale/small scale; target number = 6; 1 per subsection; 1 EO chosen from 1 subsection)													
Only one example known from ecoregion, few suspected													
Subsections 212Ea, 212Ec, 212Ee, 222Ob: no examples known, few suspected.													
Subsections 212Eb, 212Ed: no examples known, none suspected.													
Subsection 212Ec													
Valcour Island (NY)	0.1	D	N	?	?	AB	Y	B?	Y	020100	212Ec	Y	include despite small size because only known example. expert lead/estimated rank. SITE L11.

Legend:

* = BCD-documented occurrence
Thr: Meeting or surpassing viability threshold for ranking factor or overall rank? Y = Yes, N = No.
Port: Should we include in the portfolio? Y = Yes, N = No.
Notes:
  Exemplary Status:
    GE = global exemplary occurrence (per NYHP element global record).
    SE = global exemplary occurrence (per NYHP element state record for NY EOs; per VT Aquatic Working Group reference for VT EOs).
      fish = designated as exemplary river for fish in VT;
      mi = designated as exemplary river for macroinvertebrates in VT;
      mp = designated as exemplary lake for macrophytes in VT;
      Tier 2 = Not designated among the one to few best in NY, but designated as among a broader group of exemplary sites (often A ranked EOs)
  GIS = presence of basic macrohabitat type predicted from ECS GIS model, unless otherwise specified.
  ECS = ECS aquatic portfolio choices:
    1n: chosen as focus main stem or focus size class 2 watershed within best one (or one of two) stream network for ten size class 3 biophysical units.
    2: chosen as one of one to many best examples of type (A to AB ranked leads for NY; among VT exemplary lakes and rivers designated in 1998 reference), and disjunct from chosen stream networks.
    xn: not chosen as focus main stem or size class 2 watershed, but within best one (or one of two) stream network for ten size class 3 biophysical units.

Table 5. STL Aquatic Community Occurrences Assessed and Chosen for Portfolio. Primary Targets/Part 1: **AQUATIC MACROHABITATS / RIVERINE COMMUNITIES**

Community name/Survey Site	Size (miles) Value	Size (miles) Rank	Size (miles) Thr	Condition Rank	Condition Thr	Landscape Context Rank	Landscape Context Thr	Overall Rank	Overall Thr	EDU	Subsect	Port	Notes
GL Deepwater River (very large scale; target number = 3; 1 per EDU; 1 EO chosen from 1 EDU)													
Saint Lawrence River (NY/Ontario)	100000	A	Y	.	?	C	Y	C?	Y?	041503	212Ea/Ee	Y	Only example in ecoregion. SITE R1.

STL Unconfined River (large scale; target number = 6; 1 per subsection; 4 EOs chosen from 3 subsections)													
Subsections 212Eb, 212Ed, 222Ob: no examples predicted from GIS, nor suspected.													
Subsection 212Ea													
Grass River (NY)	50	A	Y	.	?	C	Y	AB	Y	041503	212Ea	Y	GIS, SE (Tier 2), ECS-1n, expert lead/estimated ranks. SITE R2.
St. Regis River/lower Deer R. (NY)	20	A	Y	.	?	C	Y	AB	Y	041503	212Ea	N	GIS, ECS-1n, expert lead/estimated ranks for Deer River.
Raquette River (NY)	<105	A?	Y	.	?	CD	N?	AB	Y	041503	212Ea	N	GIS, ECS-2, expert lead/estimated ranks - but may be overestimated due to reclassification and abundant flow alterations in this type.
Oswegatchie River (NY)	<72	A?	Y	.	?	C	Y	AB	Y	041503	212Ea	N	GIS, SE (Tier 2), ECS-2, expert lead/estimated ranks - but may be overestimated due to reclassification and abundant flow alterations in this type.
Salmon River (NY)	10	AB	Y	.	?	C	Y	B	Y	041503	212Ea	N	GIS, ECS-2.
Black Creek (NY)	0?	F?	N?	.	?	C	Y	F?	N	041503	212Ea	N	GIS, ECS-1n, misidentified by GIS: mapped by NYHP as a lake.
Chippewa Creek (NY)	0?	F?	N?	.	?	C	Y	F?	N	041503	212Ea	N	GIS, ECS-2, small and probably better treated as marsh headwater stream.
Subsection 212Ec													
Boquette River (NY)	<30	A	Y	.	?	BC	Y	AB	Y	020100	212Ec	Y	GIS, SE (Tier 2), ECS-1n, expert lead/estimated ranks. SITE R3.
Lamoille River (VT)	.	.	?	A?	Y?	.	?	.	Y	020100	212Ec	Y	GIS, SE (fish/mi), ECS-1n, associated confined river=A ranked condition, large size. Exception to 1 per subsection rule made to allow one example each for NY and VT.
Saranac River (NY)	>30	A	Y	.	?	C	Y	AB	Y	020100	212Ec	N	GIS, ECS-1n, expert lead/estimated ranks. Good alternate choice for NY.
Missiquoi River (VT)	.	.	?	AB?	Y?	.	?	.	Y	020100	212Ec	N	GIS, SE (fish/mi), ECS-2, associated confined river=AB ranked condition.
Lewis Creek (VT)	.	.	?	A?	Y?	.	?	.	Y	020100	212Ec	N	GIS=marsh headwater stream, SE (fish/mi), ECS-2, associated confined river=A ranked condition, probably small size.
Winooski River (VT)	.	.	?	B?	Y?	.	?	.	Y	020100	212Ec	N	GIS, associated confined river=B ranked condition.
LaChute River (NY)	4	C	Y	.	?	CD	N	B	Y	020100	212Ec	N	GIS, expert lead/estimated ranks.
Salmon River (NY)	7	B	Y	.	?	C	Y	BC?	Y	020100	212Ec	N	GIS, no expert data obtained yet.
Little Ausable River (NY)	6	B	Y	.	?	C	Y	BC?	Y	020100	212Ec	N	GIS, no expert data obtained yet.
Otter River & tribs (VT)	.	.	?	.	?	.	?	.	Y	020100	212Ec	N	GIS.
Subsection 212Ee													
Indian River (NY)	<30	A?	Y	.	?	C	Y	AB	Y	041503	212Ee	Y	GIS, ECS-1n, SE (Tier 2), expert lead/estimated ranks. SITE R4.
Oswegatchie River (NY)	<72	A?	Y	.	?	C	Y	AB	Y	041503	212Ee	N	GIS, ECS-2, SE (Tier 2), expert lead/estimated ranks - but may be overestimated due to reclassification and abundant flow alterations in this type. Occurrence spans sections Ea/Ee.
Beaver Creek (NY)	8	B	Y	.	?	B	Y	B	Y	041503	212Ee	N	GIS, expert lead/estimated ranks.
Black Creek (NY)	0?	F?	N	.	?	B	Y	F?	N?	041503	212Ee	N	GIS, small and probably better treated as marsh headwater stream.

