THE

WATER-FALLS,

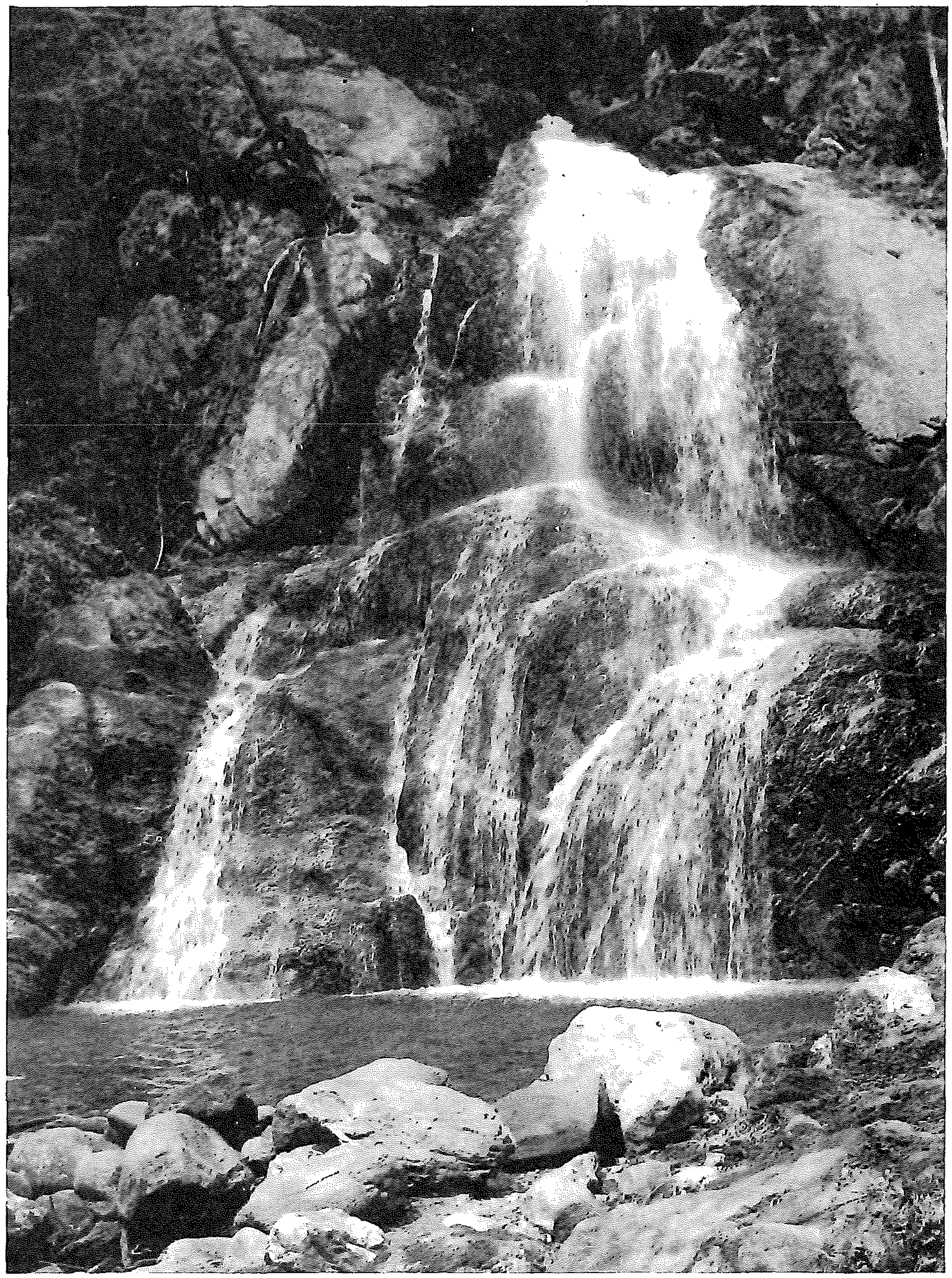
CASCADES

AND

GORGES

OF

VERMONT



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for the

AGENCY OF NATURAL RESOURCES

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

and the

DEPARTMENT OF FORESTS, PARKS AND RECREATION

WATERBURY, VERMONT

THE WATERFALLS, CASCADES AND GORGES OF VERMONT

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TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

TABLE OF CONTENTS (CONTINUED)

TABLE OF CONTENTS (CONTINUED)

ACKNOWLEDGEMENTS

This report was prepared by consultants Jerry Jenkins and Peter Zika for the Fragile Areas Registry Committee, the Department of Forests, Parks and Recreation and the Department of Water Resources and Environmental Engineering. The employees of the Agency of Environmental Conservation wish to express their gratitude to the consultants for the depth and thoroughness of their field work and of this report. This document has already been instrumental in aiding important decisions on the future of Vermont's river environment.

This project was conceived of originally by Thomas Willard, Environmental Engineer in the face of a renaissance in hydropower. The project was developed and overseen by Charles Johnson, State Naturalist and Stephan Syz, Water Resources Planner. Many people have contributed to the report including Alison DesMeules, Jeffrey Cueto and Jerry McArdle, all of the Agency of Environmental Conservation.

DISCLAIMER

This report was prepared by consultants and does not necessarily represent the views of the Department of Water Resources and Environmental Engineering (hereafter referred to as DWR&EE or "Department"). The descriptions of water quality are subjective evaluations by the authors and may not, in some cases, accurately describe the present water quality or the present fishery. The recommendations also may or may not represent the views of the Department. They do warrant careful consideration. The most current data can be obtained from the Department or the District Fisheries Biologist.

EDITING

Some sections of this report have been edited by the Department to prevent confusion and to make the report consistent with state policy.

HEALTH HAZARD

Swimming is not recommended in Class C waters due to the possibility of a health hazard in the event of the failure of disinfection systems.

PRIVATE PROPERTY

The property adjacent to many of the sites described is privately owned and permission from the land owner should be obtained before entering upon the land.

STUDY LIMITATIONS

There are many unknown, waterfalls, cascades and gorges. This report must be regarded as a sampling rather than as a complete inventory. No significance should be attached to the fact that a site has been omitted from this report. Prior to this survey, there had been no inventory of waterfalls, gorges, and cascades in Vermont. The consultant studied those sites which the Agency staff happened to know. Additional sites were uncovered during the study and others have been reported to the Department while this report has been in draft form.

ADDITIONAL SITES

The Department intends to eventually make this report a complete and accurate description of all the waterfalls, cascades and gorges in Vermont. You are invited to write the Department at 103 South Main Street, Waterbury, Vermont with the location, description and, if possible, photos of additional sites. These sites will be investigated further and included in the next printing.

PHOTOGRAPHS

Photographs, including numerous slides and color prints, of many sites are on file in the Agency of Environmental Conservation. Most of the photos were taken by Peter Zika and Agency personnel. However, certain prints were taken from slides provided by the Vermont Travel Division.

SITE IMPORTANCE

The evaluation of site importance contained in this document represents the opinion of the consultants. It is entirely possible that other sites in this report or sites as yet unreported will be considered to be important by the Agency either because of their intrinsic characteristics or as similar sites are harmed in the future making the remaining sites of a type more important.

CORRECTIONS AND AMPLIFICATIONS

Appendix 4, "Corrections and Amplifications", includes sites already included in the main report which have been studied in more detail.

PART I

ABOUT WATERFALLS, CASCADES AND GORGES

INTRODUCTION

This report contains the results of an inventory of waterfalls, cascades and gorges that was commissioned by the State of Vermont and took place in the spring, summer and fall of 1983 and 1984. The purpose of the study was to list the waterfalls and gorges of Vermont, help classify them by size and appearance, and help decide which were important recreational sites and natural areas.

There are several reasons for the study. The first is that waterfalls and gorges are beautiful places that deserve to be protected, and, as with any resource, to protect them you must first know how many exist and where they are and what is interesting and important about each one.

A second reason for surveying waterfalls, cascades and gorges is that many of them - perhaps one-third or more - are potential sites for hydroelectric development. There is currently much interest in hydroelectric projects, and in 1984 the Vermont Department of Water Resources and Environmental Engineering (DWR&EE) was considering over 100 applications for permits to build dams and powerplants. Many of the projects being planned would alter falls, cascades and gorges and the Agency wanted to know the uses and natural and recreational values of all known sites. This information is important when the Agency issues comments to the Federal Energy Regulatory Commission on a developer's license or exemption application. If an area is especially unique the Agency could oppose the project. In addition, the DWR&EE issues or denies Water Quality Certificates and the ability of a water to support important water uses is one of several criterion considered.

In the early summer of 1983, we were given a map of about 100 places that were believed to have waterfalls and/or gorges. We visited 92 of these sites and found about 70 waterfalls and gorges and about ten other wet places that were not big enough to include in the study*. An additional 13 sites were surveyed in 1984. At each site, we would try to explore as much of the area as we could, look for rare plants, make general biological and geological observations, and try to determine what the site was good for and how many people use it. The time we spent at each site varied with our schedules and the complexity of the site, but for the most part, our visits were brief and devoted to reconnaissance rather than to investigation.

This report contains descriptions of 89 individual sites, some general information about the methods used and the

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* For this report, a waterfall or a cascade had to be over three feet high, and a gorge had to have a pair of continuous rock walls over ten feet high.

limitations of the study, and eight chapters that compare the sites and summarize particular findings.

The report is organized as follows: PART I contains methods and general results, and includes sections on geology and geomorphology, types and sizes of sites, plant communities and rare plants, uses, comparative importance, water quality, and conservation and restoration. PART II contains a glossary of our technical and descriptive vocabulary, and brief reports on the 90 sites where we found waterfalls or gorges. The APPENDIX contains reports on nine sites where we did not find waterfalls or gorges, a list of sites for future investigation, and a summary of information on the sites studied.

The site reports in PART II are arranged by river basin, following the normal procedure for DWR&EE reports. Summary lists for each basin precede the site reports for that basin, and give an idea of the regional groupings of sites. Indices to sites, river, town, and DWR&EE number are provided at the end of the report.

Readers interested in a brief summary and evaluation of the sites are referred to the various tables in PART I, which compare the sites and give lists of the most exceptional sites in various categories.

We would particularly like to call attention to limitations of the survey. These are discussed more fully in Chapter 1; but we note here that this survey was at best a reconnaissance and not a thorough investigation. We neither investigated every known falls and gorge, nor searched out every unknown one, nor conducted thorough biological and geological investigations of the sites we visited. Hence, our comparative rankings of sites are only provisional. A deeper investigation is bound to discover important sites that we did not visit, and biological or geological virtues at sites which we thought were undistinguished.

We have tried to allow for the effects of future discoveries by not stressing distinctions between sites based on our estimates of the abundance of a certain type of site or a certain type of feature. (For example, we do not place great stock on our estimates of exactly how rare a certain plant or a certain type of gorge is, because experience has taught us that these estimates change quickly.) Hence, we stress that 60 out of the 80 sites we visited have importance as natural and recreational areas, but de-emphasize our more detailed estimate of the number of sites that are highly important at the state level.

We have included quantitative estimates of the latter sort because they are an intellectually convenient way of summarizing information, and because they are useful for the administrative classification of sites. But we stress that they are suspect: they are based on partial information, introduce a specious quantification and very subjective estimates about naturalness, beauty, and wildness, and because they can only be made at all by pretending that the values of certain users - scientists and geographers for example - are representative of the values of all the rest of the users.

The last difficulty is especially significant. Places are not important in themselves, but only because someone values them. Thus, estimates of their value depend on whether the estimator can identify (and sympathize with!) the persons to whom they are valuable. In science and geography, it is customary to value the unusual: hence, we as scientists value a damaged, unswimmable, dangerous, and unloved gorge on the Clyde highly because it is the only limestone gorge in north central Vermont, and because limestone gorges are rare in the state as a whole. We expect, and rightly so, that rare places illustrate the farthest possibilities of our landscape and so contain information we can not get elsewhere. But for many activities - walking, fishing, swimming, resting, and so on - it is much more important that a place be beautiful and clean and satisfying and near you than that there be no other places like it. We would no more retire to the Clyde Gorge for recreation and pleasure than we would bother to hunt rare plants at our favorite swimming holes.

And so we are dealing not only with different grades of importance, but also with different kinds of importance, and this makes it difficult to decide whether a place that is of high importance because it is an unusual land form is more or less valuable than a place that is locally important because it is beautiful and pleases the people who go there.

Hence, rather than make too much of the differences between sites, we prefer to say that there are at least 60 waterfalls and gorges that have undeniable importance for science, scenery, beauty or recreation, and that all of them are important natural areas. If any one is destroyed, the state will lose something of value. In some cases, what is lost will be unique, and in some cases it will be duplicated elsewhere. As explorers and scientists, we are biased towards the unique, but as conservationists, we oppose any destruction of attractive landscapes, regardless of whether they are unusual or ordinary.

* * *

Finally, a few notes on style and authorship. This report is the result of collaboration between Peter Zika and Jerry Jenkins. Both of us are field biologists who specialize in botanical survey. Usually only one of us visited a given site. We used a standard survey method, but our abilities - hence, our emphasis - differed: Zika did very thorough vascular plant lists and concentrated on rare vascular plants. Jenkins did more extensive moss inventories and concentrated on rare moss species.

The site descriptions were prepared by each of us separately for the sites visited, using a standardized descriptive language which is explained in Section 9. After the individual reports were written we then spent several days discussing and comparing sites until we agreed on our comparisons and evaluations. Jenkins wrote the main text of the report, drafted the summaries and tables, and edited the site reports. Zika researched and prepared the historical information on rare plant records, edited the entire text, and surveyed the additional sites in 1984. Despite the individual responsibilities, we emphasize that the design and accomplishment of the survey was very much a collaboration, and that the conclusions and judgements are our joint product and responsibility.

The report makes very little use of numbers, except for our visual estimates of the size of the waterfalls and gorges. We have avoided creating a numerical rating system to evaluate the importance of the sites visited, and we avoid expressing either the relative importance or abundance of a particular group of sites as a percentage. This is done in the interests of precision. The senior author was trained in mathematics and the philosophy of science, and regards numerical ratings of landscapes and percentages derived by dividing one uncertain quantity by another as gross examples of haphazard thought and poor scientific taste, and eschews the pretense of quantification when the substance is unquantifiable.

* * *

There has already been much alteration and destruction of waterfalls and gorges. This, combined with the number of people who use and appreciate the ones that remain, seems to us argue for the defense of every important site we have left. We believe, with the psalmist, that waters restore the soul; and with an Irish poet that by climbing to the places where water moves over stones we find both calm and passion. We have ourselves experienced restoration and calm and passion in our walks and explorations, and treasure the experiences and the places that produced them. The places existed long before we did; it is our greatest hope that we can help to assure that they live long after we do.

1. METHODS OF LIMITATIONS

A map of about 100 sites believed to have waterfalls or gorges was prepared by the DWR&EE and edited by Charles Johnson, the state naturalist. It included sites from various natural areas surveys and published sources, sites that might possibly be used for hydropower projects, and sites known personally to state employees who happened to be available when the map was being made. We refer to this in the reports as the state waterfall map or the water resources map. It is not official and has not been published.

Because the map had more sites than there was time to survey, no attempt was made to locate additional sites.

Usually only one of us visited each site. We would explore the whole area, make notes on the landscape, setting, rocks, site condition, and water quality, and do some biological investigation. We would always note the general vegetation and look for rare vascular plants. At about two-thirds of the sites we made species lists, either of vascular plants, or of bryophytes, or of both. The object was to see as much of the site as possible in the time we had, and this usually did not allow us the time for very detailed scientific work.

We did not inventory animals. We noted the presence of aquatic insects because they are roughly indicative of the amount of oxygen in the water, but did not count or identify them. In a few site reports we included information on a rare animal or important fishery, but no effort was made to evaluate every site for its importance to fauna.

We did not do any detailed geological investigations. We would locate the site on the state geological map or on a USGS geological quadrangle and attempt to correlate what we saw with what the map said should be there, but because of the difficulties in recognizing individual strata and because of our own deficiencies as geological observers we often were uncertain about what we were really seeing.

While at each site we attempted to guess how much it was used, by looking for paths and trampling and litter and by asking neighbors and visitors. We also looked for fish and swimmable pools and noted old dams, mill foundations, and so on. These studies were of necessity catch-as-catch-can: in many cases we do not really know much about who uses the site or what they do there.

No attempt was made in our study to determine the history of the sites or their cultural value. This will require a separate investigation.

* * *

Since the survey was limited in completeness and intensity, the findings and conclusions are provisional, and we would ask that the reader keep in mind the following:

1. The survey was limited to published sites and sites personally known to us or to employees of the State Environmental Agency.

2. Most sites were seen only once, usually at low water, and hence, we do not know what the sites look like at full flow. Thus, we know a lot about what was under the waterfalls, and less about how spectacular the water itself was.

3. Surveys of vascular plants were done in late season and so some early species (particularly rare sedges and violets) would not have been found.

4. Full surveys of bryophytes were only done at about half the sites that looked like they had interesting bryophyte communities.

5. No information about birds, reptiles, amphibians or insects was systematically gathered. Most of such information found in this report is derived from the authors' study of white-water rivers in Vermont.

6. Geological information is incomplete, and in particular we are for the most part unsure about the relation between the structural geology of the sites and the land forms we observed.

7. Our estimates of the amount and kind of use a site receives are circumstantial and approximate.

8. We do not know the culture and the history of the sites.

* * *

Unknown Sites

We believe that there are likely to be twice as many waterfalls and gorges in Vermont as are reported here. The argument goes as follows:

This survey was limited to published sites and sites that were known to us or to government employees. A site was liable to get on the list if it was a major hydropower or recreation site, or if it had been included in the natural areas survey*, or if it were in one of the parts of the state that we or the state

* The natural areas survey, done in the early 1970's, concentrated on places known to the investigators, and omitted many places and many regions of the state entirely.

people knew well, or if it were a known site for rare plants. On the other hand, if it were a local swimming hole or a falls or gorge on a mountain brook some distance back in the woods, it was quite likely that it did not get on the list.

Thus, the survey was biased towards large and well-known sites, and was in no sense a systematic river-by-river inventory of everything that exists. A few examples may make the extent of this bias clear.

a. Out of 90 sites, only six were more than one-quarter mile from a general-use road, and three of these six were on woods roads or major hiking trails. Even admitting that nice waterfalls attract users and hence, tend to have trails or roads, this suggests strongly that backwoods sites had little chance of being listed and surveyed.

b. Falls and gorges seem to occur somewhat randomly as a result of local stratigraphic peculiarities (see page 8). Since we are unable to look at maps and predict that some streams will have sites and others would not, we have every reason to expect that the mountain streams that have not been surveyed will have their share of sites. This is particularly true of the formation we call a chain of pools and cascades, which is more frequent on mountain brooks than anywhere else.

c. There is no reason to assume that every large or spectacular site is widely known or has been included in published lists. A 50-foot-high falls on Baldin Brook in Wolcott, one of the five or so falls this high in the state, was officially unknown until its owner applied for a permit for a hydroelectric project. The beautiful cascades on the Rock River in Dover were almost unknown, even locally, but was on the natural areas survey because a local geologist had visited them.

d. It is also wrong to assume local swimming holes are always widely known; many times, while looking for one site, we were told that it was an indifferent place, and if we really wanted to see a nice swimming hole, we should go somewhere else.

e. This survey includes no high altitude falls. Such falls certainly exist: they are usually temporary falls that run mostly in the spring and are found on the headwalls of mountain ravines. They are often quite pretty and can be important botanical sites.

We have no way of estimating how many unlisted sites exist. With very little effort, we learned of 20-30 more sites while surveying the 90 on the list, and would suspect that, by asking in the garage or general store of each village in Vermont, we would have no trouble finding out about 50 other local swimming holes. We would imagine that, with more difficulty, an equal number of mountain sites could be discovered by systematic exploration. Hence, we estimate - entirely by guess work - that this survey covers, at most, half of the extant small falls and gorges.

Note, however, that the coverage of large sites is likely to be much better than 50%. Large sites are often on large rivers, and even when they are not, they are often noticed and used, either recreationally or for power. In the course of our survey, we neither were told about nor discovered any large sites that had not been listed. Doubtless some exist (cf. paragraph c, above), but we believe that there are likely to be very few large sites that are not currently known*.

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* This has been partially confirmed since the above was written. While doing field work on other projects in 1984-5, we encountered approximately 20 small falls and gorges, confirming our expectation that they are really quite numerous in the state as a whole. In addition, basin planning studies by DWR&EE have revealed another ten to 15 new sites, including a number of important swimming holes and several large falls. These findings suggest that there are still many unknown falls and gorges, and make it essential that this report be regarded as a sampling rather than as a complete inventory.

2. GLOSSARY OF DESCRIPTIVE AND TECHNICAL TERMS

For the purposes of this study, we used the following conventions:

A site is called a **gorge** if it has continuous rock walls at least ten feet high on both sides.

A site is called a **waterfall** if water fell vertically or almost vertically for three feet or more.

A site is called a **cascade** if the water fell three feet or more over rocks that were not vertical or almost vertical.

A site is called a **chain of pools and cascades** if there were five or more pools and cascades along a stream and the total length of the chain was over 300 feet.

(Sites that did not fit into at least one of the categories above were not considered as a waterfall or gorge for the purposes of this report. In particular, wooded ravines (which are often locally called gorges) of whitewater streams without drops of over three feet were not studied.)

Large gorges: walls 40 feet or more high.

Small gorges: walls ten to 40 feet high.

New York type gorge: a gorge with vertical walls and a large falls at the head of the gorge, generally in limestone.

Large falls and cascades: vertical drop greater than 20 feet.

Small falls and cascades: vertical drop ten to 20 feet.

Urban sites: sites located within a heavily settled area.

Industrial sites: sites currently or formerly used for hydropower, with evident dams, penstocks, retaining walls, buildings, powerlines or other alterations.

Rural sites: sites in farm country, with or without buildings in view.

Woodland sites: sites largely surrounded by woods.

Mountain sites: woodland sites on steep slopes.

Wild sites: sites largely or completely in their natural condition.

Secluded sites: sites at least one-quarter mile from a maintained road, and not receiving heavy recreational use.

Degraded sites: a site that formerly was of at least moderate importance but which has been damaged by pollution or alteration.

Restorable sites: a site whose importance could be increased by pollution abatement, or by increasing the summer flow, or by removing derelict structures.

Large stream: any stream with an average width of over 75 feet.

Medium-sized stream: a stream with an average width of 20-75 feet.

Small stream: a stream with an average width of 20 feet or less.

Mountain stream or **headwaters stream:** small steep gradient woodland stream on steep terrain near the top of its watershed.

Alluvial stream: a stream with a continuous flood plain more than three times its own width.

Rippled rocks: water-shaped rocks with rippled or fluted surfaces. Generally we did not note them unless the rippling was about 3cm deep or more.

Bedding: the layers of the rock.

Sculptured rocks: rocks with concave surfaces formed by erosion, usually associated with potholes.

Contact: a place where two different formations meet.

Uncommon plant or **scarce plant:** one currently known from less than 50 sites in Vermont.

Rare plant: one currently known from less than ten sites in Vermont.

Bryophytes: mosses and liverworts.

Vascular plant: one of the flowering plants, ferns, or fern allies.

Penstock: a pipe, often large, diverting water under pressure from a dam to feed a powerplant.

For purposes of comparison, in the summary section of each report we compare the construction, botany, privacy, tidiness, and swimmability of each site using the following ratings:

1. As to the overall visual interest of the rock formations at the site.

   poor rocks: hardly worth noticing.

   average rocks: similar to those at many other sites. (Please note that an average waterfall can be a very pretty place.)

   nice rocks: above average, hence, the site is memorable either for overall prettiness, or for details.

   fine rocks: exceptional visual interest, as good as any place like it in the state.

   spectacular rocks: formations of striking size and rockiness.

Spectacular rocks are by definition bigger than non-spectacular rocks, but they are not necessarily prettier or better-made. Thus, Quechee is spectacular, but we do not judge the cliffs to be outstandingly pretty and hence, do not rate the rocks as fine.

2. As to botany.

   poor botany: few plant species at the site.

   average botany: about what you would expect.

   exemplary botany: better than average in either the number of species or the general abundance of vegetation; judged to be an excellent example of the type of community that can develop in this habitat.

3. As to privacy and naturalness.

   not secluded or wild: roads or buildings adjacent and visible.

   somewhat secluded: isolated from the surroundings; roads and buildings may be nearby but you can not see them, and the site does not get large numbers of visitors.

wild: in its natural condition, with only forest or mountain land visible; at least 400 yards from a maintained road.

very secluded: over one-half mile from a road and not on a major trail.

private: isolated from its surroundings and receiving few visitors.

4. As to tidiness.

clean: no litter, junk or debris.

fairly clean (= **some trash**): <1 bottle/1,000 square feet.

a mess: lots of litter, junk or debris.

5. As to water quality.

clean: A subjective evaluation indicating no turbidity, only small amounts of green algae (diatoms may be abundant), no particular smell, generally natural aspect.

mild pollution: A subjective evaluation indicating some discernible odor, natural or not, scum may be on rocks and in pools, some turbidity, possibly very fine colloidal particles, faintly murky, substantial algae growth possible.

bad pollution: a subjective evaluation indicating masses of algae, bad smell, a plume, toilet paper, anything one would not like to look at or smell or would not swim in.

6. As to swimmability.

good bathing: pools and clean water, not deep enough to swim.

fair swimming: pools to swim in.

good swimming: good water, deep pools, pretty site.

great swimming: very beautiful or very exciting or both.

3. CLASSIFICATION, GEOMORPHOLOGY, GEOLOGY

This report uses a very simple descriptive classification:

A **falls** is a vertical or near vertical drop, at least three feet high, at which the water shoots outward and falls without touching the rock. A **small falls** is under 20 feet high, a **large** falls over 20 feet high.

A **cascade** is a bedrock exposure, which may be low-angle or high-angle but is not vertical, over which a stream drops at least three feet, and at which the water remains in contact with the bedrock and does not shoot upward. A **small cascade** is under 20 feet high, a **large cascade** over 20 feet high.

A **gorge** is a section of stream channel with continuous rock walls at least ten feet high on both sides. A **small gorge** is under 40 feet high, a **large gorge** over 40 feet high.

This classification is straight-forward and easy to apply, but does not take into account the geomorphological processes that create and maintain the sites. We developed a more complicated classification based on geomorphology, but found it was not very useful in field studies.

The rest of the chapter is devoted to a geomorphological classification of falls and gorges: even if it is not directly applicable to the present field results, such a classification contains ideas that are interesting in themselves and might be applicable in more detailed field work in the future.

To develop a geomorphological classification, we begin by noting that in our part of the world, with old mountains and a humid temperate climate, exposed rock faces of any sort are unusual. Stream and hillslope processes, if left to themselves, create smooth hillslopes and stream beds; cliffs wear down and become vegetated and indistinguishable from other slopes; cascades and falls wear away at their lips and are obliterated. Thus, our falls and cliffs are transitory features; the ones we see are either recently created, or are self-renewing and so are able to counteract the normal action of erosion.

There are other landscapes for which this is not true. Such landscapes either lack substantial surface and stream erosion, or have features in their structure or history which interfere with the tendency of erosion to produce even slopes. Thus, in the Sierra Nevada range there has been recent tectonism and faulting; in the Hudson and Connecticut Valleys there has been recent fluvial erosion; and throughout the north temperate zone the mountains have been exposed to recent glaciation, both by valley glaciers and large ice sheets.*

Falls and gorges have exposed rock faces, and since in our part of the world rock faces get obliterated fairly quickly, this either means that they are recently created, or that some process is re-steepening them and hence, keeping them free of talus or alluvium. Thus, a logical way to classify them is according to the processes that create them or keep them steep. Table 1 summarizes such a classification:

TABLE 1

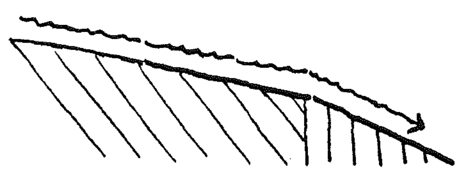
CLASSIFICATION OF ROCK FACES ACCORDING TO THE PROCESSES THAT CREATE AND MAINTAIN THEM

1. Rock faces created by glaciation. These are found on the headwalls of cirques, and on the lee sides of mountains that were completely glaciated.

2. Faces created by thrust faults.

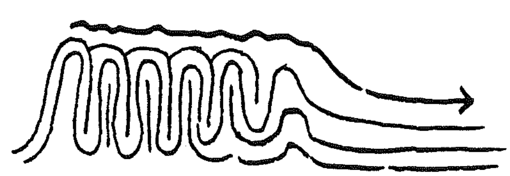
3. Faces resulting from differential erosion. A difference in the erosion of adjacent rocks can both either create or maintain a face. Several instances can be distinguished:

   3a. Erosion rate varies downslope, resulting in cascades and falls.



less erodable rock more erodable rock

Differences in erodability are often associated with differences in bedding:



vertical bedding horizontal bedding

*Living in the postglacial northeast, we tend to believe that steep mountains are automatically ledgy and steep streams automatically have falls. But the unglaciated southern Appalachians - old, well-eroded mountains - are extremely steep and yet are almost entirely smooth and vegetated, with few large ledges or major falls.

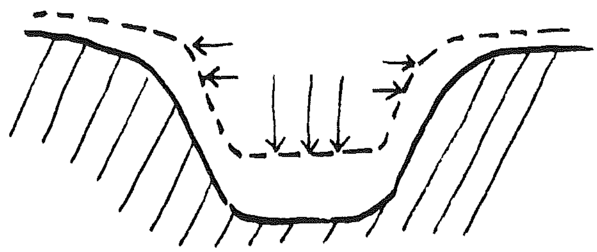
Table 1, continued.

3b. Erosion rate varies across the slope, resulting in gorges.

less erodable more erodable less erodable

3c. Erosion rate varies with direction, resulting in gorges.

horizontal erosion is slow

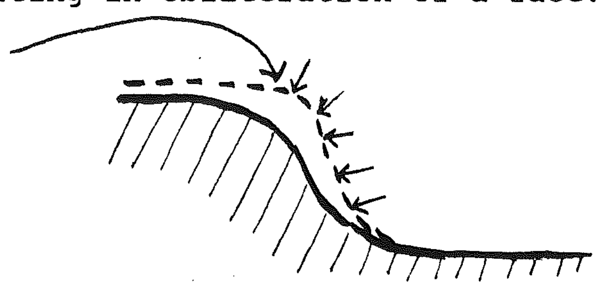


vertical erosion is fast

3d. Erosion augmented at the base of a drop, undercutting it and resulting in the "parallel retreat" of the face.

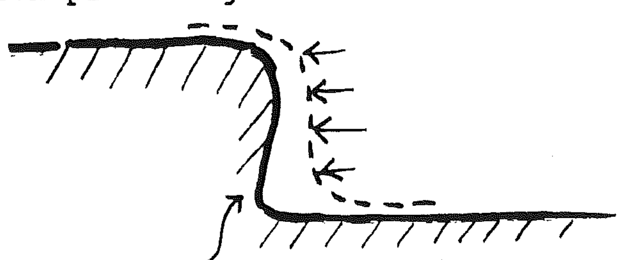
Normal situation resulting in obliteration of a face:

erosion greatest here



before after (cliff angle declines)

Augmented erosion producing the "retreat" of the whole face:



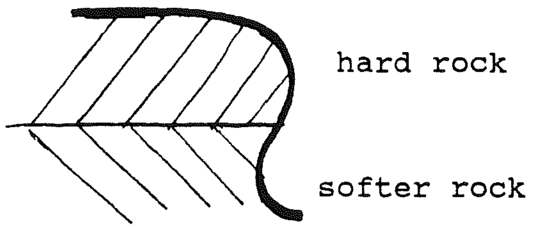
erosion augmented below and equal or greater than above

cliff angle remains the same or steepens

Table 1, Continued.

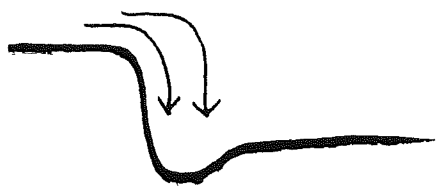
Parallel retreat is both common and important. It may take place in several ways:

There may be a layer of soft rock underneath a harder rock.



Or a river may cut laterally at the cliff base.

Or a falls may develop sufficient energy to make a plunge pool and undercut its own lip.



The last case mentioned - the parallel retreat of a falls that undercuts itself - is important because the retreating falls may be creating a gorge as it grows, and because the retreating falls may actually grow in height.

Not all of the processes in Table 1 are equally common, and not all of them apply equally to falls and gorges. Thrust faulting seems unimportant in Vermont because most of the faults are very old, and erosion and glaciation have long since obliterated the faces created by the thrusting.* Glaciation has been important in the mountains, but not along the major lowland rivers. It creates cliffs and small falls but rarely large falls or gorges.

Eliminating glaciation and thrust faulting, we get the following geomorphological classification of waterfalls and gorges.

*Some falls are found at thrust faults but this is usual because the rocks are of different hardness rather than because an ancient scarp still persists.

TABLE 2

GEOMORPHOLOGICAL CLASSIFICATION OF WATERFALLS AND GORGES

1. Gorges created by the lateral migration of streams.
2. Gorges created by the upstream migration of a falls.
3. Gorges created in other situations where the river is cutting down faster than the walls are receding.
4. Falls and cascades that originated by the steepening of mountain slopes by glaciers.
5. Falls and cascades located at the contact points between formations of different hardnesses.
6. Falls and cascades located at points within a single formation where the bedding is more resistant.
7. Falls (usually not cascades) that are undercut at the base and moving upstream.

The problem with the sort of classification outlined in Table 2 is that to use it you have to know something about the history of the site. Usually direct evidence on geological history is lacking, and the history has to be inferred - when it can be inferred at all - from fairly technical evidence. Often to use this classification at a site you would have to look carefully at all the rocks there, map their bedding and stratigraphy, try to determine how erodable they are, and look for evidence of former river channels. This is obviously not something that can be done in a few hours, and equally obviously not the sort of thing that a botanist is liable to be very good at doing, no matter how many hours are spent.

For these, we did not try to apply our geomorphological classification to every site, but instead confined ourselves to the following general remarks about the importance of each type in Vermont.

1. Rock faces caused by the lateral migration of streams are common. Most wooded ravines have some cliffs next to the stream that seem to have originated in this manner. These streamside cliffs are usually confined to the outside of bends, and do not occur opposite one another and so do not form gorges. They are usually less than 30 feet high. Their small size and restriction to the outside of bends seem to indicate that they are geologically short-lived forms, that can only exist as long as the stream continues to cut at their bases.

2. While for the most part sidewards migration of streams does not seem to have created major gorges it is possible that some wide, steep-walled gorges - the Clarendon Gorge for example - may be maintained by side-cutting rather than down-cutting and so be examples of Type 1 above. But this is just conjecture. In practice it may prove difficult to decide whether a given gorge owes its steep walls to side-cutting or to down-cutting or both, and so the distinction between Types 1 and 3 may be difficult to make.

3. The best examples of Type 2 gorges - gorges formed by the recession of falls - are the large limestone gorges of northern and western Vermont. These gorges typically have vertical walls and a sharp change in slope at the rim of the gorge. They all have large falls or steep cascades at the head of the gorge which are two-thirds to fully as high as the gorge is deep. We currently have five good examples (cf. Chapter 3) of this type of gorge. All are in soft limestone. Because similar gorges are much commoner west of Vermont we call these "New York" type gorges.

4. A number of falls on woodland streams are at the heads of small gorges and show the steep gorge walls and undercutting of the base of the falls we associate with the recession of falls. Many of these are undoubtedly Type 2 gorges with receding (Type 7) falls.

5. Most of the remaining gorges do not have a falls near the head of the gorge and so it is not obvious whether they are formed by down-cutting or the recession of a falls or a combination of the two. We can argue for down-cutting in many cases. This is clear for what we call sculptured gorges*, which are gorges which have concave vertical walls made by an eddy first cutting a pothole which then enlarges and cuts vertically down into the rock. Here the continuous vertical markings are proof that rapid down-cutting has

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*Sculptured gorges are very striking. Some sculpture occurs at about a dozen gorges, and large sculptured features at about six gorges. In two places - Texas Falls and the Huntington Gorge - the whole gorge is sculptured and the sculpture extends up to the rim of the gorge. It appears that these sites began as a chain of potholes that enlarged until they met each other and cut vertically down and formed the gorge. At Huntington Gorge, it is possible to see where individual potholes have bored down 30-40 feet vertically into the rock.

Potholes are interesting features because they can influence the eddies that create them, and hence, are potentially self-amplifying features - agents of erosion as much as products of it. It would be interesting to know why they occur at some sites and not others. Geologists have no general answer to this, (note continues on next page)

occurred. It is also probably true for long gorges like Quechee where the walls are much the same angle for one-half mile or more. If the gorge had been formed by the recession of a falls followed by the subsequent widening of the walls the angle of the walls would be less at the lower end than at the upper.

6. Besides these two types (the sculptured gorges and long gorges with walls at a constant slope) there are many smaller gorges which we cannot classify from our field studies, and which may have been created either by down-cutting or recession, or by some combination of the two.

7. Many high mountain cliffs, especially those at the heads of ravines or in a down-ice direction, are generally believed to have been made by glaciers. For the most part these cliffs have only small, intermittent streams. Thus, Type 4 sites - falls of glacial origin - do occur in the state but are mostly small and only flow in the spring and early summer. So far as we know none of the falls we surveyed is of glacial origin.

8. A number of our falls and cascades are mapped as occurring at or near the contact between different formations, and so are potentially Type 5 falls that have resulted from the differential erosion of the two rocks. In some cases, particularly where continuous dikes of a hard rock extend across the stream (Jelly Mill Falls, Clarendon Gorge) this was easy to determine in the field. In other cases we could not identify the formations at a site and could not prove that this was the case.

9. A large number - perhaps two-thirds - of the small cascades and falls we visited occurred in places where the bedding (layering and cracks) of the bedrock was vertical rather than horizontal. Such sites are examples of our Type 6 falls - falls created by structural inhomogeneities rather than by differences in the composition of the rock. Presumably vertical bedding, like the end grain of wood, is more resistant to wear than horizontal bedding. In any event it is very common at small falls, and, especially in

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but we might, from our observations this summer, suggest two things: first that they require a reasonably steep gradient, and second that the rock must be homogenous and without conspicuous joints, so that it will be disposed to wear away rather than break off in chunks. The type of rock seems less important. Potholes are found in both limestone and schist, but not, so far as we know, in shale, nor in quartzite, and probably not in gneiss. It appears from this that they can occur in rocks of a range of hardnesses, but neither in very hard nor in very soft rocks.

the central Green Mountains where the rocks are intricately folded and vertical bedding is common, is perhaps the commonest cause of irregular stream profiles in the state.*

10. Receding falls (recognizable by undercut bases and downstream gorges) are uncommon. As mentioned above there are a few receding falls associated with large limestone gorges. There are also a number of mountain falls that are undercut; some of these are clearly receding and others may recede someday. But such sites are far less common than ones at which the face of the falls is parallel to the bedding, without noticeable undercutting or a downstream gorge. Hence, it seems like that, while moving waterfalls occur, the majority of our falls, especially in schists and quartzites, are stationary.

Returning to our superficial classification of falls and gorges by size, it is logical to ask if certain types of falls or gorges tend to be associated with certain types of rocks. This can be determined from Table 3, which gives the number of sites where different types of rocks occurred, and the number of each sort of feature (small gorges, large gorges, etc.) at these sites.

TABLE 3

TYPES OF FEATURES ASSOCIATED WITH PARTICULAR ROCKS

Rock	# Sites*	Number of Features**			
		Small Falls & Cascades	Large Falls & Cascades	Small Gorges	Large Gorges
Schist & phyllite Schist	37	27	12	6	9
Quartz granulite & conglomerate	4	1	1	1	1
Phyllite	8	5	2	1	
Quartzite	9	6	2	3	
Limestone	12	5	2	5	1
Dolomite	9	3	3	3	3
Granite	4	2	2	1	
Slates	3		1	2	1
Gneisses	2	1		2	
Amphibolites	2		3		
Greywacke	2		2		

* Number of sites at which this rock type occurred.
** Number of features of this type at sites with a given rock type; note that a single site can have several kinds of features.

*Our subsequent work on whitewater rivers provided additional confirmation of this: in that study we looked at the small ledges and rock-lined chutes that create the turbulence in many whitewater rivers, and found that the vast majority of them are associated with vertical or high-angle bedding.

No strong patterns emerge from Table 3, but we can use it as the basis for several weak generalizations and negative results:

1. The number of sites of a particular rock type is roughly proportional to the abundance of that rock in the state. Thus, there is no evidence that falls and gorges are more common in some types of rock than others.

2. Every type of falls and gorge can occur in schist.

3. Gorges appear to be relatively more common in limestone and dolomite than in harder rocks, but the difference is not great.

4. Large features of any kind are quite uncommon in quartzite, gneiss or granite. They are relatively much more common in slate, phyllite and limestone.

5. Both of the sites where greywacke occurs had large falls or cascades, though with only two sites surveyed, this might be coincidence.

6. Rocks of all ages occurred at the sites, but precambrian rocks were rare at falls and gorges, despite the extensive occurrence of precambrian rocks in south central Vermont.

7. No obvious geographic patterns in the incidence of different sorts of sites were discernible.

Looking at these results, we might venture the following tentative generalization: the presence of a certain type of geomorphological structure may not depend so much on the particular type of rock present as on whether the appropriate contrasts of hardness and erodability occur within that rock, or between that rock and adjoining formations. In limestone terrain there are complicated patterns of joints and layers, and gorges and falls - especially receding falls and gorges formed by the recession - are common. In the terrain dominated by schists, lithologies are more homogenous but there has been much complicated folding and hence, much local variation in erodability, and falls and gorges of all types are common. Our schists may be comparatively less fractured and jointed than our limestones, and this may be why carved features seem somewhat more common than in the limestones, and receding falls rarer. Finally, quartzite and gneisses and granites are very homogenous hard rocks, often without much jointing, and perhaps more uniformly erodable than the softer rocks. They produce falls and gorges in places where they adjoin softer rocks, but many falls and gorges may be less common in regions where they are the dominant rocks (the precambrian highlands of the southern Green Mountains, for example) than elsewhere. They tend to chip off rather than wear away and so rarely produce sculptured surfaces, at least in Vermont.*

* Since this was written we have examined a number of whitewater streams, and found that the streams on precambrian gneisses and quartzites tend to have large numbers of large, round, fairly mobile boulders in their beds. In addition their beds are very smooth, and lack the small ledges and cascades characteristic of many streams on cambrian and younger rocks. We now suspect that this is because the mobile boulders grind the stream beds smooth, but it is still possible that the lack of conspicuous joint systems and bedding planes in the older rocks may be involved.

4. THE TYPES OF SITES AND THEIR ABUNDANCE

Compiling the results of the surveys using a simplified classification we can get a rough picture of the abundance of various sorts of falls and gorges in Vermont.

Tiny falls or cascades from one to three feet high probably occur on almost every stream in the state, and are not worth noting individually.

Small falls or cascades from three to 20 feet high are common on mountain and headwaters streams, and also occur, though less frequently, on larger streams. We noted a total of 45 falls or cascades under 20 feet high in this survey, and assume that two to five times that many exist which are unknown to us. Table 4 (at the end of this section) lists the sites at which there are only small cascades and falls.*

These small cascades and gorges differ in importance. About half of them are either very pretty natural areas or are popular recreational areas or both, and are what we call either locally important or moderately important sites.

Since many small cascades and falls are currently unknown or unlisted it follows that there are a number of important sites not on our list. We do not advise that a systematic attempt be made to locate these sites and survey them, since at present there is not much pressure for the development and alteration of small sites. But since many small sites have local or statewide importance, we do advise that a careful field check be made when there is a proposal to develop or alter a small site that has not been surveyed here.

Large falls and large cascades are rarer. Only 22 were found. They are listed by size in Table 5 (at the end of this section). The highest site would be the steep falls and cascade at Benjamin Falls, about 320 feet high. If you agree to regard the two falls at Carver Falls as a single large falls, the second highest waterfall in the state is 120 feet high. (And this seems fair: if you rode a barrel down Carver Falls you would very quickly be 120 feet lower than when you started, though there would be a bump and a bit of cascading in the middle.)

Twenty of the 22 large falls and cascades were within one-quarter mile of a road. Nine are on large and medium streams in the lowlands and 12 on smaller streams in the mountains. Nine of the mountain sites are important recreation areas; the other three are on brooks used for hydropower or water supply and have dams above them and reduced summer flows. Six of the nine

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* Since this table was compiled at least 20 more small falls have been encountered which are not included in this report.

lowland sites currently have major dams above them, and hence, much reduced flows. A permit has been issued for the construction of a dam at one of the three remaining undammed lowland sites.

Let us stress the last fact: so far as we know there are only two places in Vermont where a large waterfall on a medium-sized or large stream has natural flows, and where you can see a falls or cascade 20 feet high or more on a large river without seeing a dam as well.

In the course of our study we did not encounter any large falls or cascades that were not on the DWR&EE map.* We still suspect that unknown large falls and cascades exist, but think that they must be either quite rare or quite remote or both. The best chance for finding them is to look for high falls on very small brooks, somewhat like the 50 foot falls on Baldin Brook in Wolcott. At present we have no way of knowing how many such falls might exist.

Because an undisturbed high falls or cascade would automatically be a very valuable natural area, it might be worthwhile to survey mountain streams for unknown large falls. Such a survey is not a high-priority matter for the state, but would certainly be an interesting thing to do in the future.

Gorges are apparently less common than falls. This is partly because many gorges have a falls or cascade in them but many falls and cascades do not have a gorge. It is also because gorges are not as attractive as falls and cascades and may be under-reported.

We surveyed 18 small gorges and 16 large ones. Twelve of the 18 small gorges were associated with a falls or cascade. All the gorges had streams in them, and so far as we can tell all the gorges are the direct results of fluvial erosion. Table 6 summarizes the small gorges, and Table 7 the large ones. (Both tables are at the end of this section.)

Our definition of a gorge (any site with ten foot high, paired, rock walls) is broad, and hence, the small gorges described here are a small sample - perhaps only 10% - of the small gorges in the state. Most small gorges are modest places which differ only slightly in biology and attractiveness from the woods around them and do not merit special consideration as natural areas. But this is not universally true: some small gorges are very beautiful, and others have interesting plants, particularly mosses. Hence, it should not be assumed that because we have a lot of them we can mess up as many as we want, or that because they are smaller than the large gorges they are automatically less important. Some are very important natural

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* Since this was written we have collected reports of several unsurveyed large falls and gorges.

features, and get just as much attention from conservationists as the large gorges.

The major gorges are all on medium-sized and large rivers, and we think it unlikely that a mountain brook could cut a gorge 40 feet deep. All of the large gorges are near roads, which would be expected since essentially every major river in the state has roads following the valley.

Because of the association of large gorges with major rivers and medium-sized rivers we do not think it likely that there are any unknown large gorges.

Five of the large gorges are what we have called "New York" type gorges: steep-walled gorges in soft rock formed by the recession of a large waterfall.

Ten of the 17 large gorges have dams; at seven of the dam sites the gorge is dammed at the top and the flow restricted. At the other three, the dam is below and the gorge is flooded.

Thus, only seven of the large gorges currently known in Vermont, have not been altered by a dam. Only one of these, the Big Falls of the Missisquoi, is on a big river. It is a treasure: originally there were five large falls and six large gorges on the major Vermont rivers. At present, the Big Falls is the only site where either a large falls or a large gorge can be seen in their unaltered condition. (It is also the only "New York" type gorge without a dam, and also an important botanical site.)

Brockway Mills, one of the four large gorges without a dam, is currently proposed as the site for a hydroelectric project. The project would not damage the gorge or the flora, but it would place some large structures within a large gorge and gorges such as this are rare in Vermont.

Potholes and sculptured rocks are found at a number of different kinds of sites. Table 8 (at the end of the section) lists 13 sites at which we found large sculptured features. Small potholes and minor sculpturing were found at several other sites.

Chains of pools and cascades seem to occur mostly on mountain streams, or, less commonly, on larger streams in upland valleys. None have been found on major rivers, and none in the Connecticut and Champlain lowlands. We believe that they are associated with high-gradient streams that carry fairly coarse bedload. They are frequently associated with gorges: we currently know 12 major chains of pools in the state, and eight of the 12 are either in or directly below a gorge. Table 9 (at the end of the section) lists the major pool chains found in the survey.

Almost all the chains of pools are valuable sites. Many afford excellent swimming, and by good fortune all of them are largely undisturbed and have in consequence much natural beauty. Several are one-half mile or more from a road, and are among the very few sites we surveyed to which there is not direct road access. Others, particularly Cavendish Gorge and Brockway Mills Gorge, are near roads but are in deep gorges and when you are in them you seem very isolated. Cavendish is a popular local swimming area, and there are trails and you can climb down into it at several places, but when you have been in it alone for an hour or two you come to believe you have at least a planet to yourself, and are surprised if you meet another person.

The pool chains are often very pretty places, modest and pleasing and fitting the scale of the countryside. In many ways it is far more satisfying to ascend a series of small falls than to come upon a single large falls in an otherwise ordinary stream. The single falls seems anomalous and accidental; you are there and see it and it is all done. Because it is anomalous it has not told you anything about the character and energy of that stream, or of the way the valley is put together. A chain of pools leads you on and shows you how the rock changes and how the stream has used its liveliness and imagination, and hence, is a more thorough expression of the structure and personality of the whole mountain.

We thus find pool chains fascinating places to visit, appropriate to our landscape and expressive of it. We have come to think of them as a distinctly New England feature, natural in our country just like high granite falls are in the Adirondacks, or deep "shut-in" gorges and falls in the Ohio Valley. Hence, we value them highly, and are pleased that a number of fine ones exist and are still wild, and even more pleased to think that there are likely a number in the mountains that are as yet undiscovered.

TABLE 4

SITES CONTAINING SMALL CASCADES OR FALLS BUT NO LARGE CASCADES OR FALLS AND NO POOL CHAINS*

Site	Features Present**	Comments
Allen Brook Cascade	SC	industrial site
Bellows Falls	SC, SG	industrial site, former site for *Astragalus alpinus*
Blake Falls	SF, SC	small falls in woods
Covered Bridge Falls	SC	a sign says you can walk your dog here
Devils Pothole	SF, SC	big potholes carved out of rock
Dogs Head Falls	SF	undisturbed site, fine view, nice rocks, good swimming
Duck Brook Cascades	SF, SC	on Long Trail, important because remote and popular with hikers
East Calais Cascade	SC	a lot of junk dumped here
Falls of Black River	SF	chunks of an old bridge around
Falls of Little Otter Creek	SC	wide but not high
Highgate Falls	SG, SF	fine rocks, former site for *Anemone multifida*, needs more summer flow, existing hydro site
Jelly Mill Falls	SC, SF	popular swimming site
Kelly River Falls	SC	several small cascades in a chain with small pools, nice rocks, good swimming
Lana Falls	SC	nice rocks, popular recreation site
Lower Falls of Union Village	SC	would be flooded by proposed hydro project
Lower Green River Falls	SC	proposed to be dammed

Table 4 (Continued).

Site	Features Present**	Comments
Lulls Brook Ravine	SC	pretty place, unusual in this part of the state, recently dammed for hydro (11/85)
Marshfield Falls	SC	low cascade 100 yards long; hydro plant has been approved for this site
Nelson Brook Gorge	SG, SF, SC	granite gorge with exemplary mosses, only site for _Neckera pinnata_ in our study
New Haven River Cascades	SG, SF, SC	nice rocks, exemplary biology, pretty view, good swimming
North Branch Falls	SF, SC	good swimming, nice rocks
Northfield Falls	SC	more average than most
Pikes Falls	SC	popular swimming place
Roaring Brook Cascade	SC	very small site
Seven Falls of Huntington River	SC	rocks average to nice
Shelburne Falls	SC	one of the most northern sites for _Platanus occidentalis_
Sutton Brook Falls	SF, SC	small site altered by I-91
Tillotsons Mills	SC	
Twin Falls	SF, SC, SG	good swimming
Upper Falls of Union Village	SC	developed as a recreation area, nice rocks, popular place
Upper Green River Falls	SC	
West Branch Falls	SC	possibly a good site for mosses, locally popular site, fine rocks, moderate seclusion
Willoughby River Falls	SC	famous rainbow trout migratory route

* The sites with no annotations are thoroughly unremarkable.
** SG = small gorge, SF = small falls, SC = small cascade

TABLE 5: LARGE FALLS AND CASCADES

Site	Type	Height x Width (Feet)	Comments
Benjamin Falls	falls and cascades	320 (total) x 15-30	falls and cascades near Montpelier, secluded spectacular in spring pretty ravine 2,000-2,500 feet long
Marshfield Falls	large cascade	200	cascade 100 yds. long, hydro plant has been approved for this site but developer at this time has decided not to develop the site
Carver Falls	two falls and large gorge	120 (total) x 250	big dam & power plant
Mollys Falls	steep cascade	100 x 10-20	dam above; dry all year except the spring
Moss Glen Falls II	cascade plus falls	100 (total) x 10	mountain stream, popular recreational site, state natural area
Thundering Falls	large cascades	75 x 15	popular recreational site now degraded by logging and some construction
Crystal Cascade	large cascade	70 x 50	popular wooded site; pretty dry in summer
Fairfax Falls	45 degree cascade	60 x >100	dam and power plant
Barnet Falls	45 degree cascade	60 x 6	rock chute cuts across a cliff
Sutherland Falls	steep cascade	60 x 75 ?-100	dam, industrial plant badly polluted
Hamilton Falls	steep cascade	50 x 10	popular recreational site
Baldin Brook	falls	50 x 3	mountain stream, small dam, falls damaged by new road

TABLE 5: LARGE FALLS AND CASCADES (Cont.)

Site	Type	Height x Width (Feet)	Comments
Emerson Brook	cascade	40 x 30-50	important swimming area
Bingham Falls	falls and cascade	20 x 5, 20 x 5	mountain stream, popular recreational site
Moss Glen Falls I	steep cascade	30 x 10	mountain stream, popular recreational site, state natural area
Boltonville Falls	steep cascade	25 x 10	dam and power station, developed for hydro in 1984
North Hartland Falls	two cascades	both 25 x 10-20	dam; pretty site
Big Falls of Missisquoi	steep cascade	25 x ? 50	only undammed large falls on a large river
Web Falls	falls	25 x 50	large undammed falls
Old City Falls	falls	20 x 15	undisturbed ravine
Woods Falls	cascade	20 x 50	dam and powerhouse
Glen Falls	cascades	25 x 10	mountain stream, tiny dam above the site

TABLE 6: SMALL GORGES

SG = small gorge, LG = large gorge, SF = small falls, LF = large falls, SC = small cascade, LC = large cascade, PC = pool chain

Name	Other Features at Site	Comments
Flower Brook Gorge	SG	industrial site
Middlebury Gorge	SG, SF, PC	high priority site, very wild, fine rocks, exemplary biology, possibly rare mosses
New Haven River Cascades	SG, SF, SC	nice rocks, exemplary biology, pretty view, good swimming
Battell Gorge	SG	small gorge on large river, undammed, undisturbed, very pretty; threatened by hydro proposal
Highgate Falls	SG, SF	fine rocks, former site for <u>Anemone multifida</u>, needs more summer flow; dam to be raised (existing hydro site)
Ithiel Falls Gorge	SG	barely a gorge
Baldin Brook Falls and Gorge	SG, LF	fine falls on a small stream recently damaged by the access road to a small hydro dam, exemplary biology
Wrightsville Gorge	SG	old mill site
Nelson Brook Gorge	SG, SF, SC	granite gorge with exemplary mosses, only site for <u>Neckera pinnata</u>
Moretown Gorge	SG	small site
Bingham Falls	SG, LF, LC	spectacular rocks, fine sculpture, former site for <u>Osmorhiza obtusa</u>, popular site, perhaps threatened by housing developments
Texas Falls	SG, SF, PC	handsome rocks, exemplary, major tourist site in GMNF
Quechee Village Falls	SG	falls degraded by dam, <u>Cinna arundinacea</u> present
Saxtons River Falls	SG	dam being rebuilt
Twin Falls	SF, SC, SG	good swimming
Glen Falls	SG, LC	small dam at top of gorge for drinking water supply
Sheldon Falls	SG	waterfall has been destroyed by a dam
Belden Falls	SG	small gorge below a dam

TABLE 7: LARGE GORGES

Site	Dimensions*	Comments
Quechee Gorge	150+ x 1,000+	total depth about 160 feet; sloping walls, formerly many rare plants; dam at upper end
Bolton Falls	100 x 1,000+	major river; flooded by a dam at the bottom; used to have a falls where dam is
Carver Falls	80 x 500+	major river; "New York" type gorge with large falls at head of gorge; dam above falls; gorge gets little summer flow because of dam; flows reduced year round
Cavendish Gorge	80 x 1,000+	sculptured gorge, in places deep and narrow dam at head of gorge; fine mosses
Clarendon Gorge	75 x 800	wide gorge with vertical sides; fine mosses; chain of pools and cascades; popular recreational site
Brewster River Gorge	75 x ?	pretty woodland site, popular recreational area
Lime Kiln Gorge	70 x 700	major undammed gorge in an urban setting; formerly had six rare plants; now has two uncommon ones
Winooski Gorge	50-80 x ? 2,000	dammed gorge in industrial setting; formerly with the best limestone gorge flora in Vermont, but now much diminished by damming and alterations
Big Falls of Missisquoi	60 x 250	undammed gorge and large falls on a major river
Middlesex Gorge	60 x 1,000+	major river; flooded by dam on the lower end; no falls
Woods Falls	60 x ? 300	major river; "New York" type limestone gorge; dammed above gorge

TABLE 7: LARGE GORGES (Continued)

Site	Dimensions*	Comments
Brockway Mills Gorge	50 x 1,000	scenic, undisturbed gorges with pretty rocks and various small pools and cascades; threatened by a proposed dam
Sutherland Falls	50 x ? 400	"New York" type limestone gorge, dam above industrial plant on one bank and below
Williston Gorge	35 x 500+	dolomite gorge in industrial setting with two rare plants
Huntington River Gorge	40 x 200	very narrow sculptured gorge, formed from a chain of potholes; beautiful rocky; popular scenic attraction and recreational site
Great Falls of Clyde	50 x 800	"New York" type limestone gorge with vertical walls and a small cascade at the top; dam above, penstock along one wall, powerhouse below

* Maximum height of rock walls x length, in feet.

TABLE 8

SITES WITH MAJOR SCULPTURED FEATURES

Site	Comments
West Branch	rippled rocks, small potholes
Middlebury Gorge	sculptured gorge walls, rock-rimmed pools
Cavendish Gorge	sculptured gorge walls, rock-rimmed pools
Huntington Gorge	sculptured gorge walls, rock-rimmed pools
Texas Falls	sculptured gorge walls, rock-rimmed pools
Clarendon Gorge	sculptured boulders and pools
Woods Falls	sculptured walls and potholes
Hamilton Falls	large pothole pool
Devils Pothole	large potholes
Belden Falls	potholes, fissures in rock islands, stream channel makes tunnel under an island
Bingham Falls	potholes
Brockway Mills Gorge	potholes and sculptured rocks
Bristol Memorial Etc.	potholes
Web Falls	one sculptured ledge
Lime Kiln Gorge	small water-cut caves

TABLE 9

CHAINS OF POOLS AND CASCADES

Site	Comments
Woodbury Falls	small gorge and one-quarter mile chain of pools and cascades; remote and undisturbed site
Hamilton Falls	major cascade and recreational area near road; then one-half mile chain of pools and cascades, these largely remote and undisturbed
Terrill Gorge	one mile long chain of pools and cascades; partly near road and heavily used, part remote
Rock River Cascades	one-half mile chain of cascades and pools, wild and remote
Middlebury Gorge	deep ravine, fairly remote because inaccessible, with one mile of cascades and pools; also segments of gorge
Texas Falls	small carved gorge and 600 foot chain of pools and cascades; major tourist site in National Forest
Clarendon Gorge	one-quarter mile chain of pools and cascades within a large gorge; very popular recreational site
Cavendish Gorge	one-quarter mile long chain of pools and cascades in a gorge below a dam; wild but not remote, used for swimming; very pretty
Brockway Mills Gorge	about 1,000 foot chain of pools and potholes along a zigzag stream in a large gorge; wild and secluded but not remote; pretty place; threatened by a hydroelectric project
Sterling Brook Gorge	about 400 foot chain of cascades and pools, in a small gorge on a mountain brook; moderately remote and secluded, but gets local use; accessible by a jeep trail; some logging nearby
Mill Brook Cascades	remote set of low-angle cascades and pools in dense boreal forest; pretty but not exceptional, threatened with a dam
Granville Cascade Chain site	about one-quarter mile long chain of pools and cascades; lovely remote

5. BOTANY

As explained in Chapter 1, plant community surveys were done at all the sites, detailed vascular plant inventories at about two-thirds of the sites and detailed moss inventories at about one-third of the sites. As a result, we can give a nearly complete account of the vascular plant flora of gorges and waterfalls and a preliminary account of the bryophyte flora.

5A. Vascular Plant Communities

By a plant community, we mean a group of plants commonly found together at a site of a particular type. The notion of community thus implies proximity and usually some ecological uniformity. It does not imply mutual dependence or interrelatedness.