Community name/Survey Site	Size (miles) Value	Size (miles) Rank	Size (miles) Thr	Condition Rank	Condition Thr	Landscape Context Rank	Landscape Context Thr	Overall Rank	Overall Thr	EDU	Subsect	Port	Notes
STL Unconfined River (continued)													
Subsection 221Bc													
Poultney River (NY/VT)	10	AB	Y	.	?	C	Y	B?	Y	020100	221Bc	Y	GIS, ECS-1n, SE-VT (fish-mi), preliminary rank from brief 1997 review by D. Hunt in NYHP files. SITE R5.
NAP Unconfined River (large scale; target number = 6; 1 per subsection; 6 EOs chosen from 5 subsections)													
Subsections 212Ea, 221Bc: no examples predicted from GIS, none suspected.													
Subsection 212Eb													
Little River (NY)	15	A	Y	.	?	C	Y	AB	Y	041503	212Eb	Y?	GIS, ECS-1n, small size, tentative choice pending more expert review. SITE R6.
St. Regis River (NY)	7	B	Y	.	?	BC	Y	B?	Y	041503	212Eb	N	GIS, ECS-1n, small segment, no expert data yet.
Lawrence Creek? (NY)	4	C	Y	.	?	C	Y	B	Y	041503	212Eb	N	GIS, ECS-1n, small size.
Raquette River (NY)	3?	C	Y	.	?	C	Y	C?	Y	041503	212Eb	N	GIS, ECS-2, primary occurrence ranked AB, but this segment/sub occurrence degraded from flow alterations.
Subsection 212Ec													
Great Chazy River (NY)	44	A	Y	.	?	C	Y	AB	Y	020100	212Ec	Y	GIS, ECS-1n, expert lead/estimated ranks, EO entirely within STL. One of two apparently equal choices. SITE R7.
Boquette River (NY)	<30	A?	Y	.	?	C	Y	AB	Y	020100	212Ec	Y	GIS, ECS-1n, SE (Tier 2), expert lead/estimated ranks, peripheral part of NAP EO. One of two apparently equal choices. SITE R8.
Ausable River (NY)	24	A	Y	.	?	C	Y	B	Y	020100	212Ec	N	GIS.
none predicted by GIS in Vermont, none suspected.													
Subsection 212Ed													
Missiquoi River (VT)	.	.	Y	.	?	.	?	?	Y	020100	212Ed	Y	GIS, SE-VT (fish/mi), large size, ECS-2, associated confined river=B ranked condition.
Winooski River (VT)	.	.	Y	.	?	.	?	?	Y	020100	212Ed	N	GIS, large size, associated confined river=AB ranked condition.
Subsection 212Ee													
Indian River (NY)	<30	A	Y	.	?	CD	N	AB	Y	041503	212Ee	Y	GIS, ECS-1n, expert lead/estimated ranks, SE (Tier 2). SITE R9.
Oswegatchie River (NY)	<72	A	Y	.	?	C	Y	AB	Y	041503	212Ee	N	GIS, ECS-2, expert lead/estimated ranks, SE (Tier 2).
Subsection 222Ob													
Beaver River (NY)	7	B	?	.	?	C	Y	BC?	Y	041501	222Ob	Y?	GIS, ECS-xn, no expert data yet, only example from subsection. tentatively keep in portfolio - balance between upstream dams and notable warmwater fish stream. SITE R10.
GL Unconfined River (large scale; target number = 6; 1 per subsection; 1 EO chosen from 1 subsection)													
Restricted in ecoregion to subsections 212Ee, 222Ob.													
Subsections 212Ee/222Ob													
Black River & lower Deer R. (NY)	75	A	Y	.	?	CD	N	BC?	Y	041501	222Ob	Y	GIS, ECS-1n, only example in ecoregion, gestalt overall rank estimated from roadside observations of stream and landscape, very long size. exemplary bay at mouth. SITE R11.

Community name/Survey Site	Size (miles) Value	Size (miles) Rank	Size (miles) Thr	Condition Rank	Condition Thr	Landscape Context Rank	Landscape Context Thr	Overall Rank	Overall Thr	EDU	Subsect	Port	Notes
STL Confined River (large scale; target number = 6; 1 per subsection; 2 EOs chosen from 2 subsections)													
Subsections 212Ea, 212Ee, 221Bc: no examples predicted from GIS, none suspected.													
Subsection 212Eb													
Chateaugay River (NY)	5	BC	Y	.	?	C	Y	B?	Y	041503	212Eb	Y	GIS, part of EO extending into subsection 212Ea in Quebec, no expert data yet, but predict at least B overall rank based on good landscape context on state gazetteer map. SITE R12.
Subsection 212Ec													
No VT or NY EOs predicted from GIS, however VT macroinvertebrate sampling points suggest presence in VT and despite no leads in NY, may be present as small segments within mapped unconfined rivers.													
Lamoille River (VT)	.	.	?	A	Y	.	.	A?	Y	020100	212Ec	Y	GIS=unconfined river, A segment MI sample, ECS-1n. VTHP needs to choose one of 3.
Lewis Creek (VT)	.	.	?	A	Y	.	.	A?	Y	020100	212Ec	N?	GIS=unconfined river, A segment MI sample, ECS-2. VTHP needs to choose one of 3.
Missiquoi River (VT)	.	.	?	AB	Y	.	.	AB?	Y	020100	212Ec	N?	GIS=unconfined river, AB segment MI sample, ECS-2. VTHP needs to choose one of 3.
Subsection 212Ed													
Lewis Creek (VT)	.	.	?	A?	Y?	.	.	A?	Y?	020100	212Ec	?	GIS=marsh headwater stream?, small size, SE (fish/mi). identity uncertain.
Subsection 222Ob													
No examples predicted from GIS, but may be present.													
NAP Confined River (large scale; target number = 6; 1 per subsection; 4 EOs chosen from 4 subsections)													
Subsections 212Ea, 212Ec, 221Bc: no examples predicted from GIS, none suspected.													
Subsection 212Eb													
Grass River (NY)	30	A	Y	.	?	BC	Y	AB?	Y	041503	212Eb	Y	GIS, ECS-1n, expert lead/estimated ranks. SITE R13.
St. Regis River, Middle Br. (NY)	20	A	Y	.	?	BC	Y	AB?	Y	041503	212Eb	N	GIS, ECS-1n, expert lead/estimated ranks, p/o EO mostly in NAP.
Oswegatchie River (NY)	32	A	Y	.	?	BC	Y	AB?	Y	041503	212Eb	N	GIS, ECS-2, small p/o EO mostly in NAP (see subsect Ee).
St. Regis River, W Br. (NY)	15	A	Y	.	?	BC	Y	AB?	Y	041503	212Eb	N	GIS, ECS-1n, no expert data yet.
Salmon River (NY)	20	A	Y	.	?	BC	Y	AB?	Y	041503	212Eb	N	GIS, no expert data yet.
Deer River (NY)	10	AB	Y	.	?	B	Y	AB?	Y	041503	212Eb	N	GIS, no expert data yet.
Little Salmon River (NY)	15	A	Y	.	?	C	Y	B?	Y	041503	212Eb	N	GIS, no expert data yet.
Trout River (NY)	10	AB	Y	.	?	C	Y	B?	Y	041503	212Eb	N	GIS, no expert data yet.
Great Chazy River (NY)	8	B	Y	.	?	BC	Y	B?	Y	041503	212Eb	N	GIS, no expert data yet.
Chateaugay River (NY)	5	BC	Y	.	?	BC	Y	B?	Y	041503	212Eb	N	GIS, no expert data yet.
Raquette River (NY)	5	BC	Y	.	?	C	Y	BC?	Y	041503	212Eb	N	GIS, ECS-2, no expert data yet, sections impounded.
Subsection 212Ed													
Lamoille River-Browns River (VT)	.	.	?	.	?	.	.	AB?	Y	020100	212Ed	Y	GIS, ECS-1n, SE-VT (mi), AB/B segments for MI.
Missiquoi River (VT)	.	.	?	.	?	.	.	B?	Y	020100	212Ed	N	GIS=unconfined river?, B MI segment for MI, SE-VT (mi), small size.
Winooski River (VT)	.	.	?	.	?	.	.	B?	Y	020100	212Ed	N	GIS=unconfined river?, AB MI segment for MI, small.
Fairfield-Black Creek (VT)	.	.	?	.	?	.	.	.	?	020100	212Ed	N	GIS, no expert data yet.
Subsection 212Ee													
Oswegatchie River, Main Br. (NY)	32	A	Y	.	?	BC	Y	AB?	Y	041503	212Ee	Y	GIS, ECS-2, expert lead/estimated ranks, also spans NAP and subsect Eb. SITE R14.
Elm Creek (NY)	8	B	Y	.	?	C	Y	BC?	Y	041503	212Ee	N	GIS, no expert data yet.
Subsection 222Ob													
Moose River (NY)*?	56	A	Y	.	?	A	Y	A	Y	041501	222Ob	Y	GIS, ECS-1n, BCD EO, small and lower quality p/o large EO mostly in NAP. SITE R15.
Independence River (NY)	9	B	Y	.	?	B	Y	AB?	Y	041501	222Ob	N	GIS, ECS-1n, no expert data yet, rank from DH observation & landscape, small p/o EO mostly in NAP.

Community name/Survey Site	Size (miles) Value	Size (miles) Rank	Size (miles) Thr	Condition Rank	Condition Thr	Landscape Context Rank	Landscape Context Thr	Overall Rank	Overall Thr	EDU	Subsect	Port	Notes
GL Confined River (large scale; target number = 6; 1 per subsection; 1 EO chosen from 1 subsection)													
Restricted in ecoregion to subsection 222Ob.													
Subsection 222Ob													
Deer River (NY)	17	A	Y	.	?	C?	Y	BC?	Y	041501	222Ob	Y	GIS, ECS-1n, expert lead/estimated rank (Tug Hill 2002). SITE R16.
Sugar River (NY)	7	B	Y	.	?	CD	Y	C?	Y	041501	222Ob	N	GIS, expert lead/estimated rank (Tug Hill 2002).
Other Confined River segments sampled for MI in VT: ecoregion, subsection and type unknown.													
Tyler Branch (VT)	.	.	?	B	Y	.	.	B	Y	020100	?	?	
Malletts Creek (VT)	.	.	?	B	Y	.	.	B	Y	020100	?	?	
Hubbardton River (VT)	.	.	?	B	Y	.	.	B	Y	020100	?	?	
Allen Brook (VT)	.	.	?	B	Y	.	.	B	Y	020100	?	?	