Any classification of communities is perforce a descriptive convenience and not a delineation of natural boundaries; hence, we do not concern ourselves overmuch with the nomenclature or exact enumeration of communities.

Many different plant communities occurred at our sites, but so far as we can determine, there is no community of vascular plants that is restricted to or even best developed in gorges or near falls. (There are, as will be discussed below, a few rare species more common here than elsewhere, but since they do not regularly associate with one another, they are not a community.) Falls and gorges tend to be places where different communities meet and this is because they are places where habitat and substrate change abruptly - soil meets rock, woods meet the open, dry meets wet, flat meets steep, and so on. Ecologically, they are a lot of different edges jumbled together, and their flora usually consists of a mixture of species - often the more tolerant or opportunistic ones - from several different communities.

The major plant communities of falls and gorges are very familiar ones in the state, and may be listed here without detailed description.

1. **Hemlock-hardwoods community.** Hemlock-maple-birch-beech woods, with a small group of understory plants, mostly ferns and a few spring wildflowers and a few asters. It is an extremely common community in wooded ravines in Vermont, and is found at well over half the waterfall sites we looked at.

2. **Spruce-fir community.** An even simpler flora, with ferns and about five herbs. It is rare, at least at the waterfalls we surveyed.

3. **Shaded ravine bottom and slope community.** This is a community of plants that like rich, wet, shady, soils near streams and falls. It is commonly found in springy places

on banks and in flat areas just above streams. Its composition varies with the amount of lime in the soil, and is often a lush but never a very diverse community. Common species are bulblet fern, wood nettle, jewelweed, etc. It is common throughout the state and was found near many woodland falls.

4. **Acid cliff and ledge crest community.** A sparse and common community of exposed acid rocks, consisting of mostly a few grasses, blueberries and a few other shrubs, often a few tree seedlings (especially birch, hemlock and pine), a sedge or two, and a few herbs.

5. **Dry limy cliff and ledge community.** This develops on open limestone ravine slopes and ledges: it is most characteristic of dry limy cliffs at low altitudes in western Vermont; it is never well developed at falls and gorges but can be seen to varying extents at Milton Falls, Missisquoi Big Falls, Sheldon Falls, etc. So far the limestone falls and gorges have not proved to have very diverse floras compared to the lime cliffs elsewhere in the state, but they still need more study.

6. **Wet limy cliff community.** This is a community best developed on cold, damp, partially exposed limestone cliffs, especially in the high mountains. The community as a whole is not seen on river cliffs, but interestingly enough, some of the rare species from that community have, as it were, second homes on river cliffs and in gorges. They will be discussed in the section on rare plants below. Otherwise this is a moderately diverse community, with a number of scarce species.

7. **Spray zone rocks and channel edge.** No real community; just a few vascular plants; mostly a few ferns and grasses.

8. **Gravel bar community.** Weedy species, including many annuals, developing late in the season on channel bars. Very common community all along rivers, not restricted to the falls: dogbane, several willows, cockspur grass, several love and panic grasses, etc.

The most important thing to note here is that none of these communities is peculiar to falls and gorges. The vertical walls of large gorges and the channel rocks of cascades and falls are spatially limited and often violent environments, and perhaps this is why they have not developed a more distinctive vascular flora.

The flatter parts of falls and gorges do not usually have interesting groups of vascular plants, and hence, there is rarely any conflict between the recreational use of a falls and the preservation of its botanical value. Such a conflict can occur when rare species are present, but so far most of the rare species we have found are restricted to ledges and cliffs, and not in places where trampling or picking is a problem.

5B. Mosses and Liverworts

Mosses and liverworts - collectively bryophytes - are the dominant plants of moist rocky places, and important at many falls and gorges. A major object of this study was to identify the common species at the sites we visited and to determine how rich the sites were in species and whether rarities were present.

The results that follow are, at most, partial. Bryophyte identification is slow and technical, and so we were only able to investigate about a third of the sites, and are still uncertain about the identity of a number of species. Also, there are several interesting groups - the Pottiaceae, Mnium, Isoptyrigium and its relatives, Cephalozia, Lophozia - in which we were not able to identify the material to species at all.

Even with partial information, a number of conclusions are possible.

First, we identify about 100 bryophytes in all (Table 11, at the end of this section). Counting material that has not been identified yet we probably collected all 120 species. Doubtless others exist at the sites, but we were noting much repetition of species from one site to the next, and so would estimate, roughly, that the main bryophyte flora of gorges and waterfalls would include about 150 species. This is less than half the total vascular flora, but this is partially because we listed vascular plants from many different microhabitats, but limited our moss collecting largely to rock walls.

Second, diversity was high at the good sites. We identified about 40 species from our best sites and are sure that others are present at those sites. (Roy Perry, a bryologist from the University of Cardiff, Wales, surveyed Clarendon Gorge with us and estimated 50-60 species there.) This is about double the number of species found in a normal woodland or small wetland, and it seems that these gorges are most likely equal in diversity to the best bryophyte sites anywhere in the state.

High diversity sites are important since they are our richest localities and are our measure of how much can grow in one spot, and also since they are exciting places for naturalists to see and explore. Our preliminary survey indicates that the best falls and gorges are (as was suspected) among the most important sites for mosses and liverworts in the state.

Diversity varied a great deal: it was lower at acid sites than limy ones, low in the sites where there were great annual variations in the water level (which scour the channel and walls and limit the living space available), and low at open sunny sites. It was also low at some gorges where water was diverted for power generation. We think, without having definite proof, that when water is diverted the humidity in a gorge decreases and that this harms the bryophyte community.

Third, as was the case with the vascular plants, the bryophytes at most sites were a mixture of species from several communities: woodland species, channel species, species of wet rocks, species of dry rocks and species of seepage areas. The species intermingle in many different combinations depending on what substrates and conditions occur next to one another, and it does not seem useful to us to separate them into communities. Instead we have chosen to just list the habitat preferences of individual species insofar as we can make them out.

Table 11, at the end of this section, lists the bryophytes found and their habitats. Table 15 lists important sites that either had high diversities or seemed to us good representatives of the type of community occurring at a particular kind of site.

5C. Rare Vascular Plants

Some 42 vascular plants that we believe to be rare in Vermont were formerly or are currently known from falls or gorges; in addition another ten species occur at one or more falls and gorges and are scarce in the state.* The rare plant records are listed by species in Table 13 and by site in Table 14, both at the end of this section.

Of the 42 rare species that have been recorded from waterfalls or gorges, we have current records for 36 (31 of these are known from rivers, five from other habitats). The other six (**Astragalus alpinus**, **Astragalus robbinsii** var. **robbinsii**, **Halenia deflexa**, **Lupinus perennis**, **Osmorhiza obtusa**, and **Pterospora andromeda**) are currently missing in Vermont, despite many attempts to find them. We think it likely that **Halenia**, which was formerly known from at least six Vermont towns, will be relocated. The other two were only known from a few stations each, and may very well have gone extinct.

The rare species are not all members of a single community: they include species of sandbars, woodlands, limy wetlands, limy ledges, acid ledges, dry sandy soil, and riverside thickets. But species of limy ledges predominate: about a third of the 42 rare species are normally restricted to limy rocks.

Most of the rare species are not restricted to falls and gorges, or even to riverside habitats. Many of them grow in limy woods, or on lake shores, or on acid and limy ledges that are not

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* To us, a rare plant is one known from fewer than ten contemporary stations in Vermont and a scarce plant is one known from ten to 50 contemporary stations.

near water. Several (Vaccinium cespitosum, D. fragrans, Potentilla tridentata, Solidago randii) are northern species that we normally see on alpine and subalpine cliffs. But nine of the 42 rare species are - in our area at least - only found along rivers. And two more species (Erigeron hyssopifolius, a rare species; Trisetum spicatum, a scarce species) are commoner on river ledges than in any other habitat.

Table 10 summarizes the status of the 12 species for which river ledges are the preferred Vermont habitat. As mentioned above, three are missing and two of these are feared to be extinct in Vermont. Another is very rare, while the others have substantial local populations and are not in any danger.

TABLE 10

STATUS OF RARE AND SCARCE SPECIES FOR WHICH RIVER GORGES ARE THE PREFERRED VERMONT HABITAT

Species	Historical Records	Current Records
Allium schoenoprasum	?	3
Anemone multifida	5	1 (one colony but in two towns, small population, threatened by a dam)
Astragalus alpinus	2	0 (searched for, not found, ? extinct in Vermont)
Astragalus robbinsii var. robbinsii	1	0
Aster tradescanti	9	about 10 (large local population)
Cinna arundinacea	?	10 (not principally on rocks)
Erigeron hyssopifolius	8	about 8 (large local populations)
Elymus wiegandii	?	4 (not principally on rocks)
Equisetum pratense	?	9 (not principally on rocks)
Halenia deflexa	4	0
Hypericum pyramidatum	?	3
Trisetum spicatum	25	>10 (occasional in Champlain Valley)

TABLE 10 (Continued)

Species	Historical Records	Current Records
Tofieldia glutinosa	5	3 (both along the Connecticut River)
Vaccinium caespitosum	9	about 6 (scattered locations)

Thus a total of four of the species restricted to river ledges, all formerly rare, have now become very rare or have vanished in Vermont. We do not know the reasons. All four are northern species, and it is possible that they have been affected by the warmer climate of the last 50 years. Several of them formerly grew in gorges that have been dammed; in some of the dammed gorges, part of the flow has been diverted, or summer flows are very low, or alternately the gorges have been partly flooded. Any of these changes might have eliminated populations, and we have no way of knowing which one or ones to blame. We do think that there was a definite cause for the decline of these species, and that they did not decrease as a result of chance fluctuations in small populations; our experience has been that small populations of cliff-dwelling plants tend to be resourceful and persistent, and can maintain themselves unless something interferes with their environment.

5D. Rare Bryophytes

Table 12 (end of this section) lists eight species of bryophytes which were only seen once or twice in the survey, and which may be rare or scarce in Vermont. At present there is no published compilation of bryophyte records for Vermont, and we have no way of knowing just how abundant many species are.

Other rarities are certainly present that we have not found. There are a number of sites with good bryophyte diversity that were not sampled. Also we certainly missed some rare species at the sites that we did sample. From the present survey we know that many of the gorges are dominated by bryophytes and have high species diversities; it is always true in field work that where you have high diversity and lush growth you get rare species, and so there is every reason to believe that many rarities occur besides the ones we noted.

TABLE 11

BRYOPHYTE FLORA OF WATERFALLS AND GORGES, WITH HABITATS*

Species	Habitat
Amblystegium riparium	rocks in channel
Amblystegium serpens	wet limy rocks in channel
Amblystegium tenax	rocks in channel
Amblystegium varium	rocks in channel or seepage
Anomodon apiculatus	limy rocks
Anomodon attenuatus	limy rocks
Atrichum undulatum	shaded soil and banks
Bartramia pomiformis	rocks, often limy, often spray zone
Bazzania denudata	shaded woods, on soil and stones
Blepharostoma trichophyllum	shaded limy schist
Brachythecium oxycladon	rocks
Brachythecium plumosum	wet rocks in channel
Brachythecium sp. (populeum ?)	moist rocks
Brachythecium rivulare	wet rocks and seepage, limy or acid
Brachythecium salebrosum	moist limy rocks
Bryhnia novae-angliae	limy rocks
Bryoerythrophyllum recurvirostrum	limy rocks in spray zone
Bryum pseudotriquetrum	limy seepage
Bryum sp.	weedy, sandy soil
Calypogeia trichomanis	wet soil in shade
Campylium chrysophyllum	wet limy rocks
Campylium sp. (polygamum ?)	wet limy schist
Cephalozia sp.	rocks, soil
Ceratodon purpureus	weedy, sandy soil
Climacium dendroides	moist soil
Cololejunea biddlecomiae	limy schist
Coniocephalum conicum	rocks in spray zone, common
Crateneuron filicinum	limy rocks
Dicranum fuscescens	rocks
Dicranum scoparium	shaded wood, rock, soil
Diplophyllum apiculatum	shaded limy rocks
Drepanocladus aduncus	wet limy rocks and seepage
Drepanocladus fluitans	rocks in channel
Drepanocladus uncinatus	dry limy rocks
Encalyptra ciliata	limy rocks
Entodon seductrix	limy rocks
Eurynchium hians	rocks in channel
Eurynchium riparioides	rocks in channel
Fissidens adiantoides	wet shaded rocks, spray zone
Fissidens bryoides	wet shaded rocks, spray zone
Fissidens cristatus	wet limy rocks
Fissidens taxifolius	limy rocks
Frullana sp.	limy rocks
Funaria hygrometrica	weedy, on soil
Grimmia alpicola	dry rocks or spray zone, limy or acid

TABLE 11 (Continued)

Species	Habitat
Gymnostomum aeruginosum	limy schist
Gymnostomum sp. (recurvirostrum ?)	wet limy rocks
Hedwigia ciliata	dry acid rocks
Herzogiella striatella	rocks and soils
Homallia trichomanoides	shaded granite
Homomallium adnatum	limy rocks
Hygrohypnum sp. (luridum ?)	rocks in channel
Hygrohypnum eugyrium	limy rocks in channel
Hylocomium splendens	soil, rocks, in shade
Hypnum curvifolium	shaded limy schist
Hypnum imponens	wood
Hypnum lindbergii	wet limy rocks
Hypnum sp. (Revolutum ?)	shaded granite
Isoptyrigium distichaceum	acid rocks in spray zone
Lejunea cavifolia	limy rocks
Leucobryum glaucum	shaded soil
Lophozia sp.	shaded rocks and soil
Marchantia polymorpha	wet limy rocks
Marsupelia emarginata	wet acid rock
Metzgeria conjugata	wet ? limy rocks, spray zone, in shade
Mnium (double-toothed group)	wet rocks
Mnium (single-toothed group)	wet rocks
Mnium punctatum	wet rocks
Mylia sp.	shaded limy schist
Myurella sibirica	shaded limy rocks
Paraleucobryum longifolium	shaded rocks
Pellia epiphylla	spray zone rocks, soil
Philonotis fontana	seepage areas
Philonotis marchica	seepage and wet rocks
Plagiochila asplenioides	rocks in channel and spray zone
Plagiothecium denticulatum	shaded rocks, often in spray zone
Plagiothecium laetum	acid rocks in spray zone
Platydicta sp.	limy schist
Pleurozium schreberi	shaded rocks, wood, soil
Pogonatum alpinum	rocks and soil, often in spray zone
Pogonatum urnigerum	rocks and soil, lime and acid
Pohlia cruda	? shaded soil
Pohlia wahlenbergii	limy seepage
Polytrichum juniperinum	soil
Polytrichum piliferum	dry acid soil and rocks
Porella platyphylloides	limy rocks
Preissia quadrata	limy rocks
Ptilidium pulcherrimum	wet rocks
Radula complanata	limy rocks
Rhacomitrium aciculare	wet rocks in channel
Rhynchostegium serrulatum	limy schist
Rhytidiadelphus triquetrus	shaded limy schist
Scapania nemorosa	shaded rocks in spray zone

TABLE 11 (Continued)

Species	Habitat
Sphagnum squarrosum	peaty wooded banks
Thamnobryum alleghaniense	wet limy schist
Thuidium delicatulum	rocks and soil in shade
Timmia megapolitana	limy rocks
Tortella tortuosa	limy rocks
Tricholea tomentella	moist limy schist in shade
unknowns from Pottiaceae	limy rocks

* A question mark after a species epithet indicates uncertainty in the identification beyond the genus level.

TABLE 12

BRYOPHYTES FOUND AT FALLS AND GORGES THAT MAY BE SCARCE OR RARE IN VERMONT

Species	Site
Bryhnia novae-anglia	Clarendon Gorge
Bryhnia novae-anglia	Baldin Brook Gorge
Entodon seductrix	Allen Falls
Homalia trichomanoides	Nelson Brook Gorge
Isoptyrigium denticulatum	Baldin Brook Gorge Woodbury Falls
Metzgeria conjugata	Rock River Cascades
Thamnobryum alleghaniense	Rock River Cascades
Timmia megapolitana	Clarendon Gorge Lulls Brook Ravine

TABLE 13

RECORDS OF RARE VASCULAR PLANTS FROM FALLS AND GORGES

(H = historical record, plant thought to be extinct at the site; C = contemporary record, plant currently exists at the site; rare = fewer than ten current Vermont stations; occasional = ten to 50 current Vermont stations.)

Species	Site	Type of Record	Status in Vermont
Allium schoenoprasum var. sibiricum	Quechee Gorge	H	three current records
	Sumner Falls	C	
Anemone multifida	Highgate Falls	H	one current station (proposed as a state endangered species)
	Lime Kiln Gorge	H	
	Quechee Gorge	H	
	Winooski Falls	C	
	Winooski Gorge	H	
Aster tradescanti	Big Falls of the Missisquoi River	C	ten current stations
	Lime Kiln Gorge	C	
	Middlesex Gorge	C	
	N. Hartland Falls	C	
	Bakers Falls	C	
	Sumner Falls	C	
	Williston Gorge	C	
Aster undulatus	Sutton Brook Falls	C	occasional, rare in north
Astragalus alpinus	Bellows Falls	H	no current stations
Astragalus robbinsii var. jesupi (= A. jesupi)	Sumner Falls	C	(in NH) two current stations, VT/NH endemic (proposed as a state endangered species)
Astragalus robbinsii var. robbinsii	Winooski Gorge	H	extinct, VT endemic

6. USES

Falls and gorges are commonly used for recreation and to generate power.

6A. Power Plants and Dams

Power generation requires head (water higher than the generator) to drive the machinery, and usually a reservoir to hold water for use when natural flows are low. Commonly in Vermont, a waterfall or cascade or steep gorge is used to supply the head. A typical installation consists of a low dam upstream of the gorge or falls that stores water, a penstock diverting water under pressure downhill and around the site, and a powerhouse at the base of the site. Less commonly, the storage dam is made high enough to supply the head, and the powerhouse is right at the foot of the dam.

Dams are common: 32 out of the 78 sites we visited that had gorges or falls had dams, and of the 31 sites where there was a large falls or cascade or gorge, 17 had dams. If we look only at large falls or gorges on the five largest rivers, out of the 11 such sites in the state, nine have dams. And if we look at all sites on the five largest rivers, 14 out of 17 have dams.

The effects of dams vary. In some cases they completely alter the appearance and biology of the site. In others, they hardly intrude. In still others, they are not physically obtrusive but alter the flow and character of the water. This last case is particularly interesting because it leaves the site physically unchanged but may have great biological effects.

While the situation differs from dam to dam, in general, power dams create periods of very low flows. Where the flow is diverted around the site, the whole falls or gorge may be without water year round and flows below the powerhouse may be alternately high and low.

Often problems with low flows are worse at old dams which have been used to generate electricity for a number of years because their operating licenses do not contain any provisions for maintaining flows. We saw a number of sites where the only flow over a falls or through a dam came from leaks in the dam or the flashboards.

Dams may alter the quality as well as the amount of water delivered to a gorge or falls. Several water quality problems are associated with artificial impoundments. These include low dissolved oxygen levels due to loss of aeration over the falls, hypolimnetic water withdrawal by the hydroelectric facility, and algal respiration and increased water temperature due to increased travel times through the river reach, increased exposure to solar radiation, loss of tree canopy and more extensive shallow zones.

TABLE 15 (Continued)

The following sites have small populations of a single very rare species:

Site	Botany
Beldens Falls	Sporobolus neglecta
Sheldon Falls	Hypericum pyramidatum
Winooski Falls	Anemone multifida (Proposed as a state endangered species.)

TABLE 15

IMPORTANT BOTANICAL SITES

Site	Botany
Baldin Brook Gorge	exemplary moss flora
Big Falls of the Missisquoi R.	important vascular plants
Clarendon Gorge	exemplary moss flora
Middlebury Gorge	exemplary moss flora
Nelson Brook Gorge	exemplary moss flora
New Haven River Gorge	exemplary moss flora
Quechee Gorge	formerly many rare vascular plants, but most of these may be gone
Rock River Cascades	exemplary moss flora
Sumner Falls	many rare vascular plants
Texas Falls	exemplary moss flora
Winooski Gorge	many important vascular plants

The following sites may have exemplary moss floras but have not been studied yet:

Moss Glen Falls I, II

Bingham Falls

Brockway Mills Gorge

West Branch Falls

Old City Falls

Battell Gorge

The following sites need to be resurveyed for rare vascular species:

Woods Falls

Carver Falls

TABLE 14 (Continued)

Site	Species	Type of Record	Status in Vermont
Williston Gorge	Aster tradescanti	C	ten current stations
	Blephila hirsuta	H	one current station (proposed as a state threatened species)
	Erigeron hyssopifolius	C	seven current stations
	Shepherdia canadensis	C	rare away from Lake Champlain
Winooski Falls	Anemone multifida	C	one current station (proposed as a state endangered species)
Winooski Gorge	Anemone multifida	H	one current station (proposed as a state endangered species)
	Astragalus robbinsii var. robbinsii	H	extinct, Vermont endemic
	Elymus wiegandii	C	four current stations
	Geranium bicknellii	C	nine current stations
	Hieracium venosum	C	nine current stations
	Isotria verticillata	H	one current station
	Oryzopsis pungens	C	one current station
	Panicum xanthophysum	C	five current stations (proposed as a state threatened species)
	Shepherdia canadensis	C	rare away from Lake Champlain
	Spiranthes lacera	C	three current stations
	Vitis aestivalis	C	occasional, rare in north
Woodbury Falls	Isoptyrigium distichaceum	C	not known

TABLE 14 (Continued)

Site	Species	Type of Record	Status in Vermont
Quechee Gorge (Continued)	Erigeron hyssopifolius	C	seven current stations
	Halenia deflexa	H	no current stations
	Tofieldia glutinosa	H	two current stations (proposed as a state threatened species)
	Woodsia alpina	H	one current station (proposed as a state endangered species)
	Woodsia glabella	H	seven current stations
Quechee Village Falls	Cinna arundinacea	C	ten current stations
Rock River Cascades	Thamnobryum alleghaniense	C	unknown
	Metzgeria conjugata	C	unknown
Sheldon Falls	Hypericum pyramidatum	C	three current stations
Sumner Falls	Allium schoenoprasum var. sibiricum	C	three current records
	Aster tradescanti	C	ten current sites
	Astragalus robbinsii var. jesupi (= A. jesupi)	C	(in NH) two current stations VT/NH endemic (proposed as a state endangered species)
	Toffieldia glutinosa	C	(in NH) two current stations (proposed as a state threatened species)
Sutton Brook Falls	Aster undulatus	C	occasional, rare in north
	Lechea intermedia	C	occasional, rare in north

TABLE 14 (Continued)

Site	Species	Type of Record	Status in Vermont
Lime Kiln (Cont.)	Aster tradescanti	C	ten current stations
	Cypripedium arietinum	H	11 current stations (proposed as a state threatened species)
	Isotria verticillata	H	one current station
	Lupinus perennis	H	no current stations
	Shepherdia canadensis	C	rare away from Lake Champlain
	Solidago randii	C	rare out of mountains
Lulls Brook Ravine	Timmia megapolitana	C	not known
Marshfield Falls	Rudbeckia triloba	C	ten current stations
Middlesex Gorge	Erigeron hyssopifolius	C	seven current stations
	Trisetum spicatum	C	occasional, rare away from Lake Champlain
	Solidago randii	C	occasional, rare out of mountains
	Aster tradescanti	C	ten current stations
Moss Glen Falls I	Blephila hirsuta	C	one current station
Nelson Brook Gorge	Homalia trichomanoides	C	not known
N. Hartland Falls	Aster tradescanti	C	ten current stations
Quechee Gorge	Allium schoenoprasum var. sibiricum	H	three current records
	Anemone multifida	H	one current station (proposed as a state endangered species)

TABLE 14 (Continued)

Site	Species	Type of Record	Status in Vermont
Big Falls of the Missisquoi River	Erigeron hyssopifolius	C	seven current stations
	Vaccinium caespitosum	C	five stations
	Solidago squarrosa	C	rare in north
	Aster tradescanti	C	ten current stations
	Trisetum spicatum	C	rare away from Lake Champlain
Bingham Falls	Osmorhiza obtusa	H	no current stations
Bolton Falls	Dryopteris fragrans	H	five current stations
	Eragrostis hypnoides	C	rare away from Lake Champlain
	Scirpus inflexus	C	rare away from Lake Champlain
Brockway Mills Gorge	Erigeron hyssopifolius	C	seven current stations
	Astragalus alpinus	H	no current stations
Buttermilk Falls	Stellaria alsine	C	two current stations
Carver Falls	Carya glabra	C	four current stations
Clarendon Gorge	Bryhnia novae-anglia	C	not known
	Timmia megapolitana	C	not known
Frazer Falls	Equisetum pratense	C	nine current stations
Highgate Falls	Anemone multifida	H	one current station (proposed as a state endangered species)
Lana Falls	Potentilla tridentata	C	ten current stations
Lime Kiln Gorge	Anemone multifida	H	one current station (proposed as a state endangered species)

TABLE 13 (Continued)

Species	Site	Type of Record	Status in Vermont
Trisetum spicatum (Continued)	Big Falls of the Missisquoi River	C	
	Bellows Falls	C	
Vaccinium caespitosum	Bakers Falls	C	six current stations
	Big Falls of the Missisquoi River	C	
Vitis aesitivalis	Winooski Gorge	C	rare in north
Woodsia alpina	Quechee Gorge	H	one current station (proposed as a state endangered species)
Woodsia glabella	Quechee Gorge	H	seven current stations

TABLE 14

FALLS AND GORGES AT WHICH RARE OR SCARCE SPECIES HAVE BEEN FOUND

(H = historical record, plant thought to be extinct at the site; C = contemporary record, plant currently exists at the site; rare = fewer than ten current Vermont stations; occasional = ten to 50 current Vermont stations.)

Site	Species	Type of Record	Status in Vermont
Allen Falls	Entodon seductrix	C	not known
Bakers Falls	Aster tradescanti	C	ten current stations
	Vaccinium caespitosum	C	six current stations
Baldin Brook Gorge	Bryhnia novae-anglia	C	not known
	Isoptyrigium denticulatum	C	not known
Beldens Falls	Sporobolus neglecta	C	two current stations
Bellows Falls	Astragalus alpinus	H	no current stations
	Trisetum spicatum	C	rare away from Lake Champlain

TABLE 13 (Continued)

Species	Site	Type of Record	Status in Vermont
Lechea intermedia	Sutton Brook Falls	C	occasional, rare in north
Lupinus perennis	Lime Kiln Gorge	H	no current records
Oryzopsis pungens	Winooski Gorge	C	one current station
Osmorhiza obtusa	Bingham Falls	H	no current stations
Panicum xanthophysum	Winooski Gorge	C	five current stations
Potentilla tridentata	Lana Falls	C	ten current stations
Pterospora andromedea	Lime Kiln Gorge	H	no current records
	Winooski Gorge	H	
Rudbeckia triloba	Marshfield Falls	C	ten current stations
Scirpus inflexus	Bolton Falls	C	rare away from Lake Champlain
Shepherdia canadensis	Lime Kiln Gorge	H	rare away from Lake Champlain
	Williston Gorge	C	
	Winooski Gorge	C	
Solidago randii	Middlesex Gorge	C	rare out of mountains
	Lime Kiln Gorge	C	
Solidago squarrosa	Big Falls of the Missisquoi River	C	rare in north
Spiranthes lacera	Winooski Gorge	C	three current stations
Sporobolus neglecta	Beldens Falls	C	two current stations
Stellaria alsine	Buttermilk Falls	C	two current stations
Tofieldia glutinosa	Quechee Gorge	H	two current stations (proposed as a state threatened species)
	Sumner Falls	C	(in NH)
Trisetum spicatum	Middlesex Gorge	C	rare away from Lake Champlain

TABLE 13 (Continued)

Species	Site	Type of Record	Status in Vermont
Blephila hirsuta	Moss Glen Falls I	H	one current station (proposed as a state threatened species)
	Williston Gorge	H	
Carya glabra	Carver Falls	C	four current stations
Cinna arundinacea	Quechee Village Falls	C	ten current stations
Cypripedium arietinum	Lime Kiln Gorge	H	11 current stations (proposed as a state threatened species)
	Winooski Gorge	H	
Dryopteris fragrans	Bolton Falls	H	five current stations
Elymus wiegandii	Winooski Gorge	C	four current stations
Equisetum pratense	Frazer Falls	C	nine current stations
Eragrostis hypnoides	Bolton Falls	C	rare away from Lake Champlain
Erigeron hyssopifolius	Big Falls of the Missisquoi River	C	seven current stations
	Brockway Mills Gorge	C	
	Middlesex Gorge	C	
	Quechee Gorge	C	
	Williston Gorge	C	
Geranium bicknellii	Winooski Gorge	C	nine current stations
Halenia deflexa	Quechee Gorge	H	no current stations
Hieraceum venosum	Winooski Gorge	C	nine current stations
Hypericum pyramidatum	Sheldon Falls	C	three current stations
Isotria verticillata	Lime Kiln Gorge	H	one current record
	Winooski Gorge	H	

Again, these problems can be worse at the older installations. Some newer sites have small impoundments and less effect on water quality. Also, one new site artificially reoxygenates the water after it leaves the powerhouse.

* * *

The diversion of flow has several biological effects. Aquatic animals have to deal with raised temperatures, lowered oxygen concentrations, lowered current, and narrower and shallower streams. The effects are often severe, and fish and invertebrates die or move downstream. With reduced flows, stagnant eddies and pools may form, and if the water is fertile, these become choked with algae and may turn septic. Finally, reduced flows alter the temperature and humidity around the falls or within a gorge. This in turn will effect plant growth; many of the mosses and those vascular plant species that are restricted to riverside ledges demand high humidity, and we suspect that some species decline when the humidity is reduced.

We cannot prove that the reduced humidity hurts gorge plants, but we have a number of instances of plants that have vanished from altered sites, and we never found a diverse bryophyte community at a site where the flow was diverted and the gorge was dry.

The diversion of flow is usually detrimental to recreation: swimming holes may dry up, fish may move away, and the site may become stagnant and smelly.

Table 16 lists a number of sites that are very dry and where we think biological damage has occurred.

TABLE 16

SITES WHERE FLOW IS DIVERTED AND DRYING MAY HAVE DONE BIOLOGICAL DAMAGE

Carver Falls	restoration of low flows would be desirable
Woods Falls	restoration of low flows would be desirable
Highgate Falls	restoration of low flows would be desirable
Mollys Falls	restoration of low flows would be desirable
Sutherland Falls	restoration of low flows would be desirable
Bakers Falls	restoration of low flows would be desirable
Williston Gorge	restoration of low flows would be desirable

5B. Recreational Use

We found 33 sites at which there was swimming. After much testing, we rated the swimming at 13 sites as fair, at 12 as good, and at 7 as great.

A good deep swimming hole, with falls to look at and rocks to sun on and to dive from, is of course a treasure; think of how many people in the country never swim in clean natural water and never have jumped from a high ledge into a rock-walled pool. In Vermont you can do this (and of course should do this), and moreover you can do it at many different places. But even so, it is important to realize that the number of fine swimming holes is limited. Even if there are another 30 we have not seen, there are still 8,117 people per swimming hole, so we clearly need to preserve every one we have.

There are also a number of sites that are not really good swimming places, but which are attractive enough for people to come to wade and picnic and party and bathe. When we could identify such use in the field we noted it in the reports, but have not attempted a separate tabulation of the best picnic and party sites. It might be noted in passing that such use is substantial and traditional, and that many of our falls are favorite gathering places and have for many years played a noticeable role in local courtship, relaxation, and celebration.

Table 17 is a list of sites where the swimming was at least fair. It should be noted that there are some hazards involved with swimming at any of these sites such as slippery rocks, eddy currents and submerged rocks. Due caution should be used and private property should be respected.

TABLE 17

SWIMMING HOLES*

"Great"	Middlebury Gorge	Clarendon Gorge
	Woods Falls	New Haven River Gorge
	Cavendish Gorge	Web Falls
	Sumner Falls	
"Good"	Jelly Mill Falls	Rock River Cascades
	Pikes Falls	Buttermilk Gorge
	Battell Gorge	Ithiel Falls
	Dogs Head Falls	Twin Falls
	Terrill Gorge	North Branch Falls
	Moretown Gorge	
	Big Falls of the Missisquoi River	

TABLE 17 (Continued)

"Fair"	Devils Pothole	West Branch
	Boltonville	Willoughby River
	North Hartland Falls	Highgate Falls
	Falls of Black River	Sterling Brook
	Middlesex Falls	Moss Glen II
	Sucker Brook Cascades	Brewster River Gorge
	Granville Cascade Chain	

* Fatalities have occurred at some of these sites. Caution and use of common sense are essential.

Comparatively few sites are famous enough and accessible enough to attract many tourists and sightseers. In all, there are ten or so sites that are well known and well marked and get heavy use by visitors, and probably another 20 that have been published or are shown on maps and get a few visits from tourists. Table 18 (next page) lists the sites that we are certain are popular with visitors.

A number of the sites in this table - Quechee, Big Falls, Brockway Mills, Barnet Falls, North Hartland Cascades - are principally scenic attractions in the sense that they are sites that most people do not go into or get very near to but rather stand back from, often on bridges, and look at and photograph.

TABLE 18

POPULAR TOURIST SITES

North Hartland Falls	scenic cascade, pretty view from bridge
Lana Falls	woodland cascade near large state park
Big Falls of the Missisquoi River	undammed large waterfall and gorge on major river
New Haven River Cascades	cascades and falls right by road
Huntington Gorge	deep sculptured gorge
Buttermilk Falls	fine small falls and swimming area
Quechee Gorge	very deep long gorge; good view from bridge
Brockway Mills Gorge	large handsome gorge; good view from bridge
Bingham Falls	pretty falls near Mt. Mansfield
Barnet Falls	unique cascade in a chute angled across a cliff
Texas Falls	small carved gorge developed as a National Forest recreation site
Moss Glen Falls I	scenic attraction
Moss Glen Falls II	beautiful large falls
Old City Falls Ravine	large falls, developed for recreation
Bristol Memorial Forest Park Gorge	large gorge and small falls, developed for recreation
Brewster River Gorge	deep mountain gorge

The popularity of these sites, and hence, their importance to tourism, is very great: Quechee is certainly one of the most photographed natural features in Vermont.

* * *

Many falls and gorges are certainly important fishing spots. We have no detailed or comparative information on this.

* * *

Recreational use of any kind is potentially destructive to vegetation. But, praise native good manners and the bottle bill, most sites we visited have only minor amounts of litter and minor damage to vegetation. A number of sites certainly would be improved by occasional policing, but the extraordinary accumulations of trash seen elsewhere do not occur.*

Trampling and vegetation damage are also only minor problems. The popular sites certainly look well used, but the rocks can take it and the rare plants and rich moss communities are mostly on rock walls and in other spots where they are not damaged by visitors. There is no way that a major recreational site is going to look like virgin ground, but in our judgement, the major sites can take the use they currently receive, and we know of no cases where the presently-occurring use should be restricted to preserve the site.

We did find several spots that are currently very private and undisturbed and which we feel might be damaged by increased use. We have recommended that these not be included in any public listing.

* * *

In several instances, visitors may not endanger the site but do endanger themselves. There have been a number of fatal accidents at Hamilton Falls, Moss Glen Falls I, Huntington Gorge, Twin Falls, Putnamville Falls, and Quechee Gorge. Probably they occur elsewhere as well. The problem revolves partly around a common sort of young man who possesses a good tolerance for heights and a poor tolerance for alcohol, and partly around the desire of tourists to climb down into interesting gorges to get a better look, ignoring while doing so the most elementary climber's rules about exposure, footwear, and route selection. Various signs attempt to caution or restrict visitors: we suspect that they have very little effect.

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*For example, at Barberville Falls in Poestenkill, New York, where 20 large garbage bags of bottles and cans accumulated one year from June to August, or at some of the Adirondack lakes accessible to four-wheel-drive vehicles, where the rangers expect to pick up and carry out as much as a pickup load of garbage each weekend.

7. CONSERVATION AND RESTORATION

The principal conclusion to be drawn from our study is that the supply of waterfalls and gorges is limited and that many sites have already been altered or destroyed, commonly by hydroelectric dams.

We estimate that there are under 40 large falls or gorges in the state. About half of them have dams.

On the five largest rivers in the state* there are 17 waterfalls and gorges. Fourteen of these are dammed.

Winooski Gorge and Quechee Gorge, botanically the two finest limestone gorges in New England, both are dammed. Whether for this or other reasons, they are greatly reduced in value as botanical sites compared to what they once were.

Looking at all the sites we surveyed, both large and small, about one-third of them have dams.**

Not all of the dammed sites are damaged, but all are less wild and scenic because of the dam, and many have lost much of their biological or recreational value. The first period of dam building occurred in the late 1700's and early 1800's for mechanical water power. A large number of dams were also constructed during the industrial revolution of the 1800's. Between 1910-1960, about half of the state's most important waterfalls and gorges were destroyed or devalued when they were used for the generation of hydroelectric power.

Hence, it makes sense to look on the state's falls and gorges - especially the major ones - as a resource that has already been heavily used and consider it very important to conserve the natural value of the remaining sites. We seem to be entering into a second major period of dam building, and it would be very unfortunate if we lost the other half of our major falls and gorges in the next 50 years.

It is not inconceivable that this might happen. Many applications for hydroelectric projects are now pending. There are under 40 important sites that are large enough to be potentially useful for hydropower and which do not already have dams. Allow one to be dammed every year, and 40 years from now there would not be any.

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* The Lamoille, Missisquoi, Winooski, Connecticut and Poultney Rivers.

** This figure does not take into account the substantial number of sites at which a falls has been destroyed or obscured by dam construction: there are at least ten and perhaps 20-30 such sites in the state.

After some discussion, we have taken a fairly strong position with respect to conservation: we wish to see every fine site that remains to be preserved. By preserved, we either mean undeveloped or developed in such a way that it retains all its qualities as a natural area if that can be done without compromising the site's values.

We take a strong position because our survey, by taking us to so many sites that have been developed for power, has made us uncomfortably aware of what has been lost. Less than a century ago there were large falls on the Connecticut, the Lamoille, the Winooski, and the Missisquoi which were still in their natural condition, and where you could stand and see and hear what the Indians saw. In West Haven you could see the Poultney River go over a horseshoe-shaped falls 250 feet wide, and then drop 120 feet into a narrow gorge. Today only one of these sites - the Big Falls of the Missisquoi River - is in its natural condition; at the others there are dams and dried up falls that mostly only flow in the spring and powerhouses and penstocks and powerlines and impoundments.

It is impossible to visit one such site after another without longing to see them as they once were, and without coming to resent the expediency and thoughtlessness that industrialized almost every major waterfall and gorge in Vermont within about 50 years.

* * *

Our recommendations are as follows:

1. Major waterfalls and gorges should be acquired by the state and preserved as natural areas. We would especially recommend the following sites: Big Falls of the Missisquoi River, Brockway Mills Gorge, Cavendish Gorge, Clarendon Gorge, Battell Gorge, Huntington River Gorge, and possibly Terrill Gorge.

2. Middlebury Gorge should be acquired and preserved by the Green Mountain National Forest.

3. The state should attempt the restoration of Carver Falls, the largest falls in the state, by acquiring land and access to the area below the falls, instituting a licensing proceeding to guarantee summer flows over the falls, and getting the abandoned penstock removed.

4. When considering the development of one of the sites we have listed as important, the state should not allow a dam to alter the site. The state should not compromise by trying to figure out a way to dam them a little, their naturalness is one of their most valuable attributes, and we might as well do right by them and keep them completely natural.

5. Do not dam an unsurveyed site without doing a physical and biological survey to see if it is important.

6. Do not dam any site without investigating how much use it gets and whether it has cultural or historical values: the reader should remember that this survey did not investigate cultural values and only guessed at the amount of use.

7. If a dam is to be constructed on a site for which rare plants are present, try to preserve at least half the population.

* * *

Our recommendation in four that the naturalness of an important site be respected is the most difficult point to argue, and the one most likely to create conflict. We can only state our feeling, which is that since many sites are in settled countryside, with roads and farms and buildings nearby, the ones that are or feel wilder are special, and that specialness needs protecting. We do not know how widespread this feeling is: it might be that fishermen and swimmers do not mind a dam or powerhouse at all as long as the fishing and swimming is still good... or it may be that they do mind it. We advise, that in cases where the naturalness of a site is at stake, some research be done to find out how people really feel before proceeding with a development.

* * *

The essence of these recommendations may be stated as follows: many falls and gorges, whether privately owned or not, are, by tradition and use, part of the commons - the property valuable to everyone and available to everyone. Our recommendation is that the public's rights to the commons - to natural beauty, to the availability of recreation, and to the continuance of the historical landscape - <u>always</u> be considered before the claims of power development. If this requires that the state occasionally buy a waterfall to preserve it, our feeling is that there are <u>few</u> better things it could do with its money.

* * *

Restoration & Care

The waterfalls, cascades and gorges in the state are enormously important for recreation and tourism, and in contrast to other recreational sites, are rarely publicly-owned and receive almost no care. As we mentioned in Section 5, despite this, they remain remarkably clean and do not suffer from use.

Every resource can profit from care, and the falls and gorges are no exception. We suggest that two things could be done to improve their recreational value.

First, either the state parks division or the towns should assume the responsibility for picking up litter at popular sites.

Second, something should be done to bring existing dams up to modern standards by assuring adequate flow below the dam, reviewing and mitigating any dissolved oxygen problems and spilling sufficient water over the dam to protect the values of the waterfalls and cascades. We don't permit towns to use inadequate sewage plants just because the plants were made before there were water quality regulations, and the same should apply to dams. There should be one standard for flows and oxygen below dams and existing dams should meet as stringent environmental requirements as new dams do. The state should promulgate new regulations, give existing dams a year to comply, and if they do not, the state should open proceedings against them. If we started doing this next summer we would immediately improve the fishing and swimming in many gorges, lessen downstream pollution, and possibly begin the restoration of vegetation that has been damaged by drying out.

NOTE: The State Department of Water Resources and Environmental Engineering conducted a study in 1982 to investigate all existing hydro projects in the state, to identify problems and to make recommendations for mitigation. These recommendations will be presented to FERC, the Public Service Board, the Public Service Department and the utilities for implementation. Many of the recommendations contained in the draft of "The Waterfalls, Cascades and Gorges of Vermont" have already been incorporated into the recommendations of this hydrostudy and the Department of Water Resources and Environmental Engineering has begun acting on the recommendations.

8. FORMAT FOR SITE REPORTS

The reports use a uniform format, though not all contain information on every point. The format is:

Report number, site name, river, town, county, state.

Water Resources number, date of visit, initials of surveyor.

Brief description.

Map number in Vermont Atlas and Gazetteer, USGS quadrangle, directions to site.

* * *

Setting and surroundings.

Description of stream and water quality.

Description of site.

Particulars about the rocks.

Botany of site.

Use of site, cleanliness.

Prettiness and quality.

* * *

Importance

Summary

Recommendations

PART II

REPORTS ON INDIVIDUAL SITES

Basin 1: Batten Kill, Hoosic River and Walloomsac River

Including the following site:

Roaring Brook Cascade	Roaring Brook, Stamford

See the appendix for the following:

Downer Glen	Bourne Brook, Sunderland
Hemlock Gorge	Potter Hollow Brook, Pownal
Imaginary Falls	Roaring Branch, Sunderland

This basin is located in the southwest corner of the state, and contains parts of the Taconic Mountains and southern Green Mountain Plateau. The streams are all small to medium rivers and we are sure there are no major lowland falls or gorges in the basin. There are, however, a number of headwaters streams, especially on Mt. Equinox and the western scarp of the Green Mountains, and almost certainly there are a number of cascades and falls on the headwaters streams that have not been mapped. We know of several falls on intermittent streams in Cooks and Skinner Hollows on Equinox and of small cascades on several brooks in Pownal and Sunderland. None of these would qualify as more than locally important, but it is quite possible that moderately important sites exist.

Report 1, Roaring Brook Cascade, Roaring Brook, Stamford, Bennington County, Vermont.

Site NN, surveyed 17 October 1983 by J.C. Jenkins.

Small cascade under a bridge on a mountain brook.

Atlas map 1, USGS Stamford 7.7-minute quadrangle. Take County Road west out of Stamford, climb the hill and at the top (1st house) where the stream goes under the bridge is the cascade.

* * *

A wooded part of the Green Mountain Plateau, with a few houses and small fields along a dirt road. Rather scruffy beech-birch-maple. The cascade is about 25 yards from a house and directly below a small bridge.

The stream is a small mountain brook about ten feet wide with very clean water. The channel bottom is mostly boulders.

Site is a short cascade, about 75-100 feet long by 15 feet wide with a total drop of 20 feet. The rock seems to be the Readsboro Schist, of Precambrian age. The cascade has a slope of about 20 degrees, a number of large boulders, and discontinuous rock walls five to ten feet high. There are no pools and the rock is not carved or rippled.

No rare plants occur. There are no vascular plants within the stream channel. Around the edges are:

Tsuga canadensis	Spiraea latifolia
Rubus occidentalis	Solidago rugosa
Carex torta	Thelypteris phegopteris
Dryopteris intermedia	Aster acuminatus

All of these are very common upland plants.

About ten species of mosses and liverworts occur, all apparently common. The collections have not been named yet.

No particular use seems to be made of the falls.

Given that it is a small site it is still a pretty one; as noted in the introduction in these boulder-channel streams that come off the plateau even small cascades are uncommon and worth noting.

* * *

Summary: rural setting, average to nice rocks and water, average botany, not secluded, no trash, clean mountain water, hardly used, natural area.

Basin 2: Poultney and Mettawee Rivers.

Including the following sites:

Sucker Brook Cascades	Sucker Brook, Hubbardton and Castleton
Carver Falls	Poultney River, West Haven
Flower Brook Cascades	Flower Brook, Pawlet

See the Appendix for:

Gully Brook Ravine	Gully Brook, West Haven

This basin includes the west slopes of the Taconic Mountains in central western Vermont, and the southern end of the Lake Champlain Plain. The basin contains some high mountains in Dorset and Danby and a major part of the Taconic crest in Castleton. Otherwise it is mostly lowlands. Compared to the Green Mountains the rocks are softer and less folded (the western edge of the basin is a major slate-producing area) and without abrupt changes in bedding and hardness. Hence, we judge it a poor area for waterfalls and gorges. Small mountain cascades and falls are known to occur on Dorset and Danby mountains, and probably elsewhere. What the prospect is for unknown areas of state significance we cannot say.

Only three sites are described in this basin.* Flower Brook is a minor gorge in the middle of the Village of Pawlet and a former mill site. Carver Falls is the highest falls in Vermont, and currently important both as a natural area and as a hydroelectric site. Sucker Brook is a small but handsome wooded cascade near Lake Bomoseen, formerly a popular local recreational site but now closed to the public.

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* Since these reports were written, we have visited Button Falls, on the Mettawee River, approximately one and one-half miles from the New York/Vermont border. South of Button Falls Road, there is a wide gorge and superb swimming hole with a falls 15-20 feet high. North of this road, there is a narrow limy gorge with some fine swimming pools and very handsome rocks. One rare plant (the brooklime Veronica catenata) was found along the river below the gorge.

Report 2, Sucker Brook Cascade, Sucker Brook, Hubbardton and Castleton, Rutland County, Vermont.

Site not numbered by the state, surveyed on 17 August 1984 by P.F. Zika.

A small steep cascade. No dam.

Atlas map 18, USGS Bomoseen 7.5-minute quadrangle. Take Route 30 to Lake Bomoseen; one mile south of the north end of the lake turn east on a road that runs almost due south; go one mile, turn east; go one-quarter mile, turn southeast; park just before the bridge that crosses Sucker Brook. The landowner (Malcolm Vail, RFD 1, P.O. Box 2156, Castleton, Vermont) has posted the property and lives nearby.

* * *

Sucker Brook Cascade is in a forest with a few scattered houses. The access road is a dead-end and poorly maintained. The Vails live near the site and there has been some recent logging along the stream. Otherwise the area is undisturbed.

Sucker Brook is a small mountain stream. It was visited shortly after a rainstorm, and had a moderate flow. Some brown and green algae are present on the wet rocks, and larvae of caddisflies, mayflies, and midges are common. Minnows live in the pool at the base of the cascade. The streambed is a shingle or cobble of flat pieces of slate.

Approaching the cascades from upstream there are first a few cascades between three and six feet in height. Then the stream separates into three narrow channels and falls three to four feet, and then these channels unite and there is a steep cascade about 12 feet. Then there is a steep-sided ravine approximately 20 feet deep and 150 feet long, with some nice pools. Below the ravine the stream enters a swamp.

The rock at the site is a limy slate from the Cambrian West Castleton formation. A thrust fault is near this area but probably is unrelated to the formation of this cascade. The slates are bedded at a very steep angle where they are exposed along the cascade, and are handsome. Several potholes under one foot in diameter are present. There is a bit of sculpted and rippled rock by the brink of the cascade.

The vascular plants at the cascades are ordinary. Bryophytes are common on the rocks, but there are only a few species.

Before the land was posted, the cascade was a popular recreational area and was used for camping, swimming, picnicking, and parties. The landowner objected to this and closed the site. He said that use increased greatly after the site was listed on the state natural areas survey, that there still is a problem with trespassers, and that he would prefer that the site is not publicized.

The cascade and ravine are small but undisturbed, and quite nice. It is a pleasant swimming hole with a nice woodland setting. Some old hemlocks along the shores provide deep shade and add to the appeal of the brook. Unfortunately the wooded corridor along the stream is narrow and recent logging on either side of Sucker Brook has eliminated almost all of the adjacent trees, in places to within 50 feet of the water. This greatly decreases the attractiveness of the cascades. We recommend that the landowner be approached for an easement to perpetually preserve the site as a natural area.

* * *

Summary: Woodland setting, average rocks and biology, private, clean, clean water, receives some local use as a campsite and swimming hole. The landowner wishes to preserve the site as a natural area.

Vascular Plants Seen at Sucker Brook Cascade

Tsuga canadensis
Betula alleghaniensis
Fagus grandifolia
Tilia americana
Betula papyrifera
Populus grandidentata
Acer pensylvanicum
Vaccinium angustifolium
Rubus idaeus
Corylus cornuta
Dryopteris marginalis
Cystopteris bulbifera
Thelypteris phegopteris
Athyrium filix-femina
Polypodium virginianum
Maianthemum canadense
Aralia racemosa
A. nudicaulis
Aster divaricatus
A. lateriflorus
A. puniceus
Eupatorium perfoliatum
E. rugosum
Taraxacum officinale
Lycopus uniflorus
Mitella diphylla
Epilobium glandulosum
Laportea canadensis
Galium triflorum
Pilea pumila
Mentha arvensis
Verbascum thapsus
Veronica officinalis
Hieraceum scabrum
Potentilla norvegica
Erigeron canadensis
Cerastium vulgatum
Lobelia inflata
Cinna latifolia
Poa compressa

Report 3, Carver Falls, Poultney River, West Haven, Rutland County, Vermont.

Site 946, surveyed 2 October 1983 by J.C. Jenkins.

The highest major falls in Vermont; two large falls at the head of a large limestone gorge; a spectacular site but much altered by hydropower development. The state's best example of a "New York type" falls and gorge.

Atlas map 17, USGS Benson and Thorn Hill 7.5' quadrangles. Dam and upper falls most easily accessible from the NY (south side), by road. Lower falls and gorge accessible by going to the end of the dirt road and then walking across the fields and down into the gorge.

* * *

Located on the VT/NY border about five miles above the mouth of the Poultney River, in moderately low, flat dairy country. The river lies in a wooded ravine which is about 100 feet deep above the falls and 200 feet deep below them. The general topography - flat country, low hills, not much dissection, gentle transitions between terraces and slopes - is typical of the Champlain Valley. The site itself - an abrupt ravine with sharp crests incised below the level of the surrounding country - is the sort of feature that develops in areas with fairly soft bedrock and hence, is not typical of Vermont.

The site is a very steep-walled gorge, with cedar, pine, and hardwoods in the gorge and second-growth hardwoods on old agricultural land at its edge. The site is industrialized: there is a major dam about 250 feet long by 20-25 feet high above the falls; an abandoned penstock crosses the top of the falls below the dam; a new penstock runs parallel to the falls down the west bank; there is a stone powerhouse down in the ravine, and a house, fences and grounds, presumably for the maintenance staff, above the powerhouse. There is also a dog (large, loud, cowardly) who guards the dam.

The river is a medium to large lowland river; average size could not be observed because of the gorge. It receives municipal wastes from Poultney, Castleton and Fair Haven. It is Class C water upstream and is Class B below the Castleton River and hence, in the area of the falls. Because of the dam and consequent lack of oxygenation, and because of the fertility of the water (it drains a heavily-farmed area as well as receiving the discharges from the sewage treatment plants) the river appears to be deoxygenated and somewhat unattractive below the dam.

The natural part of the site consists of a double falls: looking down from the dam, there is a horseshoe-shaped falls (the only one in Vermont?) about 250-300 feet across by 50 feet high.

This concentrates the water into a steep chute about 100 feet long, where it then goes over a second falls about 100 feet wide by 60 feet high. At the bottom there is a pool about 50 feet across, after which the river makes a sharp turn, goes through a rocky gorge about 30 feet wide at the bottom with walls from 20-80 feet high, and then into a wider portion of the channel. The gorge is what is called a "shut-in" in the midwest: a narrow rock-walled gorge abruptly incised into generally flatter land.

The rock is limy. Quite possibly the falls are at the contact between the Ordovician Middlebury limestone and Chipman dolomite, but there are a lot of rock types mapped in this area and I am not sure. The rock is highly jointed and breaks off in chunks rather than being worn away, resulting in a jagged-walled, sharp-crested gorge of the type seen more commonly west of here. The rock exposures are spectacular, but not really sculptured. They have not been shaped by the water as much as just chipped away along the bedding planes, leaving a lot of abrupt angles and a surprisingly complicated surface for a limestone area.

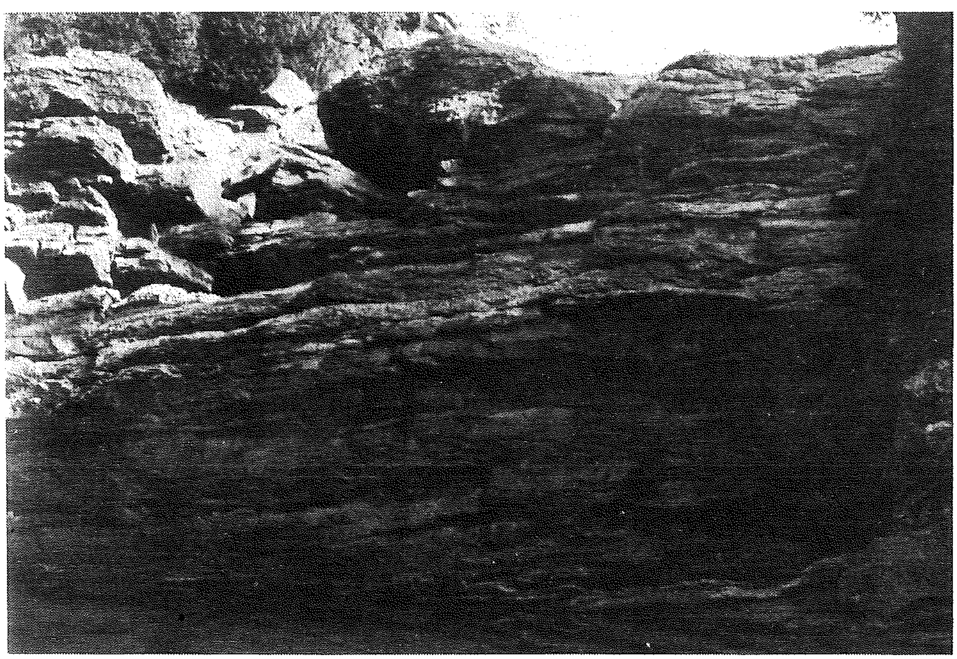
Because of the high rock walls and the lime, the gorge appears to be a good site for vascular plants. One rarity (pignut hickory) was found. It is quite possible that others occur (especially since West Haven is a town with a number of rare limestone plants) and the area should be checked earlier in the year.

There were a number of areas with good moss cover on the gorge walls, but to my surprise there were very few species present. I recorded only eight species and three of these were in limy seepage where a small side stream comes in and not on the walls. This seems abnormal: even the heavily industrialized falls of the Otter at Proctor have 12 species and I might have expected 20-30 in a site like this. I conjecture that this is a result of the diversion of water; the only flow over the falls in the summer comes from a few leaks in the dam and since the gorge is fairly wide and the main rock wall faces west this may not be enough to maintain the humidity that mosses need. In support of this it might be noted that none of the mosses normally characteristic of continuously wet limy rocks (<u>Campylium</u>, <u>Gymnostomum</u>, etc.) was seen at all.

There do not seem to be any trails to the bottom of the falls; the area is a potentially fine swimming and fishing area, but suffers badly from low summer flows and pollution. There are at least two trails down to the gorge just below the powerhouse and appear to receive a moderate amount of use.

I am left with very mixed feelings about this site: it is the widest and highest falls in the state; it empties into a fine narrow rocky gorge and is our best example of a deep limestone gorge of the Finger Lakes type. But there is not enough summer spillage to oxygenate the river, and the main falls are altered by the dam and penstock.


CARVER FALLS - DAM


CARVER FALLS - BELOW DAM

The site might be improved in two ways. First, some provision could be made for better summer flows. Second, the old penstock, which is awkward and ugly and right on top of the falls could be removed. This would make it impossible to see any part of the dam and related structures from the bottom of the falls, and make it possible to use the site recreationally.

* * *

Summary: Developed for hydroelectric generation, spectacular rocks and falls but altered and degraded by dam, average botany with a possibility for rare vascular plants, not wild but moderately secluded, no trash, mildly polluted water or worse.

HIGH IMPORTANCE: The largest falls, both in height and width, in the state; also the largest "New York type" gorge and falls combination.

WE RECOMMEND THAT SOME THOUGHT BE GIVEN TO RESTORING THIS SITE. IT IS ONE OF THE MOST SPECTACULAR IN THE STATE AND WOULD BE A VERY BEAUTIFUL PLACE IF THE ABANDONED PENSTOCK WAS REMOVED AND IF THERE WERE ADEQUATE FLOWS YEAR ROUND.

Plants Seen at Carver Falls

Mosses and Liverworts

Amblystegium tenax
Marchantia polymorpha
Philonotis fontana
Drepanocladus uncinatus
Grimmia alpicola
Bryum pseudotriquetrum
Brachythecium rivulare
Thuidium sp.

Vascular plants

Xanthium strumarium
Bidens frondosa
Scutellaria lateriflora
Lycopus americanus
Ambrosia artemisiifolia
Trifolium pratense
Salix rigida
Aster lateriflorus
Campanula rotundifolia
Eupatorium perfoliatum
Fragaria virginiana
Saxifraga virginica
Panicum lanuginosum
Solidago canadensis
Potentilla argentea
Myosotis scorpioides
Geranium robertianum
Chelone glabra
Equisetum arvense
Glyceria striata
Solidago rugosa
Cystopteris bulbifera
Elymus riparius
Vitis riparia
Lysimachia nummularia
Platanus occidentalis
Quercus rubra
Tilia americana
Verbena hastata
Taxus americana
Acer rubrum
Betula lenta
Aster laevis
Solidago juncea
Antennaria neglecta
Bidens tripartita
Bidens cernua
Lycopus virginicus
Lythrum salicaria
Rumex crispus
Polygonum persicaria
Tussilago farfara
Poa compressa
Eupatorium rugosum
Ulmus americanus
Oenothera sp.
Melilotus alba
Panicum capillare
Juncus dudleyi
Mentha arvense
Geranium maculatum
Cyperus dentatus
Alnus rugosa
Solidago graminifolia
Solidago gigantea
Desmodium sp.
Erigeron annuus
Rorippa sp.
Cornus stolonifera
Rudbeckia hirta
Salix discolor
Tsuga canadense
Muhlenbergia frondosa
Rhus toxicodendron
Panicum clandestinum
Celastrus scandens
Aster cordifolius
Carya ? glabra
Chrysanthemum leucanthemum

Report 4, Flower Brook Cascade, Flower Brook, Pawlet, Rutland County, Vermont.

Site EE, briefly noted from a survey on 3 September 1983 by J.C. Jenkins.

A small gorge and cascade, formerly developed as a mill site, in the middle of the Village of Pawlet.

Atlas map 9, USGS Pawlet 7.5' quadrangle; right behind the general store and under the Route 30 bridge.

* * *

Briefly noted: a small limestone gorge, 15-30 feet deep, about 200 feet long, mostly under 40 feet wide, dammed at the upper end, formerly a mill site. Flower Brook Hydro, Inc. has developed a 16KW hydroelectric facility at the site. The penstock bypasses the gorge. The facility maintains a minimum flow over the dam and through the gorge so the gorge is not dewatered. No rare plants, a few mosses but not very interesting. Some pretty rock walls, but distinctly an urban site.

* * *

Summary: Urban setting, developed for hydroelectric generator, average rocks, no seclusion or wildness, mostly clean site with clean water, not used recreationally.

Basin 3: Otter Creek, Little Otter, Lewis Creek

Including the following sites:

Sutherland Falls	Otter Creek, Proctor
Middlebury Gorge	Middlebury River, Middlebury
Clarendon Gorge	Mill River, Shrewsbury
New Haven River Gorge	New Haven River, Bristol
Belden Falls	Otter Creek, Weybridge-New Haven
Lana Falls	Sucker Brook, Salisbury
Battell Gorge	Otter Creek, Weybridge-New Haven
Falls of Little Otter Creek	Little Otter Creek, Ferrisburg
Bristol Memorial Forest Gorge	Baldwin Creek, Bristol

The following sites on the State list have not been done:

Abby Pond Brook Falls	Abby Pond Brook, Bristol
Lewis Creek Gorge	Lewis Creek, Starksboro

For the following site see the appendix:

Big Branch Ravine	Big Branch, Mt. Tabor

Basin 3 is located in central western Vermont and includes the northern Taconic Mountains, the central western Green Mountains, and the southern half of the Champlain Valley. It is an area that contains many different rocks and land forms, and the sites described here vary accordingly. Many of the mountain streams are poorly known and we consider it likely that there are additional sites of moderate and possibly high importance which are currently unknown to us.

Report 5, Sutherland Falls, Otter Creek, Proctor, Rutland County, Vermont.

Site 758, surveyed 3 October 1983 by J.C. Jenkins.

Major cascade and limestone gorge developed as an industrial site.

Atlas map 19, USGS Proctor 7.5' quadrangle. Just east of the main Vermont Marble plant in Proctor.

* * *

Site is just north of the center of town, adjacent to a large industrial plant and used for power generation. There is a dam above the falls, retaining walls, roads and buildings to the west, and an elevated pipe and roads and wires below it. There are a number of other buildings and roads in the vicinity. The dam diverts much of the flow to a powerplant, resulting in low summer flows through the gorge. There is no minimum flow requirement through the bypass.

The Otter Creek is a large river at the site, averaging 50-100 feet wide. It receives a large amount of slightly treated sewage in Rutland (eight miles upstream) and is designated a cold water fish habitat to Proctor and beyond. The water at the site is turbid and smelly and the rocks are very slimy. The diversion of water for the powerplant probably aggravates the dissolved oxygen problems downstream.

The falls are in a major limestone gorge about 100-140 feet deep and perhaps 200 feet wide, with exposed vertical rock walls 30-50 feet high. This is one of the three large limestone gorges in the state. From upstream there is a dam about 120 feet wide by ten feet high, an upper falls of about five feet, a gentle cascade about 100 yards long, and finally a steep cascade (the "falls" proper) about 60 feet high and 50 yards long. To the east of the steep cascade there is a side channel or chute with vertical rock walls about 40 feet high.

The rock is a blue or blue-brown dolomite (Cambrian Winooski dolomite). The strata are almost vertical at the falls. It is cracked along the bedding, separated into blocks, and been smoothed and rippled some. There is not much sculpture and only a few potholes. The rock is good-looking and massive but not particularly fine or dramatic.

The east side of the gorge has young hemlock-white cedar-pine-hardwoods forest; the west side has a few trees and bushes adventive on quarry tailings and miscellaneous industrial waste. The rocks in the channel have comparatively few vascular plants but a number of limestone species live on the east wall of the gorge above the channel. No rare or scarce species were seen.

SUTHERLAND FALLS

There is some good habitat for mosses on the gorge walls and on exposed rocks in the channel. Eleven species were noted; the low diversity is probably the result of polluted water and the lack of flow in the summer.

The falls are not used except as an industrial site; given the pollution and the low flow they offer no swimming and probably little fishing. With better water quality and more flow the pool at the bottom would have the potential to be a nice swimming hole. This river segment is designated a Class C zone. Even if the water quality improved, swimming would not be a proper use because of the hazard to health in Class C zones downstream of sewage treatment plant discharges.

A major site, once certainly one of the most beautiful in the state, but currently unattractive, and often largely dry. It is regrettable that the City of Rutland does not yet have secondary treatment* of its sewage, and that the Vermont Marble factory was originally placed right on the edge of one of the finest gorges in the state.

* * *

Summary: Industrial setting, nice rocks, average botany, no seclusion, no trash but lots of metal and stone and machinery and industrial junk. Polluted water, site used only for power generation.

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* A secondary plant is under construction as of 4/86.

Plants From Sutherland Falls

Mosses and Liverworts

Amblystegium tenax
Marchantia polymorpha
Ceratodon purpureus
Lophozia sp.
Anomodon attenuatus
Bryum sp.
? (Pottiaceae)
Philonotis marchica
Fissidens adiantoides
Hygrohypnum ? eugyrium
Mnium punctatum

Vascular Plants

Aquilegia canadensis
Cystopteris bulbifera
Solidago gigantea
Apocynum cannabinum
Diervilla lonicera
Acer spicatum
Lycopus uniflorus
Dryopteris marginalis
Achillea millefolium
Aster macrophyllus
Taraxacum officinale
Aster puniceus
Andropogon gerardi
Eupatorium rugosum
Scutellaria galericulata
Festuca elatior
Aster cordifolius
Campanula rotundifolia
Acer saccharum
Betula lenta
Poa compressa
Athyrium filix-femina
Elymus riparius
Salix sericea
Aster lateriflorus

Report 6, Middlebury Gorge, Middlebury River, Middlebury, Addison County, Vermont.

Site 585, surveyed 3 October 1983 by J.C. Jenkins.

A deep wooded ravine with discontinuous rock walls, containing pools and small falls and cascades; one of the major chains of pools and cascades.

Atlas map 24 and 25; East Middlebury 7.5' quadrangle. You can walk up the gorge from the west end where Route 125 crosses it, or bushwhack down from further along Route 125.

* * *

The Middlebury River runs in a steep wooded ravine for three miles between Ripton and East Middlebury. I surveyed one-half mile of this, a particularly fine stretch below where the North Branch joins the main stream. This area had cascades and rock walls and so qualifies for this study. Other parts of the ravine were not surveyed owing to time, and difficulties in descending parts of the ravine without a rope. Some stretches appear to be fairly uniform and unrocky and so are not properly called a gorge or falls, but it is quite possible that there are other cascades along the stream that would qualify for study.

The site surveyed is in dense spruce-hemlock-hardwoods forest, in a very steep ravine, about 100 yards and about 120 vertical feet below Route 125. No houses or other roads are near. This section of the ravine has rock walls and you have to climb or fall down the last 30-50 feet.

The river is a mountain stream, averaging ten to 15 feet wide, with very clean water.

The part of the river surveyed contains a small gorge with rock walls 25-50 feet high sloping at about 60-80 degrees to the horizontal. The stream has a gradient of about 150-200 feet/mile and is confined to a narrow channel and so has done a lot of rock moving and rock cutting. There are 20 foot boulders in the stream channel, potholes and sculptured walls ten to 15 feet above water level, undercut rock caves in the banks, and rock-circled pools. The largest feature I saw, and one of the prettiest I have ever seen, was an eight foot falls with a rock-walled pool 30 feet in diameter below it and water carved walls extending 20 feet above the pool.

The ravine is steep enough that the trees overhang half the stream and hence, the whole area is dark, cool, mountainy and mossy. The banks are all ledge or boulder and it is comparatively hard to move up or downstream in this section. You have to climb or swim in a number of places.

The rocks in this section were blue schist with vertical strata. A number of formations occur close together here, and presumably to a geologist the gorge would be interesting because you would have, in a short space, a section of the whole west limb of the Green Mountain anticline. (According to the state geological map and sequence in the two miles from East Middlebury to the area surveyed would be: Cambrian Cheshire quartzite; Cambrian Moosalamoo phyllite; Cambrian Forestdale marble; Precambrian Mt. Holly gneiss.)

No marble outcrops were noted but both the moss and vascular floras contained some lime-requiring species, and the gorge had the sort of general lushness we associate with limy soils in the mountains.

The vascular plant flora was fairly limited (about 25 species, no rarities), as is to be expected in a steep dark ravine with comparatively few habitats and not much horizontal space. The moss and liverwort flora was anything but limited: 36 species were collected (and doubtless a number were missed), and many species were strikingly robust and plentiful. It is the kind of a place where you look up and all the rocks are shaggy with mosses. After a summer of looking at little timid things in dry gorges it was exciting to see just how big and happy and luxuriant the mosses of a good place can be. No species were seen that are rare in Vermont, but five species were seen that did not occur at any other waterfall where we made moss collections, and this indicates that the habitat is quite unusual. A number of rare species of moss are restricted to this habitat. Hence, with further investigation the gorge might yield some important records.

The lower gorge is used for swimming, and certainly a number of parts of it are fished; the part I was in is particularly hard to get down to, and seems to receive no use.

A remarkable place; not that far from a road, but seeming to be completely undisturbed and private; beautiful mosses and rocks and water.

* * *

Summary: Mountain setting, fine to spectacular rocks, possible geological importance, exemplary and potentially rare botany, very wild and private, no trash, very clean water, good swimming.

HIGH IMPORTANCE: as fine an example of a mountain gorge with a chain of potholes as any we saw.

Plants Seen in Middlebury Gorge

Mosses and Liverworts (* = a species not seen elsewhere in this study).

Sphagnum squarrosum
Atrichum undulatum
? Mylia*
Blepharostoma trichophyllum*
Polytrichum juniperinum
Bazzania denudata
Dicranum scoparium
Pogonatum alpinum
Hypnum ? curvifolium*
Plagiothecium denticulatum
Leucobryum glaucum
Fissidens adianthoides
Thujidium sp.
Pohlia cruda*
Coniocephalum conicum
Diplophyllum apiculatum*
Anomodon attenuatus
? from Pottiaceae
Pleurozium schreberi
Sphagnum sp.
Tricholea tomentella*
Scapania nemorosa
Lophozia species
Hypnum imponens
Cephalozia sp.
Paraleucobryum longifolium
Pogonatum urnigerum
Brachythecium sp.
Mnium punctatum
Mnium (double toothed)
Rhytidiadelphus triquetrus*
Herzogiella striatella
Bazzania trilobata
Pellia epiphylla
Amblystegium varium
Hygrohypnum ? eugyrium
Hylocomnium splendens

Vascular plants

Hemlock-spruce-northern hardwoods forest

Aster umbellatus
Aster acuminatus
Thelypteris phegopteris
Athyrium filix-femina
Thalictrum polygamum
Gymnocarpium dryopteris
Streptopus amplexifolius
Laportea canadense
Asplenium trichomanes
Sagina procumbens
Osmunda claytoniana
Festuca obtusa
Polypodium vulgare
Oxalis montana
Aster divaricatus
Dryopteris intermedia
Agrostis sp.
Aralia racemosa
Galium triflorum
Circaea alpina
Rubus odoratus
Rubus flagellaris
Mentha arvense

Report 7, Clarendon Gorge, Mill River, Shrewsbury, Rutland County, Vermont.

Site 612, surveyed 20 July 1983 by J.C. Jenkins and Roy Perry.

A large rock-walled gorge with many small cascades and rock pools, very popular for swimming and also with a good moss flora.

Atlas map 14, USGS Rutland 7.5' quadrangle. Site is easily accessible from Route 103; use the parking area for the Long Trail.

* * *

The site is in hemlock-pine-hardwoods forest, and begins about 100 yards from Route 103. The river has been running in a fairly open valley next to the road and railroad, and then enters a ravine about 100 feet wide and 100-150 feet deep. No houses are near. There is a parking lot (for Long Trail and Appalachian Trail hikers) at the upper end of the gorge and the trail itself crosses the gorge on a footbridge. No other structures are visible from the gorge.

The river is a medium-sized stream, alternately in alluvium and in a rock channel. Above the gorge it is perhaps 30-50 feet wide. The water is clean and there are no official polluters above the gorge.

The gorge itself is wider than deep; standing in the channel, you have as much the sense of being in a stream with high bluffs on either bank as you do of being in a ravine. There are more or less continuous rock walls from 25-75 feet high. The natural areas report on the gorge mentions 100 foot high walls, but they are either exaggerating or not distinguishing between rocks and wooded slopes.

The gorge is about 800 feet long and is skewed at a right angle to the overall axis of the valley. According to the geological maps there is a thin belt of schistose quartzite with dolomite and conglomerate (Cambrian Dalton formation) sandwiched between the Mt. Holly gneiss and the Cheshire quartzite. The latter two are very hard, massive rocks, and it appears that the stream turned at right angles to its average course to cut through the softer schists.

If this interpretation is correct, then the gorge is one of our better examples of a gorge created by the differential erosion of soft and hard rocks.

The stream channel is piled full of boulders, the largest 20 feet or more long and up to ten feet high. The rock is soft enough to be carved by the water, and there are many potholes and consequently many pools. The slope is rather flat and there are no major falls or cascades, but there are small falls or chutes under three feet in height above some of the pools.

The surrounding woods are normal hemlock-hardwoods forest, generally rather dry. The gorge has a sloping wall and there is a lot of space for plants above the scoured portion of the channel, so there is a fairly varied vascular flora, including a number of lime-requiring species. No rarities were seen.

The moss and liverwort flora is exceptional. About 35 species were recorded, including several (<u>Bryhnia novae-angliae</u>, <u>Timmia megapolitana</u>) that occurred at only one other site each. Roy Perry, who helped in the survey, is a moss expert from the University of Cardiff; he made a number of collections and eventually we should have a good idea of the flora from his work. Altogether we collected about 40 species and estimate that, with the common plants included, the gorge contains 50-60 mosses and liverworts, making it one of the most diverse areas we studied.

The gorge has superb bathing and swimming. It is sunny, has big rocks with all kinds of nice hollows and shapes, and has a series of perhaps 15 pools so that you can have your own pool by going further upstream. It is a good place for sitting and great place for kids because it is pretty safe, for a Vermont kid anyway. There are no big ledges or drops and the rocks are not very slippery, and there are all the different pools to explore. We were there on a weekend and perhaps 50 people were picnicking or swimming, and the kids were running like rabbits up and down the gorge.

Currently, it is moderately clean and can stand the use it gets. It would be nice if someone could get in there once or twice a season and take a few bottles out.

The rocks are not exceptionally pretty and because it is a wide gorge you do not have a great sense of seclusion or enclosure. The best things about it are the boulders and hollowed out pools and cascades, and the variety of the rocks and the water in the channel. We, of course, enjoyed all the mosses on the gorge walls, but they are varied rather than lush, and unless you look at the gorge with a taxonomist's eye you will probably not think of it as a very mossy place.

* * *

Summary: Woodland setting, fine rocks, exemplary to rare botany, some seclusion (at the far end on weekdays), a little trash but not much considering the use, clean water, great swimming and bathing, much used.

HIGH IMPORTANCE: one of the major chains of potholes in the state, important botany, important for recreation.

WE RECOMMEND: that someone pick up the litter twice each season.

Plants Seen at the Clarendon Gorge

Mosses and Liverworts

Marchantia polymorpha	Bryum pseudotriquetrum
Mnium (double-toothed)	Herzogiella striatella
Bryhnia novae-angliae	Pohlia sp.
Thujidium delicatulum	Climacium dendroides
Pogonatum urnigerum	Anomodon attenuatus
Mnium thompsonii	Homomallium adnatum
Brachythecium plumosum	Brachythecium rivulare
Scapania nemorosa	Timmia megapolitana
Marchantia polymorpha	Encalyptera ciliata
Amblystegium tenax	Coniocephalum conicum
Preissia quadrata	Dicranum sp.
? from Pottiaceae	Bryoerythrophyllum recurvirostrum
Hypnum curvifolium	Drepanocladus uncinatus
Brachythecium ? populeum	Plagiochila asplenioides
Tortella tortuosa	Anomodon rostratus
Bartramia pomiformis	Lejunea cavifolia
Radula complanata	Frullana sp.
Myurella sibirica	Crateneuron filicinum
Cephalozia sp.	etc.

Vascular Plants

Hemlock-pine-hardwoods forest

Cystopteris fragilis	Cystopteris bulbifera
Athyrium felix-femina	Thelypteris hexagonoptera
Dryopteris spinulosa	Taxus americana
Sphenopholis intermedia	Glyceria striata
Agrostis perennans	Solidago rugosa
Solidago gigantea	Poa compressa
Carex flava	Carex torta
Aster puniceus	Aster lateriflorus
Erigeron annuus	Dryopteris marginalis
Pilea pumila	Rubus pubescens
Tussilago farfara	Taraxacum officinale
Eupatorium maculatum	Eupatorium purpureum
Mitella diphylla	Thalictrum polygamum
Danthonia spicata	Cicuta bulbifera
Solidago juncea	Aster divaricatus
Polypodium vulgare	Apocynum cannabinum
Aster macrophyllus	Rubus odoratus
Carex communis	Achillea millefolium
Salix rigida	Calamagrostis canadensis
Aquilegia vulgare	Solanum dulcamara
Diervilla lonicera	Chrysosplenium aureum
Aralia racemosa	Acer pensylvanicum
Prunus serotina	Lycopus americanus
Betula alleghaniensis	Plantago major
Phalaris arundinacea	Juncus dudleyi
Woodsia ilvensis	Solidago candensis
Epilobium sp.	Asplenium trichomanes
Rumex obtusifolius	Rorippa sp.

Report 8, New Haven River Gorge, New Haven River, Bristol, Addison County, Vermont.

Site 756, surveyed 27 September 1983 by J.C. Jenkins and P.F. Zika.

A series of three adjacent sites with small falls, small cascades, pools, a small gorge, and some low rock walls.

Atlas map 31; Bristol and South Mountain 7.5' quadrangles. Adjacent to the road from Bristol to Lincoln. The first cascade is right above the highway bridge at Rocky Dale; the gorge is about 0.2 miles upstream from the bridge and the upper cascade about 0.4 miles upstream.

* * *

The site is in a wooded gorge at the edge of the mountains, adjacent to a paved road but with no houses in sight. The Village of Rocky Dale is about one-eighth mile from the lowest falls. The lower and upper cascades are natural; at the middle one there is a small dam, apparently fairly old, of uncertain origin and purpose.

The river is a large mountain stream over 25 feet in width, with a bouldery channel. The water appears quite clean.

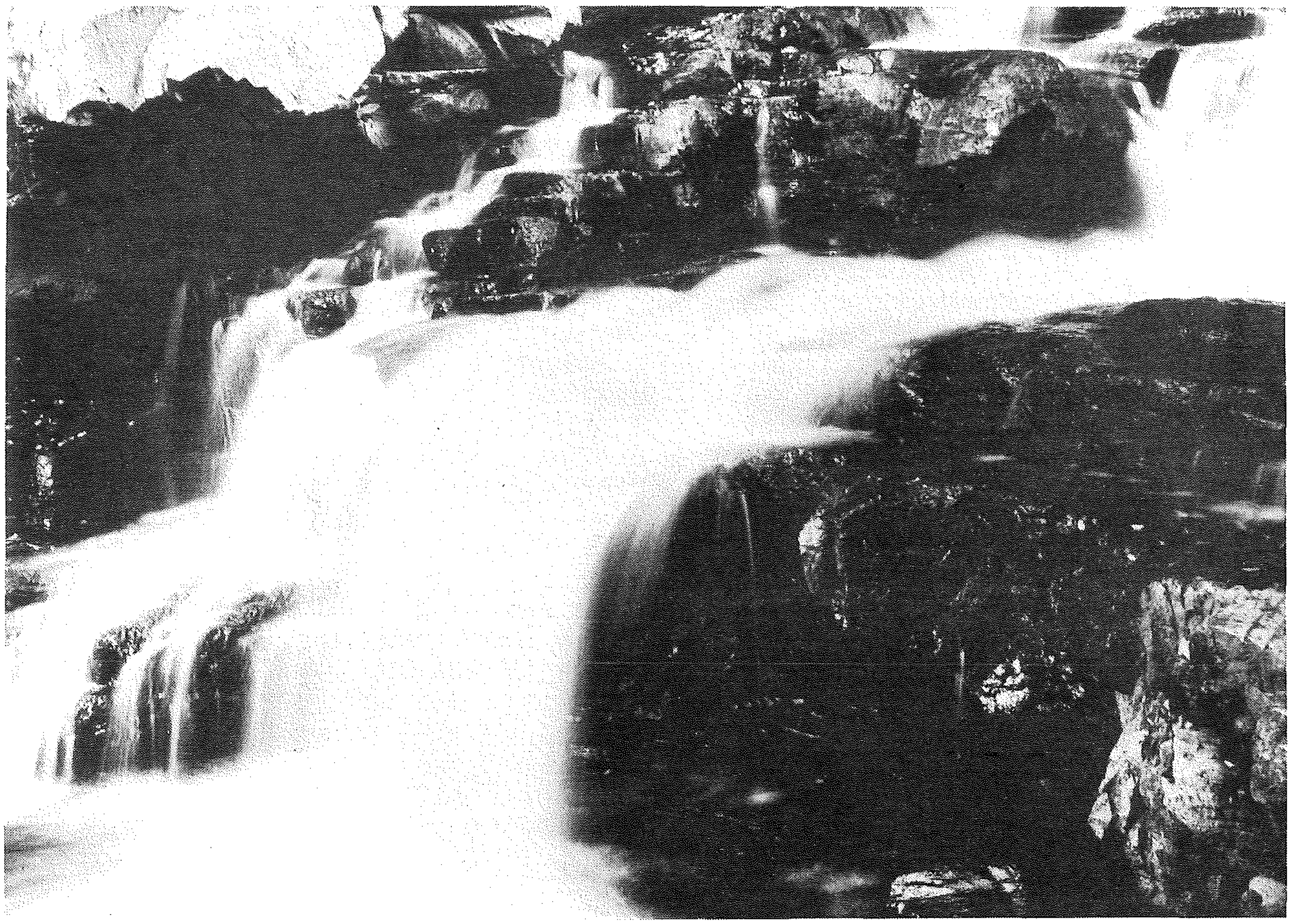
The lowest site is a flat cascade over tilted ledges, about 50 yards long.

The next site is a small gorge with a dam and falls. There are rock walls to 30 feet high, some overhanging walls, a falls about 12 feet high, and a nice rock-circled pool below the falls.

The uppermost site has more tilted quartzite ledges with pools and cascades.

The rock is largely the Cambrian Cheshire quartzite, a smooth, hard rock that usually fractures into cubical blocks and so far as we know does not make ripples or potholes. Normally this formation has no lime, but we were surprised to find several plants at the site we think of as limestone indicators and a greater variety of both higher plants and mosses than is usual for quartzite. It is quite possible that, as seems to be the case in the Middlebury Gorge, some of the Forestdale marble which outcrops upstream is mixed or interbedded with the quartzite here.

The forest is northern hardwoods-hemlock woods plus elm, basswood, aspen, etc. There are a reasonable number of plant species, but no rarities are present. The diversity is not exceptional but at the middle falls we have the rather odd situation of at least six different limestone mosses growing on



NEW HAVEN RIVER GORGE

normally unlimy quartzite outcrops. This seems to us an odd enough situation to be worth noting, and we rate the botany as exemplary although we do not know just what it is it exemplifies.

All three cascades seem to be popular swimming and take-your-girl-and-look-at-the-water-places. From the lower and middle ones there are nice views of Rocky Dale and the cliffs there. They lack large flat-topped rocks and so are less suitable as party places. Some of the pull-offs are trashy and need cleaning.

* * *

Summary: Rural woodland setting, nice rocks, exemplary botany, no seclusion, some trash, clean water, good swimming.

Plants Seen at The New Haven River Gorge

Mosses and Liverworts

Preissia quadrata	? Rhynchostegium serrulatum
Bryum pseudotriquetrum	? Gymnostomum aeruginosum
Myurella sibirica	Ceratodon purpureus
Coniocephalum conicum	Cololejunea biddlecomiae
? from Pottiaceae	Hygrohypnum ochraceum
Brachythecium rivulare	Brachythecium sp.
Amblystegium ? tenax	Platydictya sp.
Anomodon rostratus	Plagiothecium sp.

Vascular plants

Betula alleghaniensis	Acer saccharum
Ulmus americana	Tilia americana
Populus tremuloides	Tsuga canadensis
Lonicera morrowi	Tussilago farfara
Poa compressa	Taraxacum officinale
Hieracium sp.	Solidago juncea
Aster cordifolius	Apocynum cannabinum
Solidago caesia	Polypodium vulgare
Polystichum acrostichoides	Osmunda claytoniana
Polygonum cuspidatum	Rubus idaeus
Elymus riparius	Saponaria officinalis
Solidago gigantea	Panicum capillare
Verbascum thapsus	Rubus odoratus
Trifolium pratense	Rubus pubescens
Eupatorium maculatum	Cystopteris bulbifera
Laportea canadense	Lactuca sp.
Equisetum arvense	Pilea pumila
Thelypteris phegopteris	Agropyron repens
Muhlenbergia frondosa	Achillea millefolium
Aster umbellatus	Agrostis sp.
Cystopteris fragilis	Solidago flexicaulis
Sagina procumbens	Campanula aparinoides
Galium triflorum	

Report 9, Lana Falls, Sucker Brook, Salisbury, Addison County, Vermont.

Site 583, survey based on visits prior to 1983 by P.F. Zika and J.C. Jenkins.

Several small cascades.

Atlas map 25, East Middlebury 7.5-minute quadrangle. The trail to Lana Falls and Silver Lake starts on the east side of the road about one-quarter mile south of the state park on the east side of Lake Dunmore. The hike takes a half hour if you are a botanist.

* * *

The falls are in a wooded ravine of Sucker Brook. The nearest buildings are the houses on the roadside about 0.1 mile to the west. A powerline clearing and a penstock pass 1,000 feet to the south of the falls. They are obvious from the hiking trail but not from the falls.

Sucker Brook is a mountain stream less than 15 feet wide, clear and cold.

The falls are actually two angled cascades ten to 15 feet high in a steep rock chute. Below this is a pool perhaps 25 feet wide and then several very small cascades. The rocks around the stream are sheer in places, varying from ten to 30 feet in height above the water.

The rock appears to be quartzite and is not at all limy. The site is mapped as a probable contact between two Cambrian formations: Moosalamoo phyllite and Forestdale marble. The Forestdale formation is quartzitic in places. Perhaps the map is slightly inaccurate, and the bedrock is actually Cambrian Cheshire quartzite that is common up to the west shore of Silver Lake. Whatever it is, the angular form of the rocks around the main cascades is unusual, and the rocks are very nicely exposed.

Vascular plants are not common or diverse at the site. One species of note was found on the ledges: *Potentilla tridentata*, the three-toothed cinquefoil. About 50 plants were seen in 1982. This is the only waterfall or gorge in the state that is known to have the species. Elsewhere in Vermont *P. tridentata* is only known from the summits of Mt. Mansfield, Camels Hump, and Jay Peak, and from granite cliffs on several lesser mountains. Liz Thompson of The Nature Conservancy reports *Lindera benzoin* grows at Lana Falls.

Bryophytes at the falls have not been studied.

LANA FALLS

The falls are heavily visited by campers from nearby Branbury State Park, and are well known to the locals. The pools are deep enough for bathing. The site is clean.

A pretty place and somewhat remote, by Vermont standards.

* * *

Summary: Mountain setting; nice rocks; poor biological diversity but with one rare species; moderately private if you time your visit right; in a wild setting; very clean water; popular for hiking; a nice place to sit and be cold and wet on a hot day.

HIGH IMPORTANCE because it is moderately wild and secluded (and that is rare for Vermont waterfalls) and because it is much visited by hikers.

Report 10, Beldens Falls, Otter Creek, Weybridge and New Haven, Addison County, Vermont.

No site number, surveyed 15 November 1983 by P.F. Zika.

A dam and powerstation, with a small gorge between two rocky islands at the foot of the dam.

Atlas map 24, USGS Middlebury 7.5' quadrangle. Drive north from Middlebury three miles on U.S. Route 7 and turn west on a dead end road (opposite River Road, which runs east). At the end of the road is the dam and Otter Creek. The islands are accessible from walkways below the dam.

* * *

The site is a densely wooded portion of the floodplain of Otter Creek. Much of the surrounding land is farmed. A dam, powerhouse, access road and powerlines are visible from the site. There are no houses nearby.

The Otter Creek is a broad alluvial river, about 50 feet wide near the site, with clean but fertile and slightly muddy water. There was some algae near the dam but very little further downstream.

The dam is about 50 feet wide by 30 feet high, with 30 foot high cliffs to the west of it. There are two rocky islands below it and between them the river has carved a gorge 100 feet long and 15-25 feet high. The walls of the gorge are nearly vertical, and there are a number of eroded caves (less than two feet across) and potholes within the gorge. The western channel of the river ends with two broad potholes, 15 and 20 feet wide.

The eastern island is high and made of broken rock with deep cracks; the water tunnels under it and in places you can look down 30 feet into the rock and see flowing water. The tunnel is about 15 feet wide and reenters the channel between the two islands near the foot of the gorge. Rippled, water-carved rocks occur near the summit of the island, high above the current channel.

The rocks are variously white and grey marbles and an orange dolomite, mapped as the Belden member of the Ordovician Chipman formation. It is possible that the falls are the type locality for this rock. Many of the rocks are rounded, fissured, rippled and carved.

The vascular plants were typical for limy and sunny ledges in the Champlain Valley. One unusual species was found: *Sporobolus neglecta*, an inconspicuous grass. It is currently known from only two stations in Vermont, here and in Middlebury. The site should be rechecked early in the season to look for other limestone rarities.

BELDENS FALLS

Probably about 15 species of bryophytes occur on the islands: no collections are made.

The site probably does not receive much use (there are a bunch of No Trespassing signs) from sightseers. The water is designated Class C, and swimming is not recommended. Fishermen are likely to come here. There is very little trash. Kayakers and canoeists use the access road to the dam to get down to the river. They launch their boats at a point just below the powerhouse. The site is to be expanded to generate more electricity. As part of this redevelopment, a canoe portage route and scenic overlook are to be provided.

The prettiest thing about this site is the bedrock, with its bright color and rippled surfaces. The tunnel under the eastern island is a unique feature, and the island itself with its sculptured rocks and deep fissure is both attractive and unusual.

* * *

Summary: Developed for hydroelectric generation, open setting on one shore and woods on the other, fine rocks and erosional features, possibly a type locality for the Belden Member, average botany with one rare species, not secluded, clean, mildly polluted water, no swimming, heavily used for fishing, kayaking and canoeing below the project.

Vascular Plants of Beldens Falls

Salix alba ?
Ulmus americana
Betula papyrifera
Acer rubrum
Quercus rubra
Fraxinus americana
Lonicera sp.
Amelanchier sp.
Pinus strobus
Picea rubens
Thuja occidentalis
Tsuga canadensis
Cystopteris bulbifera
Cerastium vulgatum
Hypericum perforatum
Erigeron canadensis
Solidago canadensis
Solidago nemoralis
Lemna minor
Sporobolus neglecta
Muhlenbergia sp.
Agrostis stolonifera ?
Poa compressa
Chrysanthemum leucanthemum
Aquilegia canadensis
Dryopteris marginalis
Polypodium virginianum
Achillea millefolium
Hieracium sp.
Taraxacum officinale
Carex eburnea

Report 11, Battell Gorge, Otter Creek, Weybridge and New Haven, Addison County, Vermont.

Site A, surveyed 15 November 1983 by P.F. Zika.

A small limestone gorge, deeper than wide. No dam.

Atlas map 24, Middlebury 7.5' quadrangle. Drive north from Middlebury on U.S. Route 7 for three miles to a four-corners; River Road goes east, take the dead end to the west. Park by the railroad bridge and walk north along the tracks for five minutes, passing through a cut in the bedrock. The gorge is a short distance below (west of) the tracks and just north of the cut.

* * *

The site is in the floodplain of Otter Creek. The banks are wooded, mostly with hemlock and cedar, for one-quarter mile below the site. The surrounding country is mostly farmland. The dam at Beldens Falls is barely visible in the distance and passing trains can be seen from the gorge but otherwise the landscape is natural.

Otter Creek is a lowland river, 40-50 feet wide above the gorge and 15-20 feet wide within the gorge. The water is very turbulent within the gorge, and appears clean but is designated as Class C.

The gorge is about 20-25 feet deep and 250 feet long, with vertical to overhanging walls. The limestone is carved and grooved, and there are many potholes and small caves at the edges of the channel. At the bottom of the gorge is a 150 foot wide pool and several large flat ledges, very spacious and pleasing after the narrow gorge. If the water did not receive a treatment plant discharge it would be a good swimming spot.

The bedrock is a light grey limestone, part of the Belden member, of the Ordovician Chipman formation. This may possibly be the type locality for that rock.

No uncommon vascular plants were seen, but a visit should be made earlier in the season to check this. Mosses were very common on the shaded lime ledges and over the ground on the rim of the gorge. The walls of the gorge are scoured by high water in the spring and had essentially no plants at all.

The east shore of the river north of the gorge is a coniferous woods with numerous limestone outcrops, and appears to be a possible habitat for rams-head lady-slipper (*Cypripedium arietinum*) and giant birds-nest (*Pterospora andromedea*). A search should be made for the two in June.

The gorge is scenic but does not seem to be heavily used. It may be an excellent short whitewater run in the spring.

Although small, this is a wild and pretty site, little used and hence, relatively undisturbed. It is valuable because it is one of the few gorges on a large river in Vermont that is not dammed, and of those gorges it is perhaps the prettiest.

* * *

Summary: Woodland setting, fine rocks, average botany, somewhat secluded and quite wild, clean, mildly polluted water, no swimming because of the Class C water designation, nice scenery, good fishing, good whitewater.

HIGH IMPORTANCE: one of the two undisturbed gorges on a large river; fine sculptured rocks. Flora needs to be checked in spring.

NOTE. The thin soils on the rim of the gorge could be easily eroded and the site degraded by any increase in the use.

Vascular Plants of Battell Gorge

Thuja occidentalis
Tsuga canadensis
Ulmus americana
Lonicera morrowi
Carex eburnea
Panicum lanuginosum
Eleocharis tenuis
? Deschampsia caespitosa
Poaceae spp.
Chrysanthemum leucanthemum
Campanula rotundifolia
Aster divaricatus
Verbascum thapsus
Rubus occidentalis
Geranium robertianum
Asplenium platyneuron
Asplenium trichomanes
Symphoricarpos albus
Saxifraga virginiana

Report 12, Falls of Little Otter Creek, Little Otter Creek, Ferrisburg, Addison County, Vermont.

Site 294, surveyed on 22 June 1983 by P.F. Zika.

A wide low cascade.

Atlas map 30, Monkton 7.5' quadrangle. Take Monkton Road east out of Vergennes, through a four-corners, across Mud Creek, bear left (north) at a fork, cross Little Otter Creek and turn left (northwest). The site is one mile up this road, on the right (east). Access is along an old road that leads to the former bridge over the river.

* * *

The site is a flat pasture in the floodplain of the Little Otter Creek, with young second-growth woods containing aspens, elms, pines and hemlocks. Much of the surrounding land is agricultural. No houses can be seen from the site but the road is within 50 yards and there is no sense of remoteness.

Little Otter Creek is a shallow, muddy stream, at most 20 feet wide below the falls. There is no official pollution but the creek receives runoff from many fields and barnyards and the rocks are coated with algae.

The site is a single cascade of six to eight feet over red ledges extending to a width of perhaps 25 yards. At the time of the visit there was not much flow over the cascade. A pool 20-30 feet wide is at the base of the west side of the cascade.

The bedrock is the Monkton quartzite, a hard red stone of Cambrian age. The ledges are limy. No sculpture or rippling occurs.

The vascular plants were typical damp limy ledges. Two unusual sedges were found, *Carex amphibola* and *Carex formosa*. *C. amphibola* is currently known from about 20 stations in Vermont, *C. formosa* from about ten. Both are plants of wet, somewhat disturbed sites like floodplains. Both may be more common in the Champlain Valley than current work has shown.

Bryophytes are common at the site.

The falls are not heavily used. There are some fishermen's trails and cow paths in the area. The water is too shallow and muddy for good swimming. It probably receives light use as a picnic and party place. The site was not messy, but some litter was present at the time of the visit.

Although the cascade is quite wide it is not high. The muddy water is not appealing, and the site is not really very choice.

* * *

Summary: Open woodland setting, average rocks, average botany with two unusual species, not secluded, some trash, mildly polluted water, no swimming, light local use of scenery, picnics, and parties.

LOCALLY IMPORTANT.

FALLS OF LITTLE OTTER CREEK

Vascular Plants of The Falls of Little Otter Creek

Carex amphibola
Carex stricta ?
Carex stipata
Carex formosa
Iris versicolor
Solidago gigantea
Geranium robertianum
Cerastium vulgatum
Potentilla recta
Potentilla simplex
Vicia tetrasperma
Poa compressa
Poa pratensis
Taraxacum officinale
Stellaria longifolia
Potomageton sp.
Thalictrum polygamum
Berberis vulgaris
Cornus amomum
Hieraceum aurentiacum
Hieraceum pratense ?
Poa palustris
Anemone canadensis
Scirpur validus
Cicuta maculata
Poaceae sp.
Lycopus americanus
Scirpus spp.
Salix rigida
Carex vulpenoidea
Thelypteris palustris
Juncus tenuis
Betula papyrifera
Nymphaea odorata ?
Vitis riparia
Tilia americana
Fraxinus pensylvanica
Ulmus americana
Rhus typhina
Prunus serotina
Salix alba ?
Quercus macrocarpa
Solanum dulcamara
Chenopodium album
Eleocharis tenuis ?
Viola sp.
Impatiens sp.
Lysimachia ciliata
Phleum pratense
Hypericum perforatum
Bromus sp.
Medicago lupulina
Lonicera morrowi
Rhamnus cathartica
Oxalis europaea
Daucus carota
Tragopogon pratensis
Stellaria graminea
Vicia cracca
Veronica serpylifolia
Chrysanthemum leucanthemum
Solidago juncea
Prunus virginiana
Parthenocissus sp.
Rubus occidentalis
Juniperus communis
Carex sp. (ovales)
Fragaria virginiana
Ranunculus acris
Carex swanii ?
Centaurea sp.
Veronica officinalis
Plantago lanceolata
Antennaria plantaginifolia
Toxicodendron radicans
Galium triflorum
Lactuca sp.
Lonicera dioica
Equisetum arvense
Armoracea lapathifolium
Eupatorium maculatum
Cornus stolonifera
Potamogeton epihydrus
Carex sp.
Carex torta
Solidago canadensis
Amphicarpa bracteata
Carpinus caroliniana
Geum sp.
Caltha palustris
Cystopteris fragilis
Athyrium filix-femina
Galium sp.

Mosses (in part)

Thuidium abietiunum
Anomodon attenuatus
Anomodon rostratus
Brachythecium ssp.

Report 13, Bristol Memorial Forest Park Gorge, Baldwin Creek, Bristol, Addison County, Vermont.

Site 293, surveyed 17 May 1984 by P.F. Zika.

A small falls and deep gorge in a local park.

Atlas map 31, USGS Bristol 7.5-minute quadrangle. The site is exactly at the tip of the geological indicator symbol in the VT atlas. From Rocky Dale, take Route 116 north about two miles and turn right on Route 17. The park is on the right about 1.5 miles up, and is marked with a sign. The gorge is accessible from a short trail starting at the parking and picnic area. A dangerous bridge, currently blockaded by a fence, crosses the gorge. The rotten planking and supports were supposed to be replaced in the summer of 1984. At the time of the visit no repairs had been started.

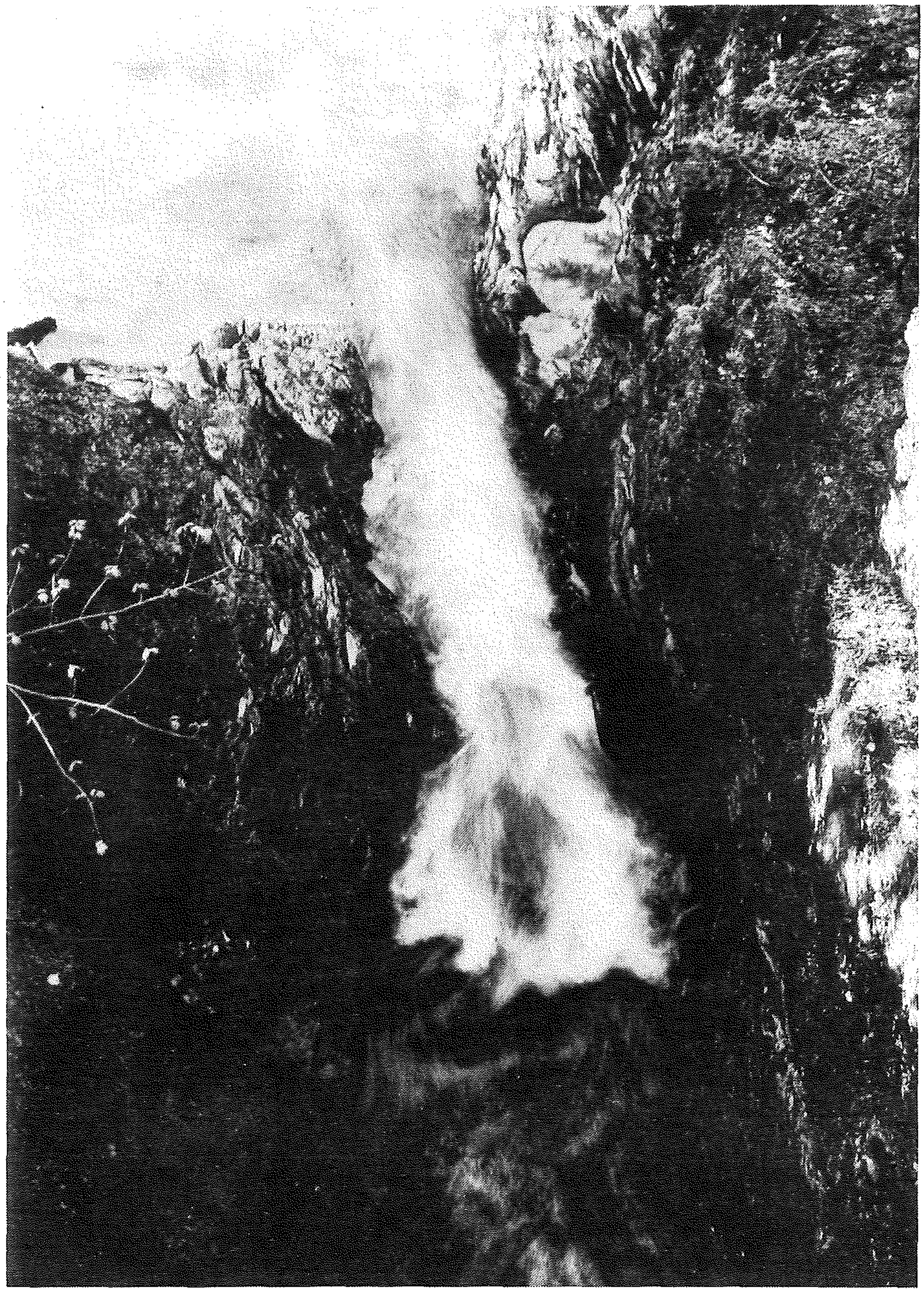
* * *

The falls and gorge are in the foothills of the Green Mountains. The land is steep, forested, and much logged. The woods near the road are a young mixed forest of birch, maple and hemlock; at the stream there is mostly hemlock with a few yellow birch. There are no houses in the vicinity. The highway passes nearby, and a conspicuous sign marks the parking for the picnic area and trail to the gorge. The highway is visible from the base of the gorge.

Baldwin Creek is a shallow mountain stream about 15 feet wide. Its water is very clean and clear. No thick growths of algae were observed in the stream channel. Below the gorge a small culvert delivers a very rusty dribble of water over the rubble used as roadfill. This is the most unattractive feature of the site; fortunately it is not very visible from the public trail.

Along the path from the parking lot, there are several cascades on Baldwin Creek, ranging from one to six vertical feet in height. At the head of the gorge is a ten to 15 foot waterfall. Below the falls the stream is diverted at a right angle and flows through a 35-40 foot high narrow gorge with sheer walls. The gorge is about 120 feet long and ten to 15 feet wide. At the foot of the gorge there is a pool, and then the channel widens and forms nearly continuous riffles until its junction with Beaver Brook.

The bedrock at the site is Cambrian and is somewhat confusing to interpret from the geological map. Most likely the schist of the gorge walls is the Fairfield Pond member of the Underhill formation. Underneath it is a softer rock, perhaps the dolomite or limestone of the Forestdale member. To the east the map shows graywacke of the Pinnacle formation. The rock at the



BRISTOL MEMORIAL FOREST PARK GORGE

base of the gorge is a little limy. Some ripple rock is present. There are about six potholes between two and eight feet in diameter along the lower walls of the gorge. One of these is active.

The vascular plants are quite ordinary and are listed at the end of this report. Bryophytes are abundant on the walls of the gorge and are largely inaccessible without ropes. This is potentially an important moss locality, and it would be good to have a thorough inventory.

The park was established by the Town of Bristol as a memorial to veterans of World War II and Korea. It is well-kept. Locals and tourists use the site as a rest area and for picnics or short hikes. There is no swimming.

This is a highly important site, with considerable visual appeal, heavy use, and protected status. There are very few other deep and narrow gorges in Vermont without dams. Currently there are no known threats to the integrity of the park. We offer two recommendations: that the bridge is repaired and a trash barrel is supplied by the Town. At the time of the visit all the trash at the parking area had been neatly piled in the fireplace in the absence of a more proper receptacle.

* * *

Summary: Wooded mountainous setting, fine rocks, average biology, clean, clean water, no swimming, popular for picnics and short hikes.

HIGH IMPORTANCE.

Vascular Plants of Bristol Memorial Forest Park Gorge

Dryopteris marginalis
Polypodium virginianum
Acer saccharum
Taxus canadensis
Betula alleghaniensis
Cystopteris fragilis
Tiarella cordifolia
Populus balsamifera
Equisetum arvense
Acer spicatum
Tussilago farfara
Taraxacum officinale
Aster puniceus
Mitella diphylla
Barbaria vulgaris
Ranunculus acris
Myosotis scorpioides

Basin 4: Shores and minor tributaries of lower Lake Champlain.

No waterfalls or gorges are known in this basin.

Basin 5: Shores and minor tributaries of upper Lake Champlain.

This basin contains the Champlain shoreline north of Ferrisburg but excludes the mouths of the major rivers. It contains a single site:

Shelburne Falls, LaPlatte River, Shelburne.

Report 14, Shelburne Falls, LaPlatte River, Shelburne, Chittenden County, Vermont.

Site 54, surveyed 12 May 1983 by P.F. Zika and J.C. Jenkins.

Low cascades in the bed of the LaPlatte River with adjacent cliffs.

Atlas map 36, USGS Burlington 15' quadrangle. The falls are 50 yards north of the crossroads the maps called Shelburne Falls, and accessible by a short walk from Irish Hill Road.

* * *

The LaPlatte is a medium-sized lowland river, averaging over 50 feet across; it receives treated dairy and municipal wastes from Hinesburg and agricultural runoff all along its length. It is classified as C water below Hinesburg and B water at Shelburne Falls, and the 1982 Water Quality Assessment notes that the Hinesburg plant had operational problems and the river did not meet dissolved oxygen standards. In May, we noted moderate pollution.

The falls are in a wooded valley in agricultural countryside; several houses are nearby. The west bank has cedar and hardwoods, the east bank has second-growth hardwoods. A bridge and several houses are visible from the falls.

The site is near the contact between the Ordovician Shelburne limestone and the Cutting dolomite, and appears to be largely limestone. The falls are about 50 feet wide by 100 feet long; the water cascades down shelves and low falls with a total drop of about 20 feet. The rocks are grooved and somewhat rippled but no striking features are present. Along the west bank are vegetated limestone ledges about 25 feet high and 75 yards long. The rock is orange and typical of the Champlain Valley limestones.

No botanical records are included; because of pollution and disturbance the area is not particularly interesting. A single rare plant, the sedge <u>Carex formosa</u> was found about 25 feet from the water along a small creek on the east side of the river. The species is currently known from about ten sites in Vermont.

Again, because of pollution, the area does not appear to be an important recreational site. It is important for the oxygenation of a river with pollution problems.

About half a mile below this site, the river has a wooded floodplain and there is a line of limestone cliffs about 80 feet high and one-quarter mile long running along the west edge of the floodplain. This area is not a waterfall or gorge and so is not treated here, but might be mentioned as a natural area of considerable beauty from which there are old records of several rare plants.

* * *

Summary: Rural setting, indifferent rocks and falls, indifferent botany except for one rare plant, no seclusion, no trash, polluted water, perhaps light use for fishing.

Basin 6: Missisquoi River Basin

This basin contains the following sites:

Tillotson Mill	Lockwood Brook, Lowell
Highgate Falls	Missisquoi River, Highgate
Sheldon Falls	Black Creek, Sheldon
Pierce Mill	Missisquoi River, Troy
Big Falls	Missisquoi, Troy

The following site has not been done:

Mill Brook Falls	Mill Brook, Westfield

See the appendix for:

Jay Branch Gorge	Jay Branch, Troy

Basin 6 contains the Missisquoi River watershed in northwest Vermont. Most of the watershed consists of farm country with low hills and much cleared land, and we suspect that all the major waterfalls and gorges are known. The eastern edge of the watershed includes portions of Jay Peak, Hazens Notch and Belvidere Mountain. No upland waterfalls are known from these ranges but there must certainly be some that have not been reported. Limestone and serpentine outcrops occur in several places in these mountains, and it is quite possible that interesting botanical sites occur along some of the headwaters streams.

Report 15, Tillotson Mill, Lockwood Brook, Lowell, Orleans County, Vermont.

No site number; surveyed 6 October 1983 by J.C. Jenkins. Visited by accident owing to a mistake in the state waterfall map; by happenstance there was a small falls at the point where someone believed Potters Pond Falls to be but where it was not.

Small woodland cascade below an old mill site. Barely qualifies for this survey.

Atlas map 47, USGS Jay 15' quadrangle. Taking the back roads from Lowell you come to the Tillotson's Lumber Mill; the site surveyed is downhill from their barn.

* * *

Site is 50 yards below a lumber mill, in second-growth woodlands, just downstream from the old mill pond which now is an alder swamp. Deserted part of the country, flanks of Belvidere Mountain, only one house for a mile. The sawmill used water power until the 1930's (!), then, the 19th Century having caught up with them, switched to steam. It is currently powered by gasoline, but they are considering rebuilding the dam and putting in a turbine.

Small mountain brook, averaging ten feet wide, clean water.

Currently there is a five foot beaver dam at the old mill pond. Below it are the footings for the old concrete dam, then a falls about four feet high and some sloping ledges that form a cascade about 25 feet long at high water.

The rocks are blue quartz-mica schist (Cambrian Hoosic schist). They are smoothed but not particularly sculptured.

There is no lime and the plants are unremarkable. No rarities were seen.

Other similar cascades could occur further along the brook; the Tillotsons did not know or would not admit to there being any bigger falls.

A small pleasant place but without any particularity or distinction.

* * *

Summary: Woodland setting, poor rocks, average biology, some seclusion, no trash, no users.

Plants Seen At Tillotson Mill

Mosses and Liverworts

- Climacium dendroides
- Brachythecium plumosum
- B. salebrosum
- B. rivale
- Grimmia alpicola
- Thujidium sp.
- Tortella tortuosa
- Ceratodon purpureus
- Hypnum lindbergii
- Amblystegium sp.
- Anomodon attenuatus
- Coniocephalum conicum
- Plagiochila asplenioides
- Rhacomitrium aciculare
- Atrichum undulatum
- Mnium sp. (single-tooth)
- Metzgeria conjugata
- Drepanocladus fluitans
- Campylium sp.

(There are several calciphiles on this list, indicating the schist contains small amounts of lime.)

Vascular Plants

- Solidago graminifolia
- Rubus flagellaris
- Scirpus cyperinus
- Salix lucida
- Juncus articulatus
- Solidago rugosa
- Hypericum perforatum
- Carex lurida
- Eupatorium perfoliatum
- Apocynum cannabinum

Report 16, Highgate Falls, Missisquoi River, Highgate, Franklin County, Vermont.

Site 761, surveyed 15 July 1983 by P.F. Zika.

A wide gorge below a small dam and the remnants of a falls.

Atlas map 53, Highgate Center 7.5' quadrangle. From Highgate Center an old bridge crosses the gorge just below the falls. Further downriver a new bridge also crosses the river.

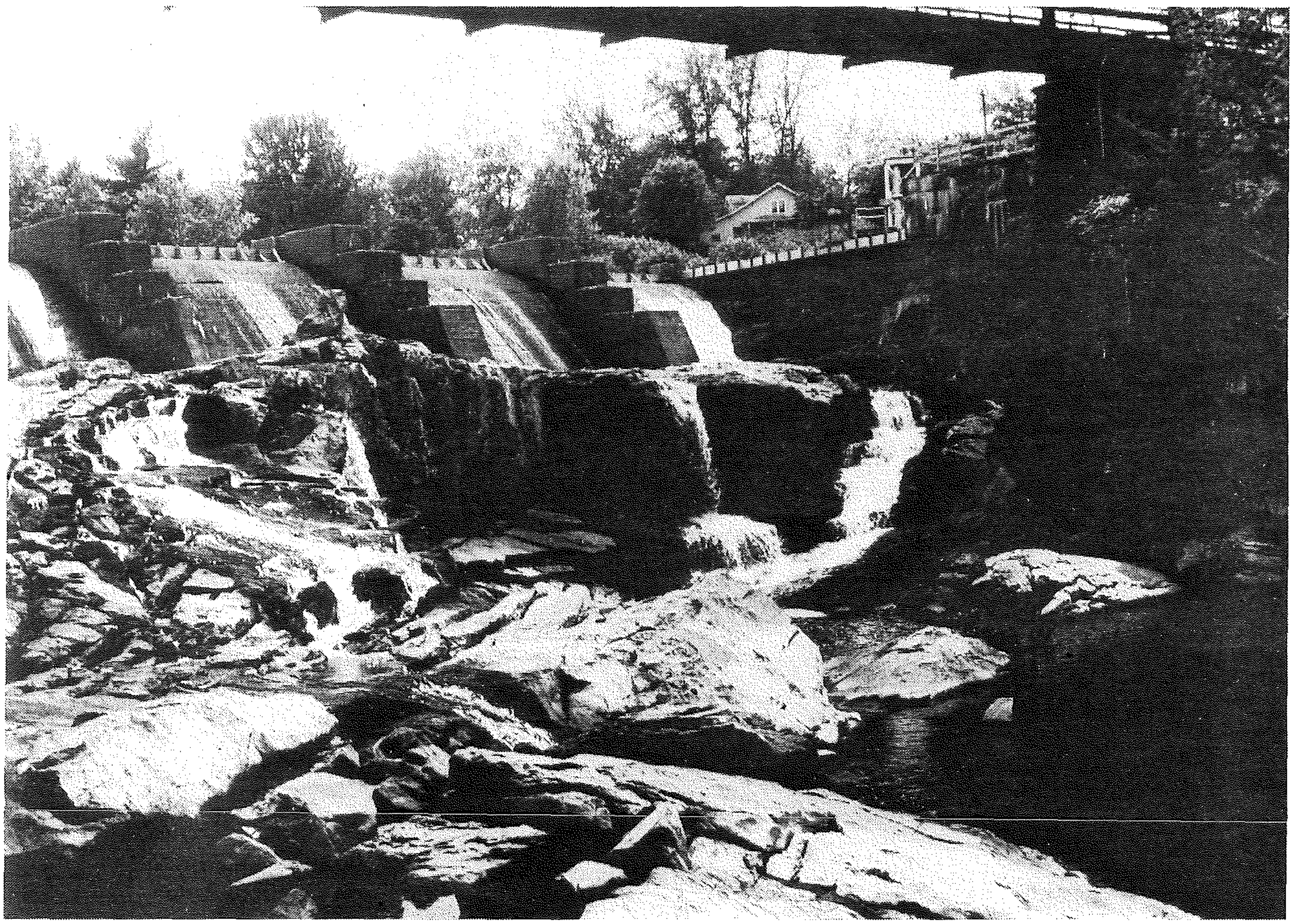
* * *

The site is on the outskirts of the Village of Highgate Center. Houses, streetlights, powerlines, two bridges, a dam, and the intake or powerhouse are visible from various points of the gorge. The rim of the gorge is forested with second-growth woods.

The Missisquoi is a large river, over 50 feet wide above the dam. The dam diverts most of the flow and the river was only ten feet wide below the dam at the time of the survey. The hydroelectric project at this site is to be expanded. In permitting this expansion, the state has required that a minimum flow of 35 cubic feet per second must be maintained in the bypass at all times when water is available. This minimum flow is the flow which presently leaks through the dam. The Missisquoi receives treated sewage upstream, and was turbid and foamy and appeared messy and septic, with much algal growth in the channel below the dam.

Below the dam, there is a falls about 15 feet high and a cascade of about the same height on either side of the falls. The falls are undercut and have a cave at their base. Below the falls is a gorge about one-third mile long with walls 20-30 feet high. The floor of the gorge is largely boulder-strewn rather than carved, but there are a few potholes and some carved rock near the upper end of the gorge. At one point a 15 foot high cascade enters the gorge from the north. The gorge might be a pretty place with clean water and more of it, but in its present state is smelly, slimy, and unpleasant. The striking features of the site are the cave behind the falls and the fine exposures of bedrock along the walls of the gorge.

The geology is complex, with a number of different formations exposed. At the falls the rock is limestone of the lower Ordovician Highgate formation, and this may be the type locality for this formation. The lower gorge is a dolomitic conglomerate, the upper gorge Cambrian dolomite. The conglomerate continues down the gorge to the new bridge and there meets a dark slate, the Hungerford member of the upper Cambrian Sweetsburg formation. In one area it makes a clear contact with older rocks mapped as the Saxe Brook dolomite, and that formation is mapped as the oldest (middle Cambrian).


HIGHGATE FALLS

Hence, the gorge contains a stratigraphic section including four formations from two different periods; we think that this is one of the most complicated stratigraphies that we encountered at any gorge.

No unusual vascular plants were located, despite an intensive search along both walls of the gorge and around the falls. There is an old published record, unsupported by a collection, of <u>Anemone multifida</u> from this site. (Circa 1890, H.G. Jesup.) Before the dam was built the habitat at the falls would certainly have been very similar to the two sites on the Winooski River where the plant grew in the 19th century.

The area around the falls receives some local use despite the low summer flows. The gorge itself is almost dry and probably gets little use. There was a lot of trash and junk on the riverbed at the time of the visit.

The site must have been spectacular before the dam was built. Now it is very trashy and somewhat polluted. The rocks are remarkable and with more flow the gorge would be a beautiful site.

* * *

Summary: Developed for hydroelectric generation, fine rocks, average botany, formerly a very rare plant, no seclusion or wildness, lots of junk, mild pollution, fair swimming.

Vascular Plants for Highgate Falls and Gorge

Deschampsia caespitosa
Equisetum arvense ?
Salix sp.
Populus deltoides
Salix rigida
Erigeron philadelphicus
Salix interior
Salix rigida
Apocynum sibiricum
Desmodium canadense
Solidago juncea
Campanula rotundifolia
Festuca sp.
Toxicodendron radicans
Solidago juncea
Verbena hastata
Phalaris arundinacea
Juncus dudleyi
Poa compressa
Ulmus americana
Oxalis europaea
Hieraceum sp.
Hypericum perforatum
Antennaria sp.
Melilotus albus
Houstonia caerulea
Eleocharis tenuis
Carex torta
Carex crinita
Scirpus atrocinctus
Epilobium glandulosum ?
Carex vulpenoidea
Cystopteris bulbifera
Aquilegia canadensis
Erysimum chieranthoides
Solanum dulcamara
Rorippa sylvestris
Rubus occidentalis
Diervilla lonicera
Cornus rugosa
Rubus odoratus
Betula allegheniensis
Tsuga canadensis
Acer rubrum
Pinus strobus
Thuja occidentalis
Populus tremuloides
Taraxacum officinale
Sphenopholis intermedia
Onoclea sensibilis
Galium sp.
Fragaria virginiana
Solidago gigantea
Solidago graminifolia
Tussilago farfara
Achillea millefolium
Lythrum salicaria
Acer saccharinum
Clematis virginiana
Betula papyrifera
Lysimachia nummularia

Bryophytes (in part)

Amblystegium riparium
unknowns from Pottiaceae
Plagiochila asplenioides
Fissadens cristatus
Amblystegium serpens
Coniocephalum conicum
Brachythecium plumosum

Report 17, Sheldon Falls, Missisquoi River, Sheldon, Franklin County, Vermont.

Site 0, surveyed 15 July 1983 by P.F. Zika.

A dammed and destroyed waterfall at the head of a small gorge.

Atlas map 53, Enosburg Falls 15-minute quadrangle. The road connecting Sheldon Springs and Shawville crosses the Missisquoi River just above the dam. Access is probably easiest from the north side of the river, west of the dam, but is tricky anywhere.

* * *

The site is in the Missisquoi River floodplain, and much of the land upstream from the site is agricultural. There is a large dam above the gorge (which destroyed the actual Sheldon Falls). Houses are visible above the site, while the shores in the gorge itself are wooded with young hardwoods and pine.