STL Rocky Headwater Stream (small scale; target number = 6; 1 per subsection; 1 EO chosen from 1 subsection)													
Subsection 212Ea													
few GIS-predicted occurrences, no leads, large inventory gap.													
Subsection 212Eb													
few GIS-predicted occurrences, not representative of subsection, no leads, inventory gap.													
Subsection 212Ec													
NY: few GIS-predicted occurrences, no leads, inventory gap.													
VT: several GIS-predicted occurrences, no certain leads (need review of A to B segments for MI samples.													
Trout Brook Milton (VT)	.	?	?	.	?	?	?	?	?	020100	212Ec	?	SE-VT (mi), identity uncertain, quality unknown.
Thorp Brook Charlotte (VT)	.	?	?	.	?	?	?	?	?	020100	212Ec	?	SE-VT (mi), identity uncertain, quality unknown.
Subsection 212Ed													
few GIS-predicted occurrences, not representative of subsection, no leads, inventory gap.													
Subsection 212Ee													
Chaumont River (NY)	4?	B	Y	.	?	CD	Y	BC?	Y	041501	212Ee	Y?	GIS, ECS-2, identity certain, quality unknown. tentative choice. SITE R17.
Perch River (NY)	2?	C	Y	.	?	C	Y	C?	Y	041501	212Ee	N?	GIS, identity uncertain, quality unknown.
Kents Creek (NY)	2?	C	Y	.	?	CD	Y	C?	Y	041501	212Ee	N?	GIS, identity uncertain, quality unknown.
Subsection 222Ob													
few GIS-predicted occurrences, not representative of subsection?, no leads, inventory gap.													
Subsection 221Bc													
no examples predicted from GIS, no leads, none suspected.													
NAP Rocky Headwater Stream (small scale; target number = 6; 1 per subsection; 4 EOs chosen from 3 subsections)													
Subsections 212Ea, 221Bc: no examples predicted from GIS, none suspected.													
Subsection 212Eb													
10s to 100s of GIS-predicted occurrences, no leads, large inventory gap.													
Subsection 212Ec													
10s of GIS-predicted occurrences in VT, no VT leads, large inventory gap.													
10s of GIS-predicted occurrences in NY, few NY leads, large inventory gap.													
Coot Hill (NY)	1	C	Y	.	?	B	Y	AB?	Y	020100	212Ec	Y	not on GIS (too small), expert lead/estimated rank, p/o EO extending into NAP. SITE R18.
Subsection 212Ed													
numerous GIS-predicted occurrences, need comparison to VT segments with MI samples, especially A to AB rank segments (especially Crossett Brook).													
Lewis Creek (VT)	.	?	?	.	?	?	Y	A?	Y	020100	212Ed	Y	GIS, ECS-2, A segments for MI samples in lower part, SE-VT (mi), one of two examples of similar value.
Browns River (VT)	.	?	?	.	?	?	Y	B?	Y	020100	212Ed	Y	GIS, ECS-1n, B segments for MI samples in lower part, SE-VT (mi), one of two examples of similar value.

Community name/Survey Site	Size (miles) Value	Size Rank	Size Thr	Condition Rank	Condition Thr	Landscape Context Rank	Landscape Context Thr	Overall Rank	Overall Thr	EDU	Subsect	Port	Notes
NAP Rocky Headwater Stream (continued)													
Subsection 212Ee													
10s of GIS-predicted occurrences, no leads, large inventory gap.													
Subsection 222Ob													
10s of GIS-predicted occurrences E of Black River, no expert leads, large inventory gap.													
Black Creek New Bremen (NY)	7?	AB	Y	.	?	BC	Y	AB?	Y	041501	222Ob	Y?	GIS, ECS-xn, DH roadside observation/estimation, tentative choice. SITE R19.
GL Rocky Headwater Stream (small scale; target number = 6; 1 per subsection; 1 EO chosen from 1 subsection)													
Restricted in ecoregion to subsection 222Ob.													
Subsection 222Ob													
Whetstone Creek (NY)	4	B	Y	.	?	C?	Y?	B?	Y	041501	222Ob	Y	GIS, ECS-xn, expert lead/estimated rank (Tug Hill 2002). SITE R20.
Gulf Stream (NY)	8	A	Y	.	?	D?	N?	B?	Y	041501	222Ob	N?	GIS, expert lead/estimated rank (Tug Hill 2002), questionably in STL, alternate choice.
Roaring Brook Martinsburg (NY)	5	B	Y	.	?	D?	N?	B?	Y	041501	222Ob	N	GIS, expert lead/estimated rank (Tug Hill 2002).
Gulf Stream, tributaries (NY)	3?	B?	Y	.	?	CD	N	BC?	Y	041501	222Ob	N	GIS.
Other Rocky Headwater Stream segments sampled for MI in VT: ecoregion, subsection and type unknown.													
Crossett Brook (VT)	.	.	?	A	Y	.	.	A	Y	020100	?	Y?	only A-ranked occurrence from VT. ecoregion uncertain.
Stevensville Brook (VT)	.	.	?	AB	Y	.	.	AB	Y	020100	?	?	
Baker Brook (VT)	.	.	?	AB	Y	.	.	AB	Y	020100	?	?	
Dowsville Brook (VT)	.	.	?	AB	Y	.	.	AB	Y	020100	?	?	
Bradley Brook (VT)	.	.	?	AB	Y	.	.	AB	Y	020100	?	?	
Austin Brook (VT)	.	.	?	AB	Y	.	.	AB	Y	020100	?	?	
Bear Wallow Brook (VT)	.	.	?	AB	Y	.	.	AB	Y	020100	?	?	
Crook Brook (VT)	.	.	?	B	Y	.	.	B	Y	020100	?	?	
John Brook (VT)	.	.	?	B	Y	.	.	B	Y	020100	?	?	
Lily Brook (VT)	.	.	?	B	Y	.	.	B	Y	020100	?	?	
Dowsville Brook, Tributary 5 (VT)	.	.	?	B	Y	.	.	B	Y	020100	?	?	
Dowsville Brook, Tributary 7 (VT)	.	.	?	B	Y	.	.	B	Y	020100	?	?	
Dowsville Brook, Trib. 11 (VT)	.	.	?	B	Y	.	.	B	Y	020100	?	?	
Mad River, Tributary 46 (VT)	.	.	?	B	Y	.	.	B	Y	020100	?	?	
Slide Brook (VT)	.	.	?	B	Y	.	.	B	Y	020100	?	?	
Moon Brook (VT)	.	.	?	B	Y	.	.	B	Y	020100	?	?	
Sargent Brook (VT)	.	.	?	B	Y	.	.	B	Y	020100	?	?	
Jay Branch, Tributary 7 (VT)	.	.	?	B	Y	.	.	B	Y	020100	?	?	