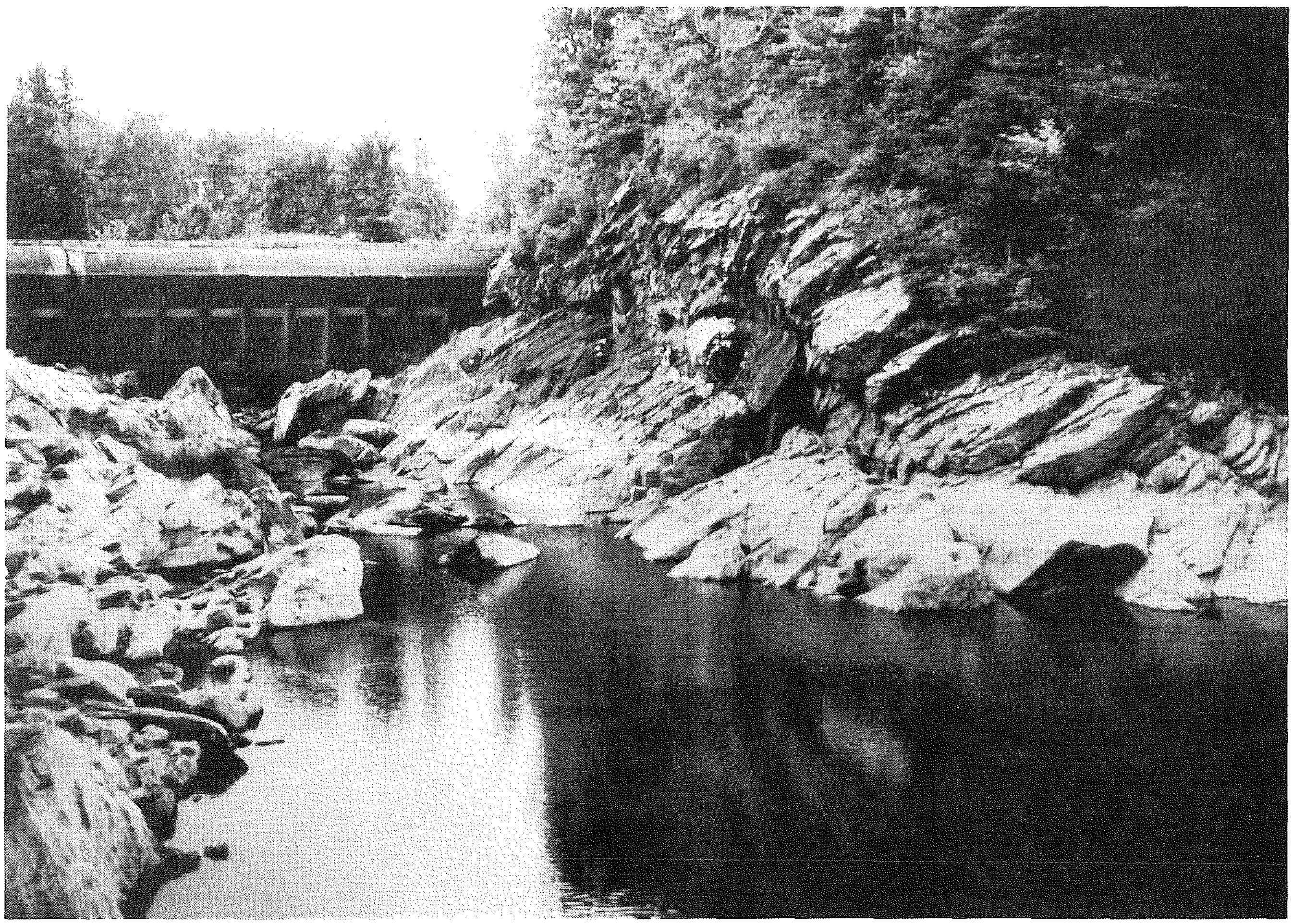
The dam diverts most of the water to a mill belonging to the Missisquoi Specialty Board Company, formerly Missisquoi Paper and Pulp. They return it to the river below the gorge, about one-half mile downstream.

The Missisquoi is a large alluvial river, with a channel averaging 30-50 feet wide below the site. The shores are mostly cobble. The water had a slight smell of sewage, and there was some algae on the rocks in the channel. We understand that process effluent from the pulp mill and some treated municipal wastes are discharged below the mill. The flow through the gorge is minute at low water, and there are many algae-filled pools.

The waterfall is completely obliterated by the dam.

Below the dam there is a short gorge about 100 feet long with rock walls about 25-35 feet high. After this, the river widens and there are ledges and carved rocks and chutes in the channel, making an impressive stretch of whitewater. The run is fairly short, approximately one-half to three-quarters of a mile, but very difficult and demanding, probably Class IV or higher depending on the water level. Several canoe organizations are trying to arrange some scheduled water releases here. If they are successful, the gorge will become an important recreational area, particularly for closed boats and competitions.

Below the walls, the south bank of the river is lined with rusty scrap metal and tangles of rusty wire, looking something like the reject pile of a bed spring factory. There are amazing amounts of this stuff: we judge it the most extensive industrial-fluvial deposit in the state.



SHELDON FALLS

The site is on or near a thrust fault, mapped as the contact between quartzites and dolomites of the Cheshire formation slate, and conglomerates of the Bridgeman Hill formation, both of Cambrian age. The ledges are limy, especially on the south shore of the river. The rocks of the Bridgeman Hill formation have a few potholes and are slightly carved in one place.

About 30 plants of *Hypericum pyramidatum*, a rare St. Johnswort currently known only from two other sites in Vermont, were found on the ledges north of the river, just below the dam. The rest of the plants are common species of cobble shores and limy woods.

The falls and gorge receive no use from swimmers because of the lack of water. There is a bass fishery in some of the pools in the gorge. The metal garbage below the gorge is also unpleasant, and, with all respect to the industrial base of our economy, the mill is not very scenic either.

Editor's Note: It should be pointed out that the project is being redeveloped. The Department of Water Resources and Environmental Engineering has issued a 401 water quality certificate which now contains a minimum flow requirement of 7Q10 through the bypass. Prior to this 401 certificate there had been no minimum flow requirement.

* * *

Summary: Industrial setting, developed for hydroelectric generation, nice rocks by the island, one rare plant species, no seclusion or wildness, mild pollution, no swimming, not used for picnics or hiking, receives some use by boaters in the spring.

Vascular Plants of Sheldon Falls

Phalaris arundinacea
Deschampsia cespitosa
Trisetum spicatum
Amelanchier sp.
Spartina pectinata
Pinus strobus
Populus tremuloides
Vaccinium sp.
Solidago juncea
Antennaria sp.
Festuca sp.
Cystopteris bulbifera
Cryptogramma stelleri
Erigeron sp.
Dryopteris marginalis
Sphenopholis intermedia
Saxifraga virginiana
Aquilegia canadensis
Cystopteris fragilis
Tsuga canadensis
Tilia americana
Ulmus americana
Acer saccharinum
Oxalis europaea
Athyrium filix-femina
Hypericum pyramidatum
Carex sp. (ovales)
Spiraea alba
Calamagrostis canadensis
Apios americana
Apocynum sibiricum
Panicum clandistinum
Phleum pratense
Lilium canadense
Veratrum viride
Alnus rugosa
Lysimachia ciliata
Salix rigida
Equisetum arvense
Osmunda claytoniana
Prunus virginiana
Desmodium canadense
Vitis riparia
Clematis virginiana
Galium sp.
Campanula aparinoides
Campanula rotundifolia
Achillea millefolium
Onoclea sensibilis
Rorripa sylvestris
Thalictrum polygamum
Smilax herbacea
Toxicodendron radicans
Populus deltoides
Cornum rugosa ?

Report 18, Bakers Falls, Missisquoi River, Troy, Orleans County, Vermont.

Site M, surveyed 7 August 1983 by P.F. Zika.

A dried up cascade below a dam.

Atlas map 55, Irasburg 15-minute quadrangle. From the center of Troy drive east on Vermont Route 100 (about 0.4 miles) and take the first left (north) turn. Follow that road north about one mile to the bridge over the pond formed by the dam. Access to the rocks below the dam is from the road to the powerhouse west of the river.

* * *

The site is in the broad floodplain of the Missisquoi River. Much of the surrounding land is cultivated. The site is quite flat and the dam is the most prominent single feature.

The Missisquoi is a large stream and averages about 40 feet wide above the dam and 25 feet wide below it. There are discharges in Troy and the water in the impoundment and in the pools below the dam was very smelly. The dam releases very little water in the summer. Algae are common and form great slimy masses in some of the pools. Small oil seeps were seen. No aquatic insects were seen, and we suspect that the water may be very poorly oxygenated.

Below the dam there is a cascade about 25 feet high, and below this two small cascades about ten feet high. None of them were very impressive because of the smell of the site and the lack of flow.

The rock was schist and phyllite from the Ordovician Stowe formation, a very common rock in this part of the state. There are no potholes or sculptured rocks. The damp ledges on the shaded north-facing bank of the river at the lower end of the cascades had traces of lime.

Two uncommon plants were found at the edge of the channel near the bottom of the cascades. The first was <u>Aster tradescanti</u>, a species restricted to rocky shores in Vermont, and is known from about ten contemporary stations. The second is <u>Vaccinium caespitosum</u>, the dwarf bilberry, which is known from about seven stations in Vermont and is restricted to alpine tundra and river gorges. A single small colony of about 20 stems was found here. Both of these species occur in larger populations elsewhere along the Missisquoi.

It is an ugly, smelly place, without recreational value, and with only a remnant of the original falls. Swimming is not recommended because the water is designated Class C. The two small colonies of rare plants are the only important things there.

* * *

Summary: Developed for hydroelectric generation, average rocks, two rare plants, no privacy, some trash, disgusting water, no swimming, an unpleasant place to visit.

WE RECOMMEND THAT THERE BE A MINIMUM FLOW RELEASE TO PROTECT PLANTS, IMPROVE WATER QUALITY AND AESTHETICS.

Plants From Bakers Falls

Agrostis sp.
Ulmus americana
Achillea millefolium
Antennaria sp.
Populus tremuloides
Pinus strobus
Aster umbellatus
Thuja occidentalis
Tsuga canadensis
Trisetum ?
Betula populifolia
Danthonia spicata
Hypericum perforatum
Salix rigida
Erigeron annuus
Alnus rugosa
Houstonia caerulea
Juncus tenuis
Thelypteris phegopteris
Aster tradescanti
Rubus pebescens
Acer spicatum
Betula alleghaniensis
Mimulus ringens
Phalaris arundinacea
Eupatorium maculatum
Solidago gigantea
Calamagrostis canadensis
Sagina procumbens
Phleum pratense
Rumex obtusifolius
Verbena hastata
Carex torta
Myosotis scorpioides
Bidens sp.
Laportea canadensis
Elymus riparius
Salix nigra
Polygonum sp.
Viola sp.
Vaccinium caespitosum
Campanula rotundifolia
Thalictrum polygamum
Spiraea alba
Aster puniceus
Ranunculus acris
Potamogeton epihydrus
Lindernia dubia
Galium sp.
Lycopus uniflorus
Hydrocotyle americana
Cardamine pensylvanica

Report 19, Big Falls of the Missisquoi River, Troy, Orleans County, Vermont.

Site 348, surveyed 7 August 1983 by P.F. Zika.

A gorge and large high-angle cascade. No dam.

Atlas map 55, Irasburg 15' quadrangle. From North Troy take Route 105 east for one mile, turn south, go about 1.5 miles to a pulloff on the right which is the parking for the falls. There is a smaller gorge one-tenth of a mile above the falls. It can be reached from the same road.

* * *

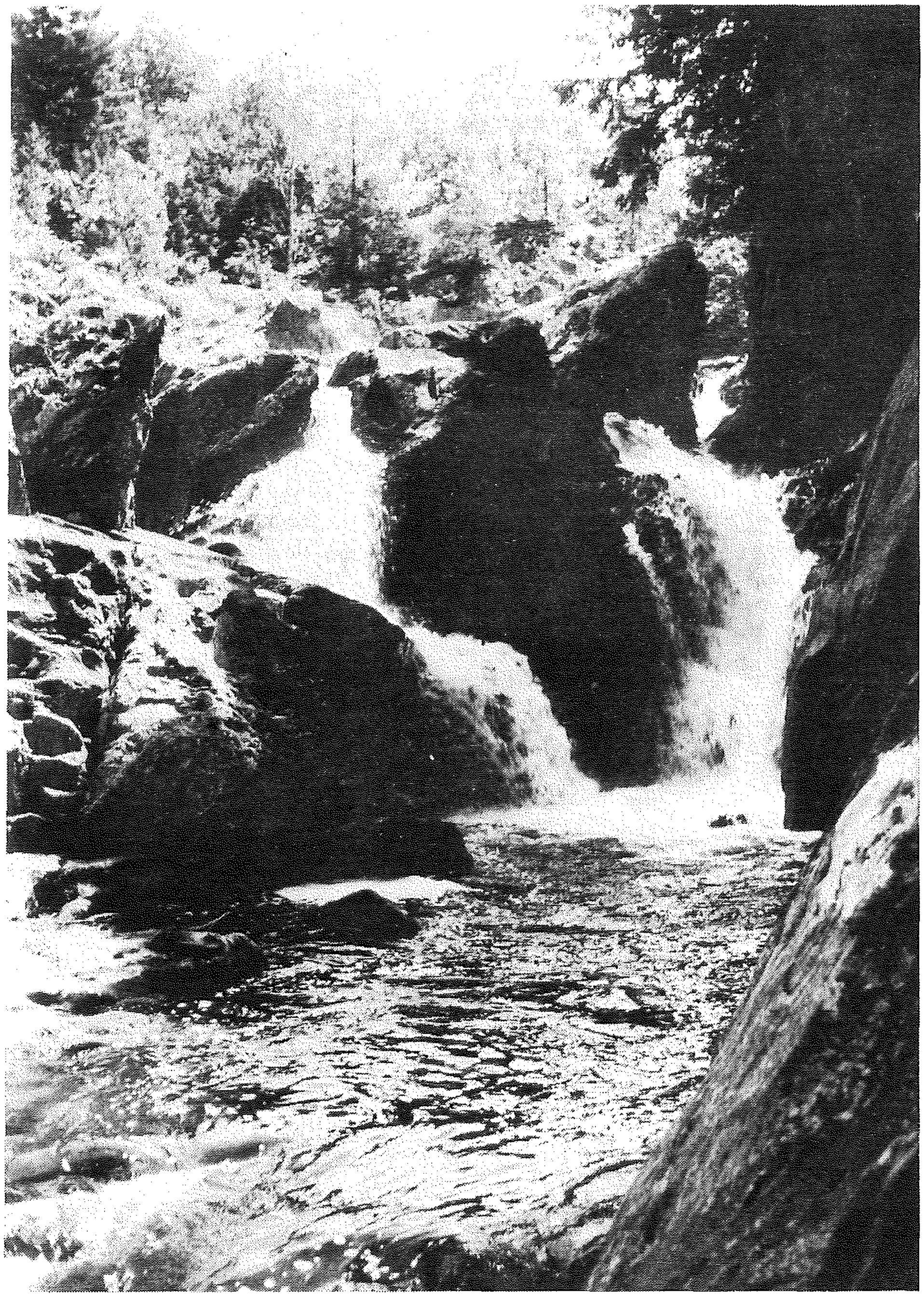
The site is in the floodplain of the Missisquoi River and is forested with hemlock, pine, and hardwoods. No houses are visible. Route 105 parallels the river but is not obtrusive, and the sound of the falls drowns any noise from traffic. An abandoned sandpit is visible below the falls; otherwise the surroundings are undisturbed. The upper gorge is secluded.

The Missisquoi is a large river, about 60-75 feet wide above the site with clear but fertile water. There are moderate amounts of algae in the channel but no foam or scum, and small fish are plentiful and the water looks and smells clean.

The site is about one-half mile long. Above the falls there are rapids, braiding channels, low cliffs ten to 35 feet high, and many small islands. Immediately before the falls is a large pool about 100 feet wide. The falls themselves (actually steep cascades) consist of three channels and drop about 25 feet. The middle channel is beautiful and spectacular and very noisy. Below the falls there is a gorge about 75 yards long with walls about 60 feet high. The east walls are vertical, the west walls sloping. At the bottom of the gorge there is deeper water which makes good swimming, and several sandy beaches.

The falls are at the contact between the Ordovician Stowe formation and the Cambrian Ottauquechee formation. Schist, phyllitye and greywacke all occur. Parts of the rock are limy and in places there are pretty bands of quartz. The upper gorge has rippled rocks and potholes. The lower gorge has smoothed rocks but no potholes or sculpture.

The gorge has a diverse group of vascular plants, including several species that are otherwise unknown in the Missisquoi basin and rare or uncommon in the state as a whole. The most notable were <u>Erigeron hyssopifolius</u>, <u>Vaccinium caespitosum</u>, <u>Solidago squarrosa</u>, <u>Aster tradescanti</u>, and <u>Trisetum spicatum</u>. The first two are known in Vermont only from two mountaintops and several gorges. Large populations of each were found on both shores of the river. The total number of species is impressive



BIG FALLS OF THE MISSISQUOI RIVER

and this together with the five uncommon species makes this an important botanical site.

Bryophytes were common and diverse; they need more study.

The falls are a popular tourist attraction (marked on free-bee chamber of commerce maps), and the deeper water below the falls is good for swimming and fishing. Only small amounts of litter were found, primarily below the falls.

The site is the only undammed large cascade and large gorge remaining on a major Vermont river.

The site is threatened by a proposal to dam it and divert water for hydropower. Since it is a major area for rare plants and the only large falls on a major river without a dam, we feel very strongly that it deserves protection, and urge that no development at all occur.

* * *

Summary: Woodland setting, nice rocks, exemplary biology with five unusual species, moderately wild, some trash; mild pollution, good swimming and fishing, a popular tourist attraction with a nice view of the falls, popular for picnics.

HIGH IMPORTANCE: Major recreational area, major botanical site, largest undammed falls in the state.

Vascular Plants of The Big Falls of The Missisquoi River

Acer rubrum
Betula alleghaniensis
Tsuga canadensis
Ulmus americana
Amelanchier sp.
Corylus cornuta
Solidago gigantea
Spiraea alba
Acer saccharum
Populus grandidentata
Solidago rugosa
Prunella vulgaris
Achillea millefolium
Agrostis perennans
Aster umbellatus
Houstonia caerulea
Aster tradescanti
Deschampsia caespitosa
Salix rigida
Fragaria virginiana
Erigeron annuus
Festuca spp.
Sagina procumbens
Carex torta
Carex spp.
Phleum pratense
Campanula rotundifolia
Trisetum spicatum
Penthorum sedoides
Lindernia dubia
Salix interior
Solidago squarrosa
Erigeron hyssopifolius
Chimaphila umbellata
Trisetum spicatum
Vaccinium caespitosum
Bidens sp.
Polygonum pensylvanicaum
Viola spp.
Leersia oryzoides
Galium mollugo
Solidago graminifolia
Athyrium filix-femina
Tilia americana
Cerastium vulgatum
Thalictrum polygamum
Thuja occidentalis
Poa compressa
Antennaria neglecta
Hypericum perforatum
Bidens cernua
Eupatorium maculatum
Taraxacum officinale
Oxalis europaea
Phalaris arundinacea
Mimulus ringens
Onoclea sensibilis
Calamagrostis canadensis
Sium suave
Carex sp. (ovales)
Cornus stolonifera
Scirpus atrocinctus
Betula populifolia
Salix nigra
Lotus corniculatus
Verbena hastata
Clematis virginiana
Prunus virginiana
Matteuccia struthiopteris
Vicia cracca
Chelone glabra
Thelypteris phegopteris
Lysimachia ciliata
Cardamine pensylvanica
Brachyeletrum erectum
Hieracium sp.
Campanula rotundifolia
Bromus latiglumis
Populus tremuloides
Eleocharis obtusa
Pinus strobus
Apios americana
Salix lucida
Elymus riparia
Campanula aparinoides
Galium asprellum
Veratrum viride
Lythrum salicaria
Lycopus uniflorus
Glyceria grandis
Cicuta bulbifera
Aster puniceus
Alnus rugosa
Mentha arvensis
Trifolium repens
Glyceria striata
Aralia nudicaulis
Clintonia borealis
Impatiens capensis
Salix discolor
Trifolium agrarium
Polygonum sagittatum
Epilobium glandulosum
Silene cucubalis

Leontodon autumnalis	Luzula multiflora
Polygonum sp.	Panicum clandestinum
Chrysanthemum leucanthemum	Agrostis hyemalis
Asclepias syriaca	Hypericum ellipticum
Solidago hispida	Pteridium aquilinum
Vaccinium myrtilloides	Trilium undulatum
Juncus tenuis	Lycopodium annotinum
Agrostis sp.	Asplenium trichomanes
Plantago major	Polygonumn cilinode
Scutellaria lateriflora	

Byrophytes of Big Falls (partial list)

Pleurozium schreberi	Campylium sp.
Bartramia pomiformis	Plagiothecium ? denticulatum
Hylocomnium splendens	Amblystegium sp.
Anomodon attenuatus	Ceratodon purpureus
Polytrichum sp.	? Brotherella recurvans
? from Pottiaceae	Thujidium sp.
Campylium chrysophyllum	Scapania nemorosa
Climacium dendroides	Pohlia wahlenbergii

Basin 7: Lamoille River Basin

Including the following sites:

Woods Falls (Milton Falls)	Lamoille River, Milton
Fairfax Falls	Lamoille River, Fairfax
Ithiel Falls Gorge	Lamoille River, Johnson
Kelly River Falls	North Branch of Lamoille, Belvidere
Dogs Head Falls	Lamoille River, Johnson
Baldin Brook Falls	Baldin Brook, Wolcott
Woodbury Falls	Tributary of Cooper Brook, Woodbury
Terrill Gorge	Kenfield Brook, Morristown
Upper Green River Falls	Green River, Hyde Park
Lower Green River Falls	Green River, Hyde Park
Brewster River Gorge	Brewster River, Cambridge

See appendix for:

Cady Falls	Lamoille River, Morristown

Basin 8 is the Lamoille watershed, located in northwestern and north central Vermont, between the Missisquoi and Winooski basins. Much of the basin is heavily farmed, but it also contains the northern part of the Mt. Mansfield range (Underhill, Cambridge and Morrisville) and part of the Worcester Range (Elmore, Woodbury) and the Lowell Range (Eden). With the exception of a few sites in Morristown no upland or mountain sites are known for this basin, and we believe that there must be a number of sites that have not been mapped.

Report 20, Woods Falls (Milton Falls), Lamoille River, Milton, Chittenden County, Vermont.

Site 919, surveyed 18 July, J.C. Jenkins and P.F. Zika.

Large and small falls, large cascade, large and small gorges, potholes, pools for swimming, major dam and hydroelectric plant.

Atlas map 44, USGS Milton 15' quadrangle. The falls are located about one-quarter mile downstream of the Town of Milton and accessible from the road to the dam and powerplant.

* * *

The falls are in a broad wooded ravine quite near town; a dam, penstock and powerplant are adjacent to the area and visible from most parts of the falls.

The river is a large lowland river; it receives much agricultural runoff and treated waste from Milton, Fairfax, Johnson, and Morrisville. The Milton Wastewater Treatment Plant is downstream of the falls.

Woods Falls are located immediately below the dam; there is a cascade dropping about 20 feet below the dam, then a falls of about 15 feet into a large pool where people swim. Cliffs to 40 feet high overhang the pool. Below this there is a complicated area of rocks, channels and pools, in which the water divides into one of two gorges. The north gorge has walls to 40 feet high and flows only at high water. The south gorge has walls to 60 feet and flows through the summer. There is a 30 foot high waterfall at the side of the south gorge. The area is large, perhaps 400 yards from the dam to the bottom of the gorges. We classify it as a "New York" type gorge, a steep-walled gorge abruptly incised in flatter country and formed by the recession of a falls.

The falls are near the contact zone between the Cambrian Dunham dolomite and the Sweetsburg slate-conglomerate. Most of the rock seems to be dolomite; it is highly sculptured and has many potholes, water carved channels, undercut ledges, enlarged cracks and other forms occur. Altogether it is an attractive and interesting area, and if it were not for the dam would be a real beauty spot.

The plants are typical of limy Champlain Valley ledges. No rarities occur. Much of the falls area is scoured at high water, and so the plants are limited to the ledge walls and other protected sites. The open rocks have few plants. We judge the botany to be above average for a limy ravine, and were pleased at a few crevices and grottos under overhangs that had nice collections of limestone mosses, and at two walls with good colonies of cliffbrakes <u>Pellaea</u> <u>atropurpurea</u> and <u>Pellaea</u>

WOODS FALLS

glabella, two ferns that are locally frequent in the Champlain Valley and rare elsewhere in Vermont.

The water is mildly polluted; it does not smell bad and is fairly clear but is heavily loaded with nutrients and encourages algae growth, and turns septic in stagnant pools.

The large pool is quite deep and affords good swimming; the area is used frequently, probably mostly by kids. Three local boys showed us how they jump from a ledge 40 feet above the pool. They offered to let us try, but we did not. It does not appear to be a party site, and there is no litter or junk.

All the flow at low water comes from more or less accidental leakage around the dam.

We judge the site important at high water for the oxygenation of a river carrying heavy nutrient loads, and in general as a large, interesting and spectacular area; we regret that the summer flow is almost totally intercepted by the dam, and that the dam and power facilities impinge on what otherwise would be one of the state's most striking gorges.

* * *

Summary: Developed for hydroelectric generation, fine to spectacular rocks, exemplary botany, no seclusion, clean site, mildly polluted water, great swimming.

HIGH IMPORTANCE: Exemplary botany, large and spectacular site, great swimming.

RECOMMENDATIONS: Guarantee minimum flows to keep the gorge moist and to oxygenate the water, assure good swimming, and improve aesthetics.

Vascular Plants of Milton Falls

Andropogon gerardi
Solidago puberula
Lonicera dioica
Poa compressa
Campanula rotundifolia
Quercus rubra
Aralia nudicaulis
Hamamelis virginiana
Erigeron annuus
Sphenopholis intermedia
Deschampsia caespitosa
Panicum lanuginosum
Thuja occidentalis

Chrysanthemum leaucanthemum
Hypericum perforatum
Melilotus albus
Carex eburnea
Anemone virginiana
Impatiens sp.
Cystopteris bulbifera
Pellaea glabella
Aralia racemosa
Betula allegheniensis
Populus deltoides
Toxicodendron radicans
Smilacina stellata

Report 21, Fairfax Falls, Lamoille River, Fairfax, Franklin County, Vermont.

Site 759, surveyed 18 July 1983 by P.F. Zika and J.C. Jenkins.

A large cascade in the lower part of the Lamoille River, dammed and used for hydroelectric power since 1918.

Atlas map 45, USGS Gilson Mountain 7.5' quadrangle. Take Route 104 east one mile from Fairfax; park at or opposite the power-station and walk north to the river and falls.

* * *

The Lamoille is, by Vermont standards, a large river; it flows through six towns above Fairfax Falls and at least formerly received sewage and industrial wastes from them. The floodplain is extensively farmed and the river receives sediment and agricultural runoff.

We observed the river at low summer flow, after a dry spell. The water was basically clean but carrying some fine sediment and had a slight river smell and taste. Where the water collects in stagnant pools among the rocks there is considerable algae growth. Sediment and some algae accumulate in the shallows and in the pools below the waterfall. We judge the water here to be very fertile and probably have some unnatural sediment sources and light organic pollution. You could easily swim in it but would not think it extremely fine water.

The area around the falls is about half farmed and half wooded. Standing at the falls you see wooded banks and one pasture in the distance, and the dam, powerlines, penstock, and powerhouse nearby. The dam and powerhouse are large, and the site feels industrial rather than natural.

The river channel is about 200 feet wide at the falls. The rocks are massive cubical blocks of green greywacke and form an irregular series of ledges about 60 feet high, down which the river cascades in a series of low falls, which we regard as a single large cascade. Above the ledges is a concrete dam about 25 feet high. There is a pool at the bottom partially circled by a rock spur, and below this about 200 feet of scattered rocks where the channel runs among boulders and where there are several small pools. Further downstream the river has sandy and silty banks with vegetated bars and islands and wooded bluffs about 50 feet high along the concave bank.

The bedrock is a massive greywacke with vertical bands of mica-schist and quartzite. It is listed by the state geological map as the Pinnacle formation, of lower Cambrian age and part of the Camels Hump group of quartzite-schists. It seems a hard rock, barely rounded by the river, and with few potholes. It is dark grey to deep green, and the vertical strata and cubical

FAIRFAX FALLS

cleavage make it unusual for Vermont as a whole. There are some handsome colors and shapes, and the site as a whole seemed to us quite striking and memorable.

The rock lacks lime and is for the most part bare, with only a few mosses and flowering plants. No rare species were seen, and in fact the flora of the rocks themselves consists for the most part of weedy species that are widespread and have no particular association with rivers or ledges.

The cobble bars and sandy shores are dominated by a common group of riverside plants that we call the willow-dogbane community. No rare or scarce species were seen: again the plants are all common moderately aggressive species of sunny wetlands.

Near the south bank of the river there is a large elevated steel penstock that feeds water to the powerhouse. In a shaded seepage area below the pipe there are a number of mosses that may be receiving some lime from the masonry. Four different species from the Pottiaceae were noted; I can not identify anything in this family accurately, but someone who could might find them interesting.

Plant lists are included, but they are purely for documentation; neither the individual species nor the community as a whole are remarkable.

The site has been used for hydroelectric power for 65 years. The dam diverts much of the river into the penstock and this feeds two vertical turbines. The water re-enters the river below the falls. Because of the diversion, summer flows over the rocks are usually very low. P.F. Zika happened to see the site after a large rainstorm and reports that the falls are extremely impressive.

There are a few paths used by fishermen, but local use is believed to be light. There are a few places for swimming, but with the low flows they are not too attractive. More water might help. There is very little trash.

These falls must have been a place of great beauty and power in Indian times. At present they are noteworthy for the handsome exposures of the greywacke and for the width of the river and the size and squareness of the ledges, but the site as a whole is compromised by the dam, powerhouse, powerlines and pipes, and by the low summer flows and mild pollution. The site is proposed for redevelopment and expansion of the generating facility.

* * *

Summary: Developed for hydroelectric generation, fine rocks, average biology, no wildness, fairly clean site, mild pollution, fair swimming, fine rocks, large cascade, very impressive when the water is high. Would be very important without the dam.

Plants From Fairfax Falls

Bryophytes

Amblystegium riparium
Amblystegium tenax
Bartramia pomiformis
Brachythecium ssp.
Eurynchium riparioides
Grimmia alpicola
Hygrohypnum luridum
Philonotis sp.
Tortula tortuosa
Pottiaceae: 4 spp., including:
? Barbula sp. &
Gymnostomum recurvirostrum

Vascular plants

Apocynum sibiricum
Cornus stolonifera
Rubus idaeus
Solidago graminifolia
Chrysanthemum leucanthemum
Poa pratensis
Poa compressa
Oxalis europaea
Galium mollugo
Agropyron repens
Solidago gigantea
Salix rigida
Alnus rugosa
Phalaris arundinacea
Agrostis sp.
Hypericum perforatum
Calamagrostis canadensis
Fragaria virginiana
Tanacetum vulgare
Lysimachia ciliata
Juncus tenuis
Vicia cracca
Populus tremuloides
Solidago juncea
Achillea millefolium
Acer saccharinum
Aquilegia canadensis
Lindernia dubia
Epilobium glandulosum
Aster lateriflorus
Lysimachia nummularia
Spiraea alba
Taraxacum officinale
Eupatorium maculatum
Verbena hastata
Onoclea sensibilis
Trifolium pratense
Eleocharis obtusa
Athyrium filix-femina
Betula populifolia
Dryopteris marginalis
Ulmus americana
Prunus virginiana
Diervilla lonicera
Potentilla norvegica
Amelanchier sp.
Amphicarpa bracteata
Trifolium agrarium
Trifolium hybridum
Thuja occidentalis
Lactuca canadensis
Thalictrum polygamum
Ribes cynosbati
Clematis virginiana
Myosotis scorpioides
Juncus brevicaudatus ?
Festuca pratensis
Carex crinita
Carex cephalantha
Cerasteum vulgatum
Xanthium strumarium
Prunella vulgaris
Sphenopholis intermedia

Report 22, Ithiel Falls Gorge, Lamoille River, Johnson, Lamoille County, Vermont.

Site 193, surveyed 25 September 1983 by J.C. Jenkins.

A rapids and cascade. Not really a gorge.

Atlas map 46, USGS Hyde Park 15' quadrangle. Area is about two to three miles west of Johnson. There is good access from a secondary road.

* * *

This area barely qualifies for this survey and is briefly noted. It is in an agricultural valley in a pretty setting. A road runs close to the river and a few houses and farms are visible.

The river is a large lowland river over 100 feet wide. It receives treated municipal waste in Johnson and industrial waste from a talc plant in Hyde Park but is moderately clean here; some turbidity is evident.

The area consists of two stretches of rapids. The upper rapids are about 150 yards long and are in a wooded ravine; there are occasional slanting rock walls to 30 feet but the walls are not continuous and it is not really a rock gorge. After some quiet water there is another stretch of rapids of much the same length and character, with interrupted slanting rock walls to 20 feet high. Below this the channel divides around some rock islands with isolated rapids at the bends. There are no falls or drops.

The rock is the Cambrian Hazens Notch schist, and appears to be without lime. The outcrops are massive and rather handsome, but are not sculptured or particularly striking.

The biology appears ordinary and no plant lists were made. The surrounding woods are hemlock and hardwoods.

The gorge is used by fishermen; the area is clean, and generally pretty and pleasing though not particularly distinctive. On a canoe trip it would be a nice change from the farmed land along much of the river.

* * *

Summary: Rural setting, average rocks, average biology, no seclusion, clean site, mildly polluted water, used for fishing.

Report 23, Kelly River Falls, North Branch of the Lamoille River, Belvidere, Lamoille County, Vermont.

Site 255, surveyed 26 September 1983 by J.C. Jenkins.

Small pretty cascade, bordered by low ledges.

Atlas map 46, USGS Hyde Park 15' quadrangle. The falls are just north of Route 109 and right on the Waterville-Belvidere town line. The west part of the area is probably in Belvidere.

* * *

The cascade is in a ravine about 30 feet deep, in the Village of Belvidere Junction. Next to it is a house, the road, and some meadows. The walls of the ravine have hemlock, pine and hardwoods. The Village has only five houses and the setting is quiet, attractive and rural.

The river is a small to medium-sized alluvial stream, averaging 30-75 feet wide, with clean or very clean water.

The cascades are created by sloping rock dikes that project into the stream from alternate sides; the stream comes around one such dike, makes an s-turn into a narrow channel of solid rock behind an island, cascades down through some small pools, makes another s-turn into a pool about 15 feet across, goes around the last dikes and then down a cascade about five feet high into a pool about 75 feet across. Below the pool are a few small sandy beaches. The whole area, island, dikes and cascades, is about 100 yards long.

The dikes are typically about five feet high and of dense blue mica-quartz schist (Cambrian Underhill formation). There are no side walls. The colors and texture of the rock are nice. There are no major carved features, but small potholes occur.

The rock is acid and has the common mosses and vascular plants normally seen in such places. The plants are attractive but not noteworthy. Because of the clean water there is little algae on the rocks.

The falls are a popular place for fishing and bathing. They are privately owned and the owners do not have them posted but selectively discourage noisy and messy users and out-of-towners in general. They also keep them clean.

This is a small but very attractive area. I was impressed by a nice balance of water and rock, and found it a sunny, quiet, inviting place - the kind of place that you wish you could find on every farmland stream but usually do not. Nice flat sheets of water, good places to sit, and the mountains are in close and are handsome.

* * *

Summary: Rural setting, nice rocks, average biology, not secluded, no trash, clean water, good for bathing, very good for sitting, popular but use regulated.

Plants From Kelly River Falls

Mosses and Liverworts

Polytrichum piliferum
Climacium americanum
Fissadens taxifolius
Tortella tortuosa
unknown

Vascular Plants

Carex torta
C. lurida
C. gynandra
Aster umbellatus
A. puniceus
A. lateriflorus
A. cordifolius
Eupatorium maculatum
E. perforatum
Panicum clandestinum
P. lanuginosum
Agrostis stolonifera
Onclea sensibilis
Alnus rugosa
Solidago graminea
Prunella vulgaris
Juncus articulatus
J. sp.
Eleocharis obtusa
E. acicularis
Hypericum boreale
H. perforatum
Salix bebbiana
S. rigida
S. sp.
Alisma plantago-aquatica
Fragaria virginiana
Plantago major

Report 24, Dogs Head Falls, Lamoille River, Johnson, Lamoille County, Vermont.

Site 357, surveyed 28 September 1983 by J.C. Jenkins.

A single small falls with overhanging ledges and two large pools.

Atlas map 46, USGS Hyde Park 15' quadrangle. Located one mile southeast of Johnson, accessible from a secondary road that parallels the south bank of the river.

* * *

The area is surrounded by meadows and woods. There is a large gravel operation north of the falls, audible but not visible. A tracks of the St. Johnsbury & Lamoille County Railroad run along the south bank. The north bank of the river has hemlock-hardwoods forest, the south bank meadows and scattered trees.

The river here is a large lowland river, averaging over 75 feet in width. It receives treated waste and agricultural runoff and has some color, foam, and turbidity but is not heavily polluted.

The falls are created by two sloping rock dikes which narrow the river to about ten feet. It drops six feet in a chute to a rock pool 30 feet in diameter overhung by ledges about 15 feet high. From there it goes through another neck into a larger pool, then past a last dike into quiet water. The whole area is about 75 yards long.

The rocks are blue-grey schist (Cambrian Hazens Notch formation), tilted about 40 degrees to the horizontal, with long sloping faces. It is nicely carved into potholes and ripples.

The rock is acid and doesn't support many plants. No rarities were found. An interesting feature is that the flat ledge tops in the spray zone have many lichens; 60-80% of the rock surface is covered over large areas. The species are all common and the diversity is low, but the effect is attractive, we saw only a few waterfalls with good lichen cover.

The rocks within the channel have much algae on their surfaces.

The area seems to receive moderate use; there is a worn trail and a little litter. It looks to be a good swimming spot, and would be a fine one if the water was cleaner.

Altogether a very pretty place; a rural view - woods, fields, mountains - but no buildings, a wide pretty stretch of the river with wooded banks and islands above and below, a sudden constriction of the whole river into a chute, no major road, some privacy, good places to sit and swim. One of the only places in the state where a large river goes over a falls without human disturbance. And the only site we visited where you could look upstream and downstream along a large river from a waterfall and not see any buildings.

Possibly threatened. If the gravel operation expands southwards it will become visible from the falls and spoil the view and peacefulness. Currently it is separated from the river by a thin band of woods, and it is very important that these trees be kept as a buffer.

* * *

Summary: Rural setting, beautiful open view without people, nice rocks, average biology, some seclusion, some litter, polluted water, good for fishing and sitting, fair for swimming and would be good if the water was cleaner, one of the few undisturbed falls on any large river in the state.

RECOMMENDATIONS: State should make sure that the gravel miners do not expand southwards which would ruin the view and make the site a lot noisier.

Plants From Dogs Head Falls

Mosses

Hedwigia ciliata
Bryum sp.
Grimmia alpicola
Polytrichum piliferum

Lichens

Parmelia sulcata
Ramalina intermedia
Unidentified spp.

Vascular plants

Agrostis hyemalis
Poa compressa
Solidago nemoralis
Aster puniceus
Spiraea latifolia
Iris ? pseudoacorus
Ulmus americana
Phalaris arundinacea
Tsuga americana
var. atrocinctus
Athyrium filix-femina
Juncus brevicaudatus
Trisetum spicatum
Eupatorium perfoliatum
Carex sp. (section ovales)
Acer rubrum
Solidago gigantea
Panicum clandestinum
Scirpus cyperinus

Report 25, Baldin Brook Falls, Baldin Brook, Wolcott, Lamoille County, Vermont.

Site CC, surveyed 28 September 1983 by J.C. Jenkins.

A small narrow wooded gorge and 50 foot waterfall on a mountain brook, the falls recently damaged by road construction for a small hydro project; also two small falls lower down on the brook.

Atlas map 47, USGS Hardwick 15' quadrangle. The brook crosses the North Wolcott road just south of North Wolcott; you can walk up it to the gorge and falls or try to find a new road that goes to a little hydrostation halfway up it.

* * *

The area is in the woods, on a steep slope in spruce-hardwoods, adjacent to farm country. A small reservoir has recently been built above the falls which diverts a portion of the flow to a buried 12 inch pipe which goes to a small (about 15-30KW) private hydro plant below the gorge. A new road comes up from the south and goes to the reservoir and then down to the powerhouse. It was placed right next to the falls and in order to build it a lot of debris and fill was pushed into the falls, spoiling their beauty.

The stream is a mountain stream, mostly four to eight feet wide, with very clean water. Its headwaters are two small ponds just below the Green River Reservoir. It has a remarkably constant summer flow for its drainage area and the owner believes that it is fed by underground seepage from the reservoir; the soils are light and sandy, so this might be possible.

The section of the stream of interest lies below a 12 foot dam that was built three years ago. Immediately below the dam there is a sheer falls of 50 feet, which as mentioned has been largely spoiled by building a road too close to it and bulldozing fill and trees over the ledges. Below the falls is an abrupt gorge about 20 feet wide by 30 feet deep by 200 feet long, separated from the road and undisturbed, in hemlock-spruce woods. Below the gorge is the small powerhouse (about 15 feet by six feet) and about 50 yards below it two lower falls of ten to 15 feet each.

The rock is a blue quartz-mica schist (Cambrian Hoosic schist); in the gorge it is slightly sculptured, but by the large the gorge has developed by the removal of layers and chunks from the channel rather than by the carving of a smooth channel or the enlargement of potholes.

The gorge was biologically the most interesting area. It is dark and sheer; the only vascular plants were wood sorrel, polypody, marginal fern and evergreen woodfern. Mosses and liverworts were abundant; the following 13 species were collected:

Plagiochila asplenioides	Bazzania trilobata
Atrichum undulatum	Coniocephalum conicum
*Bryhnia novae-angliae	Plagiothecium denticulatum
Cephalozia sp.	*Isoptyrigium distichaceum
Thujidium sp.	Mnium punctatum
Dicranium scoparium	Pogonatum alpinum
Hylocomnium splendens	

The two starred species have been rare elsewhere in the waterfall survey. The diversity is not great, but the rocks are acid and the site is dark and fairly uniform. The coverage is good and I consider this an above average bryophyte site because of the lush growth and the two scarce species.

The gorge receives no use. The owner says that even during the drought in July and August the stream flow was such that he could keep the turbine going at full power and still use no more than a third of the brook's flow. Certainly this was true when I visited in September. Hence, the diversion of part of the water does not seem to be a threat to the plants in the gorge.

The gorge is a small feature but it is abrupt and striking and quite pretty; we saw only a few comparable places in our survey, and so think of it as a small but nice feature. (Since mountain brooks are poorly known it is quite possible that there are a number of similar places that we have missed.) The falls must have been very pretty before they were messed up. Fifty-foot sheer falls are very rare in Vermont, either in big streams or small, and hence, these falls were of state significance, but since the damage can not be repaired, they are currently of lesser significance.

* * *

Summary: Partially degraded site; mountain setting, nice rocks, exceptionally large falls on small stream, exemplary botany, moderate seclusion and wildness, clean site, very clean water currently used for hydropower.

Report 26, Woodbury Falls, tributary of Cooper Brook, Woodbury, Washington County, Vermont.

Site LL, surveyed 15 September 1983 by J.C. Jenkins.

A large cascade with a chain of small falls and rock exposures along a small, steep woodland stream.

Atlas map 39, USGS Plainfield 15' quadrangle. The stream crosses Route 14 2.5 miles south of the center of Hardwick.

* * *

After leaving Hardwick, Route 14 runs for about two miles in a narrow, largely unsettled valley between Woodbury Mountain and Round Knoll. The main falls are about one-half mile up Woodbury Mountain, north of the road, and completely surrounded by woods. A smaller falls is right next to the road. The stream crossing is not obvious and I recall no good landmarks.

The stream is a small mountain brook, mostly under five feet wide, with very clean water.

The upper cascade, about one-half mile from the road, is a series of small cascades, falls and pools about 100-200 yards long; there is a ravine about 30 feet deep with rocks to 15 feet high along the walls, and a sequence of small falls up to ten feet high and chutes and pools. It is one of those mossy, landsliding, trees-fallen-across places, very pretty and continuous, but on a small scale and without individual features of striking scale or design. An ordinary woodland stream in a hurry to get to the valley, but as pretty as they come.

The lower cascade is directly above the road and consists of a 30 foot drop over slanting ledges (about 45 degrees to the horizontal) to a small pool.

The rock is a platy schist that splits into layers easily: the geological map lists it as the Ordovician Moretown quartz granulite. The falls and ravine have been made by breaking the rock rather than carving it and there are no potholes or other carved features.

Granite is supposed to occur on the side of the mountain in or near the brook, and may be involved in parts of the falls.

The rock is acid and the flora correspondingly limited. The woods are commercial maple-yellow birch woods with some pine and spruce. All the vascular plants are common woodland species. The diversity is good for a place without lime. Mosses are abundant. Eleven species were recorded, all but one (Isopterygrium distichaceum) fairly common or common species found in a wide variety of habitats. Again the diversity is not high but is about what would be expected for a fairly uniform woodland habitat without lime. The biology is rated as average. It is a nice place but the flora is too simple and duplicated in too many other places to rate as excellent.

The lower falls may occasionally be used by bathers or fishermen. The upper falls are probably rarely visited.

A fine, pretty, mountain site, of a type that is probably not uncommon in the state, but certainly not found on every mountain stream.

Could easily be degraded by careless logging.

* * *

Summary: Mountain setting, nice rocks and falls, average biology, moderate seclusion and wildness, clean site, very clean water, not used, potentially threatened by logging.

Plants From Woodbury Falls

Mosses & Liverworts

Pogonatum alpinum
Plagiothecium laetum
Isopterygrium distichaceum
Plagiochila asplenioides
? Rhynchostegium serrulatum
Hypnum imponens
Coniocephalum conicum
Calypogeia sp.
Lejunea cavifolia
Thujidium sp.
Brachythecium spp.
Eurynchium riparioides

Vascular Plants

Viburnum alnifolium
Dryopteris intermedia
Medeola virginiana
Oxalis montana
Clintonia borealis
Lycopodium lucidulum
Trientalis borealis
Mitella diphylla
Maianthemum canadense
Gymnocarpon dryopteris
Laportea canadense
Aster acuminatus
Solidago juncea
Athyrium filix-femina
Aralia nudicaulis
Matteuccia struthiopteris
Carex prasina, spp.
Acer spicatum
Galium triflorum
Tiarella cordifolia
Brachyeletrum erectum
Cinna latifolia
Thelypteris phegopteris
Thalictrum sp.
Solidago flexicaulis
Chiogenes hispidula

Report 27, Terrill Gorge, Kenfield Brook, Morristown, Lamoille County, Vermont.

Site 763, surveyed 2 October 1983 by P.F. Zika.

A long series of small cascades and falls in a ravine.

Atlas maps 38 and 46, Hyde Park 15' quadrangle. Take Route 15 west from Morristown, fork left off it, cross the railroad, fork left again, then turn left and cross the river. Take the second right turn, about 0.2 miles beyond the river. This road parallels Terrill Gorge. The trail to the falls and swimming hole begins by a red barn with "PARK HERE" painted on it. To get to the head of the gorge continue on the road to a four-corners, turn right, and go one-half mile to where the bridge crosses Kenfield Brook.

* * *

The gorge is in the midst of farmland but has conifer forests along and within it, and so is quiet and isolated. There are houses and roads within 1,000 feet of the gorge, but they cannot be seen from within it.

Kenfield Brook is an alluvial valley stream, eight to ten feet wide above the gorge, with occasional wider places where it floods. The water is clean, with only small amounts of macroscopic algae.

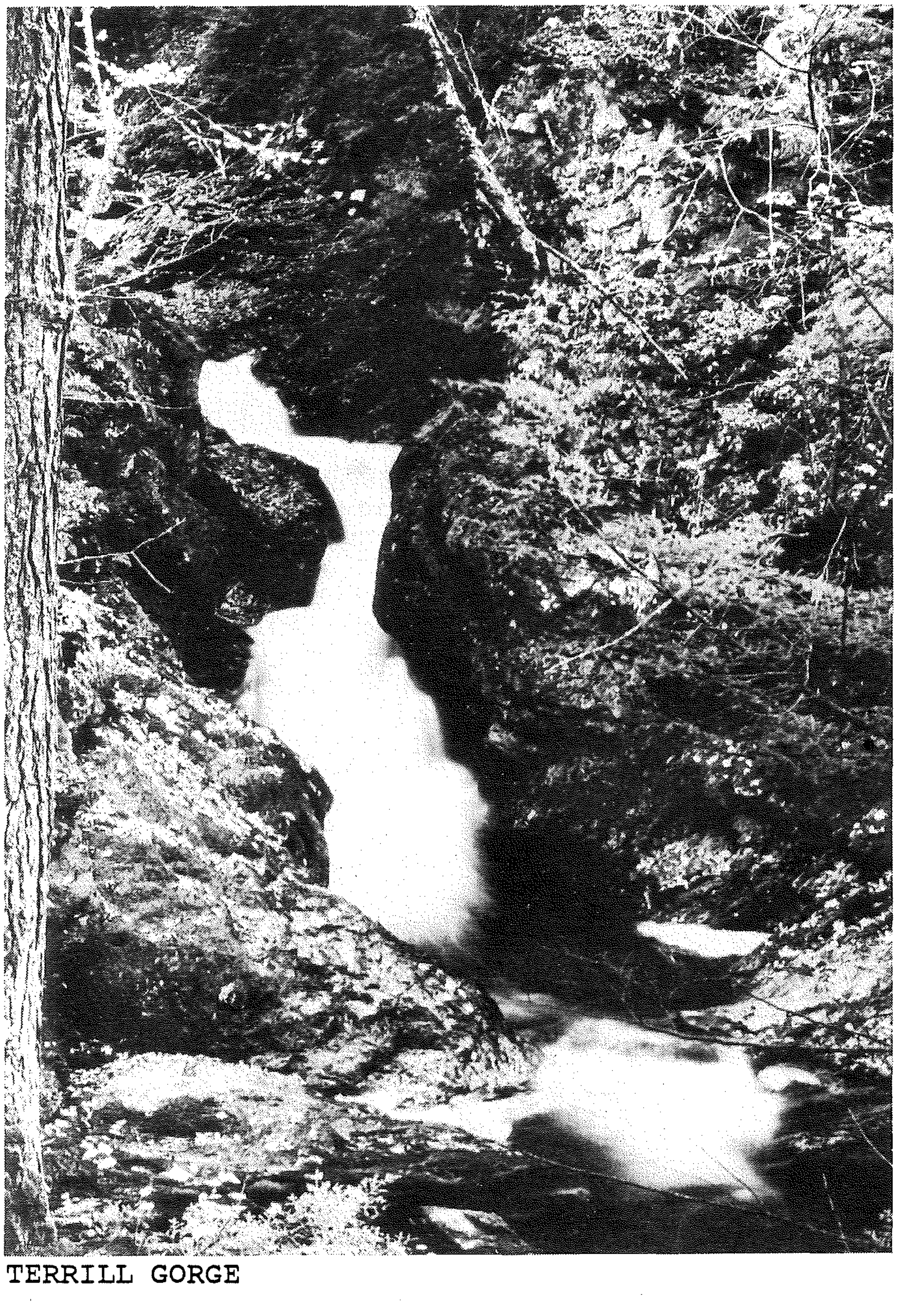
The gorge is about a mile long and contains rapids, riffles, small potholes, water-smoothed ledges, tiny caves, cascades to ten feet high, waterfalls to six feet high, and interrupted segments of rock walls up to 100 feet long and 15 feet high. The largest and most attractive feature is a cascade-falls combination about 20 feet high with a deep pool below it and high rocks for diving.

The area is quite long, and was not completely explored.

The rock was mostly schist, from the Cambrian Hazens Notch formation. Small areas of either unbanded gneiss or quartzite from the same formation were seen. Erosional features were varied and common, although mostly small in scale.

No unusual vascular plants were found. Bryophytes were common to abundant for most of the length of the gorge.

The lower end of the gorge receives very heavy use from both locals and visitors. The trail from the shed to the swimming pools is heavily traveled. Other trails are discontinuous and more lightly used. Fishing is probably good at the lower end of the ravine. The middle and upper parts of the gorge probably receive much less use, due to their remoteness and the absence of


TERRILL GORGE

trails. One party spot near the extreme upper end of the gorge was messy and one rock had grafitti. No trash was seen in the river.

An attractive place, large, moderately secluded, wild, continuous, with many varied cascades and pools. Pretty views of the cascades are available from the walls of the gorge.

* * *

Summary: Woodland setting, fine rocks, average biology, parts very wild and private, some trash, clean water, great swimming; a good place to sit or to hike, gets moderate use by locals and visitors.

HIGH IMPORTANCE: Fine recreational site, one of a few large chains of pools and cascades in the state.

Vascular Plants of Terrill Gorge

Tsuga canadensis
Acer rubrum
Acer saccharum
Betula alleghaniensis
Picea rubens
Taraxacum officinale
Sagina procumbens
Polypodium virginianum
Spiraea alba
Solidago canadensis
Aster acuminatus
Spiraea tomentosa
Brachyeletrum erectum
Plantago major
Carex sp. (section ovales)
Dennstaedtia punctilobula
Dryopteris intermedia
Agrimonia sp.
Prunella vulgaris
Aster puniceus
Galium sp.
Ranunculus acris
Houstonia caerulea

Report 28, Upper Green River Falls, Green River, Hyde Park, Lamoille County, Vermont.

Site J, surveyed 13 October 1983 by P.F. Zika.

A short series of small, gently sloping cascades.

Atlas map 47, Hyde Park 15-minute quadrangle. The site is directly upriver of the culvert bearing the Green River in the ghost-village of Garfield. The best access is from the road leading north out of Garfield.

* * *

The stream is in a partially forested ravine. Several houses are on the main road about 75 yards to the west. Two roads have limited views of the cascades.

The Green River is a mountain stream with a channel under ten feet wide. The survey was done shortly after a rainstorm, hence, the water was slightly muddy or murky, and had a dirty taste. Mayfly larvae were seen. Some green and brown algal scums were on the rocks of the channel, indicating the water has some fertility.

The river drops in a series of one foot high cascades, losing perhaps 20 vertical feet before disappearing into the culvert. There is one small pool and a short 25 foot high ledge at one point on the west shore.

The rock is Stowe schist, of Ordovician age. It is not limy. There are a few partially formed potholes, less than one foot in diameter, but no sculptured or rippled rock and no large potholes.

The vascular plants are ordinary.

There is a path from an old concrete mill foundation or bridge abutment on the east to the shore of the stream. There is not enough water for swimming or fishing, and it is hardly a beauty spot or party place. Morrisville Water and Light Department proposes to construct a dam at the head of the cascade.

* * *

Summary: Woodland setting, poor rocks, average biology, not secluded or wild, clean site, clean or perhaps mildly polluted water, no swimming, limited local use as a hangout. Threatened by a dam proposal.

UPPER GREEN RIVER FALLS

Vascular Plants of the Upper Green River Falls

Tsuga canadensis
Betula alleghaniensis
Betula papyrifera
Acer spicatum
Acer saccharum
Acer rubrum
Populus tremuloides
Salix bebbiana
Rubus idaeus
Spiraea alba
Polygonum cuspidatum
Poa pratensis
Poa compressa
Solidago gigantea
Solidago nemoralis
Solidago graminifolia
Alnus rugosa
Aster umbellatus
Aster puniceus
Aster divaricatus
Fragaria virginiana
Clematis virginiana
Plantago lanceolata
Prunella vulgaris
Taraxacum officinale
Carex crinita
Thalictrum ploygamum

Report 29, Lower Green River Falls, Green River, Hyde Park, Lamoille County, Vermont.

Site K, surveyed 10 August 1983 by P.F. Zika.

Several small cascades.

Atlas map 47, Hyde Park 15-minute quadrangle. The Green River passes through the place maps call Garfield in a culvert. The site is about 500 feet downstream of the culvert. It is easy to miss.

* * *

The cascades are in a steep wooded ravine. The trees along the stream are mostly red spruce, hemlock, and yellow birch. Because of the dense woods the ravine seems isolated and private.

The Green River is a mountain stream, some 15 feet across and generally quite shallow. The water was cold, light brown, and tasted a bit dirty, perhaps because of a recent rain. There were masses of brown foam in the eddies. The rocks in the channel were covered with a thin layer of slippery algae. Mosses were common on emergent rocks in the channel. Thus the water is either fertile or mildly polluted. The latter is more likely since there is very little development in the watershed.

The rock is schist of the Stowe formation, dating back to the Ordovician. There is no striking exposure of ledge at the site. No potholes or prominent sculptured rock were seen. The bedrock is not very limy.

The plants were ordinary.

The falls receive very little use. P.F. Zika speculates that there may be other small cascades in the area that offer better swimming.

The site is a pretty wooded ravine but the rocks and water are unimpressive.

A hydroelectric project proposed by Morrisville Water and Light Department would place a dam some 500 feet upstream and divert water around Lower Green River Falls.

* * *

Summary: Woodland setting, average rocks, average biology, moderately wild and private, clean, no swimming, receives light local use for hiking, hunting, and perhaps fishing.

LOWER GREEN RIVER FALLS (SITE "K")

Plants of Lower Green River Falls

Bryophytes (in part)

Scapania nemorosa
Mnium sp.
Fissadens cristatus
Hypnum imponens
Brachythecium plumosum

Vascular Plants

Picea rubens
Tsuga canadensis
Betula alleghaniensis
Acer rubrum
Acer spicatum
Fagus grandifolia
Populus grandidentata
Eupatorium maculatum
Solidago caesia
Solidago rugosa
Aster puniceus
Taxus canadensis
Viburnum alnifolium
Thelypteris phegopteris
Habenaria fimbriata
Epipactis helleborine
Brachyeletrum erectum
Glyceria striata
Elymus sp.
Bromus ciliatus
Carex ssp.
Ranunculus abortivus
Fragaria virginiana
Arisaema triphyllum
Athyrium filix-femina
Dryopteris intermedia
Polypodium virginianum
Clintonia borealis

Report 30, Brewster River Gorge, Brewster River, Cambridge, Lamoille County, Vermont.

Site 256, surveyed on 12 July 1984 by P.F. Zika.

Atlas map 46, USGS Jeffersonville 7.5-minute quadrangle or Mt. Mansfield 15-minute quadrangle. Take Route 108 south from Jeffersonville. About one-half mile out of town, just past the Brewster River Gristmill and Country Store and a driveway, turn east at a fork. Turn right (south) just before the covered bridge. Drive south along the stream to the second parking lot. A trail leads south about 100 yards, fords the stream, and continues another 70 yards through the woods to the noisy base of the cascades in the gorge.

* * *

Aside from the nearby country store and highway, the gorge is remote, and after you leave the parking area there is no sign of habitation, utilities, or roads. The site is in a ravine above a floodplain. The entire area is forested with relatively open and untrampled hemlock woods. Hobblebush and wildflowers are common.

At the base of the gorge, the Brewster River is 20 to 30 feet wide and has one to six foot long boulders in its bed. Although the water is normally very clean, at the time of the visit it was the color of instant lemonade from a heavy load of sediment resulting from heavy rains the day before. The water had no smell, and there was no scum or slime. Aquatic insects were uncommon and no stonefly or mayfly larvae were found.

At the top of the gorge, the stream cascades over a low spine of rock, then turns north and runs through two deep potholes eight to ten feet wide. Below this the gorge deepens and widens, increasing to 50 feet deep and becoming 25-30 feet across at the rim. A footpath on the east rim gives a nice view north over the whole gorge and the forest beyond, with no sign of houses or people. The walls of the gorge are jagged and in places are nearly vertical. About half-way down the gorge becomes a jumble of huge boulders and cliffs, and the stream cascades down them in zig-zags, forming several nice pools. There are several small caves. The total vertical drop is between 50 and 75 feet and is abrupt. At the base of the gorge is a six foot cascade ending in a pool ten by 35 feet that is suitable for bathing.

The bedrock at the gorge is all Cambrian schist from the Hazens Notch or Underhill formations. It is a hard rock and is not very waterworn. There is very little sculpture: only a few potholes and a bit of ripple rock at the base of the site. The rock is not limy.

The plant life at Brewster River Gorge is ordinary. No inventory of the bryophytes was attempted. The vascular plants are listed at the end of this report.

Judging from the two large parking lots at the trailhead and the amount of trash along the first 100 yards of the path, the gorge receives a lot of summer visitors. A large percentage of the cars in the parking lot were from out of state. Sunbathers, photographers, fishermen, swimmers, and hikers were seen.

This site is important because of the long vertical drop, naturalness of the site, and heavy recreational use it receives. We recommend that a trash barrel be placed at the upper parking lot.

* * *

Summary: Woodland setting, nice rocks, average biology, moderately secluded, some trash, clean (?) water, fair swimming, popular recreational site, needs a trash barrel. One of Vermont's deepest gorges.

HIGH IMPORTANCE

Vascular Flora of Brewster River Gorge

Tsuga canadensis
Betula alleghaniensis
B. papyrifera
Prunus pensylvanica
Picea rubens
Populus tremuloides
Acer spicatum
A. rubrum
Sorbus americana
Ulmus americana
Rubus idaeus
Carex torta
Ranunculus acris
Taraxacum officinale
Phleum pratense
Agrimonia sp.
Equisetum arvense
Aster puniceus
A. cordifolius
Tussilago farfara
Solidago rugosa
Lysimachia nummularia
Myosotis scorpioides

Galium sp.
Poa compressa
P. sp.
Onoclea sensibilis
Matteuccia struthiopteris
Osmunda claytoniana
Chrysanthemum leucanthemum
Centaurea jacea
Festuca pratensis
Juncus sp.
Polypodium virginianum
Dryopteris marginalis
Hieraceum piloselloides
Danthonia compressa
Cystopteris fragilis
Maianthemum canadensis
Achillea millefolium
Fragaria virginiana
Potentilla norvegica
Agrostis sp.
Thalictrum polygamum
Panicum lanuginosum

Basin 8: Winooski River Basin

Including the following sites:

Huntington Gorge	Huntington River, Richmond
Seven Falls of the Huntington	Huntington River, Starksboro
North Branch Falls	North Branch of Winooski, Worcester
Wrightsville Gorge	North Branch of Winooski, East Montpelier
Nelson Brook Gorge	Nelson Brook, Orange
Blake Falls	Kingsbury Branch, Woodbury
Mollys Falls	Mollys Falls Brook, Marshfield
Moretown Gorge	Mad River, Moretown
Duck Brook Cascades	Duck Brook, Bolton
Devils Pothole	Joiner Brook, Bolton
Bolton Falls	Winooski River, Duxbury
Sterling Brook Gorge	Sterling Brook, Stowe
Bingham Falls	West Branch of Waterbury River, Stowe
Middlesex Gorge	Winooski River, Middlesex and Moretown
Benjamin Falls	Pond Brook, Berlin
Northfield Falls	Cox Brook, Northfield
East Calais Cascades	Kingsbury Branch, East Calais
Marshfield Falls	Marshfield Pond Brook, Marshfield
Allen Brook Cascade	Allen Brook, Williston
Frazer Falls	unnamed stream, Williston
Moss Glen Falls II	Glen Brook, Stowe
Lime Kiln Gorge	Winooski River, Colchester and South Burlington
Williston Gorge	Winooski River, Essex and Williston
Winooski Falls	Winooski River, Burlington and Winooski City
Winooski Gorge	Winooski River, Colchester, South Burlington, and Winooski City

See the appendix for the following site:

Warren Falls	Mad River, Warren

Basin 8 is the Winooski watershed of north central Vermont. It contains a large central valley which is heavily farmed, and a lot of mountains. It also has more waterfalls than any other basin in the state. This is partly because it is a large basin, partly because the areas where major streams leave the mountains are good places for falls and gorges, and probably partly because it is close to Montpelier and hence, best known to the state employees who compiled the list of sites for this study.

Six sites in this basin are of state significance and, of these, three are considered to be of high importance. Huntington Gorge is a unique, thin, deep gorge made from a series of interconnected potholes. Moss Glen II and Bingham Falls are major mountain falls that are popular tourist attractions.

Report 31, Huntington River Gorge, Huntington River, Richmond, Chittenden County, Vermont.

Site 593, surveyed 27 September 1983 by P.F. Zika and J.C. Jenkins.

Remarkable narrow, vertical-walled gorge carved 30-40 feet deep in blue stone.

Atlas map 37, USGS Camels Hump 15' quadrangle. Take the dirt road south from Jonesville along the river, and it is clearly visible from the road at the top of the hill. The no parking signs start a mile or so away in each direction so wait till you really see the gorge.

* * *

Rural setting; side of a hill, wooded valley, horse farm 100 yards up hill.

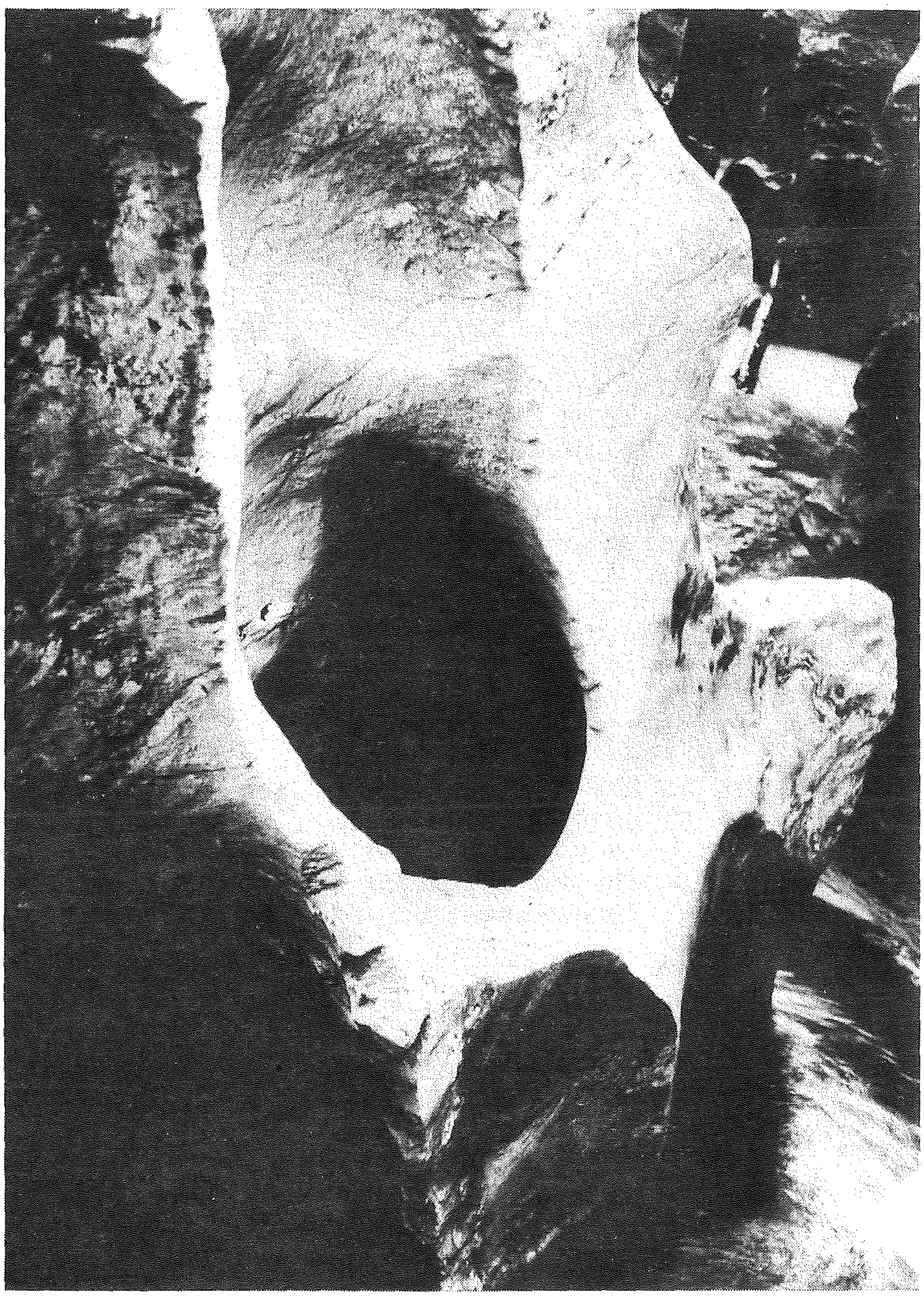
River is medium-sized, typically 20-30 feet wide, alternately running in alluvial valleys and mountain ravines. It receives no official discharges but may occasionally get some domestic sewage. There is comparatively little farming along its banks. Water is clean, stones have only the normal summer algae growth.

Gorge is 30-40 feet deep and in the upper part only ten to 15 feet wide, with vertical walls formed from the enlargement of potholes. It is fluted and carved and twisty and has two falls about five feet high in the middle of it. It is also dangerous: overhanging walls, places that you think you might climb down but can't, places right on the brink where visitors stand that slope outwards and can be slippery. If you fell in and the water was not too high and you were not hurt and kept your head you could work your way safely down the gorge to the bottom or possibly to a place to climb out. Otherwise you would be drowned, and that has happened.

Gorge is about 300 feet long; at the lower end there are cliffs about 50 feet high, another falls, a lovely pool encircled by arching rocks, and a rock walled channel leading downstream. It is, of course, a classic swimming hole.

The rock is blue mica-quartz schist (Cambrian Underhill schist). It appears as if there is a band of softer schist in the middle, and that the gorge was made by the river cutting into this band.

Essentially no plants live in the gorge proper. The accompanying list of vascular plants was recorded around the edges of the gorge. The mosses were recorded on a separate visit to an area about one-half mile downstream. This area is a



HUNTINGTON RIVER GORGE - POT HOLE

mountain ravine, popular for bathing and camping, with rock walls about 15-20 feet tall at the edge of the water. The walls are not continuous and do not constitute a real rock gorge in our sense. Some lime occurs in the schist and there is an interesting moss flora. No rarities were noted but the total of about 30 species ranks favorably with other areas of good moss diversity we have seen.

The gorge is used for swimming, picnics, parties and sightseeing and is extremely popular. (And difficult to get near owing to almost three miles of no parking signs; this in itself is a unique official commendation.) Considering the use, the gorge itself is moderately clean, there being only a few bottles and an old, unfortunate car wreck to mar the site. The lower ravine, below the gorge is used for camping and picnics and swimming, and is dirtier and could use a cleanup.

A unique place: no other gorge we have seen is so narrow and deep. P.F. Zika likes the bends in the rock. Two rocks arch over the lower pool. An important place in any case.

Does not seem threatened, but it does threaten visitors. This and Hamilton Falls are the most dangerous sites (among the ones popularly used) that we visited.

* * *

Summary: Rural setting, fine and spectacular rocks, average botany (good mosses in ravine below), wild but not secluded, some litter, clean water, great swimming below, dangerous above, not threatened.

HIGH IMPORTANCE: Unique structure, very beautiful, popular recreation area.

RECOMMENDATIONS: Put in precautionary signs, perhaps a small fence at the dangerous overlook right where people park, install steps down the steep bank to the pool.

Vascular Plants on the Rocks at the Gorge

Agrostis sp.	Achillea millefolia
Aster lateriflorus	Juncus tenuis
Betula papyrifera	Acer rubrum
Spiraea alba	Polygonum achoreum
Leontodon officinalis	Poa compressa
Plantago major	Aquilegia canadensis
Eupatorium maculatum	Galinsoga radiata
Athyrium filix-femina	Panicum lanuginosum
Oxalis europaea	Muhlenbergia frondosa
Onoclea sensibilis	etc.

Clearly a weedy and unmemorable lot.

Surrounding woods are hemlock, white pine, and hardwoods.

Mosses and Liverworts From About One-Half Mile Downstream

Scapania nemorosa	Thujidium sp.
Two unknowns from Pottiaceae	Rhytidiadelphus triquetus
Mnium punctatum	Plagiochila asplenioides
Hypnum sp.	Mnium sp. (single-tooth)
Pogonatum alpinum	Anomodon attenuatus
P. urnigerum	Myurella sibirica
Cephalozia sp.	Campylium ? hispidulum
Lophozia sp.	Grimmia alpicola
Herzogiella striatella	Rhacomitrium aciculare
Mnium sp. (double-tooth)	Drepanocladus fluitans
? Rhynchostegium serrulatum	Philonotis marchica
Hygrohypnum eugyrium	Radula complanata
Coniocephalum conicum	Atrichum undulatum

Report 32, Seven Falls of the Huntington, Huntington River, Starksboro, Chittenden County, Vermont.

Site 41, surveyed 27 September 1983 by P.F. Zika and J.C. Jenkins.

Wooded ravine and small gorge with low falls and small pools.

Atlas map 31, USGS Mt. Ellen 7.5' quadrangle. Hard to find; take the road south from Hanksville, pass a right and then a left turn, go another 0.3 miles, park and bushwhack west.

* * *

The site is in a wooded ravine about 200 yards from road in rural area. Some houses, trailers, meadows within one-quarter mile.

The river is a small clean upland stream, averaging about ten to 15 feet wide, in narrow mountain valley.

Beginning at a place where someone has bulldozed a road and put a culvert in the river, there is a rock cascade about 50 feet long with two three foot high waterfalls; then a pool; then a rocky cascade about 75 feet long with only a few feet of drop; then a series of about five miniature gorges averaging 20-25 feet deep, with sloping rock walls and cascades, small (ten feet across or less) pools and falls of one to three feet. There are sloping rocks, potholes, mossy walls, rippled rocks and a few small pebble bars. Everything is on a small scale, and the whole formation is probably 500-700 feet long.

The rock is the standard Green Mountain blue mica-schist, in this instance without lime.

The plants are ordinary. The forest is mostly hemlock, some hardwoods, quite dark.

The area seems to receive light local use; there are paths and some garbage and the normal peri-riparian junk that is attracted to ravines near roads. There is also some flood debris.

A pretty place, nice mosses, an attractive local stream but if you came a ways to see it you would be disappointed. If it were a little bigger, or a little more private, or had a few more plants it would start to stand out. The name is a bit grandiose, and gets your expectations up.

* * *

Summary: Rural, wooded setting; average to nice rocks, average botany, slight seclusion, some trash, clean water, used for bathing (not swimming) and perhaps fishing; not threatened.

SEVEN FALLS OF THE HUNTINGTON

Report 33, North Branch Falls, North Branch of the Winooski River, Worcester, Washington County, Vermont.

Site AA, surveyed 7 October 1983 by J.C. Jenkins.

Single small falls and low-angle cascade; a fine swimming hole and pretty place.

Atlas map 39, USGS Montpelier 15' quadrangle. We have not got it mapped exactly but believe it to be about 1.5 miles south of the Worcester-Elmore line.

* * *

The site is in the woods, 50 yards downslope from road, with no houses or open land near.

The river is a medium-sized, mountain stream about ten to 20 feet wide, with very clean water.

The site includes a cascade over horizontal rocks for about 75 feet followed by a falls of nine feet and a large pool about 30 by 40 feet. The falls and cascade are about 40-50 feet wide. There are a few vertical rock faces eight to 15 feet high along the east side of the cascade, but no real rock gorge.

Rock is a pretty blue quartz-schist with narrow stripes (Moretown member of the Cambrian Missisquoi quartz granulite). It is variously grooved and rippled and in the cascade there are some nice small pools and low drops.

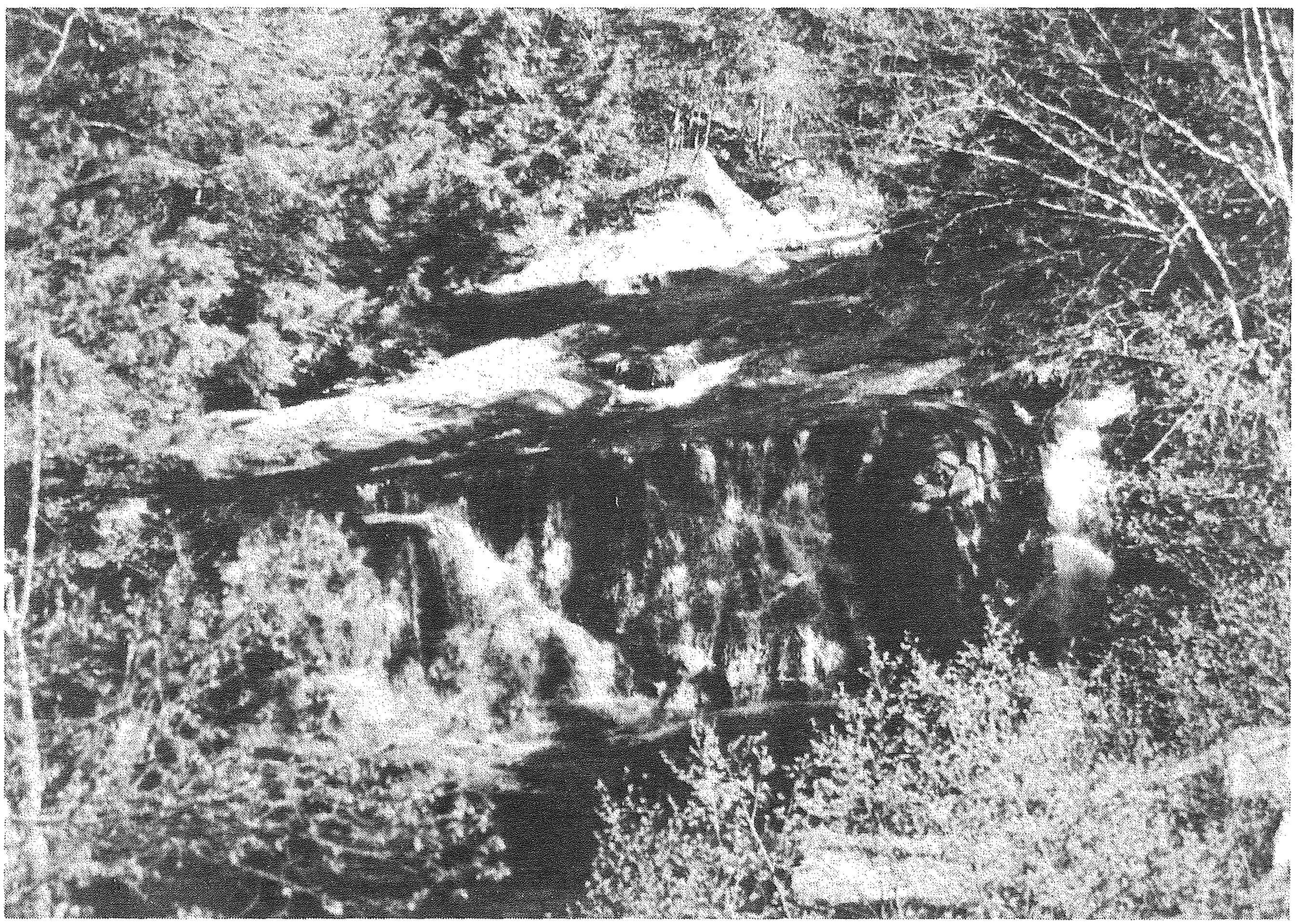
The rock is acid and mostly confined to the stream channel so there is little habitat for mosses or vascular plants at the falls themselves. Only common species occur, and no list was made.

This is a favorite swimming hole and is said to get a lot of summer use. Nonetheless it is quite clean and not very trampled.

Visually a nice, medium-sized falls and a great swimming place in a mountain setting. Just big enough to be memorable. Not distinguished or exceptional in the state as a whole, but pretty nonetheless.

* * *

Summary: Woodland setting, nice rocks, average or poor botany, not secluded, no trash, very clean water, good swimming, popular recreational site.



NORTH BRANCH FALLS

Report 34, Wrightsville Gorge, North Branch of the Winooski River, East Montpelier, Washington County, Vermont.

Site BB, surveyed 7 October 1983 by J.C. Jenkins.

Small degraded gorge below outlet of Wrightsville dam.

Atlas map 33, USGS Montpelier 15' quadrangle. The gorge is right below the flood control dam.

* * *

The site is a former mill village: woods east of the gorge, cleared land west, houses, mill foundations, an old dam, machinery, rubble from the former mill that was demolished and burned. An old dam and mill debris were removed and a new hydro plant was constructed by 1985.

The river is medium-sized, about 20 feet wide in the gorge.

The gorge is about 80 feet deep with rock walls for the last five to 15 feet. The rock is blue-green schist (mapped as the Moretown member of the Ordovician Missisquoi quartz-granulite); it has a few potholes but little sculpture.

The area has been an industrial site for a long time, and is now as much rubble and masonry as it is natural gorge. All the vascular plants seen were common weedy species. There are some good moss habitats down in the gorge on wet faces just above the channel, but though they looked nice and green, there were only a few species.

The area is not used except to catch things that people throw. It is not very pretty in its present state and is not considered to be of natural importance except for reoxygenating the water that comes out of the dam.

* * *

Summary: Degraded site; impacted by hydroelectric project, industrial setting, poor rocks, poor botany, no seclusion, much post-industrial debris, clean water, not used.

NOTE: There is a penstock and hydroelectric powerhouse in this gorge constructed during 1985.

Mosses seen:

Grimmia alpicola
Bryum sp.
Ceratodon purpureus
Philonotis marchica
Mnium sp. (single-tooth)
Amblystegium riparium
        species
Bracthythecium sp.
Hygrohypnum sp.

WRIGHTSVILLE GORGE

Report 35, Nelson Brook Gorge, Nelson Brook, Orange, Orange County, Vermont.

Site 305, surveyed 7 October 1983 by J.C. Jenkins.

Small granite gorge with vertical rock walls; above it a small cascade, small falls, and several pools.

Atlas map 33, USGS East Barre 15' quadrangle. Take the dirt road on the map to the brook crossing and bushwhack one-quarter mile downstream.

* * *

In second-growth woods (hemlock and yellow birch) below the site of an old dam. Area was once farmed, now is back to woods and brush. Map shows a house or camp about 400 yards away, no others near. Older map shows three houses within one-quarter mile. Purpose of the dam is unknown. It is partially destroyed and partially standing, and appears to have been about 15 feet high.

Nelson Brook is a mountain stream, mostly under ten feet wide, with very clean water.

From the dam site down there is a cascade about 100 feet long, a waterfall about 30 feet wide and eight feet high, and then the gorge proper which is about 600 feet long, with smooth, massive, nearly vertical rock walls 30-40 feet high. It averages 30 feet wide at the bottom and about 40 feet wide at the top and so is roughly square in cross-section. The rock fractures into large square blocks and the stream bed is a jumble of these blocks. There is no carving or sculpture and no potholes.

The bedrock is granite of unknown age.

The gorge is dark and acid and apart from a few tree seedlings and occasional ferns there are almost no vascular plants within it. Mosses are abundant. About 20 species were recorded, a good number for a dark, uniform, and in theory acid habitat. (I say in theory because several of the species may indicate small amounts of lime.) One moss (<u>Homalia trichomanoides</u>, a large and striking species) that occurred here was recorded nowhere else in our study. We have always assumed that granite areas were poor in mosses, but to judge from this site they may be better than we had thought.

The area gets almost no use and was clean except for a single beer can.

A rugged, woodsy place, not strikingly pretty but impressive: granite country, and hence, chunkier and more abrupt than the schist country that we are used to. A nice place to be in, but not visually exceptional. I judge it a striking local feature. Probably it is not exceptional in the state as a whole but since at present it is the only granite gorge we know we rate it as moderately important.

The natural areas study in the early seventies noted that the area was threatened with destruction within five years. We do not know what they were thinking of. It is hardly a great hydropower site, and anyway, the natural way to do a power development here would be to use the old dam site and put your turbines above the gorge.

* * *

Summary: Woodland setting, nice rocks, exemplary botany, some wildness and seclusion, no trash, very clean water, not used. So far our only granite gorge, also good mosses.

Bryophytes From Nelson Brook Gorge

Anomodon attenuatus	Mnium (two-toothed group)
Drepanocladus uncinatus	Paraleucobryum longifolium
? Hypnum revolutum	Homalia trichomanoides
Plagiothecium laetum	Calopogeia sp.
Metzgeria conjugata	Lejunea cavifolia
Mnium (two-toothed)	Plagiochila asplenioides
Hylocomnium splendens	Herzogiella striatella
Hygrohypnum ochraceum	Hedwigia ciliata
Bracthythecium oxycladon	Bracthythecium sp.
Plagiothecium sp.	Dicranum fuscescens

Report 36, Blake Falls, Kingsbury Branch, Woodbury, Washington County, Vermont.

Site 598, surveyed 7 October 1983 by J.C. Jenkins.

Small cascade and small falls in woods.

Atlas map 39, USGS Plainfield 15' quadrangle. Near road but not obvious. Go about three-quarters of a mile south of town, just over a hill, and look on the right for a stream ravine.

* * *

Site is in young second-growth hemlock-hardwoods, about 50 yards from the road, just out of town, with no houses nearby.

It is on a small mountain stream, averaging less than ten feet wide, with very clean water.

There are two steep cascades each about 50 feet long and each dropping ten to 20 feet. The lower cascade has one sheer falls about eight feet high.

The rock is mapped as the Barton River member of the Devonian Waits River phyllite-limestone. At the falls there were few indications of limestone and the rock appeared to be mostly a black slaty phyllite.

The site is dark and habitats for plants are limited: only normal forest species were seen. The mosses are good but not exceptional in abundance or diversity. No lists were made.

The falls probably get some use as a fishing and bathing place, but they are in fairly dense woods and have no pools and little sun. There is no garbage. There are foot trails but they do not appear much used.

The site is pretty but not striking; a nice, small falls of local importance.

* * *

Summary: Woodland setting, average rocks, average botany, some seclusion, no trash, very clean water, little use.

Report 37, Mollys Falls, Mollys Brook, Marshfield, Washington County, Vermont.

Site 947, surveyed 7 October 1983 by J.C. Jenkins.

A very steep and high cascade, almost dry in the summer because of the diversion of water for hydropower.

Atlas map 40, USGS Plainfield 15' quadrangle. Accessible from below (go behind the powerstation) or from Route 2 which crosses Mollys Brook.

* * *

The site is on a steep slope between Route 2 and the Winooski River. The woods are young hemlock-cedar-hardwoods that have been recently and carelessly logged leaving large openings and much junk and slash. No buildings are visible. The road is about 25 yards from the top of the falls and a large hydroelectric plant is about 100 yards from the bottom of the falls, but neither is visible from the site.

The falls are a steep continuous cascade about 150 feet long and 25 feet wide with a steepness of about 40 degrees. There are individual falls within the cascade with drops of up to 12 feet. The rock appears to be granite; according to the geological map the site is just above the contact between the granite and the Waits River limestone. Presumably the channel of the Winooski lies in the limestone and the falls developed because of the differing hardness of the two rocks. The rock at the falls is nicely worn and smoothed but hardly sculptured; there are no potholes or pools.

The stream is dammed about one-half mile above the falls and most of the water is diverted through a penstock to the hydro station. Presumably the falls get a lot of water in the spring but the dam seems to be less leaky than most and there is very little flow. In consequence the falls are dry and grassy and weedy and look in the dry season like a set of wet ledges than a stream channel. The diversity is low: as was the case in several other dried-out sites the flora is dominated by a few common herbs and mosses which are good colonists and can profit from the change. From a distance it looks like a good botanical site, but upon examination does not prove so.

The falls seem to be unused, which is reasonable since there is not much water there to use. The logging, which comes right up to their edge, has made it difficult to climb around them.

These are one of the two or three highest woodland falls in Vermont, and are probably the tallest continuous falls of any kind in the state. I am told that before the reservoir was built you could hear them a mile away. They must be spectacular in the spring, but otherwise must be regarded as a damaged site that has lost much of its scenic and biological character.

* * *

Summary: Altered and degraded site; impacted by hydroelectric project, woodland setting (but messy), average rocks, no water, poor botany, no trash, no use, possibly spectacular in spring. Important if restored.

Plants Seen at Mollys Falls

Mosses & Liverworts

Pohlia wahlenbergi	Ceratodon purpureus
? Bryoerythrophilum recurvirostrum	Eurhychium riparioudes
Amblystegium varium	Grimmia alpicola
Bracthythecium ssp.	

Mosses are abundant on the rocks but the diversity is low.

Vascular Plants

Aster puniceus	Aster acuminatus
Aster lateriflorus	Aster umbellatus
Solidago graminifolia	Solidago gigantea
Solidago canadensis	Agrostis sp.
Galium mollugo	Impatiens capensis
Eupatorium maculatum	Mentha arvensis
Athyrium felix-femina	Lysimachia ciliata
Thalictrum polygamum	Chelone glabra
Acer spicatum	Thelypteris phegopteris
Dryopteris marginalis	Diervilla lonicera
Glyceria striata	Actea sp.

Report 38, Moretown Gorge, Mad River, Moretown, Washington County, Vermont.

Site FFF, surveyed 19 September 1983 by P.F. Zika.

A short rock-walled gorge on the Mad River.

Atlas map 32, Waitsfield 7.5' quadrangle. The gorge is north of the Route 100B bridge, about 0.8 miles north of the junction of Routes 100 and 100B. Access is easy from the east end of the bridge or down a steep bank for the next 100 years east along 100B.

* * *

The gorge is near the Village Center of Moretown and is clearly visible from along the highway and from the bridge. There are no buildings overlooking the gorge. The surrounding countryside is agricultural and there is a hardwood forest at the edge of the gorge.

The stream is a moderate-sized river, probably mildly polluted, with a broad floodplain. It is turbid (perhaps due to muddying of the water upstream by drinking cows) and slippery. Mayflies, minnows and caddisflies were plentiful.

The gorge is from 15-30 feet wide and has sloping rock walls from ten to 25 feet high. There are a few riffle areas but no falls or cascades and only one good pool for swimming. The pool is near an old mill site at the foot of the gorge; some concrete foundations and piers from the mill are still attached to the walls of the gorge.

The bedrock is Ordovician schist and phyllite of the Stowe formation. It is not limy. A few of the rocks have been rounded and smoothed but there is no sculpture or rippled rock or potholes.

The plants were ordinary.

The gorge receives moderate or perhaps heavy use as a local swimming hole and party place, mostly because it is close to the center of town. The site is fairly clean but there is a little trash near the swimming hole and some junk among the stones in the river bed.

At high water the gorge is a very interesting Class IV whitewater run, and popular with advanced boaters; see our report on Vermont whitewater rivers for details.

Because of the concrete at the foot of the gorge and the bridge at the head of the gorge, and the lack of geological phenomena, this is not a beautiful site.

* * *

Summary: Rural setting, average rocks, average botany, no privacy, some trash, murky but probably not polluted, good swimming, locally popular for parties but not for scenery.

MORETOWN GORGE

Plants of Moretown Gorge

Bryophytes

- Preissia quadrata
- Plagiochila asplenioides
- Grimmia alpicola
- Ceratodon purpureus
- Thujidium sp.
- Bracthythecium salebrosum
- ? from Pottiaceae
- Mnium (single-toothed)
- Pohlia wahlenbergii
- Funaria hygrometrica
- Mnium sp.
- Ceratodon purpureus
- Entodon seductrix
- Hypnum lindbergii

Vascular Plants

- Acer pensylvanicum
- Acer rubrum
- Acer saccharum
- Agrostis perennans
- Alnus rugosa
- Ambrosia artemisifolia
- Apocynum androsaemifolium
- Aster lateriflorus
- Aster puniceous
- Aster umbellatus
- Bidens vulgata
- Bromus ciliatus
- Calamagrostis canadensis
- Carex spp.
- Carex sp. (ovales)
- Carex torta
- Cornus stolonifera
- Danthonia spicata
- Diervilla lonicera
- Digitaria sanguinalis
- Dryopteris marginalis
- Elymus riparius
- Equisetum arvense
- Erigeron canadensis
- Erigeron strigosus
- Eupatorium maculatum
- Eupatorium perfoliatum
- Fagus grandifolia
- Fragaria virginiana
- Galeopsis tetrahit
- Geum sp.
- Glyceria striata
- Gnaphalium uliginosum
- Hamamelis virginiana
- Houstonia caerulea
- Hypericum perforatum
- Impatiens sp.
- Juncus effusus
- Juncus tenuis
- Lactuca sp.
- Melilotus alba
- Muhlenbergia frondosa
- Oenothera biennis
- Oenothera perennis
- Onoclea sensibilis
- Osmunda cinnamomea
- Oxalis europaea
- Panicum capillare
- Panicum dichotomiflorum
- Panicum lanuginosum
- Phalaris arundinacea
- Poa compressa
- Poa sp.
- Polygonum pensylvanicum
- Polygonum punctatum
- Polygonum saggitatum
- Polypodium virginianum
- Populus deltoides
- Populus tremuloides
- Prunus serotina
- Prunus virginiana
- Rubus idaeus
- Rubus occidentalis
- Rubus odoratus
- Salix alba
- Salix bebbiana
- Salix discolor
- Saponaria officinalis
- Solidago bicolor
- Solidago gigantea
- Solidago graminifolia
- Solidago nemoralis
- Spiraea tomentosa
- Taraxacum officinale
- Thalictrum polygamum
- Tilia americana
- Tovara virginica
- Trifolium arvense
- Tsuga canadensis
- Ulmus americana
- Vaccinium angustifolium X myrtilloides
- Verbascum thapsus

Report 39, Duck Brook Falls, Duck Brook, Bolton, Chittenden County, Vermont.

Site 40, surveyed 23 June 1983 by P.F. Zika.

A short series of small cascades ending with a small waterfall.

Atlas map 37, USGS Richmond 7.5' quadrangle. Take the Long Trail north to the Duck Brook Shelter; the cascades are in a ravine east of the shelter.

* * *

Site is a mountain ravine, 50 yards from the trail, remote from roads and houses, in hemlock-hardwoods forest.

Duck Brook is a mountain stream with cold clean water, averaging five to ten feet wide near the site.

The site has about 50 yards of low gradient cascades over boulders, then a waterfall about seven feet high.

The rock is the Cambrian Underhill schist, and occurs mostly as boulders rather than as ledges. There are a few small potholes but little sculpture.

The plants are all common woodland species.

The cascade is much used by hikers and is a favorite stopping point on the Long Trail.

The cascades and falls are small and not unusual, but the area is valuable because it is remote and natural and gets a lot of use.

* * *

Summary: Mountain setting, average rocks, average botany, wild and moderately secluded if you pick your day, no trash, very clean water, good bathing, popular with hikers. One of the few known waterfalls not on a road, and an important recreational site.

DUCK BROOK FALLS

Plants From Duck Brook Falls

Bryophytes (in part)

Coniocephalum conicum	Dicranum sp.
Mnium sp.	Pogonatum urnigerum

Vascular plants

Acer pensylvanicum	Hieracium sp.
Acer rubrum	Brachyeletrum erectum
Acer saccharum	Gymnocarpium dryopteris
Acer spicatum	Dryopteris intermedia
Betula alleghaniensis	Dryopteris marginalis
Fraxinus americana	Housetonia caerulea
Hamamelis virginiana	Fagus grandifolia
Clintonia borealis	Tsuga canadensis
Maianthemum canadense	Thelypteris phegopteris
Aster acuminatus	Thalictrum polygamum
Aster divaricatus	Solidago flexicaulis
Aster puniceus	Tiarella cordifolia
Carex plantaginea	Polystichum acrostichoides
Carex sprenglii	Prenanthes altissima
Carex sp. (? blanda)	Polypodium virginianum
Galium lanceolatum	Viburnum alnifolium
Plantago major	Ranunculus abortivus

Report 40, Devils Pothole, Joiner Brook, Bolton, Chittenden County, Vermont.

Site 955, surveyed 19 September 1983 by P.F. Zika.

A small waterfall, several small cascades, and a large pothole.

Atlas map 37, Huntington and Richmond 7.5' quadrangles. Access is from the road running north from the center of Bolton. One tenth of a mile from town park at a small pulloff by a powerline. The brook is a short distance to the east.

* * *

The site is in mixed conifer-hardwoods forest; a trailer park visible from the lowest cascade, powerlines over the main pothole.

Joiner Brook is a mountain stream, under ten feet wide above the site, with very clean water.

From upstream to downstream there is a 15 foot falls between two schist ledges, a small pothole, a low-angle cascade, a large (20 foot) pothole, and some more low angle cascades. The ledges are ten to 20 feet high.

The rock is the Cambrian Underhill schist; the two potholes are the only interesting features.

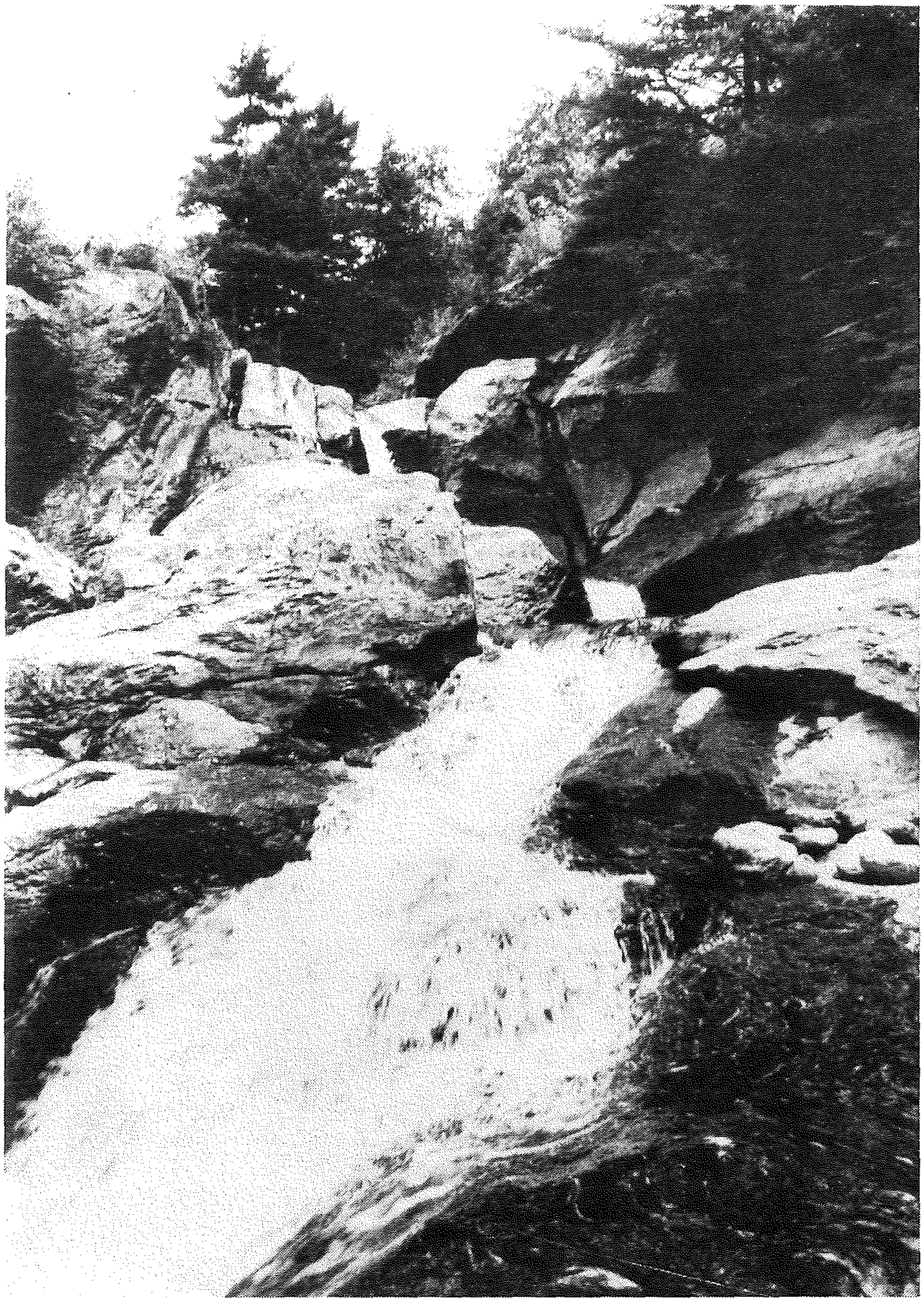
The plants are ordinary; there were few plants in the channel at all; most of the species listed come from the edge of the site.

The site is used locally for parties and bathing. There are well-worn trails, some paint on the rocks and a lot of trash in the woods. It is a nice bathing place but a bit shallow for good swimming.

The larger of the two potholes is quite striking, a big swirl of green rock and water.

* * *

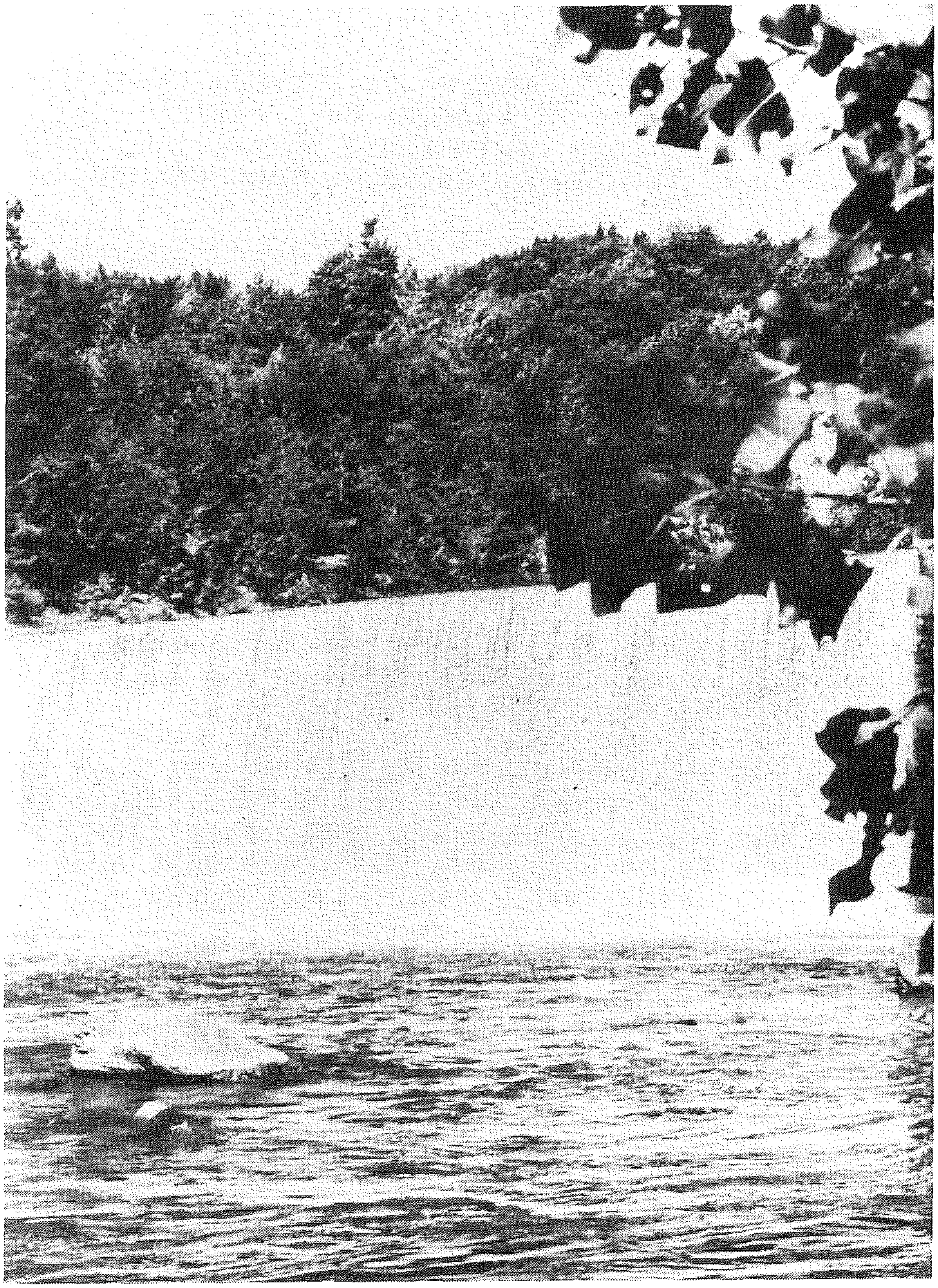
Summary: Mountain setting (but a trailer park in view), nice rocks, poor botany, moderately wild, some trash, very clean water, fair swimming, popular for parties.



DEVILS POTHOLE

Vascular Plants of Devils Pothole

Acer pensylvanicum
Acer rubrum
Achillea millefolium
Antennaria sp.
Aqueligia canadensis
Aster cordifolius
Aster umbellatus
Betula papyrifera
Clematis virginiana
Daucus carota
Dennstaedtia punctilobula
Dryopteris marginalis
Gentiana clausa
Hypericum perforatum
Juncus tenuis
Lactuca sp.
Oenothera perennis
Panicum clandestinum
Panicum lanuginosum
Pedicularis canadensis
Pinus strobus
Poaceae spp.
Poa compressa
Populus tremuloides
Potentilla argentea
Prunus virginiana
Quercus rubra
Rhus typhina
Rubus alleghaniensis
Rubus idaeus
Solanum dulcamara
Solidago bicolor
Solidago randii
Tovara virginica
Tsuga canadensis
Ulmus americana
Woodsia ilvensis



BOLTON FALLS

Report 41, Bolton Falls, Winooski River, Duxbury and Waterbury, Washington County, Vermont.

Site 334, surveyed 19 September 1983 by P.F. Zika.

A large unused power dam at the bottom of a large gorge on the Winooski River. No waterfall. The site is under redevelopment for hydroelectric power.

Atlas map 38, Waterbury 7.5' quadrangle. Cross the Winooski River in Waterbury on Winooski Street; turn right onto River Road and go south about 2.5 miles, turn right onto a jeep road which leads to the dam. It is hard to get down into the gorge; a rope helps.

* * *

The site is in an agricultural valley with a few houses nearby. There are three roads (including I-89) on the north side of the gorge and a road and a railroad on the south side, but the gorge is quite deep and not much of the traffic can be heard within it. There are hemlock-hardwoods forests on the edges of the gorge and silver-maple forests on the river banks below it.

The Winooski River is a large river, typically over 100 feet wide in the vicinity of the site. It receives treated sewage at a number of points upstream and large amounts of sewage from a secondary plant in Montpelier. The water at the site is greenish and murky, and algae are common. Sall fish and aquatic insects are common, hence, the water is not deoxygenated.

The gorge is about one-quarter mile long and over 120 feet deep. It is formed by a small hill that juts out into the floodplain from the south. There are rock walls 100-120 feet high on the south side of the gorge and 45-60 feet high on the north side. The forests extend down the walls and you do not see continuous sheer faces of exposed rocks.

There is a dam about 150 feet long by 61 feet high at the lower end of the gorge where the falls used to be. At high water, the river runs over the dam. Powerlines cross the gorge upstream from the dam and there is an abandoned powerhouse south of the dam. Green Mountain Power Company has a license to redevelop the site, and the project is scheduled to be on line in 1986.

The dam or the gorge above the dam is at the contact between the Underhill and Hazens Notch formations. They are both schists of Cambrian age and look exactly alike to us. No potholes or rippled or sculptured rocks occur. The rocks were not limy.

No interesting plants were seen in the gorge. C.G. Pringle collected the rare fragrant fern (Dryopteris fragrans) here in the 1870's, but the station has never been relocated. It is possible it was destroyed by the dam or the 1927 flood. The species is restricted to calcareous ledges in Vermont. Although no such rocks were seen on the survey, it is possible that some appropriate habitat remains for D. fragrans on the sheer and inaccessible walls of the gorge.

The sand bar below the dam contains a small grass and a sedge (**Eragrostis hypnoides** and **Cyperus inflexus**) that are rare away from the shore of Lake Champlain.

The site is popular for fishing and parties, and probably for swimming in the hot months. The parking area is trashy but the site is clean.

The site has to be regarded as degraded because the dam has flooded the lower portion of the gorge and discured the original waterfall. Hence, despite its size, we do not rate the gorge as an important feature. It is impressive to see a lot of water flow over the dam when the stream is up, but this is an all-too-available experience on Vermont rivers and does not deserve special note.

* * *

Summary: Degraded site, rural setting with abandoned dam and powerhouse, average rocks, average botany, former site for a rare plant, moderately secluded but not wild, some trash, ? fair swimming, local picnic spot. Would have been one of the major ?

Vascular Plants of the Sand Bar Below Bolton Falls

Acalypha rhomboidea
Acer negundo
Acer rubrum
Acer saccharinum
Agrostis sp.
Apios americana
Artemisia vulgaris
Aster lateriflorus
Aster puniceus
Aster simplex
Bidens cernua
Bidens frondosa
Carex torta ?
Carex spp.
Cornus stolonifera
Cyperus inflexus
Cyperus strigosus
Digitaria sanguinalis
Echinochloa crus-galli
Echinocystus lobata
Eleocharis sp.
Eleocharis tenuis
Equisetum arvense
Eragrostis hypnoides
Eragrostis pectinaceus
Erigeron strigosus
Erigeron sp.
Eupatorium maculatum
Galium mollugo
Glyceria grandis
Gnaphalium uliginosum
Hypericum boreale
Impatiens sp.
Juncus bufonius
Juncus tenuis
Leersia oryzoides
Lindernia dubia
Ludwigia palustris
Medicago lupulina
Melilotus alba
Mentha arvensis
Mimulus ringens
Myosotis scorpioides
Oxalis europaea
Panicum capillare
Panicum clandestinum
Phalaris arundinacea
Plantago major
Poa palustris
Polygonum aviculare
Polygonum penslylvanicum
Salix fragilis ?
Salix nigra
Salix rigida
Saponaria officinalis
Scirpus atrovirens
Scirpus cyperinus
Solidago graminifolia
Trifolium repens
Vernbena hastata
Vitis riparia
Xanthium strumarium

Vascular Plants of Bolton Falls, Above the Dam

Dryopteris marginalis
Dryopteris fragrans (formerly)
Acer negundo
Acer rubrum
Betula papyrifera
Cornus stolonifera
Alnus rugosa
Apios americana
Aster cordifolius
Aster lateriflorus
Aster umbellatus
Apocynum androsaemifolium
Agrostis sp.
Achillea millefolium
Aster puniceus
Lindernia dubia
Galium mollugo
Galium sp.
Juncus tenuis
Eigeron sp.
Artemesia vulgaris
Cystopteris fragilis
Aegepodium podagraria
Ulmus americana
Vaccinium angustifolium
Parthenocissus sp.
Populus tremuloides
Salix rigida
Xanthium strumarium
Oxalis europaea
Toxicodendron radicans
Solidago gigantea
Solidago juncea
Panicum lanuginosum
Melilotus alba
Poa compressa
Thalictrum polygamum
Tsuga canadensis
Spiraea alba
Thelypteris phegopteris
Onoclea sensibilis
Muhlenbergia frondosa

Report 42, Sterling Brook Gorge, Sterling Brook, Stowe, Lamoille County, Vermont.

Site 959, surveyed 17 October 1983 by P.F. Zika.

A series of small cascades and falls in a rocky ravine.

Atlas map 38, Hyde Park 7.5' quadrangle. Follow the road that parallels Sterling Brook up past a red covered bridge and past a small cemetery on the right (north). The road becomes quite rough. Descend a slope and cross a stream on a plank bridge. The next turn to the left (south) is a jeep road leading to a logging clearing and hunting camp. The west edge of the clearing is the upper edge of the ravine with the cascades.

* * *

The site is in mountain woods with no houses or open land near. There is a hunting camp and a number of logging roads nearby.

Sterling Brook is a mountain stream five to ten feet wide, very clean and clear. It is well oxygenated.

The ravine is about 400 feet long with a drop in elevation of 105 feet, but the walls are not continuous. The stream channel contains a series of cascades, falls, and pools, the drops typically under six feet. The largest pool is 15 by 25 feet and 5 to 6 feet deep.

The rock is schist of the Underhill or Hazens Notch formation, and is of Cambrian age. It is bedded at 45 or 50 degrees to the horizontal, and the cascades parallel the bedding. There are traces of lime at the top of one slope above the ravine. Five or six partially formed potholes are present in the channel. In a few places the rocks are sculptured.

There are comparatively few vascular plants in the gorge itself, owing to deep shade. An odd goldenrod, probably a hybrid, was collected. It does not correspond to any of the normal Vermont species and we do not know what it might be.

Mosses were common but were not studied.

The site receives moderate local use, probably mostly from local people. It is remote and the roads are poor. The stream may be too small for good fishing. Except for some junk left by loggers the site is clean.

A pretty series of small cascades and falls, but marred by the logging clearings.

STERLING BROOK GORGE

There are expensive subdivisions, mostly vacation homes, on the lower parts of Sterling Brook. If these continue to expand upstream as they have been doing the gorge will eventually be threatened.

* * *

Summary: Mountain setting, average rocks, average botany, moderately wild and secluded, clean site, very clean water, fair swimming, locally popular for horseback riding, picnics, scenery. We have only a few secluded chains of pools and falls in the state.

Vascular Plants of Sterling Brook Gorge

Tsuga canadensis
Betula alleghaniensis
Betula papyrifera
Picea rubens
Oxalis montana
Dryopteris intermedia
Dryopteris campyloptera
Acer spicatum
Acer saccharum
Acer rubrum
Acer pensylvanicum
Rubus allegheniensis
Dennstaedtia punctilobula
Abies balsamea
Solidago rugosa
Solidago graminifolia
Solidago ???
Aster acuminatus
Aster divaricatus
Aster puniceus
Fagus grandifolius
Polystichum acrosticoides
Fraxinus americana
Coptis trifolia
Viburnum alnifolium

Report 43, Bingham Falls, West Branch of the Waterbury River, Stowe, Lamoille County, Vermont.

Site 257, surveyed 17 October 1983 (and numerous visits previous years) by P. F. Zika.

A small gorge with a major waterfall and large cascade at the lower end.

Atlas map 38, Mount Mansfield 7.5' quadrangle. Drive up the Mountain Road (Route 108) from the center of Stowe. Pass the Toll Road and go 1/2 mile; there is a parking lot to the left (west) and a trail leading to the gorge and falls on the right (east).

* * *

The site is in the woods about one-quarter mile from the paved road. There is a logging road next to the gorge, an impoundment to store water for snowmaking upstream and recent logging and development downstream.

The stream is a mountain brook, roughly ten feet wide, with very clean water. It occasionally receives heavy sediment loads from trail construction at the ski areas.

The gorge is about three feet deep at the upper end and 30 feet deep at the lower end with a maximum width of 20 feet. It has potholes and cascades and handsome sculptured rocks. At the bottom there is a steep cascade about 20 feet high, and then a sheer falls of the same height, with a 30 foot pool at the base of the falls.

The rock is Hazens Notch schist and gneiss, of Cambrian age. It is not limy. It is beautifully sculpted by the river in the upper reaches of the gorge. There are a number of potholes greater than two feet in diameter, some in the current channel and some above it.

The plants all seem to be common species of moist woods. <u>Osmorhiza</u> <u>obtusa</u>, a rare northern relative of the common sweet cicily, was collected here once about 40 years ago by A.S. Pease. We have made several searches for it over the last three years but have never seen it. It is possible that it was extirpated by logging in the area or by the heavy trampling of recreational visitors.

Mosses are common; no collections were made.

The site is very heavily visited by locals and tourists. The lower pool is a very pretty place to swim and there are ledges to dive from. There is always some litter along the trails.

BINGHAM FALLS

A very attractive small gorge and falls.

According to the map the site is outside the boundaries of the state forest. If it is on private land, it could conceivably be threatened by expansion of the housing development downstream.

* * *

Summary: Woodland setting, spectacular rocks, average botany, formerly a site for a very rare plant, moderately wild but hardly secluded, some trash, very clean water, good swimming, popular recreational site.

HIGH IMPORTANCE: Falls and cascades with a total height over 20 feet are rare in Vermont; this is important because it is moderately natural and also because it is a popular recreational site.

Vascular Plants of Bingham Falls

Tsuga canadensis
Picea rubens
Betula alleghaniensis
Acer saccharum
Acer spicatum
Acer pensylvanicum
Fagus grandifolia
Aster acuminatus
Dryopteris intermedia
Thelypteris phegopteris
Dennstaedtia punctilobula
Polypodium virginianum
Oxalis montana
Viburnum alnifolium
Impatiens sp.
Clintonia borealis
Rubus allegheniensis
Coptis trifolia
Osmorhiza obtusa (formerly)

Report 44, Middlesex Gorge, Winooski River, Middlesex and Moretown, Washington County, Vermont.

Site 762, surveyed 19 September 1983 by P.F. Zika.

A large gorge, partially flooded by a dam near the lower end.

Atlas map 32, Middlesex 7.5' quadrangle. The site is visible downstream (west) of the Route 100B bridge over the Winooski River in Middlesex. From 100B there is easy access to the portion of the gorge below the dam, 250 yards west of the bridge.

* * *

The site is near the edge of the Village of Middlesex; from the gorge you see a dam, a bridge, roads, powerlines, a generating station and houses. Parts of the gorge are wooded with second-growth hemlock-hardwoods forest.

The Winooski averages over 100 feet wide above the gorge and is a lowland river running in a broad alluvial plain. It narrows to 15-30 feet wide in the gorge.

The water is mildly polluted; it is Class C for two miles below Montpelier but classified as B in Middlesex. There is moderate algae growth and the river is murky at low flows.

The gorge is about 1,000 feet long with high-angle rock walls from 20-60 feet high. There are no falls or cascades. The upper 2/3 of the gorge is flooded by the dam.

The rocks are a vertically bedded schist from the Moretown member of the Missisquoi formation, and are of Ordovician age. There are nice smooth rocks near the base of the dam, two potholes over six feet in diameter, and a number of small potholes under one foot wide. Otherwise the rock is not particularly sculptured or noteworthy. Some lime is present.

Most of the vascular plants are common weedy species. Three scarce species occurred in small numbers on damp ledges: <u>Erigeron hyssopifolius</u>, a scarce species of alpine areas and river gorges, currently known from six sites in Vermont; <u>Trisetum spicatum</u>, scarce and mostly restricted to the Champlain Valley; and <u>Solidago randii</u>, a scarce species restricted to ledges. Another scarce species, <u>Aster tradescanti</u>, grew in abundance on the dry south-facing ledges.

Because most of the rocks are dry there were comparatively few mosses or liverworts; no rare species were seen.

The lower end of the gorge is occasionally used for fishing or perhaps swimming. There is a little bit of trash here and the usual flotsam. The rest of the gorge does not appear to be used.

MIDDLESEX GORGE

The dam and related structures are obtrusive. It is noteworthy for the small and previously undiscovered colony of Erigeron hyssopifolius, and for the other three scarce plants. We rate it a degraded site, with one rare plant and three scarce plants.

* * *

Summary: Industrial setting, impacted by hydroelectric project, nice rocks, four noteworthy vascular plants, botany otherwise average, no seclusion or wildness, some trash, mildly polluted water, fair swimming.

We recommend that the state attempt to assure a minimum flow between the dam and the powerstation to protect the plants. Perhaps a portion of the recently negotiated minimum project release can be used.

Plants of Middlesex Gorge

Bryophytes

Amblystegium serpens
Fissadens cristatus
? from Pottiaceae
Tortell tortuosa
Pogonatum urnigerum
Grimmia alpicola
Amblystegium riparium
Bracthythecium plumosum
Coniocephalum conicum
Plagiochila asplenioides
Pleurozium schreberi
Amblystegium tenax
Anomodon attenuatus

Vascular plants

Arctium sp.
Acer rubrum
Achillea millefolium
Agrostis hyemalis
Agrostis sp.
Antennaria sp.
Apios americana
Aquilegia canadensis
Artemisia vulgaris
Asclepias syriaca
Aster cordifolius
Aster lateriflorus
Aster tradescanti
Aster umbellatus
Athyrium filix-femina
Betula papyrifera
Bidens cernua
Bidens frondosa
Bromus inermis
Calamagrostis canadensis
Campanula rotundifolia
Carex sp.
Cerastium vulgatum
Cirsium vulgare
Cornus stolonifera
Cyperus strigosus
Cystopteris bulbifera
Daucus carota
Dennstaedtia punctilobula
Dryopteris intermedia
Dryopteris marginalis
Echinochloa crus-galli
Epilobium glandulosum
Eragrostis pectinacea
Erigeron annuus
Erigeron canadensis
Erigeron hyssopifolius
Erigeron strigosus
Eupatorium maculatum
Fragaria virginiana
Galium aparine
Gnaphalium uliginosum
Hieraceum aurantiacum
Hieraceum scabrum
Houstonia caerulea
Hypericum perforatum
Juncus dudleyi
Lactuca sp.
Linaria vulgaris
Malva sp.
Medicago sativa
Mimulus ringens
Muhlenbergia mexicana
Oenothera perennis
Onoclea sensibilis
Panicum capillare
Pilea pumila
Pinus strobus
Plantago rugelii
Poa compressa
Poa pratensis
Polygonum aviculare
Polygonum pensylvanicum
Polygonum punctatum
Populus deltoides
Populus tremuloides
Prenanthes altissima
Prunella vulgaris
Prunus serotina
Quercus rubra
Rhus typhina
Solidago randii
Rubus idaeus
Rubus occidentalis
Rubus odoratus
Rudbeckia serotina
Salix sp.
Setaria glauca
Solanum dulchamara
Solidago bicolor
Solidago canadensis
Solidago graminifolia
Solidago rugosa
Taraxacum officinale
Tragopogon pratensis
Trisetum spicatum
Tsuga canadensis
Ulmus americana
Vaccinium angustifolium
Vicia cracca
Viola sp.
Xanthium strumarium

Report 45, Benjamin Falls, Pond Brook, Berlin, Washington County, Vermont.

Site 303, surveyed 20 September 1983 by P.F. Zika and 17 June 1986 by J.C. Jenkins.

Large secluded ravine with cascades and falls.

Atlas map 33, Barre West 7.5' quadrangle. Can be reached from behind Crossway Motors which is at the intersection of the Barre-Montpelier Road and the interstate access road. It can also be reached from above at the old city water supply pond off Berlin Street.