Community name/Survey Site	Size (miles)			Condition		Landscape Context		Overall		EDU	Subsect	Port	Notes
	Value	Rank	Thr	Rank	Thr	Rank	Thr	Rank	Thr				
Other Confined River/Rocky Headwater Stream segments sampled for MI in VT: ecoregion, subsection and type unknown.													
Lewis Creek (VT)	.	.	?	A	Y	.	.	A	Y	020100	?	?	
Middlebury River (VT)	.	.	?	A	Y	.	.	A	Y	020100	?	?	confined river?
Beetle Brook (VT)	.	.	?	A	Y	.	.	A	Y	020100	?	?	rocky headwater stream?
Mendon Brook (VT)	.	.	?	A	Y	.	.	A	Y	020100	?	?	rocky headwater stream?
Mill Brook (VT)	.	.	?	A	Y	.	.	A	Y	020100	?	?	rocky headwater stream?
Berry Brook (VT)	.	.	?	AB	Y	.	.	AB	Y	020100	?	?	rocky headwater stream?
Halnon Brook (VT)	.	.	?	AB	Y	.	.	AB	Y	020100	?	?	rocky headwater stream?
Furnace Brook (VT)	.	.	?	AB	Y	.	.	AB	Y	020100	?	?	rocky headwater stream?
Teney Brook (VT)	.	.	?	AB	Y	.	.	AB	Y	020100	?	?	rocky headwater stream?
Pekin Brook (VT)	.	.	?	AB	Y	.	.	AB	Y	020100	?	?	rocky headwater stream?
Mad River (VT)	.	.	?	AB	Y	.	.	AB	Y	020100	?	?	confined river?
Castleton River (VT)	.	.	?	AB	Y	.	.	AB	Y	020100	?	?	confined river?
Dowsville Brook (VT)	.	.	?	AB	Y	.	.	AB	Y	020100	?	?	confined river missing.
West Branch Little River (VT)	.	.	?	AB	Y	.	.	AB	Y	020100	?	?	confined river?
Lamoille River (VT)	.	.	?	AB	Y	.	.	AB	Y	020100	?	?	rocky hdwtr stream missing
Winooski River (VT)	.	.	?	AB	Y	.	.	AB	Y	020100	?	?	rocky hdwtr stream missing
Pike Brook (VT)	.	.	?	B	Y	.	.	B	Y	020100	?	?	rocky headwater stream?
East Creek (VT)	.	.	?	B	Y	.	.	B	Y	020100	?	?	
Great Brook (VT)	.	.	?	B	Y	.	.	B	Y	020100	?	?	rocky headwater stream?
Little River (VT)	.	.	?	B	Y	.	.	B	Y	020100	?	?	confined river?
Cold River (VT)	.	.	?	B	Y	.	.	B	Y	020100	?	?	confined river?
Thatcher Brook (VT)	.	.	?	B	Y	.	.	B	Y	020100	?	?	rocky headwater stream?
Missisquoi River (VT)	.	.	?	B	Y	.	.	B	Y	020100	?	?	rocky hdwtr stream missing
Trout River (VT)	.	.	?	B	Y	.	.	B	Y	020100	?	?	confined river?
Browns River (VT)	.	.	?	B	Y	.	.	B	Y	020100	?	?	confined river?

STL Marsh Headwater Stream (small scale; target number = 6; 1 per subsection; 3 EOs chosen from 3 subsections)

Subsection 221Bc: no examples predicted from GIS, few or none suspected.													
Subsection 212Ea													
100s of GIS-predicted occurrences, few leads, large inventory gap.													
Deer River (NY)	28	A	Y	.	?	BC	Y	A?	Y	041503	212Ea	Y	GIS, ECS-xn, expert lead/estimated rank, large. SITE R21.
Squeak Brook (NY)	10	A	Y	.	?	BC	Y	AB?	Y	041503	212Ea	N	GIS, no expert data yet. GL 2000 candidate.
Little Salmon River (NY)	8	A	Y	.	?	BC	Y	AB?	Y	041503	212Ea	N	GIS, ECS-2, expert lead/estimated rank.
Brandy Brook (NY)	7	AB	Y	.	?	C	Y	AB?	Y	041503	212Ea	N	GIS, expert lead/estimated rank.
Chippewa Creek (NY)	5	B	Y	.	?	C	Y	AB?	Y	041503	212Ea	N	GIS, expert lead/estimated rank, GL 2000 candidate.
Sucker Brook (NY)	12	A	Y	.	?	C	Y	B?	Y	041503	212Ea	N	GIS, no expert data yet.
Lawrence Brook (NY)	10	A	Y	.	?	BC	Y	B?	Y	041503	212Ea	N	GIS, ECS-xn, alternate choice? GL 2000 candidate.
Plum Brook (NY)	10	A	Y	.	?	C	Y	B?	Y	041503	212Ea	N	GIS, no expert data yet, GL 2000 candidate.
Coles Creek (NY)	8	A	Y	.	?	BC	Y	BC?	Y	041503	212Ea	N	GIS, expert lead/estimated rank, uncertain identity.
Crooked Creek (NY)	6	B	Y	.	?	C	Y	BC?	Y	041503	212Ea	N	GIS, no expert data yet.
Tibbetts Creek (NY)	4	B	Y	.	?	CD	Y	BC?	Y	041503	212Ea	N	expert lead.
Subsection 212Eb													
few GIS-predicted occurrences, not representative of subsection, no leads, inventory gap.													
Subsection 212Ec													
NY: few GIS-predicted occurrences, few leads, inventory gap.													
VT: 10s of GIS-predicted occurrences, no certain leads (may be some associated with rocky headwater segments for MI samples).													
Riley Brook (NY)	5	B	Y	.	?	CD	N	BC?	Y	020100	212Ec	Y?	GIS, expert lead/estimated rank, tentative choice, probably better choices. SITE R22.
Lewis Creek (VT)	.	?	?	.	?	?	?	?	?	020100	212Ec	?	SE-VT (mi), identity uncertain, quality unknown.
Subsection 212Ed													
few GIS-predicted occurrences, not representative of subsection, peripheral to subsection, inventory gap.													