* * *

Benjamin Falls is a long cascade in the Town of Berlin, about 1/4 mile south of the Montpelier City boundary. The lower part of the cascade was surveyed in 1983 by Peter Zika and included in Jenkins & Zika, Vermont Waterfalls and Gorges. At that time we were not aware of the extent of the site, and our evaluation was based on a partial survey. In 1986 the Vermont Agency of Environmental conservation asked Jenkins to resurvey the site. The survey was done on June 17th, during a period of high water following a heavy thunderstorm.

Benjamin Falls is located on Berlin Pond Brook. The site is in a wooded ravine just to the east of Route 302 and just north of the access road connecting Routes 302 and 62. Hence, the site is very close to the intensively developed Barre-Montpelier corridor.

Berlin Pond Brook is a small stream, averaging some 15-30 feet wide here. The water, which was seen immediately after a severe thunderstorm, was silty but otherwise appeared and smelled clean. Pond Brook is the outlet stream from Berlin Pond, the City water supply. It is a small, clear steep stream.

The cascades begin just below a small dam at an elevation of 860 feet and descend some 320 feet over a distance of 2,400 feet until the stream enters the floodplain of the Stevens Branch.

The stream channel runs almost continually in bedrock. It consists of a number of steep cascades (the largest about 50 feet high) and small falls separated by medium steep cascades and a few more gentle segments of typical woodland stream. The cascades are closely spaced: in the whole climb from the road to the reservoir there is never more than a 150 foot interval between successive cascades, and in many places the cascades merge with one another, making a continuous staircase of falling water.

The bedrock at the site is mapped as the Barton member of the Devonian Waits River formation, a mixture of limestone and


BENJAMIN FALLS

phyllite. Field examination show two distinct lithologies, a black phyllitic schist near the bottom of the site and a massive grey mica schist, apparently harder and tending to break into blocks rather than thin sheets, near the top. Both are bedded vertically. Cascades occur on both, but the steepest cascades and most striking ledges are on the massive schist.

There are no major rock walls paralleling the stream (though there are several ledges perpendicular to it, formed by the same outcrops that make the largest cascades); hence, the site is not a gorge. The ravine walls are steep in places, and there are several nice lookouts from which it is possible to get fine views of the largest cascades.

The cascades lie in a ravine between two hills. The lower parts of these hills were farmed, and there are open fields within a short distance of the stream, separated from it by a thin strip of what appear to be second-growth woods. The upper parts of the hills are wooded, and the stream is surrounded here by more extensive woodlands, dominated by hemlock and yellow birch. These are either primary woods or much older second-growth.

Much of the upper woods have been recently and rather crudely logged; as a result they are patchy and have a moderate amount of slash and logging debris, and thick, crowded stands of young or recently released hemlocks.

A botanical survey found no rare species. The plants are typical of acid woodlands. (A few lime-dependent sedges were seen around a spring in a pasture south of the site, and Charles Johnson reported walking fern on one of the upper cliffs, which also has small amounts of maidenhair and bulblet fern; otherwise lime-dependent species were absent.) A total of approximately 90 vascular plants were seen in the woods and along the stream banks: in comparison to other woods at this elevation this is a moderately diverse but not exceptional flora, better than that of acid mountain woods or dense conifer stands, but inferior to that found in the best limy hardwood stands. (Hemlocks cast deep shade and produce an acid, poorly decomposed surface soil; even if the bedrock were a pure limestone the dominance of hemlocks in the ravine would keep the diversity fairly low here.)

There are no wet cliffs in the spray zone of the stream, and hence, no exceptional habitats for mosses and liverworts. No detailed inventory of mosses was made, and only a few common species were noted in the field.

The cascade currently receives moderate use. There are some trails along the south side and a small snowmobile bridge in the middle. There are a number of nice places to sit and watch the water, but, so far as could be seen at high water, no good swimming.

The site is enclosed in by the ravine and woods, and feels quite private, in fact amazingly so considering how close it is to the roads and to the city. It is a very natural site in the sense that you cannot see any buildings or roads or wires from it. (The dam at the top is perhaps 15 feet high by 25 feet wide, and sits above the top cascade where you can't see it until you are within 100 feet of it.) It is not, however, really secluded or wild: you can see fields from the lower portions of the cascade, and, as mentioned above, the lower woods are second growth and the upper woods have been extensively cut.

In summary, what we have is a very striking water feature - a long, nearly continuous series of cascades, coming down a steep ravine, remarkable for their length and power - with nice but unexceptional surrounding woods and biology. Old mill foundations testify to the fact that there was some use of the cascades for power. The site is potentially of great interest as a future city or state park.

The height, continuity, and length of the cascades are, so far as we know, unique in the state; hence, as a geological feature the area has state significance and is rated as highly significant.

The biology and surroundings are average, with the note that the beauty of the woods will increase as they recover from logging. The cascades themselves are very impressive but lack the visual interest of places with large boulders or rock-walled gorges, and in the author's opinion cannot compare in this respect with our most beautiful gorges or cascade-and-pool chains.

The site is potentially very important as a recreation area because it is close to two urban areas, and would make a fine and very unusual public park. The woods could be considerably improved by good forestry and with the addition of trails (or upgrading of existing trails) it would be a more beautiful place to walk and sit. So far as we know there is no other large cascade near any urban area in Vermont that is still wooded and private, and no urban park in the state that has spectacular water features. All of these considerations give it high importance as a potential park, with the note that if developed as a city park it would be unique in that a geological feature normally thought of as belonging to the high mountains would be accessible, on foot, within an urban area, and in its natural form and conditions. If we may venture an opinion, it is hard to think of a more appropriate symbol for the capital of a mountain state.

* * *

Summary: Exceptional geological feature, perhaps unique in the state; average woods, biology and surroundings; water quality and site condition good; noteworthy privacy, but not really wild or secluded; no fishing and probably no swimming; exceptional potential as a city park.

Rated HIGHLY IMPORTANT (of statewide importance) as a large, spectacular cascade, and highly important as a potential urban park that, if created, would be unique in the state.

Vascular Plants Seen in the Woods and Along the Stream at Benjamin Falls

Acer saccharum
Acer spicatum
Actea rubra
Adiantum pedatum
Alnus rugosa
Aralia nudicaulis
Arismaea triphyllum
Aster lateriflorus
Aster puniceus
Aster umbellatus
Athyrium felix-femina
Betula alleghaniensis
Brachyeletrum erectum
Carex arctata
Carex blanda
Carex crinita
Carex debilis
Carex from ovales
Carex from ovales #2
Carex gracillima
Carex granularis
Carex lurida
Carex novae-angliae
Carex pedunculata
Carex stipata
Carex swannii
Circaea alpina
Clematis virginica
Cornus alternifolia
Cornus racemosa
Crataegus ? monogyna
Cystopteris bulbifera
Dryopteris intermedia
Dryopteris marginalis
Dryopteris spinulosa
Epipactis helleborine
Erigeron philadelphicus
Erigeron strigosus
Fragaria virginica
Fraxinus americana
Galium triflorum
Geranium robertianum
Geum sp. (probably canadense)
Glyceria melicaria
Glyceria striata
Gymnocarpium dryopteris
Hammamelis virginiana
Hieracium florentinum
Impatiens sp.
Juncus effusis
Laportea canadense
Lonicera canadensis
Luzula acuminata
Lycopodium lucidulum
Lycopodium obscurum
Lysimachia ciliata
Lysimachia nummularia
Maianthemum canadense
Mentha sp.
Myosotis scorpioides
Onclea sensibilis
Ostrya virginiana
Oxalis montana
Parthenocissus inserta
Phegopteris phegopteris
Poa alsodes
Polulus grandidentata
Polygonatum pubescens
Polystichum acrostichoides
Populus tremuloides
Potentilla simplex
Prenanthes sp.
Prunus virginiana
Ranunculus acris
Ranunculus recurvatus
Ribes rubrum
Rubis hispidus
Rubus idaeus
Rubus occidentalis
Rubus pensylvanicus
Solanum dulcamara
Solidago rugosa
Thalictrum polygamum
Thelypteris nova-boracense
Thuja occidentalis
Tsuga canadense
Ulmus americana
Veratrum viride
Veronica officinalis

Report 46, Northfield Falls, Cox Brook, Northfield, Washington County, Vermont.

Site EEE, surveyed 4 October 1983 by P.F. Zika.

A small cascade below a dam.

Atlas map 32, Barre 15' quadrangle. The cascade is along the road that parallels Cox Brook just to the northwest of the Village of Northfield Falls. It is about 0.1 mile beyond the second covered bridge as you leave town.

* * *

The site is in the open at the edge of the Village. There is a small dam above the cascade, some fill from the roads, several culverts, some trash and so on.

Cox Brook is a small lowland alluvial stream about ten to 15 feet wide, with fertile or mildly polluted water. Minnows and aquatic insects are plentiful.

The site consists of a series of short cascades and pools with a total drop of about 15 feet.

The most attractive feature of the site was the bedrock, which was well exposed on the south shore of the stream. There are ledges about 20 feet wide which have been rounded by the water and have a few potholes.

The rock is mapped as part of the Ordovician Missisquoi formation. The site is possibly at the contact between two different rocks from this formation, the Harlow Bridge quartzite member and the Cram Hill member which can be either phyllites or volcanic rocks. The rocks in the cascade appeared to be schist, with some striking yellow coloration. There was also a more massive green stone in the outcrop. The presence of a tiny colony of <u>Geranium robertianum</u> indicated there was some lime in the bedrock, or perhaps that lime was leaching from the road fill.

No unusual vascular plants were noted. Bryophytes were not common or diverse.

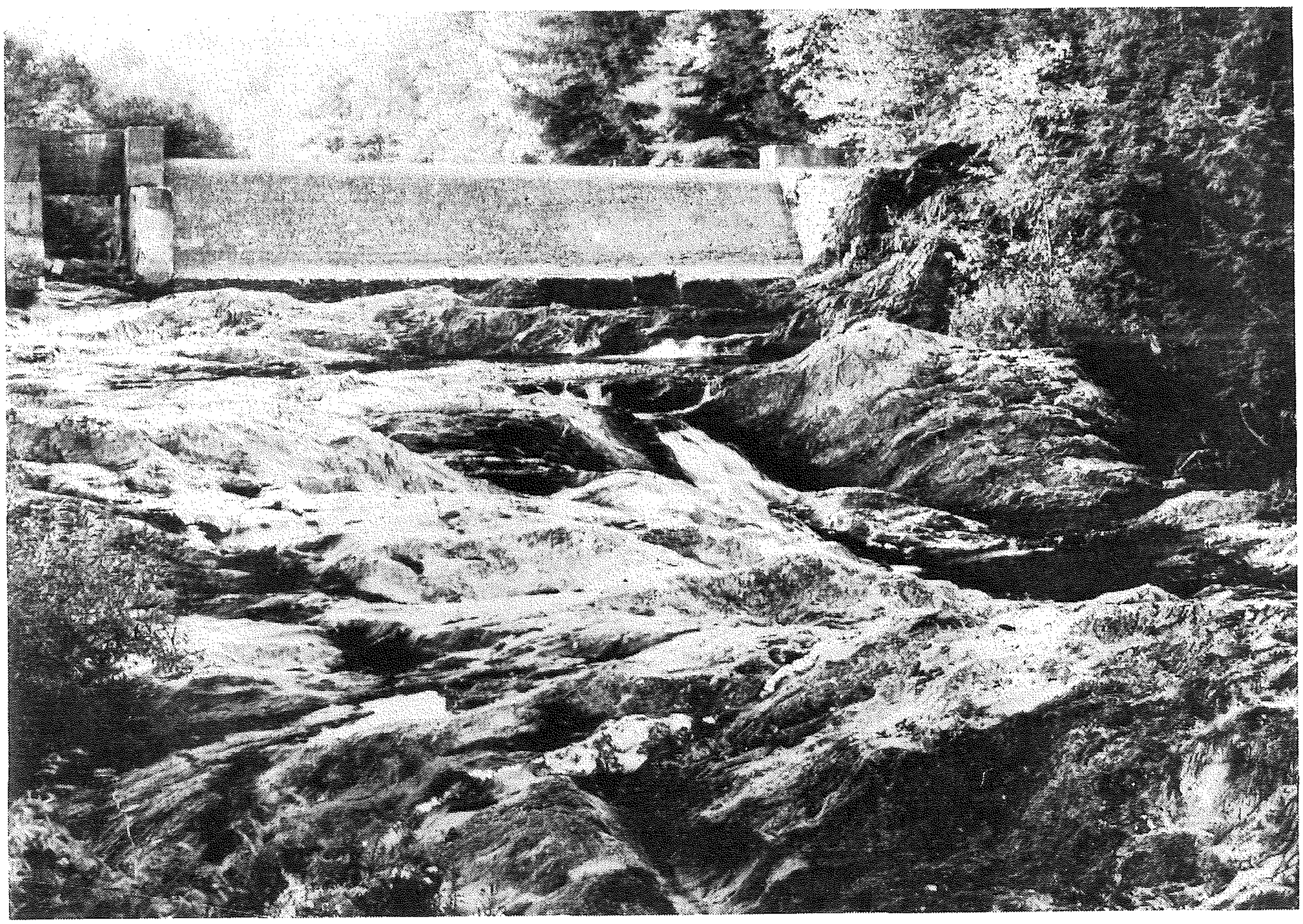
The falls receive very little use. There are no deep swimming holes and the site is not particularly attractive for other recreational activities. There is some junk above and below the dam, and a few beer cans. At best a gathering place when you can't get to anywhere else.

* * *

Summary: Rural setting, nice rocks, average botany, no seclusion, some trash, mild water pollution; no swimming.

Vascular Plants of Cox Brook Cascades

Pinus strobus
Betula alleghaniensis
Tsuga canadensis
Acer rubrum
Rubus idaeus
Galium mollugo
Ulmus americana
Amelanchier sp.
Geranium robertianum
Aster puniceus
Aster umbellatus
Oenothera biennis
Achillea millefolium
Parthenocissus sp.
Poa compressa
Poa pratensis
Taraxacum officinale
Salix rigida
Rubus odoratus
Impatiens sp.
Carex torta
Solidago canadensis
Epilobium glandulosum
Gnaphalium supinum
Eleocharis obtusa



NORTHFIELD FALLS

Report 47, East Calais Cascades, Kingsbury Branch, Calais, Washington County, Vermont.

Site HHH, surveyed 4 October 1983 by P.F. Zika.

Some low-angle cascades.

Atlas map 39, Plainfield 15' quadrangle. Vermont Route 14 goes through the Village of East Calais. Just north of the gas station turn west over Kingsbury Branch. The cascade is below the dam.

* * *

The site is second-growth pine-hardwoods forest at the edge of the Village. The cascades are at the bottom of a wooded ravine. The bridge and road are visible; there are powerlines and houses nearby and junk from the Village and from an old mill site in the ravine.

The stream is a small, lowland, alluvial stream averaging ten to 15 feet wide. It has a lot of algae and is probably mildly polluted.

The cascades are about 250 feet long and consist of a series of chutes, flat sloping ledges and small pools with a total drop of about 50 feet. There are no deep pools for swimming and no sculpture or potholes.

The bedrock is a weakly-layered phyllite mapped as the Barton River member of the Devonian Waits River formation. There were pockets of lime on the west shore of the cascades.

The plants were uninteresting.

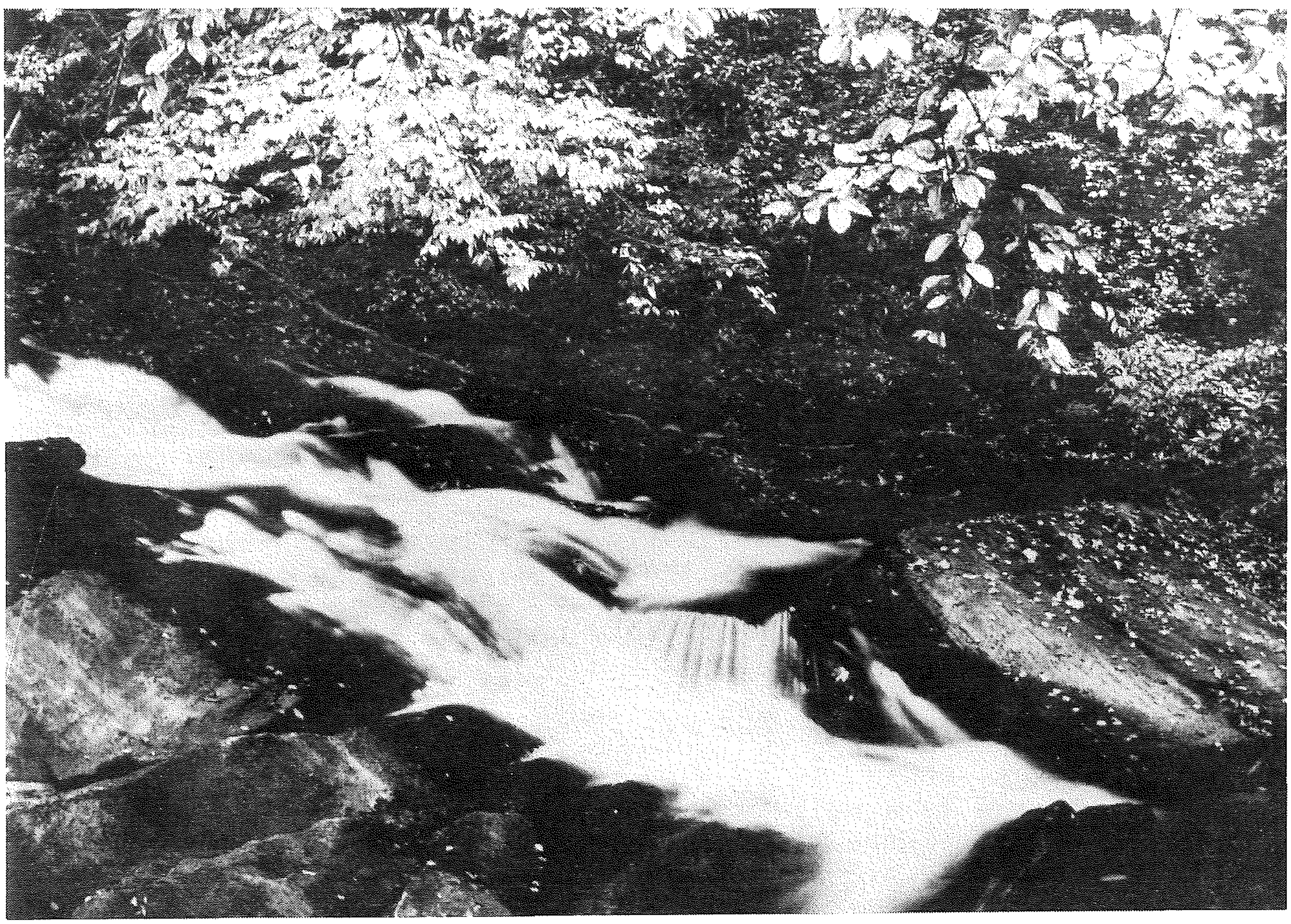
The falls were once a mill site. They probably never were particularly scenic and now suffer from junk and algae.

* * *

Summary: Somewhat degraded site at edge of a village; average rocks, average botany, not secluded or wild, some trash and junk, mild water pollution, no swimming.

Vascular Plants of East Calais Cascades

Populus tremuloides
Betula papyrifera
Betula alleghaniensis
Acer rubrum
Thuja occidentalis (one)
Ulmus americana
Pinus strobus
Iris versicolor
Mentha arvensis
Thalictrum polygamum
Poaceae spp.
Thelypteris phegopteris
Aster puniceus
Cornus amomum
Carex pedunculata
Dryopteris marginalis
Asarum canadense
Solidago flexicaulis
Elymus riparius
Taraxacum officinale
Vitis riparia
Solanum dulcamara
Lysimachia nummularia
Eupatorium maculatum
Lonicera X bella



EAST CALAIS CASCADES

Report 48, Marshfield Falls, Marshfield Brook, Marshfield, Washington County, Vermont.

Site KK, surveyed 11 October 1983 by P.F. Zika.

A long low-angle cascade between two bridges.

Atlas map 40, Plainfield 15' quadrangle. From the center of Marshfield, drive south on the road to Bailey and Marshfield Ponds, pass a sewage treatment plant on the right, come to a fork. The lower fork leads to the bottom of the cascade. The upper fork crosses the lower third of the cascade.

* * *

The site is rural, partly open and partly wooded. There are two bridges over the cascades, a stone wall (perhaps from a mill) above them and some houses and a channelized section of the stream below them. The woods are second-growth hemlock-hardwoods.

The stream is a small mountain brook four to six feet wide with clean water but some foam and algae. It may receive nutrients from summer camps upstream. Aquatic insects are plentiful and the water is well oxygenated.

The cascade is a sloping granite face 100 yards long and 20-30 feet wide over which the water runs in a straight line. The vertical drop between the bridges is about 50 feet. The granite weathers and separates into thin sheets parallel to the slope, but does not form potholes or ripples or sculptured surfaces. This gives the cascade a uniform, somewhat dull, New Hampshireish look.

The rock is an undifferentiated granite of approximately Devonian age. It is only exposed in the bed of the stream. There is no lime at the site.

The vascular flora was slightly more diverse than most sites without lime. One species of interest was seen, the cutleaved susan, <u>Rudbeckia</u> <u>triloba</u>, a scarce species that has come into Vermont from the west and is probably near its local northern limit in Marshfield.

Mosses were common on the wet rocks, and moderately diverse. No collections were made.

The cascade is a well known local scenic attraction, easily reached by road. There is no swimming but we assume it is visited by sightseers. Some junk and trash were seen.

It is a pretty place: a continuous sheet of water over smooth rocks, probably quite wild in the spring.

MARSHFIELD FALLS

There had been a proposed hydro project at the site. A dam would have been constructed at the top of the cascade and a powerhouse placed 150 feet downstream from the base of the cascade. A penstock would have diverted all the water from the cascades, except for a minimum summer flow of three cfs and a minimum winter flow of two cfs. The developers for the project have since abandoned their proposal, however.

* * *

Summary: Rural setting with roads and bridge, average rocks , average botany, no seclusion or wildness, some trash, clean water, no swimming, popular for scenery. Threatened with a hydro project.

Vascular Plants Between the Bridges at Marshfield Falls

Abies balsamea
Betula alleghaniensis
Betula papyrifera
Tsuga canadensis
Acer saccharum
Acer rubrum
Acer negundo
Populus tremuloides
Juglans cinerea
Fraxinus nigra
Fraxinus americana
Rubus idaeus
Rubus odoratus
Rubus occidentalis
Aster puniceus
Aster umbellatus
Aster lateriflorus
Salix bebbiana
Solidago gigantea
Solidago rugosa
Solidago flexuosa
Thalictrum polygamum
Mentha arvensis
Corylus cornuta
Chelone glabra
Cornus stolonifera
Cornus alternifolia
Alnus rugosa
Myosotis scorpioides
Clematis virginiana
Galium triflorum
Galium sp.
Athyrium filix-femina
Thelypteris phegopteris
Rudbeckia triloba
Glyceria striata
Prunus virginiana
Muhlenbergia sp.
Thelypteris palustris
Arctium sp.
Dryopteris intermedia
Veronica officinalis
Carex pedunculata
Aster cordifolius

Report 49, Allen Brook Cascade, Allen Brook, Williston, Chittenden County, Vermont.

No site number; surveyed 20 September 1983 by P.F. Zika.

A small cascade.

Atlas map 36, Essex Junction 7.5' quadrangle. The site is 50 yards downstream from the Industrial Drive bridge over Allen Brook.

* * *

The site is industrial, surrounded by houses and commercial buildings, with construction currently going on 50 yards away. The woods on either side of the stream are young second-growth hardwoods.

Allen Brook is a small stream averaging three to five feet wide, mildly polluted, with a lot of algae in the channel.

The cascades are about 200 feet long and drop a total of 20 feet. Small potholes under one foot across are common. There are no falls or pools.

The rock is dolomite, from any or all of three formations that seem to come together here.

The vascular plants were typical of a small, partly shaded limestone ledge. No rarities were present. A garden Sedum has naturalized itself and carpeted some of the damp rock by the cascade.

No rare mosses were collected.

There is a trail leading to the cascade but use of the area is probably light. It is not an attractive site, litter abounds, and there is no swimming.

* * *

Summary: Industrial setting, indifferent rocks, poor botany, without privacy or wildness, some trash, mildly polluted water, no swimming, not much use.

ALLEN BROOK CASCADE

Plants of Allen Brook Cascade

Bryophytes

- Bracthythecium ? oxycladon
- Hypnum lindbergii
- Cephalozia sp.
- Thujidium sp.
- Entodon seductrix
- Amblystegium tenax
- Amblystegium sp.

Vascular plants

- Acer negundo
- Amphicarpa bracteata
- Anemone virginiana
- Aquilegia canadensis
- Aster novae-angliae
- Aster simplex
- Berberis vulgaris
- Bidens cernua
- Bidens frondosa
- Boehmeria cylindrica
- Dryopteris marginalis
- Echinocloa crus-galli
- Elymus riparius
- Epilobium sp.
- Fragaria virginiana
- Geranium robertianum
- Heracleum maximum
- Lysimachia nummularia
- Muhlenbergia frondosa
- Oxalis europaea
- Parthenocissus quinquefolia
- Phalaris arundinacea
- Polygonum lapathifolium
- Polygonum sagitatum
- Rumex crispus
- Salix discolor
- Salix rigida
- Sedum sp.
- Taraxacum officinale
- Tilia americana
- Toxicodendron radicans
- Ulmus americana

Report 50, Frazer Falls, unnamed stream, Williston, Chittenden County, Vermont.

No site number, surveyed 29 June 1983 by P.F. Zika.

A large cascade on a small woodland stream.

Atlas map 37, Essex Junction 7.5' quadrangle. Take U.S. Route 2 about 1.5 miles east from the center of Williston and turn left (north) onto a dirt road. This road crosses the stream in 0.3 miles. Follow a logging road west about 100 yards and the cascade will be visible below and to the south. Just above the site is a sand quarry.

* * *

The site is in a wooded ravine on a hill slope that adjoins the floodplain of the Winooski River. The woods in the ravine are hemlock-hardwoods, and on the slope are mostly hardwoods. The floodplain is open agricultural land and the nearest houses are about one-quarter mile from the site.

The stream is a small hillside brook about five feet wide, with clear cold water.

The site consists of a narrow rock chute less than five feet high that funnels the stream into a two foot wide channel, after which it descends about 20 feet in a short cascade and then enters the floodplain.

The rock is a schistose graywacke of the Cambrian Pinnacle formation. It is not particularly well-exposed and not very interesting structurally or geologically. The vegetation suggests that it is slightly limy.

The vascular plants were ordinary except for a good-sized colony of the meadow horsetail, <u>Equisetum pratense</u>. At least 300 stems were found in the silty alluvium just below the falls in a wet meadow between the cascade and the road. Meadow horsetail is currently known from fewer than ten sites in Vermont; all but one of these is in the limestone belt in the west of the state.

Bryophytes were present but not exceptionally diverse. No rarities were found. No collections were made.

The falls receive at most light use. The water is too shallow for fishing or swimming and there are better party places nearby. There is a trail that crosses the stream just above the cascade. Some trash was present in the stream.

A nice but not unusual place. It may be quite pretty when the water is up in the spring.

* * *

FRAZER FALLS

Summary: Woodland setting, average rocks, average botany, one rare species below the cascade, moderately wild, some trash, clean water, no swimming, lightly used for walking and picnicking.

Vascular Plants of Frazer Falls

Tsuga canadensis
Fagus grandifolia
Betula alleghaniensis
Carex amphibola
Polystichum acrosticoides
Dryopteris intermedia
Prenanthes sp.
Solidago caesia
Epipactis helleborine
Aster cordifolius
Carex sp. (ovales)
Athyrium filix-femina
Ariseama triphyllum
Smilacina racemosa
Chelone glabra
Polypodium virginianum
Clintonia borealis
Circaea alpina
Impatiens sp.
Aralia racemosa
Amphicarpa bracteata
Poa palustris ?
Eupatorium maculatum
Lactuca sp.
Acer spicatum
Carex gracillima
Veronica officinalis
Clintonia borealis
Aster puniceus
Thalictrum polygamum
Gymnocarpium dryopteris
Carex communis
Acer pensylvanicum
Thelypteris phegopteris
Cardamine pensylvanica
Mitella diphylla
Dryopteris marginalis
Osmunda claytoniana
Adiantum pedatum
Equisetum pratense
Lysimachia nummularia
Acer saccharinum
Chelone glabra
Tovara pensylvanica
Rumex obtusifolius
Carex brommoides
Rubus odoratus
Fraxinus americana
Tilia americana
Ulmus rubra
Carex prasina
Onoclea sensibilis
Matteucia struthiopteris
Taraxacum officinale
Geum canadense
Prunus virginiana
Celtis occidentalis
Solidago gigantea
Polygonum cilinode

Report 51, Moss Glen Falls II, Moss Glen Brook, Stowe, Lamoille County, Vermont.

Site 371, surveyed 13 October 1983 by P.F. Zika.

A series of large cascades and falls and a short gorge.

Atlas map 38, Stowe 7.5' quadrangle. From the center of Stowe drive north on Route 100 and turn right onto Randolph Road; take the first right turn onto Moss Glen Road; follow this across the stream, park, and follow the trail about 150 yards to the falls.

* * *

The site is a steep, northwest facing ravine in hemlock woods. The nearest house is about one-half mile down the road. The site is fairly near the road but feels remote because of the deep forest and the ravine and the noise of the falls.

Moss Glen Brook is a mountain stream above the falls and widens to a meandering alluvial stream below them. The water is very clean and clear.

From above, there is first a narrow gorge six to 12 feet wide by 40 feet deep with jagged, overhanging walls and small cascades; then a 20 foot falls with a cave and pool below them; then a continuous cascade 100 feet long; and finally, another 20 foot falls. In places there are sloping vertical walls to 60 or 80 feet high. A trail northeast of the stream has fine views of the lower falls and cascade.

The total drop of the cascade and falls together is about 100 feet, one of the three greatest drops on any stream in the state, and the greatest on an undammed stream.

The rocks at the site are part of the Ordovician Stowe formation, and there is supposed to be a contact between schists and greenstones or schists and amphibolites here. We did not locate the contact: much of the site appears to be schist, but another rock type may occur at the head of the upper gorge.

The rocks are mostly smooth, and with the exception of the pools at the base of the falls, potholes and sculptured rocks are uncommon. The rock is not limy.

The steep soil banks of the ravine and the nearly vertical schist faces provide very little habitat for vascular plants, and few species were noted.

Bryophytes were common in the gorge and near the main stream channel. No collections were made.

The site is famous and heavily visited. It is marked on the official Vermont highway map, and the Vermont Atlas (in the

MOSS GLEN FALLS II

correct location!). It is beautiful and dramatic and scenic and exactly what we imagine a mountain waterfall should be like. (And also exactly what, at least in Vermont, they very seldom are.) It is a beautiful picnic place and has good bathing and fair swimming and perhaps good fishing. In any event, the people living on the road are very tired of giving directions to the falls.

The site is clean except for a little litter and a chunk of concrete at the foot of the falls, the only remnant of a former hydro development.

From what we have seen, this is the most beautiful large woodland falls in the state. It is designated as an official natural area by the Vermont Department of Forests, Parks & Recreation, and is located in the Putnam State Forest.

* * *

Summary: Woodland setting, fine rocks and a spectacular falls, average botany, moderately wild, some trash, clean water, good bathing and fair swimming, very popular for scenery and picnics, some use for parties, heavily visited by tourists as well as locals.

HIGH IMPORTANCE: Highest undammed cascade in the state, beautiful site, important recreational area. Designated state natural area.

Vascular Plants of Moss Glen Falls II

Tsuga canadensis
Thelypteris phegopteris
Ulmus americana
Aster puniceus
Aster acuminatus
Laportea canadensis
Oxalis montana
Hydrocotyle americana
Scutellaria lateriflora
Dryopteris intermedia
Galium sp.
Fraxinus americana
Poaceae sp.
Agrostis perennans ?
Glyceria striata
Polypodium virginianum
Dennstaedtia punctilobula
Picea rubens
Betula allehganiensis

Report 52, Lime Kiln Gorge (= High Bridge Gorge), Winooski River, Colchester and South Burlington, Chittenden County, Vermont.

Site not numbered by the state, surveyed on 16 August 1984 by P.F. Zika.

A deep gorge traversed by a bridge. A gauging station but no dam.

Atlas map 36, USGS Burlington 7.5-minute or 15-minute quadrangle. From the junction of I-89 and Route 15 just east of Winooski City, take Route 15 east about one-half mile and turn right (south) on Lime Kiln Road. Cross the river on High Bridge and park at the pulloff on the left (north). Access to the rim of the gorge is from the railroad tracks on the north or some faint trails on the south.

* * *

The gorge is within the Burlington suburbs, with an airport, light industries, St. Michael's College, and high density housing nearby. Upstream from the gorge there are some large farms on the floodplain, and downstream the riverbanks are forested with cedars or dry oak and maple woods. About one-half mile downstream from the Lime Kiln Gorge is the Winooski Gorge (Report 55), a famous botanical site. Besides the bridge that traverses the gorge there is a gauging station and a retaining wall on the north side of the gorge, and a short distance beyond are deep quarries and the remains of the large kiln that processed limestone in the last century.

The Winooski River is 60 to 80 feet wide in the gorge. Its water is somewhat polluted: it has a distinct river smell and a murky green color, and is scummy and has some refuse and junk floating in it.

The walls of the gorge are nearly vertical and form a straight-sided gorge about 250 yards long and from 15 to 70 feet high. Below the railroad on the north bank there is a retaining wall about 15 to 25 feet high, built from the native stone.

The bedrock is a pale limestone or dolomite of Ordovician age. It forms steep, irregularly fractured walls with little smoothing or sculpture. There are no potholes but there are some rippled rocks at the upstream end of the gorge and there are several caves on the north shore. No potholes were found.

In the last century, this and the nearby Winooski Gorge were famous for rare plants. Currently many of the rarer species are gone. In some cases they may have been over-collected: the early botanists were unscrupulous collectors and used specimens of rare plants as a sort of a currency to exchange for specimens from elsewhere. In other cases the problem may have been the development and industrial use of the land near the gorge; rare plant habitats were reduced by cutting of the forests, operation of the lime kiln and railroad, and perhaps by flooding from the dam downstream.

So far as we can determine, the following plants are no longer found at Lime Kiln Gorge:

Pterospora andromedea - collected here several times between 1881 and 1903, no longer known from any site in New England.

Isotria verticillata - recorded last from High Bridge in the early 1800's. Currently known from one site in southern Vermont.

Lupinus perennis - collected on the roadside somewhere between Winooski and Lime Kiln in 1902. No current Vermont stations.

Anemone multifida - collected here in 1881; currently known only from the Winooski Gorge, and considered endangered there.

Cypripedium arietinum - last seen at High Bridge in 1903. Currently known from only a few stations, and missing at many of the places where it formerly grew. Proposed as a state threatened species.

Shepherdia canadensis - reported at Lime Kiln in 1881. Currently rare in Vermont and restricted to the shores of Lake Champlain. This colony and one other were the only stations that were not on the lake shore. Considered a threatened species in Vermont.

The vascular plants currently found at High Bridge Gorge are all much commoner species than the ones just discussed, and the flora as a whole is similar to that of other limestone cliffs and gorges in Chittenden County. A list of the species observed is at the end of the report. Several species are noteworthy: Aster tradescanti and Deschampsia cespitosa are restricted to calcareous shores in western Vermont and are known from fewer than 20 sites in the state. There are about 50 plants of each at the gorge. Sorgahstrum nutans is sparingly present at the beginning of the gorge. It is near the northern limit of its range in northern Vermont and is known from only three towns in Chittenden County. Pellaea glabella is a characteristic plant of limestone faces in northwestern Vermont, but it is scarce across most of New England. There are about a dozen plants at the head of the gorge, and it is possible there are others on less accessible cliffs downriver. Solidago randii, a goldenrod typical of high elevations and cold cliffs, is found in small numbers at the edge of the cliff on the south side of the gorge.

The gorge also has a recent ornithological rarity; a wintering gyrefalcon has been seen on the cliffs here on several different occasions over the last five years.

Lime Kiln Gorge does not receive heavy recreational use. Boating in this stretch of the river is difficult because of limited access and the dams downstream. Fishing is uncommon because of the lack of a shoreline along the tall bluffs. There is no easy way to swim in the strong current in the gorge, and the water is not clean enough for good swimming. The pulloff is commonly used as a rest area, but not many people try to hike along the river here. The railroad cut just north of the gorge is a popular rock-climbing site.

The tall steep walls of the gorge are the primary attraction of this site. From the bridge there are nice views west over the river and east towards the main ridgeline of the Green Mountains. It is one of the deepest gorges in Vermont. The gorge is dammed in the sense that a dam located 1,000 feet downstream floods the gorge.

* * *

Summary: Industrial setting, impacted by a hydroelectric project, average rocks, formerly with an exemplary vascular flora, now average biology, no privacy or wildness, some trash, polluted water, not a popular recreational site. One of Vermont's deepest gorges.

Vascular Plants Seen at Lime Kiln (= High Bridge) Gorge

Thuja occidentalis
Pinus resinosa
P. strobus
Juglans cinerea
Carya cordifomis
Ulmus americana
Quercus velutina
Q. alba
Betula alleghaniensis
B. papyrifera
B. populifolia
Populus tremuloides
P. balsamifera
P. grandidentata
Tilia americana
Acer negundo
Tsuga canadensis
Prunus serotina
P. virginiana
Rubus odoratus
Sambucus canadensis
Ribes cynosbati
Cornus stolonifera
Corylus cornuta
Vaccinium angustifolium
V. vaccilans
Gaylussacia baccata
Comptonia peregrina
Kalmia angustifolia
Amelanchier spp.
Viburnum trilobum
Rhamnus cathartica
Vitis riparia
Clematis verticillata
Toxicodendron radicans
Lonicera dioica
Pellaea glabella
Dryopteris marginalis
Cystopteris bulbifera
Pteridium aquilinum
Bromus inermis
Agropyron repens
Deschampsia cespitosa
Poa compressa
Agrostis sp.
Andropogon gerardi
Elymus riparius
Phalaris arundinacea
Sorghastrum nutans
Danthonia spicata
Panicum lanuginosum
Phleum pratense
Carex eburnea
C. pensylvanica
Aralia racemosa
A. nudicaulis
Sonchus oleraceus
Nepeta cataria
Ambrosia artemesiifolia
Erigeron canadensis
E. annuus
Epilobium sp.
Lactuca scariola
L. sp.
Arctium sp.
Bidens sp.
Polygonum arenastrum
Solidago juncea
S. caesia
S. randii
S. nemoralis
S. bicolor
Geranium robertianum
Impatiens capensis
Campanula rotundifolia
Aster tradescanti
A. linariifolius
A. macrophyllus
A. lateriflorus
Xanthium strumarium
Senecio paupercula
Melilotus albus
Daucus carota
Hypericum perforatum
Hieraceum sp.
Anemone virginiana
Aquilegia canadensis
Galium circaezans
Polygola paucifolia
Achillea millefolium
Sanicula marilandica
Trifolium agrarium
Verbascum thapsus
Gaultheria procumbens
Commandra umbellata
Apocynum androsaemifolium
Houstonia caerulea
Viola adunca
Melampyrum lineare
Antennaria neglecta
A. planginifolia

Rare Plants Presumably Extirpated From Lime Kiln Gorge

Pterospora andromedea	Isotria verticillata
Cypripedium arietinum	Anemone multifida
Lupinus perennis	Shepherdia canadensis

WILLISTON GORGE

Report 53, Williston Gorge, Winooski River, Williston and Essex, Chittenden County, Vermont.

Site not numbered by the state, surveyed on 13 July 1984 by P.F. Zika.

A low limestone gorge below a dam and a bridge. Two rare plants grow in the gorge.

Atlas map 36, USGS Essex Junction 7.5-minute quadrangle. From Five-corners in Essex Junction take Route 2A south to the crossing of the Winooski River. There is a pulloff on the south side of the bridge at Overlook Park (maintained by the power company). Rough trails to the cliffs and ledges can be followed southeast or southwest from the bridge.

* * *

Williston Gorge is between Williston and Essex Junction; the surroundings are partly urban and partly rural. To the north is the urban center of Essex Junction. To the south in Williston is Industrial Avenue, with factories and several housing developments. There is a power dam at the head of the gorge; the powerhouse is on the northwest side of the Route 2A bridge that crosses the gorge. Utility lines from the powerhouse add to the urban feeling at the site. At night the dam is lighted and looks quite pretty when water is flowing over it. In the summer the river is usually low and there is little flow over the dam and through the gorge. The riverbanks above the rocky shoreline are steep and sparsely forested with young deciduous trees. Below the site is an intact stretch of floodplain forest.

The Winooski is a large lowland river, about 75 to 100 feet in the gorge. This width includes several rock islands in the gorge. At the time of the survey the river was a murky dirty green color, and it was impossible to see to the channel bottom to look for aquatic insects or algal growth. There was a slight river odor and bits of foam and scum in the eddies. Much of the sediment in the river was produced by heavy rains on the two days preceeding the visit. In the spring high water levels leave driftwood and trash on ledges and clifftops.

The dam at the head of the gorge is about 40 feet high by 150 feet long. There are some nice moist wet rocks at the foot of the dam, potentially a good place for bryophytes. The rock-walled section of the gorge, below the dam, is about 150 to 200 yards long and from 15 to 35 feet high. West of this (just past the powerhouse) there is a complicated system of east-west oriented canyons with various islands, channels, and cliffs on the south shore. The stone islands are 150 to 200 feet long, thin, and nearly devoid of soil or vegetation because of intense scouring in springtime.

The rocks are dolomites from the Cambrian Clarendon Springs and Sweetsburg formations. It is grey and white, has a mealy texture, with little carving or sculpture. The walls of the gorge and the islands below the bridge steep - over 60 degrees - and rugged, with lots of irregular corners and fractures. The rock is very limy and a number of calciphilic plants were seen growing on it.

Vascular plants are restricted to two general habitats at the site: fissures and pockets of soil on the dry ledges, and temporary pools or seepage zones where there is available moisture. The water level varies frequently and often drastically, depending on how much water flows over the top of the dam. High water levels in the spring remove most vegetation from the first ten vertical feet above the average shoreline.

The flora is similar to that of other limy cliffs in this part of the state. Four noteworthy species occur:

Erigeron hyssopifolius - occurs both up- and down-river from the bridge, on the Williston shore. About 15 plants were seen above the bridge and about 100 plants below. This northern species is restricted to two high mountain cliffs in Vermont and several river gorges. Williston Gorge is the only station for the species in the lowlands of western Vermont.

Shepherdia canadensis - a northern species that is mostly found on headlands along Lake Champlain. It is found to the west of the bridge, on the summits of several islands and on one bluff on the Williston shore. There are perhaps ten large shrubs and several seedlings. By local standards this is a thriving population. In Vermont, the southern limit of the range of this species, it is usually found as one or two isolated specimens when it is found at all, and young plants are uncommon. *Shepherdia* is believed to be declining in Vermont and is proposed as a threatened species in the state. Elsewhere in the northeast it is known from a number of New York populations, and a single plant in Maine.

Aster tradescanti, also occurs in Williston Gorge. There are at least 250 plants on ledges in damp and dry places. It is scarce in Vermont as a whole.

One rare species, the wood mint *Blephila hirsuta* was collected in the gorge about 1901, but is apparently extinct at present.

A detailed list of the vascular plants of the gorge and rocky shores is at the end of this report. Bryophytes were not collected, but do not appear to be common or diverse; they do not grow on the dry fractured rocks, and are restricted to springy places along the walls or at the base of the dam.

The waterfall over the dam is attractive and the picnic area on the south side of the bridge gets a moderate amount of use, as do the paths leading from there down to the river below the gorge. The gorge itself is rarely visited. Some fishing occurs below the gorge, and there is a well-traveled fishing trail. The gorge might conceivably be used as a whitewater run, but it is fairly short and hard to get into, and so far as we know is never or almost never run.

The gorge is messy because of the junk the river strands after spring flooding. The picnic area above it is well-maintained and receives a lot of local use. The length of this rocky stretch of river and its jaggedness are the primary aesthetic appeals. When the Winooski River is running at flood, the whitewater in the gorge is spectacular and frightening.

We rate the gorge as a popular local picnic site near an urban area, and because of four noteworthy interesting plants, one of which is a threatened species in Vermont.

* * *

Summary: Industrial setting, impacted by a hydroelectric project, nice rocks, two rare plants, otherwise an average flora for limy rock, not secluded, a mess, mildly polluted water, not used for swimming, popular for picnics and parties.

Vascular Plants of Williston Gorge

Zizea aurea
Xanthium strumarium
Melilotus alba
Andropogon gerardi
Agrostis sp.
Poa compressa
Trifolium repens
Oenothera perennis
Hieracium piloselloides
Campanula rotundifolia
Fragaria virginiana
Sphenopholis intermedia
Cornus stolonifera
Salix rigida
Solidago juncea
Ranunculus acris
Aster tradescanti
A. lateriflorus
A. simplex
Lythrum salicaria
Phalaris arundinacea
Rhamnus cathartica
Eleocharis sp. (tenuis ?)
Fraxinus americana
Hypericum perforatum
Bromus inermis
B. latiglumis
Agropyron repens
Convolvulus sepium
Equisetum arvense
Amelanchier stolonifera
A. arborea
Berberis vulgaris
Andropogon scoparius
Pinus strobus
Populus deltoides
P. tremuloides
P. balsamifera
Blephila hirsuta (formerly)
Juncus bufonius
J. dudleyi
J. brevicaudatus
Phleum pratense
Plantago major
Carex lurida
C. vulpinoides
C. spp. (section ovales)
Desmodium canadense
Chrysanthemum leucanthemu
Taraxacum officinale
Senecio pauperculus
Prunus virginiana
Ulmus americana
Solidago gigantea
Erigeron philadelphicus
E. hyssopifolius
Galium sp. (palustris ?)
Apocynum cannabinum
Lysimachia ciliaris
L. nummularia
Betula papyrifera
Festuca rubra
Vicia cracca
Acer saccharinum
Pastinaca sativa
Dactylis glomerata
Toxicodendron radicans
Artemesia vulgaris
Shepherdia canadensis
Verbascum thapsus
Elymus canadensis
Thuja occidentalis
Aquilegia canadensis
Vitis riparia
Scirpus atrovirens
Onoclea sensibilis
Viola sp.

Report 54, Winooski Falls, Winooski River, Burlington and Winooski City, Chittenden County, Vermont.

Site not numbered by the state, surveyed in 1982 by P.F. Zika.

A small gorge and cascades, with an artificial falls over a dam.

Atlas map 36, USGS Burlington 7.5-minute or 15-minute quadrangle. The site is at the U.S. Route 7 bridge over the Winooski River between Burlington and the City of Winooski. Access is from Riverside Avenue on the Burlington (south) shore, or from the Winooski (north) shore behind the old industrial buildings that have been converted into apartments. There are plenty of fishing paths leading to the base of the falls and the rocky islands below.

* * *

Winooski Falls is a former industrial site. It is lined on the north shore with old mill buildings that have been converted in the last ten years into housing units, offices, and a shopping mall. A dam was constructed below the present Route 7 bridge in the early 1800's, at what was probably a natural falls. The area is congested with commuter and commercial traffic through most of the daylight hours, and is on an approach path for aircraft landing at Burlington International Airport.

The Winooski is a broad alluvial river about 400 feet wide at the head above the site, and about 75 feet wide in the gorge. The water is mildly polluted, with a river smell, murky color, and some junk and foam floating in eddies. Nonetheless there is a substantial sport fishery at the base of the falls, locally known as Salmon Hole. This is one of the few areas in the state where the endangered lake sturgeon (**Acipenser fulvescens**) is known to have spawned. The fishery depends on the turbulance and deep water at the base of the falls and through the rocky islands downstream. The old dam effectively blocks any upstream fish migration.

The site starts about 800 feet upriver of the Route 7 bridge where the Winooski drops over a broad series of ledges, creating a nice chain of low cascades that is visible to the northbound cars stuck in traffic on the bridge. Just downriver of the bridge, the river is confined by limestone cliffs on the north shore, and drops about 20 feet over the old dam. Below the falls, there are some stone islands and rocky recesses in the cliffs of the northern shoreline, and then the river swings north past several sandbars. The walls of the gorge below the falls are nearly vertical, although there are numerous flat shelves on the summits of the cliffs and in the coves. In most places, there is very little soil since the river inundates and scours the area in the spring.

The bedrock at Winooski Gorge is entirely Ordovician dolomitic limestone from the Shelburne formation. It weathers to a pale gray or white. The rock seems to break down in chunks or slabs, and is not sculpted or potholed by the river.

The falls are noteworthy for harboring Vermont's only surviving colony of Anemone multifida, a species rare in New England as a whole. It was formerly known from at least three other gorges in Vermont. All of these gorges have been dammed, and we suspect that the anemone populations were either flooded out, or suffered from reduced summer flows and a consequent decrease in humidity. The dam at Winooski Falls neither reduces summer flows nor floods the anemone's habitat, and in addition lets through enough flow at spring high water to cause some scouring of the ledges in the gorge, and hence, to reduce competition from woody plants.

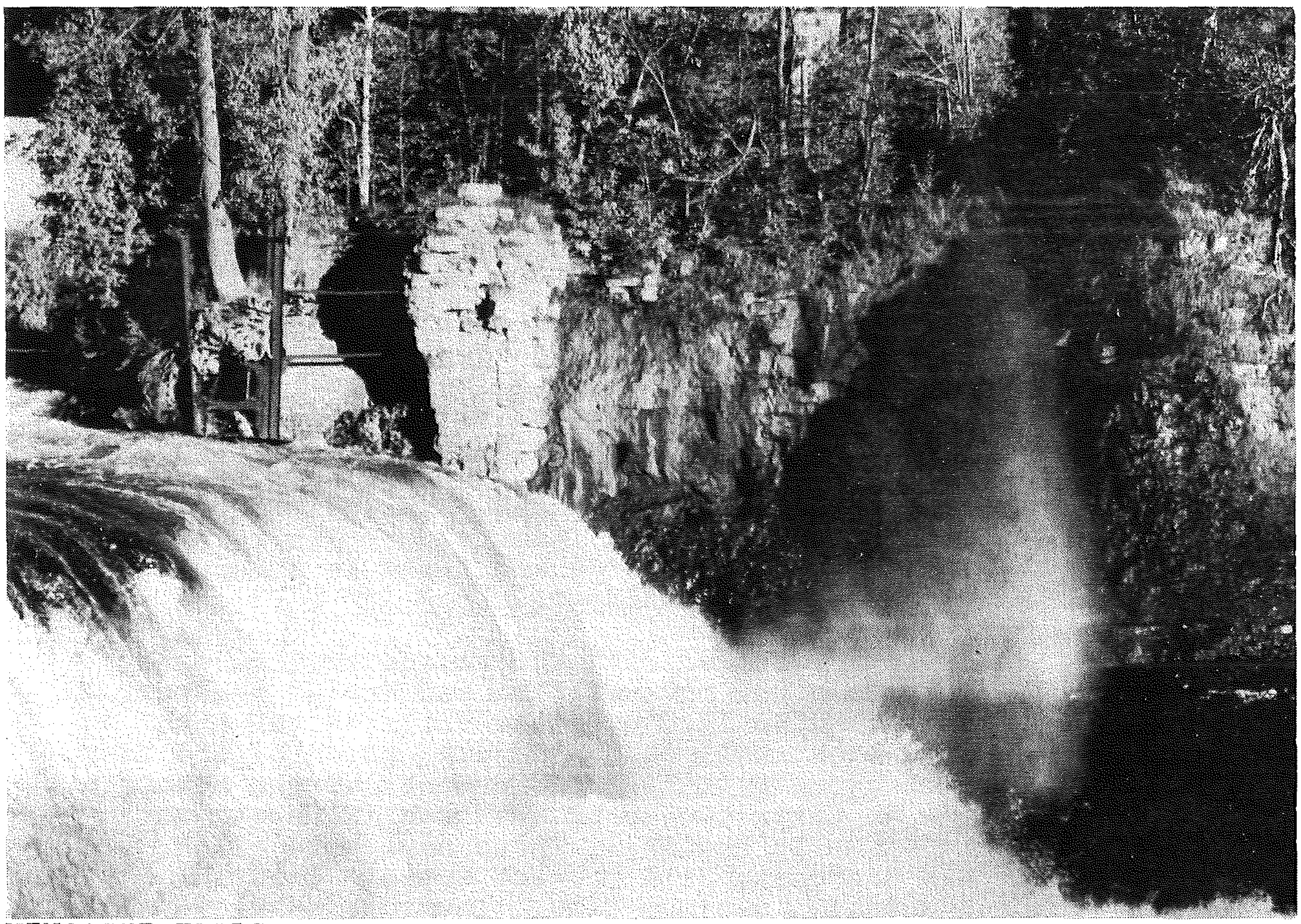
Small colonies of Anemone multifida are present on the Burlington shore and on at least two of the rock islands, where they are relatively safe from human recreational traffic. Most of the population is on the outcrops on the north shore of the river, where the foottrails and steplike bedrock allow easy access. The plants are inconspicuous and easily trampled, and we believe that they are endangered by the gorges current use.

The falls and cascades are a substantial resource to the City of Winooski. The housing complexes and shops along the river boast of the view: the Waterworks Restaurant, for example, has large windows facing the upper cascades. In addition many people visit the falls to look around, picnic, or fish in the pools below. It is an attractive gorge and falls in an urban setting, and is admired by many residents.

Winooski Falls is threatened with the reconstruction of a dam, which would include a new powerstation and buried penstock. This project may diminish the flow over the falls, alter the habitat for fish, and might well cause the extinction of the last remaining colony of Anemone multifida in Vermont. Green Mountain Power regulates flow at their two upstream sites (Winooski Gorge and Williston Falls - GMP 18 and 19). These have more of an effect on flows than the Chase Mill project would. Chase Mill would be required to pass a minimum flow. The lowered flows will also make the site less attractive to the public and decrease the value of the riverfront developments. There is considerable grass roots opposition to the dam project in the Winooski area, and the City of Winooski is fighting the proposal.

* * *

Summary: Urban setting, average rocks, state endangered plant species present, important fishing location, not private or wild, some trash, mild water pollution, no swimming, popular for fishing, a local scenic attraction, threatened by a hydroelectric development.

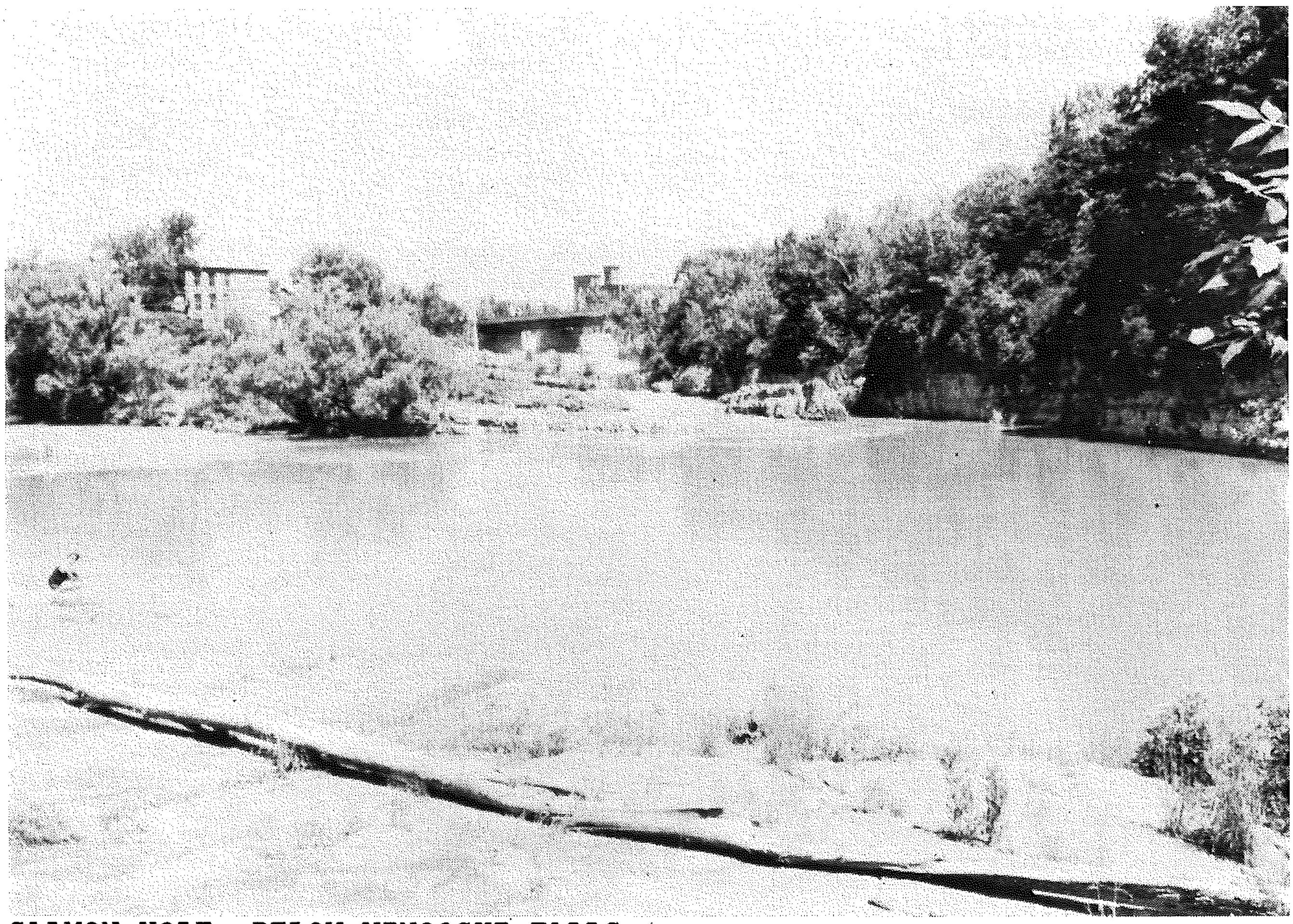


WINOOSKI FALLS

Some of the Vascular Plants of Winooski Falls

Populus tremuloides
Ribes odoratum
Clematis virginiana
Toxicodendron radicans
Pellaea glabella
Anemone virginiana
A. multifida
Ranunculus acris
Aquilegia canadensis
Senecio pauperculus
Andropogon gerardi
Deschampsia cespitosa
Campanula rotundifolia
Salix spp.
Eupatorium maculatum
Desmodium canadense
Fragaria virginiana

RAPIDS ABOVE WINOOSKI FALLS



SALMON HOLE, BELOW WINOOSKI FALLS

Report 55, Winooski Gorge (= Twin Bridges Gorge), Winooski River, City of Winooski, South Burlington, and Colchester, Chittenden County, Vermont.

Site not numbered by the state, surveyed on 30 July 1984 by P.F. Zika.

A deep gorge with two dams and rare plants.

Atlas map 36, USGS 7.5-minute or 15-minute Burlington quadrangle. Access to the gorge is a bit complicated. The best route is along the railroad line from Lime Kiln Road (off Route 15 near St. Michaels College). The tracks start near High Bridge and run west on the north side of the river, and cross the river twice. The two dams are between these bridges. Other routes include an access road to the dams from Winooski, and a service road for the airport strobe beacons to the south, in South Burlington.

The gorge may be easily seen from the northbound lane of I-89 between the Burlington and Winooski exits. The north side of the gorge is accessible from the highway, although parking there is dangerous and illegal.

* * *

The Winooski Gorge was formerly one of Vermont's most notable natural features. It has now been dammed, polluted, rendered inaccessible, and has lost its naturalness to the highways, railroads, quarries, airport, and dumps which surround it. It would be unknown to most residents in the county were it not visible from I-89.

The Winooski River is a broad alluvial river as it enters Winooski Gorge; at its narrowest point within the gorge it is still more than 150 feet across. The water at the time of the survey was a muddy green color and had a distinct river smell. Junk was common on the surface of the water and foam was evident in eddies. The water was too deep to search for aquatic insects and algae on the bottom.

The river is flowing westward here, and the gorge is basically s-shaped. About 1,000 feet southwest of Lime Kiln Gorge (Report 52) you encounter low rock walls where the river bends north. The walls increase to about 50 feet high near the first railroad bridge, and you encounter the backwater from dams. (There is an island in the center of the river and one dam on each side of it.) Here the river is about 500 feet across, and in places the ledges are covered by the water backed up behind the dam. Below the dams the river again turns southwest under the second railroad bridge and the I-89 bridge. The cliffs are about 60-80 feet high here, with a good stand of cedars and pines on top of them.

The bedrock of the gorge is a pale grey or whitish dolomitic limestone from the Ordovician Shelburne formation. The river has cut deeply and nearly vertically into it. There are several small caves along the rock walls of the river, and it is possible that the flooded portions of the gorge had potholes and sculpted rocks. Fifty feet east of the head of the gorge there are flat limestone ledges under a powerline clearing with a number of small solution cavities and other water-eroded features. The openings are an important rare plant habitat.

The vascular plants of Winooski Gorge are (or were) famous in the botanical world. The site formerly supported a remarkable limestone flora. Unfortunately many of the most renowned species, including the endemic Robbin's milk-vetch, have been extirpated by alteration of their habitats. A species list is attached to the end of this report. Even with the rarest species gone, we consider it an exemplary limestone flora. Some of the species that attracted the attention of botanists from the early 1800's on are noted below.

RARE SPECIES BELIEVED EXTIRPATED AT WINOOSKI GORGE

<u>Anemone</u> <u>multifida</u> - this plant lived on the limy ledges. This plant was formerly known in four gorges, has become extinct, probably through habitat alterations, at three of them, and is proposed as a state endangered species.

<u>Astragalus</u> <u>robbinsii</u> variety <u>robbinsii</u> - this variety is a local variant of a widespread (but uncommon) species and was never found anywhere except the river's edge in Winooski Gorge. It was destroyed when the gorge was dammed. It seems incredible to us now that no effort was made to cultivate it or to establish new populations on limestone ledges elsewhere along the Winooski.

<u>Cypripedium</u> <u>arietinum</u> - formerly found in limy woods by the gorge. This species has declined drastically in Vermont in the last 80 years and is proposed as a state threatened species. It is rare across all of the northeast.

<u>Isotria</u> <u>verticillata</u> - last seen in pine woods near the twin bridges around the turn of the century, a habitat that no longer exists near the gorge.

<u>Pterospora</u> <u>andromedea</u> - has vanished, perhaps because of habitat alteration, from all of its former sites in the northeastern United States. It needs old growth conifer forests, and formerly lived on the slopes above the gorge.

NOTEWORTHY SPECIES EXTANT AT WINOOSKI GORGE

<u>Aster</u> <u>undulatus</u> - this aster is common in the southern counties of Vermont but is much rarer north. There are fewer

than ten known sites for the species north of Rutland County in Vermont. It is scattered in deciduous and mixed coniferous-deciduous woods along the rim of the gorge.

Elymus wiegandii - a scarce plant of rivershores in Vermont, known from fewer than ten stations. A few plants are on the bank of the Winooski near the eastern railroad bridge.

Geranium bicknellii - a species with limited distribution in Vermont. There are fewer than ten extant stations, all in limestone country in western Vermont. About 50 plants are on sunny limestone ledges near the solution cavities at the head of the gorge.

Hieraceum venosum - scarce in Vermont, with fewer than ten known populations. A few plants were seen near the eastern railroad bridge in open woods on the rim of the gorge.

Lilium phiadelphicum - scarce in Vermont, with fewer than 20 colonies known at present. Scattered plants are found in grassy situations near the solution cavities at the head of the gorge.

Oryzopsis pungens - rare in Vermont, known from fewer than five extant populations in the state. About 50 plants were seen in open deciduous woods near the eastern railroad bridge.

Panicum latifolium - scarce in Vermont, with fewer than 20 known stations. Scattered in the open deciduous woods by the eastern railroad bridge.

Panicum xanthophysum - rare in Vermont. Currently recorded at less than five stations across the state. About 20 plants in open deciduous woods near the eastern railroad bridge.

Pellaea glabella - a species scarce across most of New England but well represented in limy portions of western Vermont. A large population is reported to be on the walls of the lower gorge.

Pyrola rotundifolia - the distribution of this plant is not accurately known in Vermont. It perhaps is rare. Currently there are fewer than 20 known locations for it. About 100 plants are scattered in the coniferous woods south of the western railroad bridge.

Shepherdia canadensis - found along the gorge walls in the 1800's, and still present as a few scattered individuals near the solution cavities. A species considered rare across all of New England.

Spiranthes lacera - a scarce species in Vermont, currently known from fewer than ten stations. Five plants were seen in flower in open woods at the top of the bluff near the eastern railroad bridge.

__Vitis__ *__aestivalis__* - a grape species mostly restricted to the southern part of the state, and rare there. A few vines are on the blufftops at the south end of the gorge.

It is worth noting that most of the interesting species found in the survey are open woodland plants from the rims of the gorge. A number of the extirpated species described above were characteristic of more mature woodlands, which have been repeatedly cut-over or cleared since the early 1800's. The riverside limy ledge community, which formerly supported *__Astragalus__* *__robbinsii__* and *__Anemone__* *__multifida__*, has been virtually destroyed by flooding above the dams and by the drastic flow control below the dam.

Because of industrial development and lack of access, Winooski Gorge does not get much use. There are some faint trails near the eastern railroad bridge, and on the land between Winooski Gorge and Lime Kiln Road. From these trails and the bridges there are fine views of the river cliffs. There is no swimming. The length of the gorge and its distance from public access points can give the hiker a sense of remoteness from people in some of the woodlands along the gorge, but you can always see powerlines and buildings, and always hear traffic noises.

It is a long and deep gorge, one of Vermont's largest, and is important botanically from a historical and contemporary standpoint.

* * *

Summary: Industrial setting, impacted by a hydroelectric project, average rocks, exemplary biology, not wild but in places private, clean, polluted water, no swimming, some use by hikers, the site of the extinction of an endemic plant.

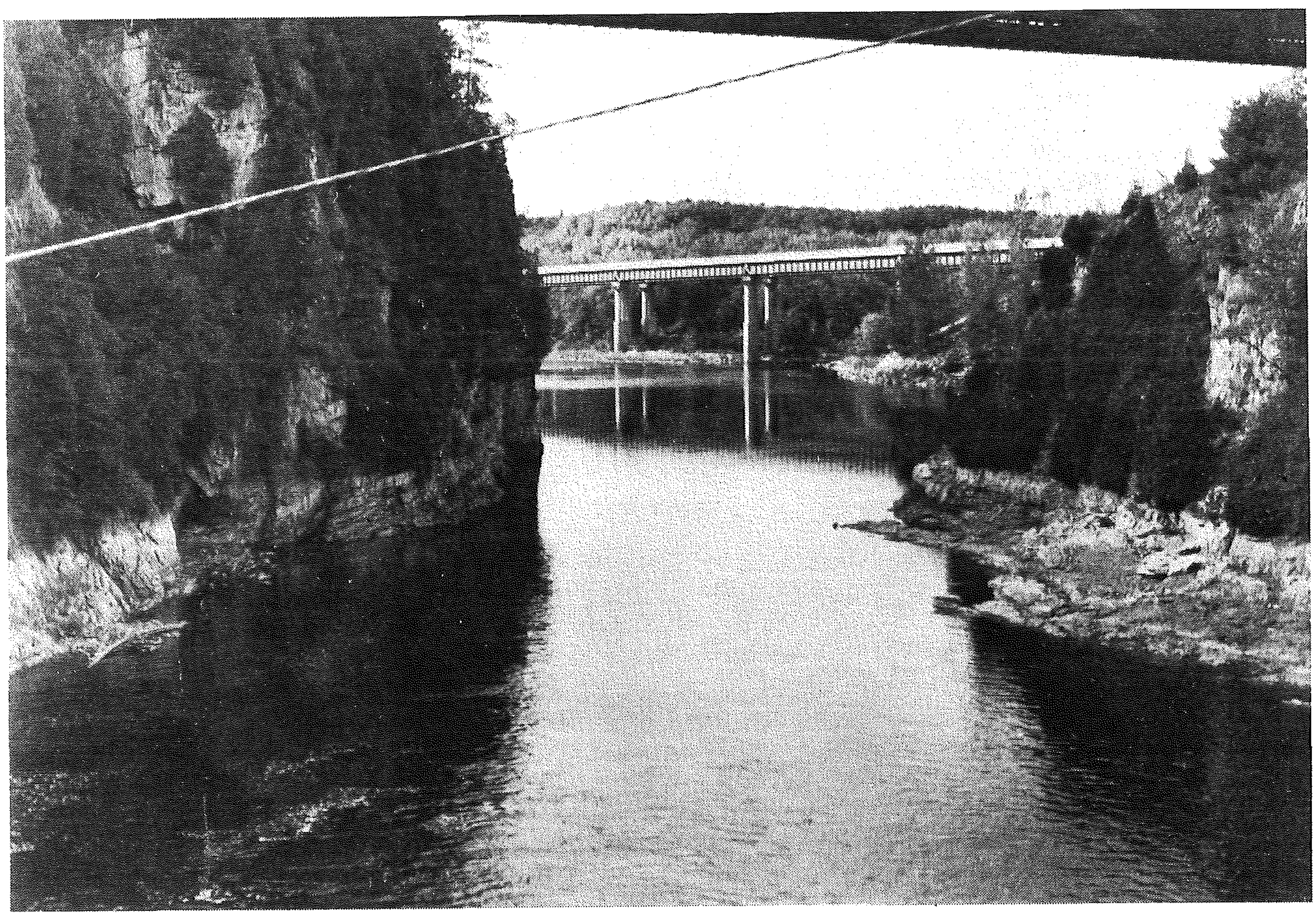
Vascular Plants Seen at Winooski Gorge

Thuja occidentalis
Tsuga canadensis
Pinus resinosa
P. rigida
Ostrya virginiana
Acer saccharinum
Ulmus americana
Betula papyrifera
B. populifolia
Populus tremuloides
Quercus rubra
Q. alba
Prunus virginiana
Shepherdia canadensis
Rubus odoratus
R. occidentalis
Diervilla lonicera
Viburnum acerifolium
Rosa multiflora
R. sp.
Cornus rugosa
Ceanothus americana
Rhamnus cathartica
Hamamaelis virginiana
Gaylussacia baccata
Vaccinium vacillans
V. angustifolium
Kalmia angustifolia
Aralia nudicaulis
Vitis riparia
V. aestivalis
Toxicodendron radicans
Clematis verticillata
Asplenium ruta-muraria
Dryopteris marginalis
Gymnocarpium dryopteris
Athyrium filix-femina
Polystichum acrosticoides
Pellaea glabella
Luzula multiflora
Carex arctata
C. vulpinoides
C. eburnea
Danthonia spicata
Panicum linearifolium
P. xanthophysum
P. latifolium
P. lanuginosum
P. dichotomum
Elymus wiegandii
E. canadensis
Festuca ovina
Poa compressa
Andropogon gerardi
Sporobolus vaginiflorus
Oryzopsis pungens
O. asperifolia
Spiranthes lacera
Viola adunca
Hieraceum piloselloides
H. venosum
H. scabrum
Solidago caesia
S. canadensis
S. squarrosa
S. juncea
Arenaria stricta
Senecio paupercula
Campanula rotundifolia
Desmodium canadense
Melilotus alba
Epipactis helleborine
Viola adunca
Chrysanthemum leucanthemum
Aster undulatus
A. novae-angliae
A. simplex
A. macrophylla
Hypericum perforatum
Aquilegia canadensis
Erigeron canadensis
Oenothera sp.
Anemone virginiana
Berberis vulgaris
Daucus carota
Plantago lanceolata
Verbena hastata
V. urticifolia
Lythrum salicaria
Ranunculus acris
Prunella vulgaris
Lotus corniculata
Rumex crispus
Apocynum cannabinum
Cuscuta gronovii
Mentha arvensis
Lycopus uniflora
Rorippa palustris
Lysimachia ciliata
L. nummularia
Xanthium strumarium
Oxalis europaea

Phleum pratense
Bromus inermis
Scirpus atrovirens
Juncus dudleyi
Phalaris arundinacea
Agrostis stolonifera
A. alba
Pyrolla elliptica
P. rotundifolia
Hepatica americana
Sanicula marilandica
Commandra umbellata
Galium mollugo
G. triflorum
Stellaria graminea
Cerastium vulgatum
C. sp. (? nutans)
Veronica officinalis
Prenanthes alba
Hackelia virginica
Geranium bicknellii
G. robertianum

A partial list of extirpated species at Winooski Gorge

Anemone multifida
Astragalus robbinsii var. robbinsii
Cypripedium arietinum
Isotria verticillata
Pterospora andromedea



WINOOSKI GORGE

Basin 9: White River Basin

Including the following sites:

Texas Falls	Hancock Branch, Hancock
Moss Glen Falls I	Deer Hollow Brook, Granville
Web Falls	Sandusky Brook, Granville
Granville Cascade Chain	Sandusky Brook, Granville

One site was not located:

Bailey Falls	Robbins Branch, Hancock

For the following see the appendix:

Bethel Falls	White River, Bethel

Basin 9 is the White River watershed of central eastern Vermont. The eastern part of the basin is hilly but not mountainous and may not have very many falls or gorges. The western part of the basin contains the Northfield Mountains and the main ridge of the central Green Mountains. It has to have many cascades, mountain gorges and small falls that have not been mapped.

At present the only sites we know in this basin are those that are well known to tourists and hikers. Texas Falls and Moss Glen Falls (Moss Glen I, distinguishing it from Moss Glen II which is in Stowe) are owned by the national forest and state respectively and are important recreational sites and designated State Natural Areas.

Bailey Falls is apparently popular with hikers and descriptions of it and directions to it are available, but it is not mapped very precisely and we never found it.

Report 56, Texas Falls, Hancock Branch, Hancock, Addison County, Vermont.

Site 295, surveyed on 3 October 1983 by J.C. Jenkins.

Small gorge with small cascades, small falls and some nice pools; developed by the National Forest as a recreational site.

Atlas map 25, USGS Breadloaf 7.5' map. The area is well-signed.

* * *

The site is in heavy hemlock-hardwoods forest in central Green Mountains, about 20 yards from a dirt road. The National Forest has built trails, bridges, handrails, and massive stone and wood fences.

The river is a steep mountain brook averaging about ten to 15 feet wide, with very clean water.

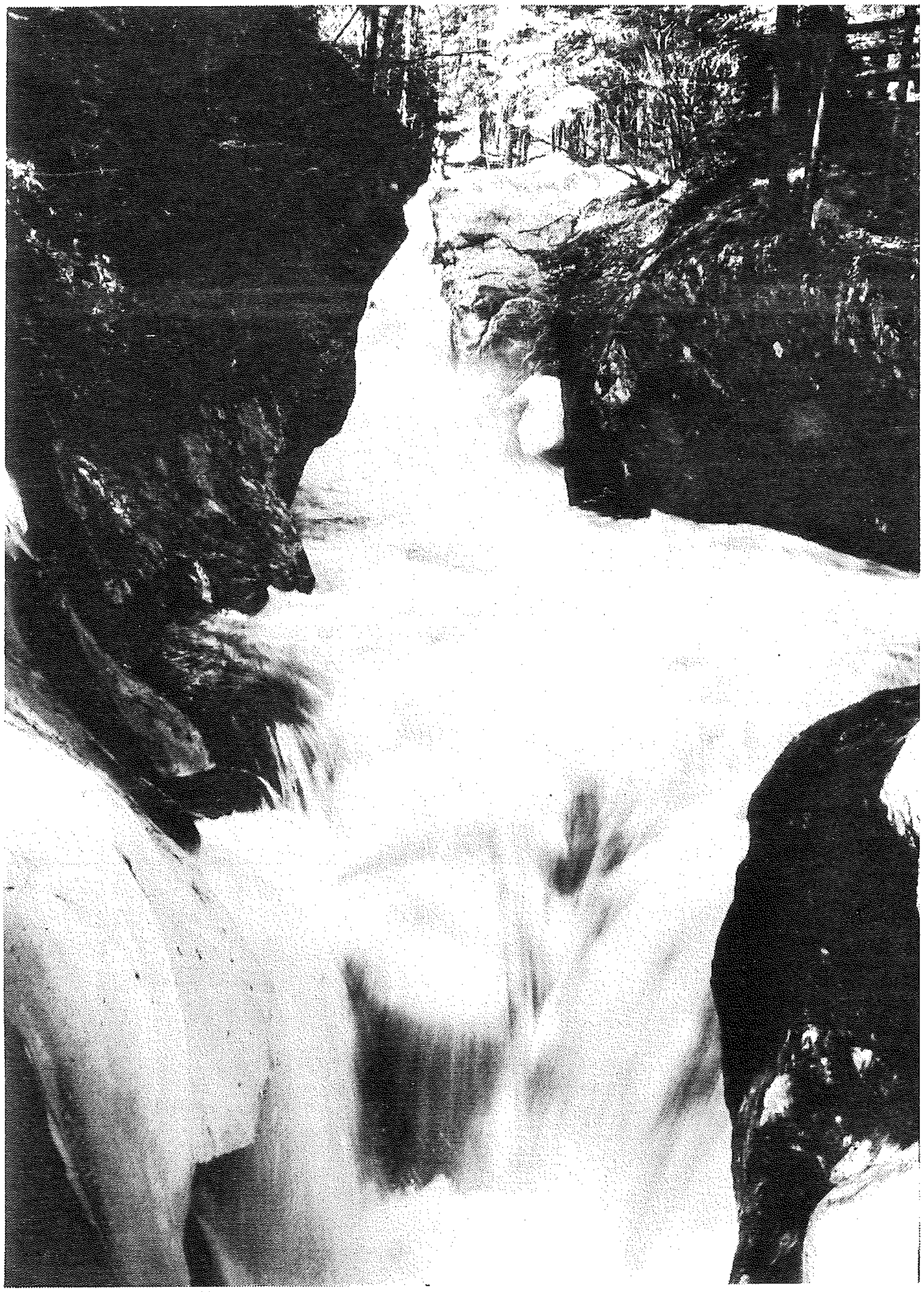
Texas Falls is really a small gorge. From the top, there is a narrow gorge about ten to 20 feet deep by five feet wide containing four falls from five to 15 feet high, and three carved stone pools about 20 feet in diameter. After about 200 feet the gorge opens up and there is a chain of small cascades about 500 feet long with sloping rock walls about five to 15 feet high and about 45 degrees to the horizontal. There are several small falls and pools in the cascade. Altogether the gorge and cascade are about 700 feet long, after which there are no more rock walls and falls and the stream becomes an ordinary mountain stream with a bouldery channel.

The rock is the Cambrian Piny Hollow formation, a standard sort of blue mountain schist. As elsewhere, it is a good rock for sculpture and potholes: the gorge has nice concave faces and overhanging walls and rippled surfaces and the other features we associate with pothole enlargement. The rock seems to be uniformly acid, with no sign of lime.

Because of the deep shade and acid rock there are comparatively few vascular plants. About 15 species were recorded within the gorge, all common in mountain woodlands throughout the state.

The sloping rocks of the lower gorge are good habitat for mosses and liverworts. About 20 species were recorded. No rarities were seen but the mosses are well developed and handsome and the species diversity is about as high as we get for an acid site. So we have rated the botany as exemplary.

The site is much visited and the trails get a lot of use. The area is generally clean and since visitors mostly stay on the trails the rocks and gorge are in good condition.



TEXAS FALLS

A pretty place: developing it for recreation has compromised the wildness but not the attractiveness, and it still has a good rock and mountain flavor. We like the scale of places like this; the amount of rock and the depth of the gorge are just right for the amount of stream. It is the right size to fit nicely under trees. Some of the falls are especially pretty if you walk up the channel and look at them from below: the trails are intended to let you look down into the gorge and see the rocks and swirls from above and that is fine, but if you really want to see any waterfall you should climb up to it from below, and this is especially true here.

* * *

Summary: Mountain setting, nice to fine rocks, exemplary botany, wild but not secluded, no trash, developed as a recreational site and much used for sightseeing, potentially excellent swimmimg, but not permitted.

HIGH IMPORTANCE: As fine a small sculptured gorge as we have in the state; important tourist site, on Vermont Fragile Areas Registry.

Plants from Texas Falls

Mosses and Liverworts

Atrichum undulatum
Bartramia pomiformis
Hylocomnium splendens
Fissadens adianthoides
Scapania nemorosa
Lepidozia reptans
Isopterygium distichaceum
Rhacomitrium aciculare
Paraleucobryum longifolium
Sphagnum sp.
Ceratodon purpureus
Pogonatum alpinum
Coniocephalum conicum
Plagiochila asplenioides
Marsupelia emarginata
Calypogeia sp.
Plagiothecium denticulatum
Herzogiella striatella
Mnium (double-toothed)
Thujidium sp.
? Pogonatum urnigerum
Hypnum imponens

Vascular Plants

Hemlock-northern hardwoods forest with some ash

Acer spicatum
Oxalis montana
Aralia nudicaulis
Aster divaricatus
Rubus flagellaris
Aster macrophyllus
Viola sp.
Oxalis europaea
Dryopteris spinulosa
Aster acuminatus
Thalictrum polygamum
Prenanthes altissima
Carex torta
Aster cordifolius
Thelypteris phegopteris

Report 57, Moss Glen Falls I, Deer Hollow Brook, Granville, Addison County, Vermont.

Site 296, surveyed on 17 October 1983 by P.F. Zika.

A large high-angle cascade (almost a large falls), pretty and popular.

Atlas map 25, Warren 7.5' quadrangle. The site is on Vermont Route 100 in the Granville Gulf Reservation and is marked by road signs.

* * *

The site is in a forested mountain ravine, about 100 feet from the highway, with a parking lot, a boardwalk and trail, and several warning signs to keep visitors off the rocks.

The brook is a small mountain stream about ten to 15 feet wide with clean, clean, cold water.

The site contains a high-angle cascade (sections of it are actually free-falling) that drops about 30 feet over a rock face 15-25 feet wide.

The rock is mapped as schist of the Pinney Hollow formation, of Cambrian age. There are no potholes or vertically carved faces.

The vascular plants are ordinary and no species list was compiled. The only notable historical record from Moss Glen Falls is the woodland mint <u>Blephila hirsuta</u>, collected there around the turn of the century. We have made several attempts to relocate the species at the falls and other places in the gulf but have not succeeded. It is not a conspicuous species and may still be present in the area. Currently it is known from only a single station in the state.

Bryophytes are common on the wet ledges along the cascade. No collections were made but it is a site that might be worth future study.

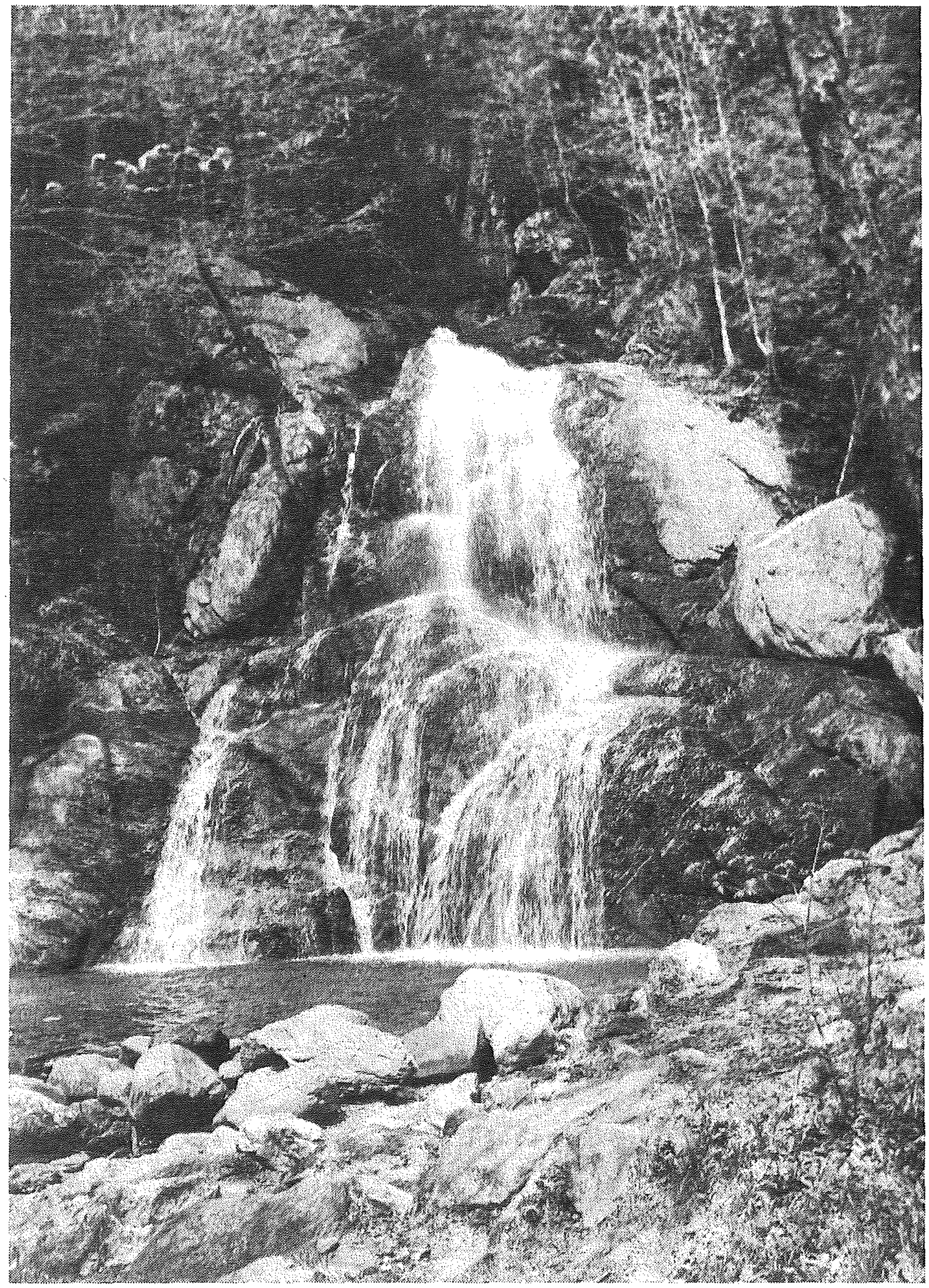
The site is a well-known scenic attraction. It is marked on the official state road map. Many visitors photograph the cascade from the road. There is no swimming, and no easy path to the top of the cascade. There is a small amount of litter along the trail.

An attractive place, principally noteworthy for the size of the cascade and the woodland setting. It is an official natural area of the Vermont Department of Forests, Parks and Recreation.

* * *

Summary: Woodland setting, nice rocks, spectacular cascade, average botany but formerly one rare plant, wild but not secluded, some trash, very clean water, no swimming, very popular for sightseeing and picnicking.

HIGH IMPORTANCE: A large pretty cascade and popular recreational site. A designated State Natural Area.



MOSS GLEN FALLS I

Report 58, Web Falls, Sandusky Brook, Granville, Addison County, Vermont.

Site not numbered by the state, surveyed on 17 July 1984 by P.F. Zika.

A large undammed falls.

Atlas map 26, USGS Warren 7.5-minute quadrangle. From Roxbury take Route 12A south to the Granville town line. The pulloff for the falls is about one-quarter mile further south and is on the right (west). Follow the footpath along the north side of the stream for about 150 yards to reach the falls. An old logging road starting at the pulloff leads above the falls.

* * *

Web Falls is in a rural basin along the Third Branch of the White River. The valley is narrow and heavily forested, with scattered homes and farms. The falls are in a steep ravine with yellow birch and hemlock woods, and are natural and undisturbed.

The stream, a mountain brook about four to ten feet wide, is clean and cold, with clear, greenish, sweet water. The rocks in the stream are mossy but have few macroscopic algae. A few stonefly larvae were seen.

The waterfall is about eight to ten feet wide and drops 25 feet over a 40 foot wide ledge. At the base is a pool seven feet deep. On one side of the stream there is a ten to 20 foot high ledge; the other bank is steep and wooded. Above the falls is a series of cascades and pools that is treated separately in report 59 (Granville Cascade Chain).

The bedrock at Web Falls is a schist from Ordovician Stowe formation, a rock found at many of our most attractive mountain waterfalls and gorges. Here the rocks are broken into big chunks with flat tops, making it easy to climb around and see the falls from different angles. One of the ledges by the pool is nicely sculpted into big pillow-shaped mounds, and is a fine place to sunbathe. In only one place was there any evidence of lime in the schist. No potholes or ripple-rock were found.

The vascular plants at Web Falls are ordinary, and are listed at the end of this report. There are abundant mosses and lichens. No detailed survey of bryophytes was attempted, but they are probably moderately diverse here.

Web Falls is a favorite local site. It has fine swimming with a good place to dive from and good rocks for sunning. There are several fire rings above the ledges, suggesting camping or partying. The nearby logging road and several faint footpaths offer good hiking along the stream. Above the falls is an

WEB FALLS

outstanding chain of pools and cascades, adding greatly to the value of the area.

This site boasts a noisy high falls, undisturbed setting, no dam, unusually attractive rocks and cryptogams, and excellent swimming. It deserves a rating of highly important. It is a very pretty waterfall. Currently there are no known threats to the site. Any logging upslope should be done very carefully to prevent excessive siltation of the brook.

* * *

Summary: Mountain setting, exemplary rocks, average biology, clean, clean water, excellent swimming, limited diving, popular for hiking, camping, partying.

HIGH IMPORTANCE

Vascular Plants at Web Falls

Betula alleghaniensis
Tsuga canadensis
Acer saccharum
A. spicatum
Dryopteris intermedia
Thelypteris phegopteris
Aster acuminatus
A. cordifolius
Viola sp.
Laportea canadensis
Athyrium filix-femina
Solidago rugosa
S. canadensis
Solidago flexicaulis
Thalictrum polygamum
Galium sp.
Glyceria striata
Oxalis europaea
Carex gracillima
Mitella diphylla
Cystopteris bulbifera
Prenanthes altissima
Rubus odoratus
Circaea alpina
Arisaema triphyllum
Brachyeletrum erectum

Report 59, Granville Cascade Chain, Sandusky Brook, Granville, Addison County, Vermont.

Site not numbered by the state, surveyed on 17 July 1984 by P.F. Zika.

A series of low cascades and narrow pools.

Atlas map 26, USGS Warren 7.5-minute quadrangle. From the center of Roxbury take Route 12A south to the Granville town line. About one-quarter mile further south there is a pulloff on the right (west). Park there and follow the stream up beyond Web Falls (Report 58). For the next quarter-mile there is a continuous chain of pools and cascades.

* * *

The site is in the narrow valley of the Third Branch of the White River, a rural and mostly wooded region. Logging is the most important land use. Along the cascade chain there are yellow birch and hemlock woods. There are no buildings, pipes, dams, wires, bridges, or recent roads near the cascades.

The brook is a mountain stream about six to ten feet wide, clear in the shallow places and green in the deeper pools. Aquatic insects are common.

The pools and drops begin at the falls and continue for about one-quarter mile upstream, between the slopes of a steep-sided ravine. The largest cascade tumbles about 15 feet; this is also about the maximum height of the rock walls. The stream goes through several small flumes in places where the schist is vertically bedded and the water has eroded out the softer exposed layers, leaving low pinacles and chutes.

The geological map indicates the bedrock is schist from the Ordovician Stowe formation. It is worn into a number of trench-shaped pools. Potholes and sculpted rock are generally absent. Only a small amount of ripple-rock is found, where the bedding is nearly vertical. The rock is not calcareous.

The forest along the cascades creates a deep shade, and the vascular plant diversity is low. But in the stream channel and on damp outcrops there are many mosses. These were not sampled. A list of vascular plants is at the end of the report.

The cascades receive light use. The trails are faint and would be much more eroded if they were regularly walked. It is likely that a number of people who visit the splendid falls downstream do not realize there is an attraction further upslope.

This site ranks highly important because of its undeveloped and remote nature, and its loveliness. The noisy cascades and narrow pools, deep shade, and mossy banks are a delight. The only possible current threat is logging near the streambank.

* * *

Summary: Mountain setting, nice rocks, average biology, secluded, clean, very clean water, some bathing, nice hiking and picnicking, should not be publicized.

HIGH IMPORTANCE

Vascular Plants Seen at Granville Cascade Chain

Tsuga canadensis
Betula alleghaniensis
Fraxinus americana
Fagus grandifolia
Acer pensylvanicum
Viburnum alnifolium
Gymnocarpium dryopteris
Polystichum acrosticoides
Clintonia borealis
Medeola virginica
Streptopus roseus
Trillium undulatum
Pyrola virens

Basin 10: Ottauquechee and Black Rivers

Including the following sites:

Cavendish Gorge	Black River, Cavendish
Buttermilk Falls	Branch Brook, Ludlow
Quechee Gorge	Ottauquechee River, Hartford
North Hartland Falls	Ottauquechee River, Hartland
Quechee Village Falls	Ottauquechee River, Hartford
Crystal Cascade	Ascutney Brook, Weathersfield
Thundering Falls	Thundering Brook, Sherburne

This is a small basin in central eastern Vermont, and includes the eastern slopes of the central Green Mountains (Pico, Killington, Shrewsbury Peak, etc.) and the usual rolling highlands found all along the western edge of the Connecticut River Valley. As was the case for Basin 9, we only have records for the largest and most well-known sites, and there are certainly many mountain sites that have not been listed or surveyed.

Despite the small size of the basin it contains four important sites: Quechee Gorge, the largest gorge in the state; Cavendish Gorge, a beautiful sculptured gorge with fine mosses; Crystal Cascade, one of the highest falls in the state and along a popular hiking trail, and Thundering Falls, a high woodland cascade and popular recreation area.

Report 60, Cavendish Gorge, Black River, Cavendish, Wind
County, Vermont.

Site 7, surveyed on 26 July 1983 by J.C. Jenkins.

A large, beautifully sculptured gorge with pools and cascades; a dam at the upper end and a powerplant at the lower end.

Atlas map 12, USGS Ludlow 15' quadrangle. Approach is somewhat difficult; sheer walls in a lot of places, hard to get into the head of the gorge because of the dam, hard to follow the stream down without climbing or swimming. Best to follow a footpath above the gorge on the south side and climb down here and there.

Crossing from one side of the gorge to the other is difficult. There is a catwalk over the dam but it has a locked gate which is difficult to surmount. At low water, you can cross the stream by swimming, or by walking across the footings of the dam, or in a few places by jumping from rock to rock. At high water, the only possible crossing is a high cable bridge (with very rotten planking) that crosses the lower end of the gorge by the powerhouse.

* * *

The gorge is on a back road about three-quarters of a mile from the center of town. The nearest houses are about one-quarter mile away. The entrance road is not marked, and is comparatively rough; hence, the area is accessible but not obvious.

Both sides of the gorge are wooded with second-growth pine and hemlock stands. To the east is Hawks Mountain and to the west a small cobble which isolates it from Route 131 and the Town of Cavendish. At the head of the gorge is a concrete dam about 30 feet high and 75 feet long, with a steel catwalk to service the flashboards and two small buildings. The water is diverted into a buried penstock north of the gorge. At the bottom of the gorge is a medium-sized powerhouse probably built in the 1920's.

The gorge turns a corner about 50 yards below the dam, and has high steep walls; hence the dam, powerhouse, and the penstock are not visible from the main part of the gorge and much of the gorge is undisturbed and private.

The Black River is a medium-sized river averaging 20-40 feet wide above the gorge. It receives treated waste in Ludlow and Proctorsville, and is classified as C water for two miles below Cavendish. Despite this the water in the gorge actually appears to be quite good, with no taste or odor and very little turbidity. There are good mayfly and stonefly populations within the gorge and we may assume that the water is well oxygenated. There are no macroscopic algae.

The gorge averages 50-100 feet wide at the base, with slanting or sheer rock walls from 50-80 feet high. The rock is a hard quartzite schist with garnets and quartz veins, described by the geological map as the Cambrian Hoosic Schist. It is not at all limy. There are boulders ten to 20 feet high in the stream channel, and in the lower part of the gorge many of these have had potholes cut into them. Some are almost cut entirely away.

There are no major falls; rather, the channel consists of a series of small falls or chutes linking pools of various sizes. The largest and finest of these is about 70 feet by 40 feet with a depth of nine feet at low water. It is almost completely circled by high, moss-covered rock walls, and is the sort of private swimming and sunning place that everyone dreams about (although swimming is discouraged in Class C water due to the health threat).

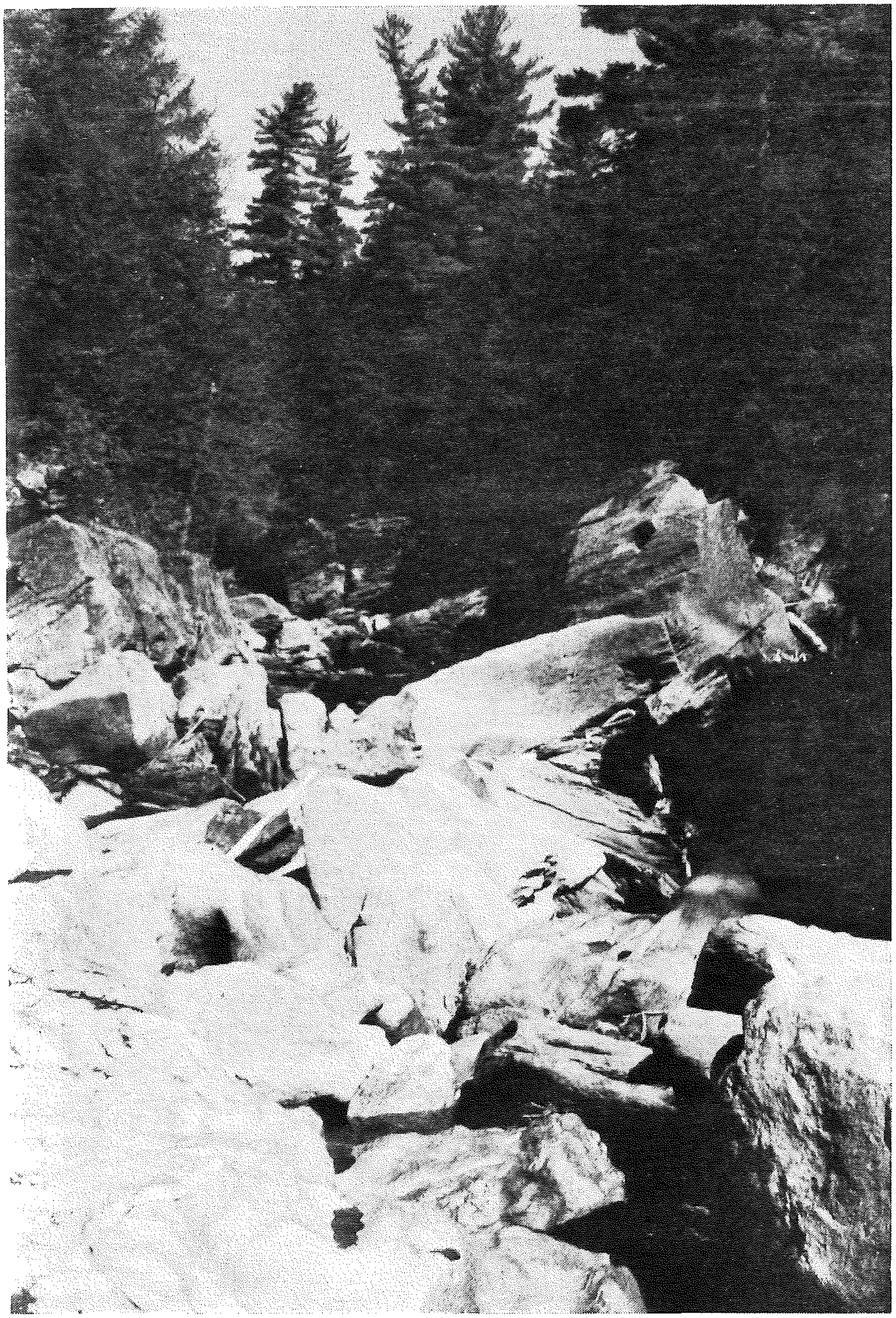
The stream probably fills the gorge from wall to wall in the spring; there are no sand or gravel deposits at the base of the walls, and no areas that support woody plants.

Because of the lack of soil, all the vascular plants in the gorge are confined to ledge tops and cracks in the walls. The flora is simple, consisting only of a few common species, mostly ferns, grasses and tree seedlings. No rarities occur. No list of vascular plants was made. As a whole, they play a very casual part in the botany of the gorge.

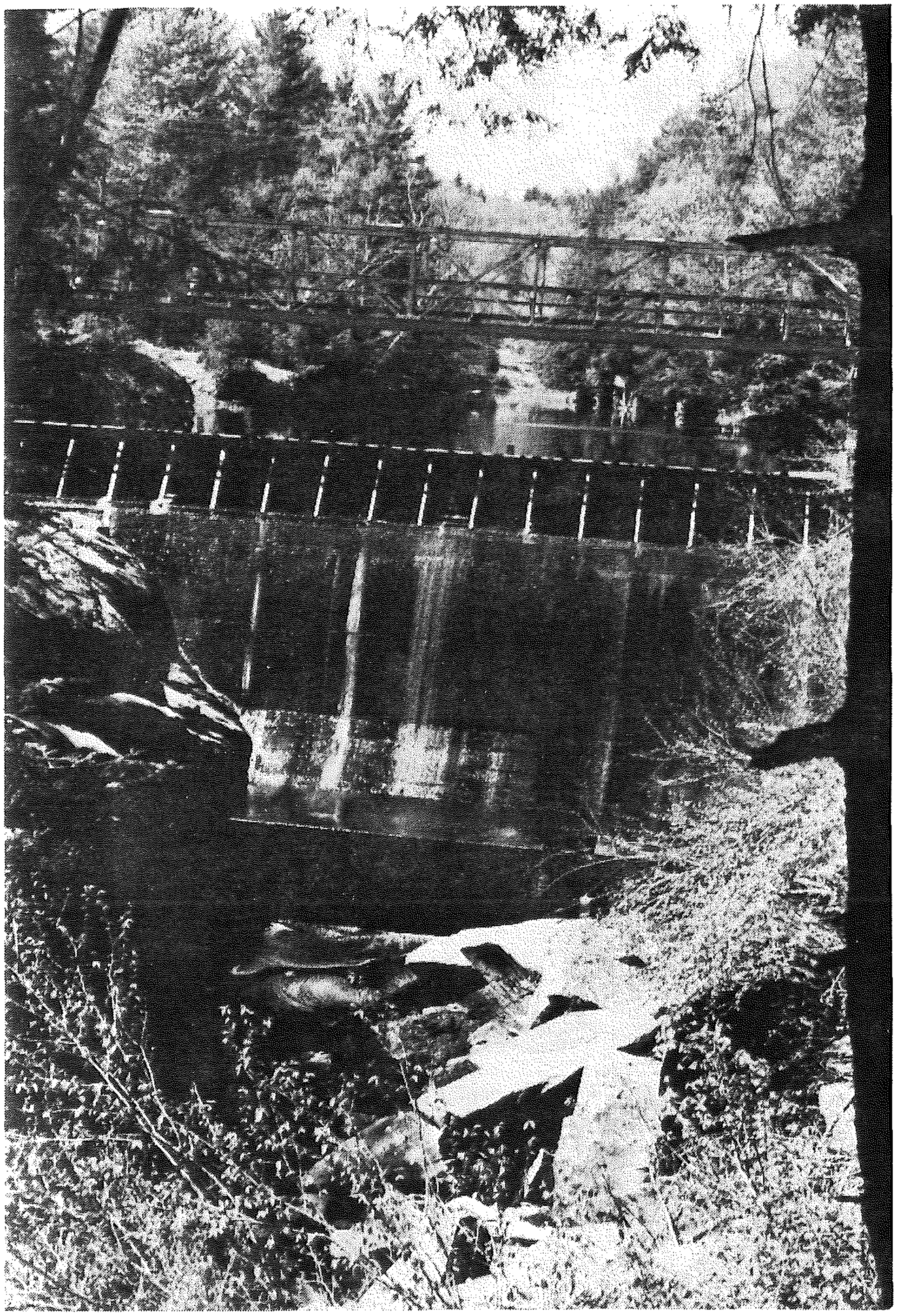
Large areas of the walls are covered by mosses and liverworts. The species identified are listed on the next page. No rare species were found, but it should be stressed that this was a general survey and not a complete inventory. The main pool mentioned above is a particularly fine place for bryophytes, and the walls are covered by the liverworts Marsupelia emarginata and Scapania nemorosa to heights of 40-60 feet above the stream. In general, mosses are abundant throughout the gorge and the variety of species is good, considering that there is no lime. We saw few gorges in which the bryophytes were as lush or extended higher up the walls, hence, we regard this as an important bryophyte site.

The gorge currently is a popular local swimming area; it does not receive much tourist use and is probably not too popular for partying, perhaps because climbing into it at night would be risky. It is currently quite clean, with definite signs of use but almost no trash or junk.

Visually it is a striking place; the rocks and the mosses are beautiful, the water is clean, and there are high walls and handsome pools. You cannot hear cars from the gorge, and because it is narrow and winding you have a strong sense of privacy and isolation. A lovely and satisfying place in good condition.



CAVENDISH GORGE


CAVENDISH DAM

Future power development is unlikely since the power station must already use most of the available flow and since there is neither any way nor any reason to get more head. The current level of recreational use is not damaging the gorge. Were the use to increase the gorge would get dirtier and more trampled, and this would be a loss.

Current summer flow from leaks around the dam appears adequate for swimming and to preserve the plant communities and keep the pools cool enough for fish*. Lower flows would dry the gorge out, raise the water temperature, and possibly damage the plants, which require considerable humidity. This would cost the state one of its best lowland sites for mosses and liverworts.

* * *

Summary: Woodland setting, impacted by a hydroelectric project, spectacular rocks, exemplary botany, moderately wild and secluded, no trash, light or perhaps moderate use, good swimming (although discouraged), clean water.

HIGH IMPORTANCE SITE: Great beauty, important site for bryophytes.

WE RECOMMEND: That arrangements be made to guarantee flows, and that no further development occurs.

* Editor's Note: Leakage through the dam is negligible based on a Department of Water Resources site visit in 1986. It is doubtful that this leakage flow would be adequate to maintain the gorge pools for fish and swimming. It is possible Jenkins saw the gorge with flows higher than normal leakage flow.

Bryophytes From Cavendish Gorge

Fissadens bryoides	Ceratodon purpureus
? Barbula sp.	? Gymnostomum aeruginosum
Myurella sibirica	Philonotis marchica
Hygrohypnum ochraceum	Isoptyrigium sp.
Rhacomitrium aciculare	Hypnum curvifolium
Plagiothecium laetum	Hygrohypnum eugyrium
Amblystegium varium	Scapania nemorosa
Marsupellia emarginata	Calypogeias trichomanes

Report 61, Buttermilk Falls, Branch Brook, Ludlow, Windsor County, Vermont.

Site 610, surveyed on 26 July 1983 by J.C. Jenkins.

A small gorge and below that three falls with pools and cascades, open and broad and sunny, popular for swimming.

Atlas map 15, USGS Ludlow 15' quadrangle. The falls parallel the old Route 103 for about one-quarter mile east of the abandoned bridge.

* * *

The falls are in a wooded section of the Black River Valley, about a one-half mile from a settled area on the outskirts of Ludlow. There are a few houses within one-quarter mile but no dwellings or structures visible from the falls. An abandoned bridge (former right of way for Route 103) crosses the gorge above the falls, but the falls themselves are separated from the road by a narrow band of woods.

Branch Brook is a medium-sized upland stream. It runs in a shallow wooded gorge and is 20-40 feet wide in the vicinity of the falls. The valley above the falls is sparsely settled and there are no major pollution sources. The Crowley Cheese Factory is about four miles upstream but according to the water quality maps they do not discharge anything into the stream. The water appears quite clean, without odor or turbidity, and the rocks in the stream have only small amounts of algae.

The site is about 300 yards long and consists of several separated falls. At the old Route 103 bridge, there is a small gorge about 100 feet long with vertical rock walls 30 feet high. This has been somewhat altered by the bridge abutments. Below this, there are two falls 50 and 100 feet wide and about 15-20 feet high. Below each falls, there is a large shallow pool enclosed by a gravel bar at its base. Just above the second falls, there is a very pretty rock pothole about 25 feet across and six feet deep. Below the second falls, there is a stretch of ordinary channel, then rocks with another pothole pool, then a steep cascade about 20 feet high down a series of rock steps, then another large shallow pool with a gravel beach.

The rock is a massive pink Precambrian quartzite with some schist. It is extremely hard and resistant. The bedding is at right angles to the river, and so the rock extends across the river in continuous square-edged dikes, and the river pours off the top of the dikes in broad, wide walls, as if it was running off a table. Most of the rock surfaces are flat planes meeting at square corners and except for the potholes - which I find anomalous in quartzite and can not explain - it looks like the falls were built yesterday and the water had not rounded them at all.

There are a lot of sunny cobble and gravel shores and so there are many wetland plants. Two species were of special interest. __Stellaria__ __alsine__ is a northern species of chickweed, known historically from less than five localities in Vermont. A few plants were found by the edge of the stream in between the second and third falls, and this is our only recent record in Vermont. __Panicum__ __boreale__ is a panic grass that is supposed to be widespread in Vermont but in our experience is at most infrequent. It occurred several times along the edge of the stream. Neither of these plants were on rocks or specifically associated with the falls as such.

The main falls had only a few mosses, but the rocks and banks along the edge of the stream had small areas of good moss habitat, and a number of species occurred. The collections have not been identified yet, but my impression is that the diversity was good but not exceptional.

The falls are a very popular swimming area, with room for lots of people and lots of places to sit and sun. There was a little garbage in the woods, but the falls themselves were largely clean.

A nice place: good swimming, a lot of sun and water, not wild but no houses in sight either, and you can see the quartz shining and looking like the backbone of the whole mountain range. Not a spectacle like Huntington Gorge, but a very satisfying place, enjoyed, used, and despite the road and the use, largely undamaged. I would travel some distance to visit it, and do not know that many sites of equal size: hence, we consider it of state importance.

* * *

Summary: Woodland setting, fine rocks, two rare species present, not secluded, a little trash, clean water, good for scenery, swimming, fairly large and fairly natural site, handsome rocks, popular recreational site.

Plants From Buttermilk Falls

Mosses not identified yet.

Vascular plants

Hemlock-hardwoods forest, some willow thickets by stream, dogbane community on bars.

Solidago rugosa
Aster divaricatus
Athyrium felix-femina
Ranunculus acris
Osmunda claytoniana
Anthoxanthum odoratum
Prunella vulgaris
Carex torta
Glyceria melicaria
Juncus articulatus
Leersia oryzoides
Trifolium pratense
Plantago major
Tussilago farfara
Hypericum ellipticum
Hieracium pratense
Rosa virginiana
Aster puniceus
Mentha arvense
Agrimonia sp.
Eupatorium perfoliatum
Woodsia ilvensis
Oxalis europa
Danthonia spicata
Panicum lanuginosum
Lactuca sp.
Rubus occidentalis
Phleum pratense
Taraxacum officinale
Fragaria
Galium asprellum
Ranunculus repens
Solidago gigantea
Chrysanthemum leucanthemum
Thalictrum polygamum
Eupatoreum maculatum
Agrostis perrenans
Phalaris arundinacea
Carex prasina
Glyceria striata
Lysimachia ciliata
Juncus nodosus
Scirpus atrovirens
Trifolium repens
Viola sp.
Spiraea alba
Salix discolor
Poa compressa
Mentha piperita
Dryopteris intermedia
Stellaria alsine
Mimulus ringens
Galium palustre
Aster lateriflorus
Oenothera biennis
Salix bebbiana
Panicum boreale
Erigeron strigosus
Vaccinium myrtilloides
Hypericum punctatum
Cerastium vulgatum
Bromus ciliatus
Anaphalis margaretacea
Aster macrophyllus

(The length of this list reflects the large amount of sunny, more or less wet stream bank habitat and not some particular favorableness or other peculiarity of the soil and rock.)

Report 62, Quechee Gorge, Ottauquechee River, Hartford, Windsor County, Vermont.

Site 392, surveyed on 5 June 1983 by P.F. Zika and J.C. Jenkins.

Vermont's deepest and longest gorge, formerly an important site for rare plants, now with hydro projects above it and regulated summer flows.

Atlas map 16, USGS Quechee 7.5' quadrangle. Vermont Route 4 crosses the gorge. The safest access to the gorge is to walk along the rim of the gorge and enter from either end. If you descend directly from the bridge you must be roped.

* * *

The site is a rural area east of Woodstock with some developed land and some second-growth woods. There are a few trails, several tourist shops, the Route 4 bridge and a dam about 40 feet high at the head of the gorge. According to maps, the gorge belongs to the state.

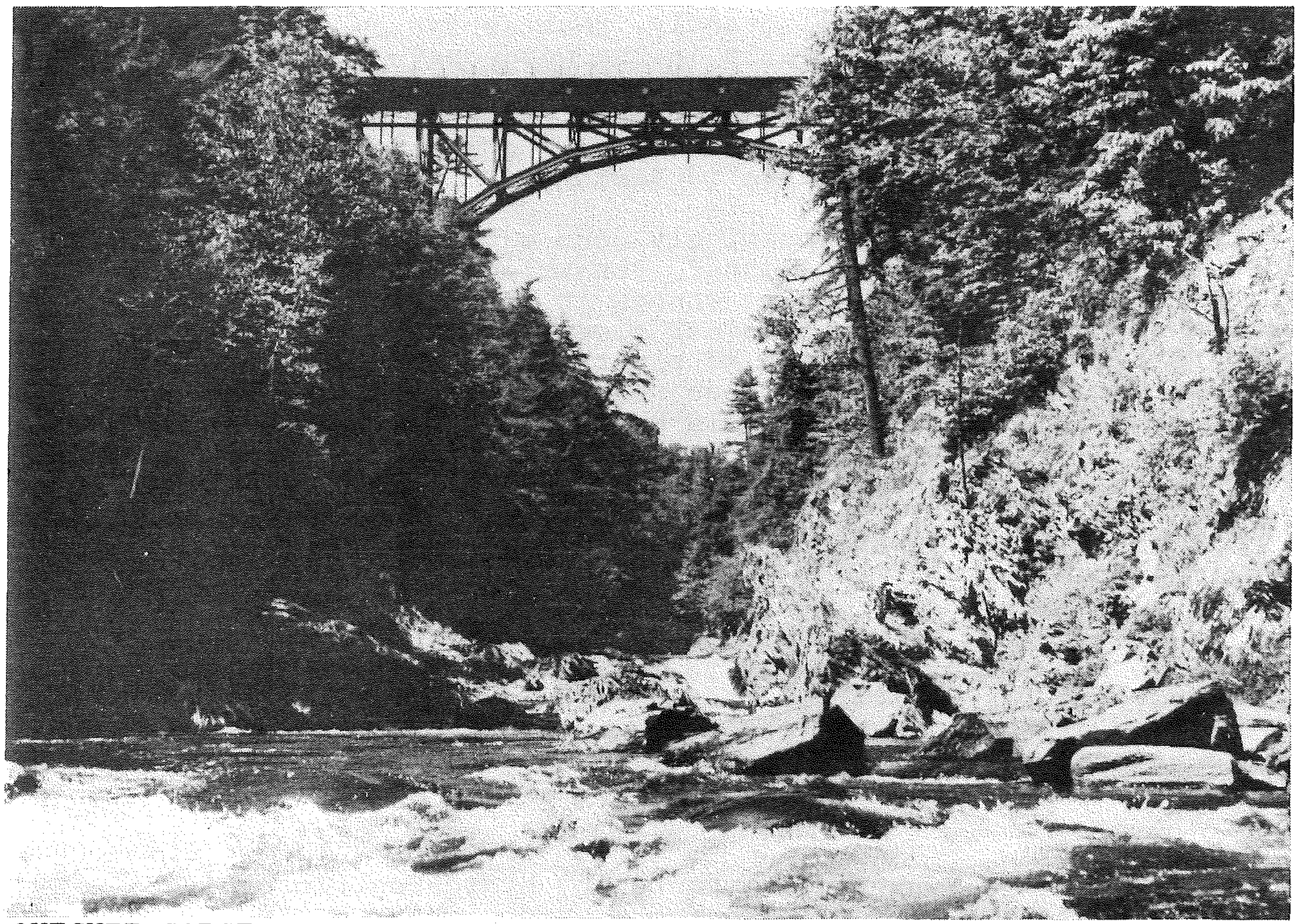
The Ottauquechee is a lowland river, mostly 25 feet wide in the gorge and quite fast and wild. The gorge is considered too dangerous to be a recreational whitewater site. The water is mildly polluted but well aerated by the rapids.

The gorge is about one-half mile long and at the deepest somewhat over 150 feet deep. It is 50-100 feet wide at the bottom and perhaps 200 feet wide at the top. The walls are partly dirt and partly rock and probably have an average angle of 45-60 degrees. In places there are vertical or nearly vertical cliffs 30-75 feet high.

The bedrock is the lower Devonian Gile Mountain formation schist; it is uniformly limy. Some of the rock is sculptured and there are a few potholes but the gorge is more memorable for its size than for the rocks themselves.

Quechee Gorge was formerly the most important low elevation site for northern plants in Vermont, and from the 1890's on, it was much visited and written about. Six rare species were found here: the ferns <u>Woodsia glabella</u> and <u>Woodsia alpina</u>, the gentian <u>Halenia deflexa</u>, the anemone <u>Anemone multifida</u>, the lily <u>Tofieldia glutinosa</u>, and the fleabane <u>Erigeron hyssopifolius</u>. So far as we know, only one of these - the fleabane - is currently found in the gorge.

The five species that seem to have disappeared from the gorge are all very rare in New England as a whole; <u>Halenia</u> is currently missing from the Vermont flora, <u>Anemone</u> and <u>Woodsia alpina</u> are currently represented in Vermont by a single colony of each, and the other two are known from fewer than ten Vermont sites.



QUECHEE GORGE

We have made perhaps eight searches of Quechee Gorge in the last nine years, and also know of other botanists who have made trips to the gorge. Parts of the gorge are hard to explore, but the botanists who found the plants in the first place were not technical climbers, and we know from their accounts that they just walked in, mostly entering by the south end and following the eastern shore. None of the searches have yielded any information about the missing species, and in fact none of the searches has added appreciably to the list of species that JJ and Peter White found when they explored the gorge in the early 1970's.

Hence, we conclude, reluctantly, that as far as we can tell the five most interesting plants in the gorge have disappeared sometime between 1930 and 1970 and that the gorge currently contains only three noteworthy species: <u>Erigeron hyssopifolius</u> (currently rare in Vermont), <u>Selaginella apoda</u> and <u>Cryptogramma stelleri</u> (both currently scarce in Vermont).

Why have five species seemingly gone extinct in an area that has not had any major alterations? Possible reasons are climatic change in the state as a whole, change in the microclimate because of the dams, reduced summer flows, destruction of plants by landslides, and destruction of plants by botanists. We are inclined against the last two reasons on general grounds (gorge plants like landslides and the old botanists did not climb much and so could not have reached all the plants), but we have no evidence that points at one cause rather than another.

So far the mosses and liverworts seem to be all common limestone species.

The bridge and trails receive heavy use from tourists, but very few people get into the gorge itself except at the bottom end. There is fair swimming, compromised by the pollution and fast water. There is some litter around the parking areas; the trails and gorge are clean.

* * *

Summary: Rural setting, impacted by hydroelectric project, woods and roads and stores; nice rocks, spectacular gorge, average botany, currently one rare species, formerly six, wild but not secluded, some trash, mildly polluted water, a little swimming, very popular tourist stop, much use of trails and lower end of gorge, none of the middle of the gorge.

HIGH IMPORTANCE: Largest gorge in the state, very popular tourist site. On the Vermont Fragile Areas Registry.

Report 63, North Hartland Falls, Ottauquechee River, Hartland, Windsor County, Vermont.

Site 957, surveyed on 3 October 1983 by P.F. Zika.

Two large cascades on either side of a rocky island, below a covered bridge and a dam.

Atlas map 22, North Hartland 7.5' quadrangle. The best view of the falls is from the railroad bridge over the Ottauquechee, just east of the covered bridge. Take U.S. Route 5 south from the Village of North Hartland, cross under the interstate, take the next left, and follow that road straight for about half a mile to the river and bridge.

* * *

The site is near the Village of North Hartland, about one-quarter mile from the Connecticut River. It is open and rural; besides the covered bridge and railway bridge there is a quarry upstream and hayfields and a few houses downstream.

The Ottauquechee is a medium-sized alluvial river, over 20 feet wide near the site. It is mildly polluted and murky.

There are two large cascades, both about 25 feet high. The south cascade is the more interesting of the two. It is split into two channels, and has nice carved and rippled rocks. The north cascade splits into about five channels but does not have any carved rocks and is less pretty overall.