Community name/Survey Site	Size (miles) Value	Size (miles) Rank	Size (miles) Thr	Condition Rank	Condition Thr	Landscape Context Rank	Landscape Context Thr	Overall Rank	Overall Thr	EDU	Subsect	Port	Notes
STL Marsh Headwater Stream (continued)													
Subsection 212Ee													
many GIS-predicted occurrences, may grade into GL type,													
Jewett Creek-Black River (NY)	12	A	Y	.	?	BC	Y	B?	Y	041503	212Ee	Y	GIS, ECS-1n, expert lead/estimated rank. GL 2000 candidate. SITE R23.
Beaver Creek (NY)	8	A	Y	.	?	BC	Y	AB?	Y	041503	212Ee	?	GIS, recent field survey lead, alternate choice. SITE R24.
Fish Creek (NY)	8	A	Y	.	?	BC	Y	B?	?	041503	212Ee	N	GIS, ECS-xn, no expert data yet. GL 2000 candidate.
Kents Creek (NY)	8	A	Y	.	?	C	Y	B?	?	041501	212Ee	N	expert lead. GL 2000 candidate.
French Creek (NY)	5	B	Y	.	?	C	Y	BC?	?	041503	212Ee	N	GIS, no expert data yet.
Chaumont Creek (NY)	5?	B	Y	.	?	C	Y	BC?	?	041501	212Ee	N	GIS, ECS-2, no expert data yet. GL 2000 candidate.
Perch River (NY)	3	BC	Y	.	?	C	Y	BC?	?	041501	212Ee	N	GIS, ECS-2, no expert data yet. GL 2000 candidate.
Cranberry Creek (NY)	3	BC	Y	.	?	C	Y	BC?	?	041503	212Ee	N	GIS, no expert data yet, ecoregional type identity uncertain (NAP type?).
Mud Creek Cape Vincent (NY)	2?	C?	Y	.	?	C	Y	C?	?	041501	212Ee	N	expert lead.
Subsection 222Ob													
not representative of subsection?													
NAP Marsh Headwater Stream (small scale; target number = 6; 1 per subsection; 4 EOs chosen from 3 subsections)													
Subsections 212Ea, 221Bc: no examples predicted from GIS, few or none suspected.													
Subsection 212Eb													
several GIS-predicted occurrences, few or no expert leads, large inventory gap.													
Little River (NY)	3	BC	Y	.	?	BC	Y	B?	Y	041503	212Eb	Y?	GIS, ECS-1n, possible expert lead/estimated rank (identity uncertain), tentative as 1 of 2 choices. GL 2000 candidate. SITE R25.
Trout Brook Stockholm (NY)	8	A	Y	.	?	BC	Y	B?	Y	041503	212Eb	Y?	GIS, ECS-1n, no expert data yet, tentative as 1 of 2 choices. GL 2000 candidate. SITE R26.
Parkhurst Brook (NY)	8	A	?	.	?	BC	?	B?	Y	041503	212Eb	N	GIS, no expert data yet. GL 2000 candidate.
Allen Brook Lawrence (NY)	8	A	?	.	?	C	?	B?	Y	041503	212Eb	N	GIS, no expert data yet. GL 2000 candidate.
Farrington Brook (NY)	8	A	?	.	?	C	?	B?	Y	041503	212Eb	N	GIS, no expert data yet.
Great Chazy River, N. Branch (NY)	6	B	?	.	?	C	?	BC?	Y	020100	212Eb	N	GIS, no expert data yet.
Allen Brook Burke (NY)	5	B	?	.	?	C	?	BC?	Y	041503	212Eb	N	GIS, no expert data yet.
Elm Creek (NY)	3	BC	Y	.	?	BC	Y	BC?	Y	041503	212Eb	N	GIS, ECS-1n, no expert data yet, GL 2000 candidate.
Subsection 212Ec													
NY: few GIS-predicted occurrences, few leads, inventory gap.													
VT: 10s of GIS-predicted occurrences, no certain leads (may be some associated with rocky headwater segments for MI samples).													
Corbeau Creek (NY)	10	A	Y	.	?	BC	Y	B?	Y	020100	212Ec	Y	GIS, ECS-xn, expert lead/estimated rank. SITE R27.
Trout Brook Milton (VT)	.	?	?	.	?	?	?	?	?	020100	212Ec	?	SE-VT (mi)?, identity uncertain, quality unknown.
Thorp Brook Charlotte (VT)	.	?	?	.	?	?	?	?	?	020100	212Ec	?	SE-VT (mi)?, identity uncertain, quality unknown.
Subsection 212Ed													
10s GIS-predicted occurrences, no leads, large inventory gap.													
Subsection 212Ee													
many GIS-predicted occurrences, no leads, large inventory gap.													
Tanner Creek (NY)	10	A	Y	.	?	BC	Y	B?	?	041503	212Ee	Y	GIS, ECS-1n, no expert data yet. GL 2000 candidate. SITE R28.
Sawyer Creek (NY)	8	A	Y	.	?	C	Y	B?	?	041503	212Ee	N	GIS, ECS-1n, no expert data yet. GL 2000 candidate.
Otter Creek (NY)	7	AB	Y	.	?	C	Y	B?	?	041503	212Ee	N	GIS, ECS-xn, no expert data yet. GL 2000 candidate.
Hawkins Creek (NY)	4	B	Y	.	?	C	Y	BC?	?	041503	212Ee	N	GIS, ECS-1n, no expert data yet. GL 2000 candidate.
Subsection 222Ob													
many GIS-predicted occurrences, no leads, inventory gap.													

Community name/Survey Site	Size (miles)			Condition		Landscape Context		Overall		EDU	Subsect	Port	Notes
	Value	Rank	Thr	Rank	Thr	Rank	Thr	Rank	Thr				
GL Marsh Headwater Stream (small scale; target number = 6; 1 per subsection; 0 EOs chosen, none known yet)													
Restricted in ecoregion to subsection 222Ob.													
Subsection 222Ob													
many GIS-predicted occurrences, no leads, inventory gap.													

Intermittent Stream Types (very small scale; target number = 6; 1 per subsection; 0 EOs chosen, none known yet)													
Now: Use ECS-targeted watershed as coarse filter, assess presence in all subsections													
Later: Identify expert leads, then fill inventory gaps.													
STL Intermittent Stream (very small scale; target number = 6; 1 per subsection; 0 EOs chosen, none known yet)													
Subsections 212Ea, 212Ec, 212Ee, 221Bc: representative, need to fill gaps for second iteration.													
Subsection 212Ea													
Pollys Creek (NY)	0.6	A	Y	.	?	CD	N	C?	Y	041503	212Ea	N	expert lead/estimated rank; expect many better examples; leave choice blank for now.
NAP Intermittent Stream (very small scale; target number = 6; 1 per subsection; 0 EOs chosen, none known yet)													
Subsections 212Eb, 212Ec, 212Ed, 222Ob: representative, no expert leads yet, need to fill gaps for second iteration.													
GL Intermittent Stream (very small scale; target number = 6; 1 per subsection; 0 EOs chosen, none known yet)													
Restricted in ecoregion to subsection 222Ob, no expert leads yet.													
Only one roadside lead; probably many better examples for portfolio choice; leave blank for now.													

Backwater Slough Types (very small scale; target number = 6; 1 per subsection)													
Size in acres.													
Now: Use ECS-targeted watershed as coarse filter to supplement few known EOs below, assess presence in all subsections.													
Later: Identify expert leads, then fill inventory gaps.													
STL Backwater Slough (very small scale; target number = 6; 1 per subsection; 2 EOs chosen from 2 subsections)													
Subsection 212Ea													
Little River Canton (NY)	5	B	Y	.	?	C	Y	B?	Y	041503	212Ea	Y?	ECS-1n, expert lead/estimated rank; tentative choice, better examples suspected. SITE R29.
Whitehouse Bay (NY)	150	A	Y	.	?	C	Y	BC?	Y	041503	212Ea	N	expert lead/estimated rank.
Subsection 212Eb													
No expert leads yet, not representative of subsection.													
Subsection 212Ec													
VT: No expert leads yet.													
Ausable Delta (NY)	15	A	Y	.	?	BC	Y	AB?	Y	020100	212Ec	Y	expert lead/estimated rank. SITE R30.
Boquette River (NY)	1	C	Y	.	?	BC	Y	B?	Y	020100	212Ec	N	ECS-1n, expert lead/estimated rank.
Subsection 212Ed													
No expert leads yet, not representative of subsection.													
Subsection 212Ee													
No expert leads yet, representative of subsection.													
NAP Backwater Slough (very small scale; target number = 6; 1 per subsection; 0 EOs chosen, none known yet)													
Subsections 212Eb, 212Ec, 212Ed, 222Ob: representative, no expert leads yet, need to fill gaps for second iteration.													

Community name/Survey Site	Size (miles)			Condition		Landscape Context		Overall		EDU	Subsect	Port	Notes
	Value	Rank											

GL Backwater Slough (very small scale; target number = 6; 1 per subsection; 0 EOs chosen, none known yet)
Restricted in ecoregion to subsection 222Ob, No expert leads yet.

Spring Types (very small scale; target number = 6; 1 per subsection; 0 EOs chosen, none known yet)
Now: Use ECS-targeted watershed as coarse filter, assess presence in all subsections
Later: Identify expert leads, then fill inventory gaps.

STL Spring (very small scale; target number = 6; 1 per subsection; 0 EOs chosen, none known yet)
Subsections 212Ea, 212Ec, 212Ee, 221Bc: representative, no expert leads yet, need to fill gaps for second iteration.

NAP Spring (very small scale; target number = 6; 1 per subsection; 0 EOs chosen, none known yet)
Subsections 212Eb, 212Ec, 212Ed, 222Ob: representative, no expert leads yet, need to fill gaps for second iteration.

GL Spring (very small scale; target number = 6; 1 per subsection)
Restricted in ecoregion to subsection 222Ob, no expert leads yet.

Subterranean Stream Types (very small scale; target number = 6; 1 per subsection)
Now: Use ECS-targeted watershed as coarse filter, assess presence in all subsections
Later: Identify expert leads, then fill inventory gaps.

STL Subterranean Stream (very small scale; target number = 6; 1 per subsection; 0 EOs chosen, none known yet)
Subsections 212Ea, 212Ec, 212Ee, 221Bc: representative, need to fill gaps for second iteration.
Subsection 212Ee

Black Bay (NY)	.	?	?	.	?	B?	Y?	C?	Y	041501	212Ee	?	only expert lead for ecoregion; location and presence in ecoregion uncertain, needs more data.

NAP Subterranean Stream
presence in ecoregion uncertain, no expert leads yet.

GL Subterranean Stream
presence in ecoregion uncertain, no expert leads yet.

Legend:

* = BCD-documented occurrence
Thr: Meeting or surpassing viability threshold for ranking factor or overall rank? Y = Yes, N = No.
Port: Should we include in the portfolio? Y = Yes, N = No.
Notes:
Exemplary Status:
GE = global exemplary occurrence (per NYHP element global record).
SE = global exemplary occurrence (per NYHP element state record for NY EOs; per VT Aquatic Working Group reference for VT EOs).
fish = designated as exemplary river for fish in VT;
mi = designated as exemplary river for macroinvertebrates in VT;
mp = designated as exemplary lake for macrophytes in VT;
Tier 2 = Not designated among the one to few best in NY, but designated as among a broader group of exemplary sites (often A ranked EOs)
GIS = presence of basic macrohabitat type predicted from ECS GIS model, unless otherwise specified.
ECS = ECS aquatic portfolio choices:
1n: chosen as focus main stem or focus size class 2 watershed within best one (or one of two) stream network for ten size class 3 biophysical units.
2: chosen as one of one to many best examples of type (A to AB ranked leads for NY; among VT exemplary lakes and rivers designated in 1998 reference), and disjunct from chosen stream networks.
xn: not chosen as focus main stem or size class 2 watershed, but within best one (or one of two) stream network for ten size class 3 biophysical units.

Table 6. STL Aquatic Community Target Selection Summary: NY & VT. Primary Targets: Macrohabitats & Embedded Features.

Community name	Stratification Units				# Occurrences		
	Type	Number	Selected	Likely Gaps	Targeted	Selected	Likely Gaps
RIVERINE COMMUNITIES							
STL Spring	Subsect	6	0	3	6	0	3
NAP Spring	Subsect	6	0	4	6	0	4
GL Spring**	Subsect	6	0	1	6	0	1
STL Subterranean Stream	Subsect	6	0	1	6	0	1
STL Backwater Slough	Subsect	6	0	3	6	0	3
NAP Backwater Slough	Subsect	6	0	4	6	0	4
GL Backwater Slough**	Subsect	6	0	1	6	0	1
STL Intermittent Stream	Subsect	6	0	3	6	0	3
NAP Intermittent Stream	Subsect	6	0	4	6	0	4
GL Intermittent Stream**	Subsect	6	0	1	6	0	1
STL Rocky Headwater Stream	Subsect	6	1	5	6	1	5
NAP Rocky Headwater Stream	Subsect	6	3	2	6	4	2
GL Rocky Headwater Stream**	Subsect	6	1	0	6	1	0
STL Marsh Headwater Stream	Subsect	6	3	2	6	3	2
NAP Marsh Headwater Stream	Subsect	6	3	2	6	4	2
GL Marsh Headwater Stream**	Subsect	6	0	1	6	0	1
STL Confined River	Subsect	6	2	2	6	2	2
NAP Confined River	Subsect	6	4	0	6	4	0
GL Confined River**	Subsect	6	1	0	6	1	0
STL Unconfined River	Subsect	6	3	0	6	4	0
NAP Unconfined River	Subsect	6	5	0	6	6	0
GL Unconfined River**	Subsect	6	2	0	6	1	0
GL Deepwater River	EDU	3	1	0	3	1	0
Acadian Freshwater Tidal River	EDU	3	0	0	3	0	0
Acadian Brackish Tidal River	EDU	3	0	0	3	0	0
Acadian Saline Tidal River	EDU	3	0	0	3	0	0
Acadian Freshwater Tidal Creek	EDU	3	0	0	3	0	0
Acadian Brackish Tidal Creek	EDU	3	0	0	3	0	0
Acadian Saline Tidal Creek	EDU	3	0	0	3	0	0
LACUSTRINE COMMUNITIES							
STL Subterranean Lake	Subsect	6	1	0	6	1	0
STL Vernal Pool	Subsect	6	0	6	6	0	6
NAP Vernal Pool	Subsect	6	0	6	6	0	6
GL Vernal Pool**	Subsect	6	0	1	6	0	1
NAP Pine Barrens Vernal Pond**	Subsect	6	0	2	6	0	2
STL Sinkhole Pond	Subsect	6	1	2	6	1	2
STL Oxbow Pond	Subsect	6	2	1	6	3	1
NAP Oxbow Pond	Subsect	6	0	4	6	0	4
GL Oxbow Pond**	Subsect	6	0	1	6	0	1
STL Flow-Through Pond	Subsect	6	1	3	6	1	3
NAP Flow-Through Pond	Subsect	6	0	4	6	0	4
NAP Bog Lake**	Subsect	6	1	4	6	1	4
GL Marl Pond**	Subsect	6	1	0	6	1	0
STL Eutrophic Alkaline Pond	Subsect	6	2	2	6	2	2
NAP Acidic Pond**	Subsect	6	0	4	6	0	4
STL Eutrophic Alkaline Dimictic Lake	Subsect	6	3	1	6	3	1
STL Oligotrophic Alkaline Dimictic Lake	Subsect	6	2	1	6	2	1
STL Winter-Stratified Monomictic Lake	Subsect	6	2	0	6	3	0
STL Summer-Stratified Monomictic Lake	EDU	3	1	0	3	1	0
EMBEDDED FEATURES							
Warmwater Fish Concentration Area	EDU	2	1	1	4	2	2
Waterfowl Concentration Area	EDU	2	1	1	4	2	2
Raptor Concentration Area	EDU	2	1	1?	4	2	2?
Bays/Great Lakes Aquatic Bed	EDU	2	2	0	4	3	1
Deltas	EDU	2	1	0?	4	1	1?
Rocky Nearshores/Great Lakes Exposed Shoal	EDU	2	1	1	4	1	3

** = community peripheral to STL.