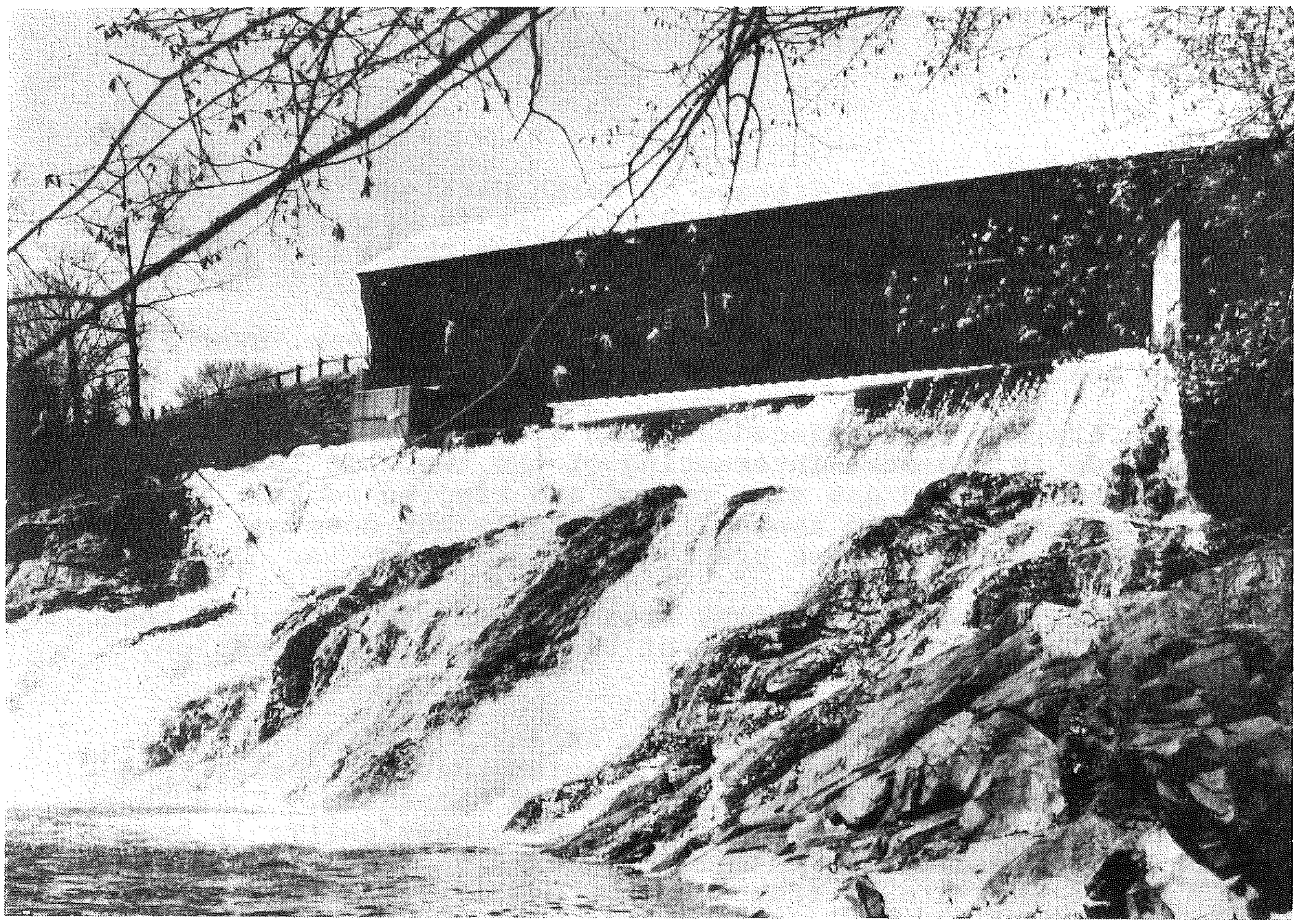
The rocks are green to light brown. They are mapped as the Post Pond volcanic series, a part of the Orfordville formation, of Ordovician age.

The vascular plants are ordinary except for <u>Aster tradescanti</u>, a scarce (almost rare) species that is locally frequent on river ledges in Vermont and New Hampshire. This is a technical species and a bit of a nuisance taxonomically: it has all the look of a distinct species but lacks decisive technical characters to separate it from commoner species.

Bryophytes were uncommon at the site.

From the railroad you can not see the dam, and the two cascades look very nice. The site is used for swimming and fishing and parties, and is a popular tourist attraction, much viewed and photographed. The dam has been in place for a long time. A hydroelectric project has recently been redeveloped at this site.

* * *


NORTH HARTLAND FALLS

Summary: Industrial and rural setting, impacted by a hydroelectric project, nice rocks, average botany, not secluded or wild, some trash, mild water pollution, fair swimming, popular for tourists and parties. Two fairly large cascades, unspoiled site if you face the right direction, popular tourist attraction.

Vascular Plants of North Hartland Falls

Quercus alba
Quercus rubra
Andropogon scoparius
Andropogon gerardii
Erigeron sp.
Medicago sp.
Verbascum thapsus
Campanula rotundifolia
Solidago puberula
Aster tradescanti
Bidens frondosa
Rosa blanda
Ulmus americana
Daucus carota
Mentha arvensis
Solidago juncea
Panicum lanuginosum
Verbena hastata
Salix rigida
Poa compressa
Amelanchier sp.
Bromus latiglumis
Hypericum perforatum
Fragaria virginiana
Juniperus virginiana
Lonicera morrowi

Report 64, Quechee Village Falls, Ottauquechee River, Hartford, Windsor County, Vermont.

Site C, surveyed on 5 October 1983 by P.F. Zika.

A small gorge and a dam, formerly a waterfall.

Atlas map 21, Quechee 7.5' quadrangle. The site is under the covered bridge in the center of the Village of Quechee.

* * *

The site is urban with buildings and roads all around. There is a concrete dam where the waterfall was. Below the gorge, the surroundings are more natural and the banks of the river have young hardwood forests and open ledge.

The Ottauquechee is a medium-sized alluvial river, 50-75 feet wide below the dam. There is trash in the channel. Summer flows can be quite small partly due to regulation by the hydroelectric plant in Taftsville.

The dam is at the head of the site. It is about 15 feet wide by six feet high and is probably on top of the old falls. The gorge begins below this and extends about 100 yards down river with walls from five to 25 feet high. The walls on the north shore slope are at about 30-40 degrees while those on the south shore are steeper and are occasionally vertical.

The rock is schist from the lower Devonian Gile Mountain formation. It has many garnets and seems limy. There are some carved and rippled rocks, and a number of small potholes under two feet in diameter.

The vascular plants were ordinary with with the exception of the grass <u>Cinna arundinaecea</u>, an uncommon but widely distributed floodplain species. It was uncommon at the site and only a few small plants were seen.

Bryophytes were not diverse or common except near the waterline on the ledges. A <u>Climaceum</u> species was seen, as well as <u>Polytrichum juniperinum</u>, <u>Polytrichum ohioense</u>, and a moss in the Pottiaceae.

The site is fairly pretty but you do not want to get close to the water. From the trash it appears to be a party spot.

* * *

Summary: Industrial and urban setting, impacted by a hydroelectric project, nice rocks, average botany with one rare plant, no seclusion, some trash, mildly polluted water, no swimming, locally popular for scenery and parties.

Vascular Plants of Quechee Village Falls

Solidago juncea
Solidago bicolor
Solidago graminifolia
Panicum lanuginosum
Panicum capillare
Taraxacum officinale
Rhus vernix
Rubus occidentalis
Rubus odoratus
Rubus idaeus
Tussilago farfara
Sagina procumbens
Spiraea alba
Salix discolor
Salix bebbiana
Vaccinium myrtilloides
Populus tremuloides
Onoclea sensibilis
Thalictrum polygamum
Thelypteris phegopteris
Solanum dulcamara
Osmunda claytoniana
Poa compressa
Vicia cracca
Phalaris arundinacea
Lythrum salicaria
Aster cordifolius
Aster novae-angliae
Elodea canadensis
Aster umbellatus
Aster simplex
Dryopteris marginalis
Apocynum androsaemifolium
Fragaria virginiana
Calamagrostis canadensis
Agrostis perenans ?
Athyrium filix-femina
Elymus riparia
Antennaria sp.
Desmodium canadense
Eragrostis pectinacea
Eragrostis sp.
Eragrostis pilosa ?
Alnus serrulata
Acer rubrum
Diervilla lonicera
Campanula rotundifolia
Bidens frondosa
Juncus dudleyi
Cinna arundinacea
Andropogon gerardi
Equisetum arvense
Danthonia spicata
Anaphalis margaritacea
Achillea millefolium
Aquilegia canadensis
Lemna minor

QUECHEE VILLAGE FALLS

Report 65, Crystal Cascade, Ascutney Brook or Mill Brook, Weathersfield, Windsor County, Vermont.

Site not numbered by the state, surveyed on 2 August 1984 by P.F. Zika.

Atlas map 16, USGS Claremont 15-minute quadrangle. See also pp. 180-181 of the Green Mountain Club's Day Hiker's Guide to Vermont. Access is from the end of Crystal Falls Road off Route 131. The Weathersfield Trail (currently closed and posted) starts behind a blue trailer and has white blazes. The site is a 25 minute walk. The stream is crossed several times and at a junction, fork to the right, following signs to the falls.

* * *

Crystal Cascade is set in deciduous mountain woods, remote from development but on a well-used hiking path maintained by the Ascutney Trails Association (ATA). The only signs of disturbance are natural rockfall from the cliff, stumps in the forest, and occasional motor vehicle sounds that carry over from I-91, about three miles distant.

Ascutney Brook (also called Mill Brook in the Vermont Atlas) is a tiny mountain stream, clear, clean and low in the summer. The water tastes good. A small amount of algae was observed on the wet cliff surface and on some of the rocks in the stream. Aquatic insect larvae were limited; only beetles were seen, no mayfly, caddisfly, or stonefly larvae.

The site begins where the brook descends 30 feet of low angle ledge and then drops over an impressive cliff face about 70 feet high and 50 feet wide. There is a six by four foot wide pool at the base of the long and steep cascade, but it is only about six inches deep, which gives an accurate impression of how low Ascutney Brook is in the summer. The trail ascends to the west of the cascade and comes out at the top of the cliff, where there is a fine view south over the Windsor County countryside.

The geology of Crystal Cascade appears to be unique in Vermont. It is a rare example of a ring dike, formed in the Permian or Triassic by the upward flow of magma in a somewhat circular fissure. The molten rock ate and shoved its way through overlying sedimentary rocks layed down in the Devonian. The fledgling volcano lacked the thrust necessary to reach the surface however, and all the magma cooled off underground. Subsequent erosion and glaciation have worn away much of the overlying bedrock, exposing the igneous edge of the ring dike at the present-day brownish cliff and upper cascades. The dike is mapped as the White Mountain plutonic-volcanic series. The rocks at the border of the newly formed pluton were metamorphosed by the extreme heat of the magma, and this contact zone is clearly visible at the base of Crystal Cascade, where a second bedrock type shows as a gray mass. It appears to be part of the Waits River formation on the geologic map. Further evidence of the ring dike formation can be found at the top of Crystal Cascade. Chunks of the surrounding bedrock were constantly consumed by the magma as it moved upwards, but pieces that were only partially absorbed when the magma had cooled are reported to be visible in the flat outcrops above the cliff. The ATA's <u>Guide to the Trails of Mt. Ascutney</u> states that the only other large example of a ring dike is in Norway, where it is called a nordmarkite.

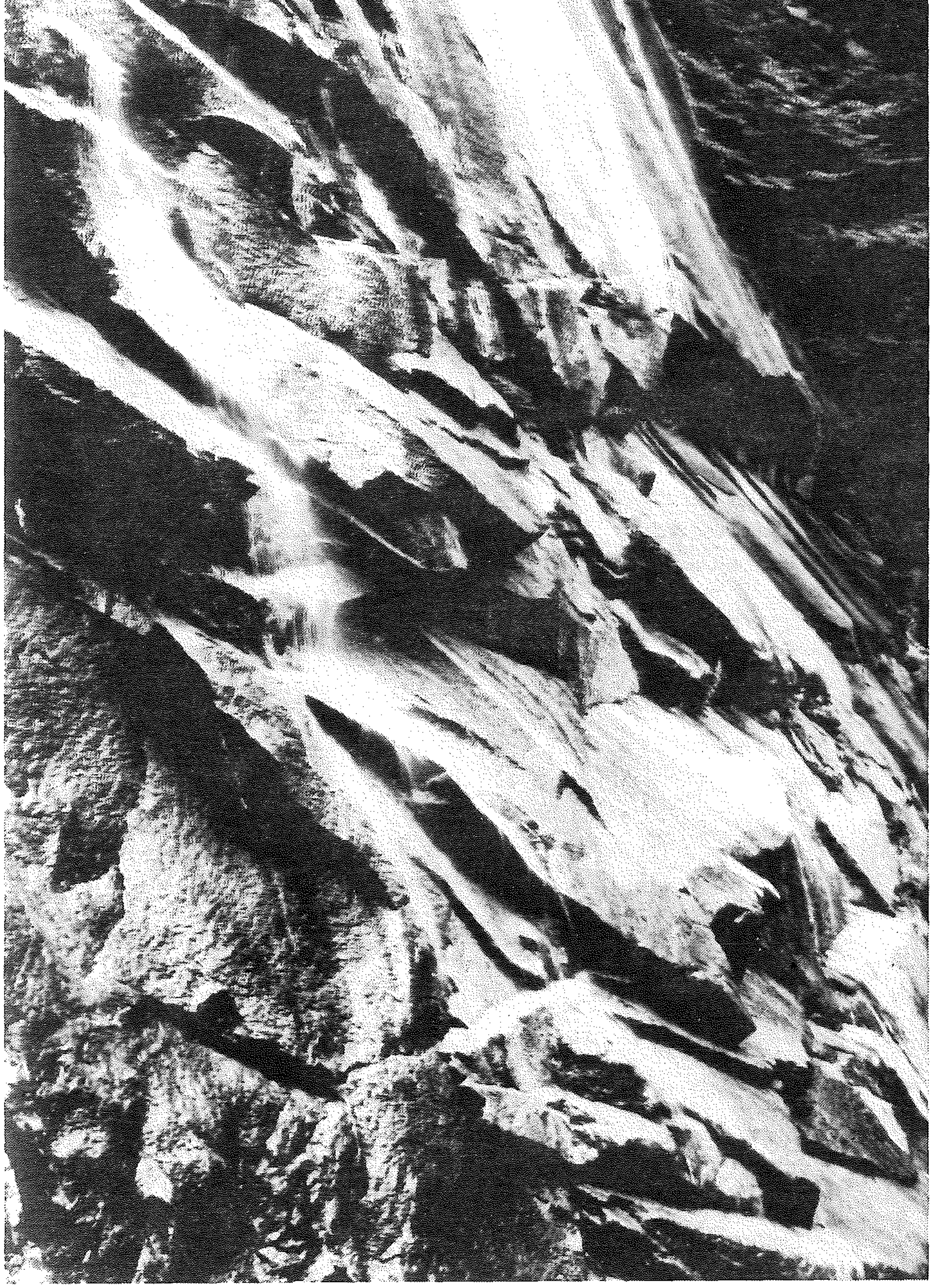
The vascular plants and bryophytes at Crystal Cascade are ordinary. A species list is given at the end of this report. The forest in the ravine at the base of the cascades is a maple, ash, and birch association. Most of the herbs recorded were in the open and damp areas along the base of the large cliff, or on the talus slopes where the woods were more open.

Crystal Cascade is a popular site with a distant view, and is surely one of the reasons the Weathersfield Trail receives so much use. It is unfortunate that the landowner at the trailhead recently decided to deny that access. The vista, the remoteness, and especially the geological uniqueness of the cliff makes this an important natural area. If it is considered a cascade in the sense of this study, it is the second tallest unaltered one we have seen in the state. Although the height of the main cascade is impressive, an estimated 70 feet, it is barely more than an ephemeral falls. In the spring and after storms it probably is a grand sight, but at the time of the visit it was not much more exciting than a garden hose spraying out a seventh story window.

* * *

Summary: Mountain setting, unique rocks - a geological landmark, average biology, secluded and private since the trailhead was closed to the public, almost no trash, clean water, no swimming, formerly a popular hiker's destination en route to the summit of Mt. Ascutney, fine view.

HIGH IMPORTANCE



CRYSTAL CASCADE

Vascular Plants at Crystal Cascade

Betula alleghaniensis
B. papyrifera
Acer saccharum
A. pensylvanicum
A. spicatum
A. rubrum
Fraxinus americana
Ostrya virginiana
Quercus rubra
Pinus strobus
Fagus grandifolia
Prunus pensylvanica
Cornus rugosa
Rubus idaeus
R. allegheniensis
R. odoratus
R. pubescens
Diervilla lonicera
Spiraea tomentosa
Amelanchier sp.
Salix humilis
Vaccinium myrtilloides
Dryopteris marginalis
D. intermedia
Cystopteris bulbifera
Athyrium filix-femina
Thelypteris phegopteris
Onoclea sensibilis
Dennstaedtia punctilobula
Carex platyphylla
C. debilis
Cinna latifolia
Oryzopsis racemosa
Danthonia compressa
D. spicata
Muhlenbergia mexicana
Panicum lanuginosum
Poa compressa
Agrostis scabra
Brachyeletrum erectum
Aster divaricatus
A. schreberi
A. acuminatus
Solidago arguta
S. juncea
S. canadensis
S. rugosa
S. sp. (? bicolor)
Smilacina racemosa
Aquilegia canadensis
Viola canadensis
V. sp.
Arisaema triphyllum
Actaea pachypoda
Polygonatum pubescens
Chelone glabra
Circaea quadrisulcata
Drosera rotundifolia
Antennaria plantaginifolia
Eupatorium rugosum
E. perfoliatum
E. maculatum
Hydrocotyle americana
Achillea millefolium
Prenanthes sp.

Report 66, Thundering Falls, Thundering Brook, Sherburne, Rutland County, Vermont.

Site B, visited on 17 May 1984 by P.F. Zika.

A series of small cascades and two large cascades, with two small dams above the large cascades.

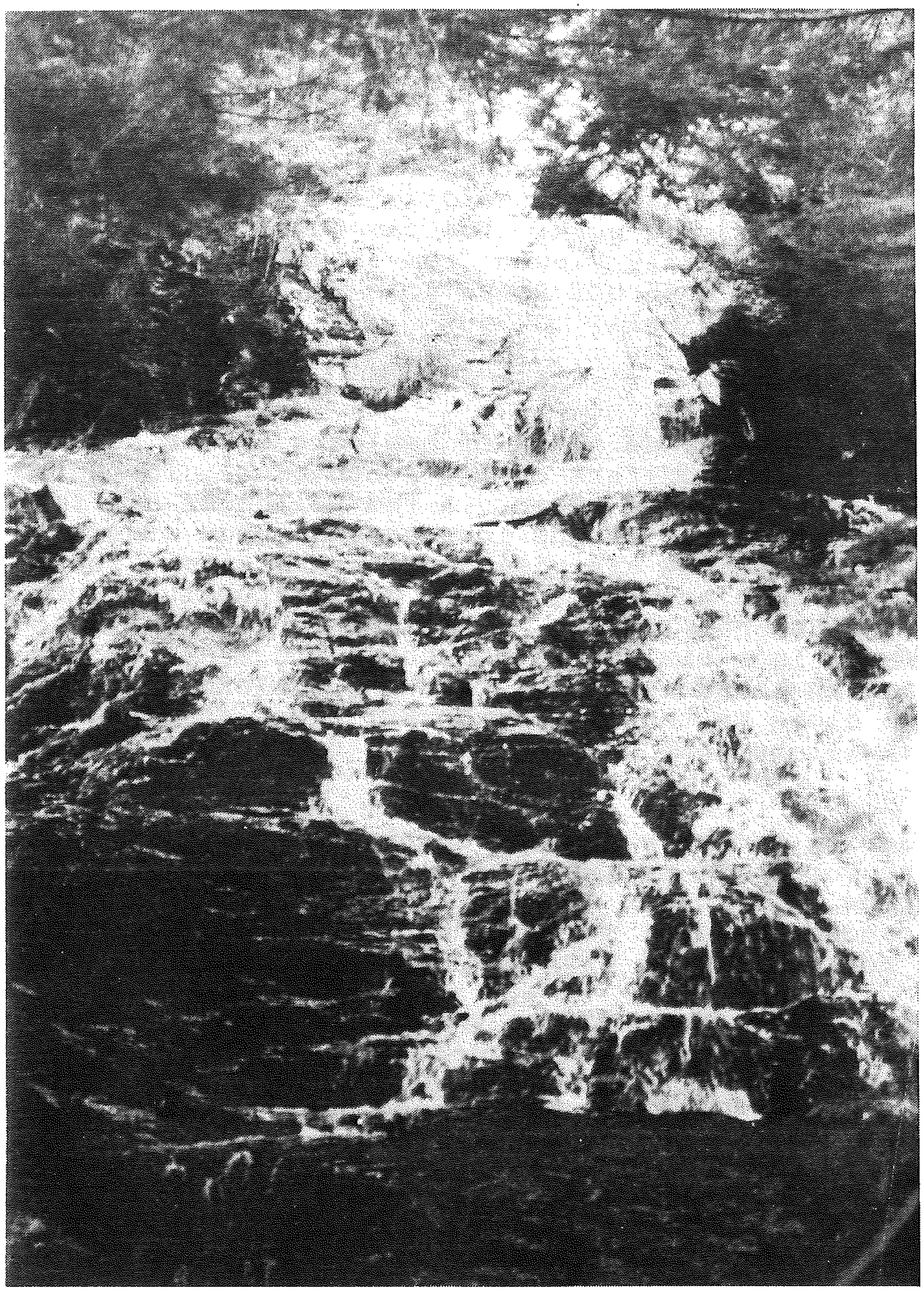
Atlas map 20, USGS Pico Peak 7.5-minute quadrangle (probably). To reach the site from Rutland take Route 4 east past the intersection with Route 100 north. The next left is Thundering Brook Road. Follow this over the dike along Kent Pond, descend to a brook crossing, and park. The cascades are a short distance downstream and are easily viewed from either bank. They can also be reached by River Road off Route 4 in Sherburne, one mile south of the Sherburne Town Hall.

* * *

The site has a dense stand of hemlocks on the north bank and mixed hardwoods and conifers on the south bank. The surrounding forest is quite rocky and steep. A red millhouse and footbridge are visible at the foot of the long cascade, but otherwise no buildings or structures are visible from the site. The surrounding forests are for the most part natural and undisturbed except for occasional logging. The Appalachian Trail passes nearby. There is a six foot high concrete dam at the top of the cascades and an abandoned penstock running along the south bank. The site is close to the Killington Ski Area, and it is likely that there will be some development in the vicinity in the next few years.

Thundering Brook is a small mountain stream emptying out of nearby Kent Pond. It varies from six to 12 feet wide, and has a moderate flow. The water is clear and cold, and at the base of the long cascade several mayfly and caddisfly larvae were seen. Streambed rocks near the mill are slippery with algae.

At the top of the cascades there is a shallow pool about 20 feet across, formed by a low (one-foot high) concrete dam. Below this, the brook splits and forms two five-foot high cascades at the base of a small island, goes over small cascades, and pools behind a six foot concrete dam. There is a diversion well that fed the now-broken penstock on the left (south) side. Below the dam, there is a 25 foot steep cascade some 12-15 feet wide over an unbroken rock face. Below this, the stream turns south along a rock wall, and the dam is no longer visible. There are then some small cascades and pools, then a pair of parallel cascades 25 feet high, then a single cascade about 50 feet high, which, at one point, funnels into a six foot channel that is cutting under a cliff. Below this cascade, there is an old mill building and some concrete retaining walls and open land.



THUNDERING FALLS

The last two cascades, taken together, have a combined drop of about 75 feet, making the site one of the tallest cascades in Vermont.

The bedrock is part of the Precambrian Mt. Holly complex. There appear to be gneiss boulders in the nearby woods, and massive sheets of a brownish quartzite at the upper cascade. The main cascade cuts through a dark schist. There is a nice contact between the schists and quartzites on the bluffs south of the cascade. There is very little sculpturing of the rock faces and only a few potholes under three feet in diameter. The ledges do not appear to be limy.

The vascular plants at Thundering Falls are ordinary. The forests are attractive, and the oldest hemlocks are probably well over 100 years old. A recently-cut three inch hemlock on the north bank was over 50 years old. The woods are dark and, except along the stream where the light levels are higher, there are few species in the understory. A list of the species identified is at the end of this report. In addition to the species in the list, there is a report of the yellow lady slipper (<u>Cypripedium</u> <u>calceolus</u>) from the site, a species that would not have appeared at the time of the survey.

Bryophytes are numerous and at least moderately diverse. No specimens have been collected. A detailed inventory might be interesting.

Because it was in the peak of the migration, a number of birds were easily seen along the cascades. Two species, Swainson's thrush and yellow-bellied flycatcher, are noteworthy. Both of these breed at higher elevations in the adjacent mountains and in the boreal forest of northern Vermont, and were probably only transients along the cascades.

Thundering Falls is a popular recreational area. There is not much fishing, but the area is suitable for picnicking, bathing, and sightseeing. There are a number of different vantage points from both banks that give good views of the twisting drops and the rocks. The Appalachian Trail is a short distance east, and the cascades are probably visited by hikers. The site is clean.

The rumble of the lower cascades is pleasing and it is easy to see how the place was named. The undercut cliffs and zig-zag drops are unusual. The site would be greatly improved if the corroded penstock was removed. Even with the penstock and the concrete at the the upper end, this site is important. It is an impressive site that gets a good deal of use, and is unusually high. Along the middle of the cascades, there is a feeling of remoteness because of the crash of the water and the surrounding dense woods. This is one of the only high waterfalls in Vermont that is still relatively unspoiled.

Thundering Falls is on private property. A hydroproject and large housing development are proposed for the area*. Surveyor's flags are already on both banks. Building and clearing would irreparably alter everything pleasant about the site except the noise it makes. We recommend the site be left in as natural a state as possible and that the old penstock be removed. We recommend against any cutting or construction.

* * *

Summary: One of the largest cascades in Vermont, impacted by hydroelectric project, mountain setting, average rocks and biology, moderately secluded but not wild, clean, clean water, bathing but no swimming or fishing, popular for picnics, sightseeing, and probably parties, well-known to Appalachian Trail hikers and locals.

HIGH IMPORTANCE

*The site was redeveloped for hydroelectric generation in 1985 and is now in operation.

Vascular Plants at Thundering Falls

Tsuga canadensis
Betula allegheniensis
Osmunda sp.
Aster macrophyllus
Acer saccharum
Acer pensylvanicum
Acer rubrum
Rubus allagheniensis
Prenanthes sp. (altissima ?)
Solidago rugosa
Dryopteris marginalis
Dryopteris intermedia
Trillium erectum
Trillium undulatum
Thalictrum polygamum
Amelanchier laevis
Amelanchier sp. (shrub)
Fragaria virginiana
Poaceae spp.
Cyperaceae spp.
Alnus rugosa
Athyrium filix-femina
Thelypteris phegopteris
Prunella vulgaris
Mitella diphylla
Heracleum maximum
Taraxacum officinale
Carex torta
Carex pedunculata
Carex sp. (communis ?)
Picea rubens
Fagus grandifolia
Diervilla lonicera
Viburnum alnifolium
Betula papyrifera
Veratrum viride
Polypodium virginianum
Spiraea latifolia
Maianthemum canadense
Lonicera canadense
Tiarella cordifolia
Polystichum acrosticoides
Taxus canadensis
Oxalis montana
Clintonia borealis
Streptopus roseus
Prunus pensylvanicus
Smilacina racemosa
Gymnocarpium dryopteris

Basin 11: Williams, West, and Saxtons Rivers

Including the following sites:

Jelly Mill Falls	Stickney Brook, Dummerston
Hamilton Falls	Cobb Brook, Jamaica
Saxtons River Falls	Saxtons River, Westminster
Twin Falls	Saxtons River, Westminster
Rock River Cascades	Rock River, Dover
Pikes Falls	Kidder Brook, Jamaica
Brockway Mills Gorge	Williams River, Rockingham

See the appendix for:

Wardsboro Brook Ravine	Wardsboro Brook, Jamaica

This basin includes three watersheds in southeastern Vermont. For the most part, they include hilly uplands rather than mountains. The area is fairly well settled and not very mountainous and it is possible that we have seen most of the larger sites in the basin.

Three sites in this basin are of high importance: Hamilton Falls, a popular recreational site which also has a secluded chain of pools below the main falls; the Rock River Cascades, a beautiful chain of pools and cascades; and Brockway Mills Gorge, a large undammed gorge.

Report 67, Jelly Mill Falls, Stickney Brook, Dummerston, Windham County, Vermont.

Site 542, surveyed on 22 July 1983 by J.C. Jenkins.

A series of stepwise falls and cascades with broad flat slabs; popular local swimming area.

Atlas map 3, USGS Brattleboro 15' quadrangle. Right next to road, right above where the brook crosses Route 30.

* * *

The site is in hemlock-hardwoods forest, adjacent to a dirt road and one-quarter mile from a main road, just above the mouth of the brook. There are houses nearby but not visible from the site; much of the surrounding land is wooded.

The site is on a mountain stream averaging ten feet wide. Water is very clean.

The falls consist of a series of cascades and short drops, and are about 30-50 feet wide and 100-150 feet long with a total drop of about 30 feet. The rock is apparently the Devonian Waits River but seems more massive and solid than is normal for this formation elsewhere. There are a series of horizontal joints and the rock has broken off in big blocks making stepwise falls. There are several shallow pools that are used for bathing.

No plant lists were made; the site itself is too scoured to support much except several mosses, particuly **Hygrohypnum** sp. and **Eurhynchium riparioides**. A few other mosses grow at the edges but the diversity is low, owing more to the lack of good rock faces than to disturbance or acidity. The common species are:

Coniocephalum conicum	Pellia epiphylla
Thujidium sp.	Ceratodon purpureus
Bracthythecium rivulare	Hypnum lindbergii

The falls are a popular bathing and party place. The woods are somewhat trampled and there are small amounts of litter, but overall the area is in good condition.

A pretty place with nice rocks, and a favorite bathing and sitting and party place.

* * *

Summary: Woodland setting with road near, nice rocks, poor botany, no seclusion, some trash, very clean water, fairly heavy recreational use, popular for bathing and parties.

Report 68, Hamilton Falls, Cobb Brook, Jamaica, Windham County, Vermont.

Site 518, described from ten visits (1973-1983) by J.C. Jenkins.

Steep cascade with pools above and below, very popular for swimming; chain of cascades in the woods with falls and pools.

Atlas map 7, USGS Londonderry 15' quadrangle. Main cascade is just south of bridge where Turkey Mountain Road crosses the bridge.

* * *

The site is in the woods, about 50 yards from a dirt road and one-quarter mile from a house and small sawmill. It is undisturbed except for trampling.

Cobb Brook is a small mountain stream, averaging ten to 15 feet wide. The water is very clean.

The main falls are on a mountain slope, in pine-hemlock woods. They are more or less in the open and get a lot of sun. From the bridge going downstream there is a small ravine with low rock walls and pools, then a small falls about five feet high, and then a pothole 25 feet across and 15 feet deep with about eight feet of water in it. At the edge of a pothole is a lip directly overlooking the main falls. The main falls are a steep cascade 40-50 feet high. Below it are two more pools.

Below the falls there is about a mile of steep wooded ravine in which there are a series of small falls, pools, and cascades. None of these features is as striking as the main falls but taken together they make a beautiful area that would be of state importance even without the main falls.

The falls probably occur at the contact between the Hoosic and Cavendish schists, both garnet containing schists of Cambrian age. The contact is not visible (at least to a botanist) in the field. The rock is brown and blue schist with nice but not extravagant sculpturing, and is easy to climb and makes good potholes.

No rare plants occur. The main falls have very few plants, but the lower cascade is a good moss and liverwort area; no list is available yet, and so far the diversity is good but not exceptional. No lime occurs and the species all seem to be the reasonably standard ones expected on wet acid rocks.

The falls are much used for swimming and picnicking. They were formerly owned by the Southern Vermont Conservation Society and now by the state and the site is now a designated State Natural Area of the Vermont Department of Forests, Parks & Recreation.

There have been a half dozen or so deaths there in the last 20 years. A sign warns of the danger. We suggest that the sign would have greater effect if it listed the names of the people killed there and the dates of the accident. The present warning is fairly meek, and since the danger is serious the sign ought to be as scary as possible.

A fine place; the main falls are big and sunny and pretty - we know of few places like them; the lower chain of pools and cascades is hardly used and not as spectacular but rates high for beauty, privacy, length and botany.

* * *

Summaries:

1. Upper falls: Woodland setting, fine to spectacular rocks, average botany, no seclusion and wildness, clean site, very clean water, great swimming, very popular for parties and swimming, dangerous steep rocks and history of fatal accidents.

2. Lower chain of cascades and pools: Woodland setting, fine rocks, exemplary botany, wild and private, no use, no trash, very clean water.

HIGH IMPORTANCE: Exceptional wild chain of pools and cascades, major recreational site, impressive large cascade, State Natural Area.

HAMILTON FALLS

Report 69, Saxtons River Falls, Saxtons River, Westminster, Windham County, Vermont.

Site V, surveyed in August 1983 by J.C. Jenkins.

Old dam site, with new dam construction and road relocation planned.

Atlas map 8, USGS Bellows Falls 15' quadrangle. Site is under Route 5, about one-quarter mile south of the junction with Route 121.

* * *

The site is at the edge of town (Bellows Falls), with a major bridge (Route U.S. 5), houses, old mill foundations, etc. in the immediate vicinity. The river runs in a wooded gorge 50-100 feet deep. From the site itself you see trees and the road but not houses.

The river is a medium-sized lowland stream, near its confluence with the Connecticut, averaging over 30 feet wide. It receives treated waste about 12 miles upstream in Saxtons River. There is a two mile Class C zone directly below Saxtons River and below that the river becomes Class B. Some mild pollution was noted (algae, sediment), and a slight smell but the water was basically pleasant.

Site consists of an old dam about 100 feet long by 15 feet high, and above that a gorge about 200 feet long with rock walls to 20 feet high. Above the gorge there is a single set of sheer ledges about 50 feet high. The rock is a granitic gneiss of Devonian age. It is acid and makes smooth, plantless cliffs.

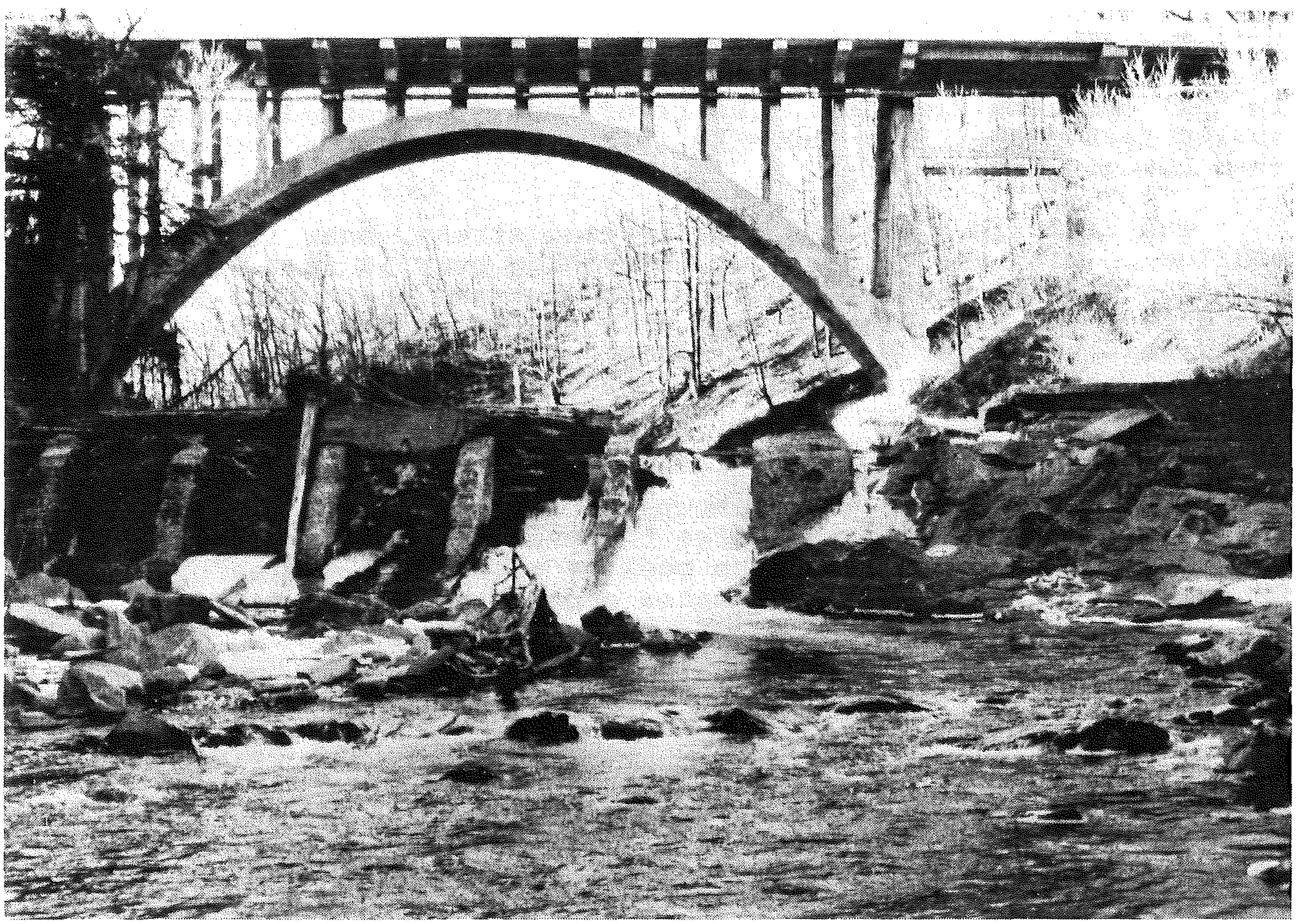
Upstream of the gorge there are extensive cobble and river bars.

No rare plants were found in the gorge or on the bars. Because the rock is granitic there are comparatively few plants at all in the gorge. No lists were made.

There is a pool below the timber crib dam but there are no cascades or pools above the dam. The area is used by fisherman and for swimming, but is not a popular recreation site.

* * *

Summary: Urban setting, site of proposed hydroelectric project, average rocks, poor botany, no seclusion, clean site, fair swimming, mildly polluted water, only occasional use.



SAXTONS RIVER FALLS

Report 70, Twin Falls, Saxtons River, Westminster, Windham County, Vermont.

Site W, surveyed in August 1983 by J.C. Jenkins.

A small gorge with small cascades and falls; popular swimming and party site.

Atlas map 8, USGS Bellows Falls 15' quadrangle. On a side road off 121, about one mile west of the junction of Routes 121 and 5.

* * *

The site is in the woods, about one-quarter mile from several houses, and about 75 feet from a dirt road. Surrounding woods are hemlock-hardwoods.

The stream is a medium-sized lowland river, about 20-30 feet wide below the site, in a fairly broad wooded valley. Just below the site it enters an alluvial plain. The water receives treated waste 12 miles upstream; it is mildly polluted but not objectionable at the site.

The site consists of several cascades totaling about 150 feet long, dropping perhaps 20-30 feet, with falls up to five feet high. There are a number of exposed ledges overlooking the cascade and a few pools to 15 feet in diameter. There are no large falls, major rock pools, or potholes. The cascade has sloping rock walls eight to 20 feet high and so may be considered a shallow gorge with sloping walls.

The rock is probably a quartz granulite (? Silurian Fitch formation). This formation is supposed to have limy beds but in the vicinity of the falls no limestone outcrops or limestone indicators were seen.

The cascade itself has only a few plants. The following (all common species) were noted:

Panicum lanuginosum	Oxalis europaea
Carex torta	Hieracium sp.
Apocynum cannabinum	Muhlenbergia mexicana
Aster puniceus	Onoclea sensibilis
Panicum clandestinum	Agrostis sp.
Aster simplex	Polygonum cuspidatum
Solidago graminifolia	Solidago rugosa
Solidago juncea	Phalaris arundinacea
Aster cordifolius	Aster lateriflorus
Phalaris arundinacea	Juncus tenuis
Sagina procumbens	Athyrium filix-femina
Deschampsia flexuosa	etc.

There were comparatively few mosses; the channel is too scoured and the walls too exposed. No list was made.

The site is a popular swimming and party place; there was some trash along the paths.

A nice local cascade and a good swimming place, but not distinguished in either size or detail. Pretty but not exceptionally so.

* * *

Summary: Rural setting, average rocks, average botany, not secluded, some trash, mildly polluted water, good swimming, popular place.

Report 71, Rock River Cascades, Rock River, Dover, Windham County, Vermont.

Site 603, surveyed on 8 October 1983 by J.C. Jenkins.

A chain of pools and cascades along the upper parts of a mountain brook; a remote, interesting, lovely place.

Atlas map 7, USGS Wilmington 15' quadrangle. From East Dover go to Goose City, take the dirt road west that follows the stream, park at the last house and ask permission. Bushwhack along the east bank of the stream for about one mile, descend to the stream and follow it up through the cascades.

* * *

The setting is a narrow mountain valley at elevation 1,900-2,300 feet, mostly in hardwoods. There is almost no hemlock, only a little pine, and almost no spruce. Soil is moderately rich: leeks occur in the river bottoms. The nearest house or road is about one mile downstream.

The Rock River is a mountain stream, averaging five to ten feet across, with very clean water. It is moderately steep but not precipitous, and probably has an average gradient through the cascades of 15 degrees. The bottom is variously bedrock, boulders, and sand.

Ascending the stream, there are approximately nine separate cascades or falls and pools. These are typically separated from each other by ten to 50 yards but occasionally meet and overlap. Potholes and carved chutes are common. There are three falls over ten feet high. The largest falls is 15 feet high and 30 feet wide, and has a broad lip from which the water arches out in the classic waterfall manner. There is a cave under the lip which is wet and slippery but has some interesting liverworts.

The pools and cascades vary greatly: there are continuous cascades over boulders, stepwise cascades descending from pool to pool, small gorges with rock walls ten to 15 feet high, and in one place there are seven linked potholes, each spilling into the next.

The rock is a dark schist, slippery under foot (? Cambrian Ottauquechee phyllite schist). It is not described as limy but the diversity of plant species seen and the presence of some lime requiring mosses strongly suggests that there is some lime in the rocks.

Unlike many mountain brooks, this stream has carved its channel rather than just smashed its way down, and in doing so has created rippled rocks, potholes, sculptured walls, and carved channels and chutes. The features are small compared to those on larger streams, but the individual formations are varied and interesting.

About 30 vascular plants were noted in the stream channel or immediately adjacent to it. This is not a large number but is in fact more than usually diverse for a fairly dark mountain stream.

The cascade is an excellent place for mosses: it has wet rock walls, lots of spray, very little disturbance, and is high enough in the watershed that it is not exceptionally violent in the spring. About 25 species were noted, including one (Thamnobryum alleghaniense) which was not seen elsewhere in this study, and another (Metzgeria conjugata) which so far appears to be rare in Vermont.

The cascades get very little use; they are not well known, and are only occasionally visited. They mean a great deal to the people that visit them.

It is a beautiful place. The individual cascades are fairly small, but each is fine by itself, and seen one after another you are left with a wonderful sense of how the variety of shapes a single stream can produce. The botany is also varied; many plants are seen in one cascade but not another, and the proportions of the common species also change from place to place. The cascades are private and remote and unspoiled; they are at the head of a roadless valley, and in woods that have not been logged for some years. They have great charm, using the word in its precise sense: they are not big or dramatic but are finely made and inviting and memorable; you keep thinking about them and want to come back to them.

The falls are currently privately owned.

* * *

Summary: Mountain setting, fine rocks, exemplary botany, very wild and private, no trash, no regular use, no paths or trails, very clean water, good bathing.

HIGH IMPORTANCE: As fine as any chain of pools and cascades in the state.

Plants Seen at the Rock River Cascades

Mosses and Liverworts

Paraleucobryum longifolium	Pogonatum alpinum
Herzogiella striatella	Atrichum undulatum
Pohlia sp.	Thujidium sp.
Marsupelia emarginata	Mnium punctatum
Hygrohypnum sp.	Hygrohypnum ochraceum
Metzgeria conjugata	Campylium polygamum
Diucranum flagellare	Philonotis sp.
Eurhynchium hians	Pellia epiphylla
Coniocephalum conicum	Thamnobryum alleghaniense
Fissadens adiantoides	Plagiothecium laetum
Bryum sp.	Mnium (double-toothed)
Mnium punctatum	

Vascular plants

Glyceria melicaria	Cinna latifolia
Dennstaedtia punctilobula	Aster divaricatus
Aster lateriflorus	Aster acuminatus
Aster puniceus	Agrostis perennis
Solidago flexicaulis	Viburnum lantanoides
Epilobum sp.	Acer pensylvanicum
Dryopteris intermedia	Dryopteris marginalis
Thelypteris phegopteris	Mitella or Tiarella or both
Hydrocotyle americana	Galium sp.
Laportea canadensis	Carex torta
Oxalis montana	Lycopus uniflorus
Glyceria striata	Viola sp.
Rubus flagellaris	Thalictrum polygamum

Report 72, Pikes Falls, North Branch of Ball Mountain Brook, Jamaica, Windham County, Vermont.

Site 909, surveyed on 2 October 1983 by P.F. Zika.

Several small woodland cascades.

Atlas map 6, Londonderry 15' quadrangle. From Route 30 in the center of Jamaica take a secondary road southwest. After 0.1 mile fork right (north) and continue another 2.5 miles to a bridge over the North Branch. The houses near here are the Village of Pikes Falls and a pulloff 0.1 mile to the east is the access to the cascades.

* * *

The falls are in second-growth hemlock-hardwoods forest in hill country near the base of Stratton Mountain. There are a few houses within one-quarter of a mile of the cascades.

The North Branch is a small mountain stream averaging about ten feet wide with clear, clean, cold water.

At the falls, the stream flows past a ledge with an odd dike formation, then funnels into a narrow channel and splits into three cascades over a single broad ledge. These cascades are one, three, and seven feet high. Below the cascades the stream runs through a narrow chute (less than four feet wide) and spills into a large pool nearly 50 feet wide. In the spring, water from the lowest cascade shoots halfway across the pool.

The rock is a massive gneiss or quartzite from the Precambrian Mt. Holly formation. There are ledges on either side of the cascade and, in all, there is a 50 foot wide band of exposed rock. There are no potholes or any other sculptured features and the rock has no lime.

No uncommon vascular plants were present. Bryophytes were not diverse or abundant.

The falls are a popular swimming hole and receive heavy local use. There is an old dump on one bank, but otherwise the area is clean.

A short distance above the falls, there are old foundations, probably of a mill and perhaps even of the sawmill that Isaac Pike built here in 1846.

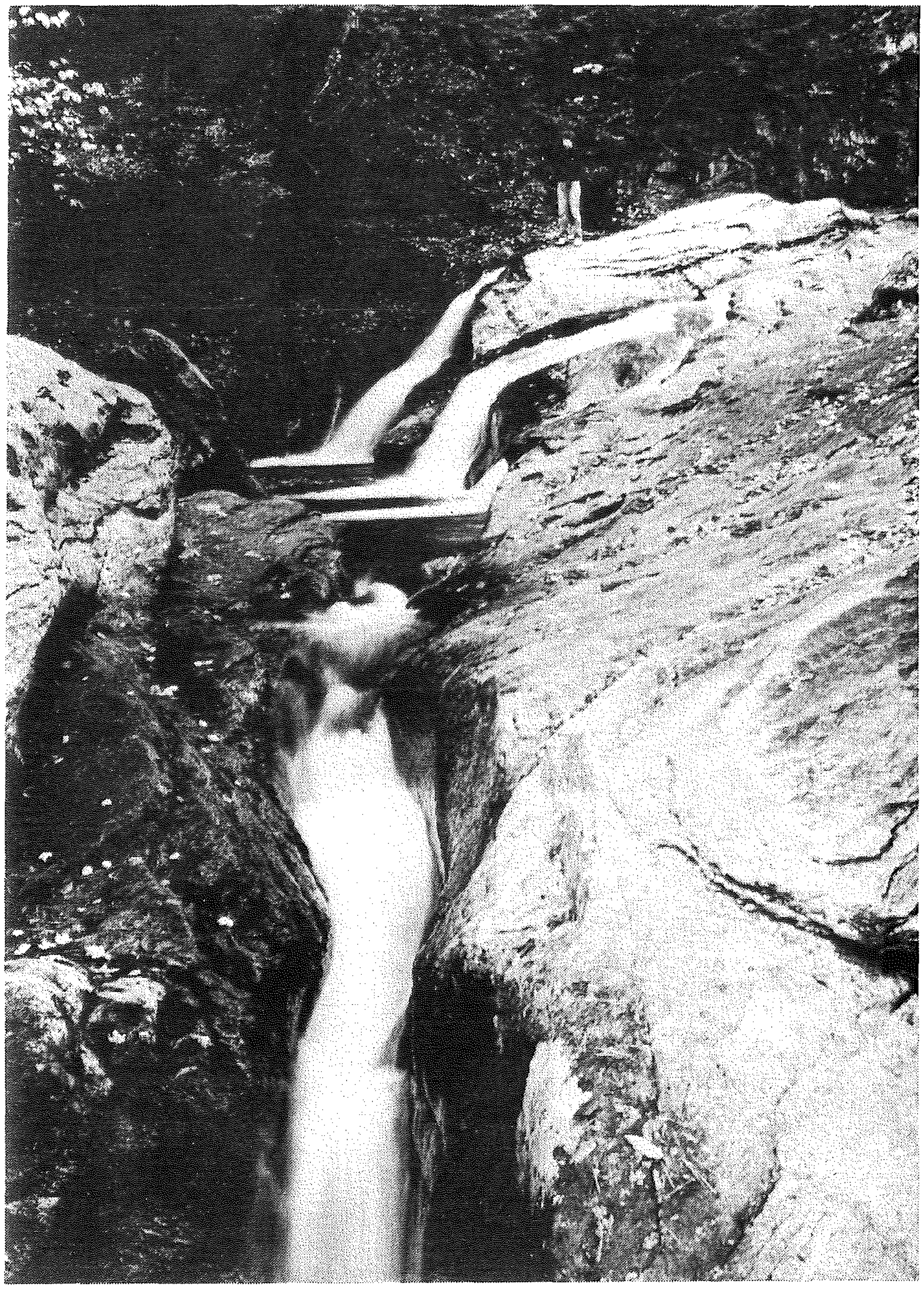
A pretty place but with no outstanding features.

* * *

Summary: Woodland setting, average rocks, average botany, moderately wild, some trash, clean water, good swimming, popular swimming hole, probably good fishing.

Vascular Plants of Pikes Falls

Aster acuminatus	Betula alleghaniensis
Salix rigida	Betula papyrifera
Taraxacum officinale	Rhododendron prionophyllum
Osmunda claytoniana	Polypodium virginianum
Aster puniceus	Viburnum alnifolium
Fagus grandifolia	Dryopteris intermedia
Pinus strobus	Dryopteris marginalis
Tsuga canadensis	Fragaria virginiana



PIKES FALLS

Report 73, Brockway Mills Gorge, Williams River, Rockingham, Windham County, Vermont.

Site 609, surveyed on 20 October 1983 by P.F. Zika.

A large, deep, winding gorge with a number of small cascades.

Atlas map 12, Saxtons River 15' quadrangle. Take Route 103 north from the center of Rockingham; at about one mile turn right (north). This road crosses the upper end of the gorge in about 0.3 miles.

* * *

The gorge is at the bottom of a deep ravine about 100 yards south of the Village of Brockway Mills. There is a road bridge over the upper end of the gorge, a railroad bridge at the lower end, and houses nearby.

The Williams River is a medium-sized to large lowland river in the vicinity of the site, averaging 75 feet wide and running in an alluvial channel. It receives some treated sewage in Chester (six miles upstream) and perhaps some unofficial sewage in Bartonsville. At the gorge, the water is fairly clean but definitely fertile.

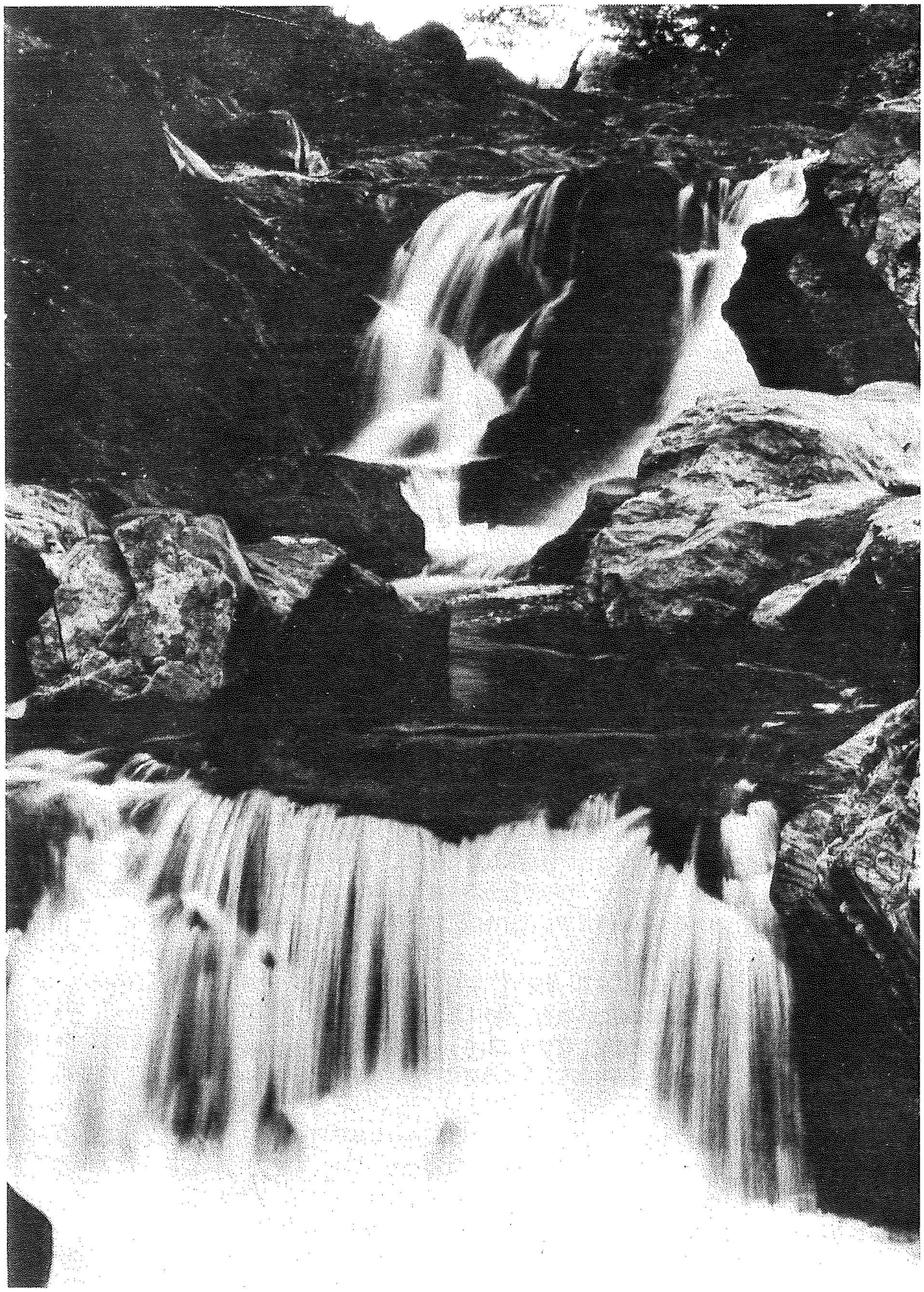
The gorge is perhaps 80 feet deep by about 1,000 feet long and about as wide as deep. There are steep rock walls up to 50 feet high. Hence, it is a large gorge, and in fact, one of the three or four largest in the state. The river zigzags within the gorge and descends through potholes, pools and five foot high cascades. There are many potholes eight to ten feet wide and some fine rounded and sculptured rocks.

The bedrock is schist and phyllite of the Standing Pond member of the lower Devonian Waits River formation. It is layered with thin beds of quartz, strikingly colored and carved, and quite pretty. It is at least partially limy.

One rare plant occurs, the fleabane <u>Erigeron</u> <u>hyssopifolius</u>. The species is restricted in Vermont to two alpine areas and several deep limy gorges. The population was well distributed on ledges on both shores of the river; more than 100 plants were present.

Bryophytes were common on damp ledges; no collections were made.

The gorge is quite attractive and receives heavy use from tourists as well as locals. There are good views of it from the road, and a fine view from the railroad bridge. There is good swimming and probably good fishing at the lower end of the gorge. The area is reasonably clean.



BROCKWAY MILLS GORGE

Because of the depth, the gorge is quiet and seems more secluded than it is. There are some beautiful rocks and attractive pools and cascades, and it is both a pretty place to look at and an exciting one to be in. It must be considered one of the five finest large gorges in the state.

The site is threatened by a hydropower proposal. Water would be diverted from the river at the head of the gorge by a dam and reintroduced at the foot of the first main cascade by a tailrace; a minimum flow is required over the bypassed cascade, and the diversion would only affect a short stretch near the upper end of the gorge.

It appears that the proposal is a careful one and will do physical harm to only the upper cascade, and, so far as we can see, should not affect the plants in the gorge. Hence, the question is one of intrusion: at present you have a gorge that is completely natural except for the bridges over it, and is in fact one of the three gorges this large in the whole state that have not been dammed or seriously altered. (The others are the Clarendon Gorge and the deep but shorter gorge at the Big Falls of the Missisquoi.) After development, a powerplant and powerlines will be within the gorge, and since it appears to be a fairly big powerplant, the landscape will be rearranged, as occurs at every sizeable industrial site. The gorge will be largely intact, but the sense of naturalness and wildness will be less, and the landscape will be altered.

In this report, our general recommendation is that, since naturalness and wildness are rare, they should be preserved when possible, especially in the case of large sites of types that are themselves rare in the state. This is especially so when, as at Brockway Mills, a large secluded natural area occurs in an area that is otherwise farmed and civilized. Our feeling is that since very few large waterfalls or gorges are both natural and wild, and since when these qualities are lost, they are irrecoverable, they should be preserved where they can be.

* * *

Summary: Rural setting, fine rocks, one rare plant species, moderately wild and secluded, some trash, mild pollution, good swimming, very popular for scenery, photography, walking, and fishing. Threatened by a hydro proposal.

HIGH IMPORTANCE: Beautiful place, important tourist site, rare landform.

Vascular Plants of Brockway Mills Gorge

Solidago puberula
Apocynum androsaemifolium
Parthenocissus quinquefolia
Panicum sp.
Erigeron canadensis
Erigeron hyssopifolius
Aster divaricatus
Aster lateriflorus
Clematis virginiana
Lycopus americana
Polygonum cuspidatum
Athyrium filix-femina
Osmunda regalis
Houstonia caerulea
Fragaria virginiana
Acer rubrum
Hypericum perforatum
Solidago canadensis

Solidago graminifolia
Juncus brevicaudatus
Poa compressa
Muhlenbergia frondosa
Salix rigida
Leersia oryzoides
Digitalis sanguinalis
Taraxacum officinale
Bidens frondosa
Polygonum sp.
Juncus dudleyi
Aster novae-belgii
Potentilla canadensis
Osmunda claytoniana
Phleum pratense
Eupatorium maculatum
Achillea millefolium
Betula papyrifera

Basin 13: Connecticut River and minor tributaries

Including the following sites:

Bellows Falls	Connecticut River, Bellows Falls, VT and Walpole, NH
Lulls Brook Gorge	Lulls Brook, Hartland
Sumners Falls	Connecticut River, Hartland, VT and Plainfield, NH

This is a small basin consisting of the floodplain of the Connecticut River and some short tributary streams in southeastern Vermont. It is an area of low relief and has only a few falls.

Bellows Falls is an industrialized site and of little natural interest, Lulls Brook Gorge is a nice small site, and Sumners Falls (really a set of bad rapids and barely a falls) is a major botanical site.*

* At which, to our dismay, all the rarest plants are providentially on the New Hampshire side of the river.

Report 74, Bellows Falls, Connecticut River, Bellows Falls, Windham County, Vermont and Walpole, Cheshire County, New Hampshire.

Site X, surveyed on 3 October 1983 by P.F. Zika.

A major hydropower site, a small remnant cascade, another short cascade below a small dam, and a gorge.

Atlas map 8, Bellows Falls 15' quadrangle. The site is the channel of the Connecticut River in Bellows Falls, below the big dam.

* * *

The site is located just east of the center of Bellows Falls. There is a large dam opposite the north end of town. The dam diverts much of the flow of the river into the Bellows Falls barge canal, which lies to the west of the natural river channel and goes to the hydropower station. The natural channel is largely dry when the river is low but fills at high water and after storms.

The site is thoroughly industrial, with roads, buildings and bridges all around.

The Connecticut is a large alluvial river at Bellows Falls. Above the dam, it is over 100 yards wide.

The dam is perhaps 40 feet high and 120 yards across. Below it, there is a second smaller dam, then a small cascade, then a gorge perhaps 100 yards long and 40 feet deep. The walls of the gorge are vertical and chunky, and there are only a few small potholes and no real sculpture. The gorge is spectacular when the water pours through it but not very impressive when dry.

The rock is Bethlehem gneiss of middle Devonian, a common rock in New Hampshire but limited to Bellows Falls in Vermont.

The gorge is very sparsely vegetated and the plants are all ordinary.

There is a historical record for the rare vetch <u>Astragalus alpinus</u> from Bellows Falls. The vetch is usually a river ledge plant. It was collected only once, in the 1890's, by Willard W. Eggleston. Careful search failed to turn up the species, but it may not have been visible so late in the season. The diversion of most of the river flow has probably altered the habitat for the species. There are no current records of <u>Astragalus alpinus</u> in Vermont. The old stations for the species were all at Connecticut River sites which have since been dammed, and the species may be extinct in the state.

BELLOWS FALLS

The only species of interest found at the site was <u>Trisetum spicatum</u>, a grass confined to rocky shores and mountain slopes in Vermont. The species list is moderately long because about one-half mile of channel was surveyed, but except for the <u>Trisetum</u> contains all common species.

The site gets no use. We liked the chunky appearance of the gneiss, but otherwise could not find much to admire. The river does boil through here sometimes, though. Ancient Indian carvings are located on the east wall of the gorge, below the site.

* * *

Summary: Industrial setting, nice rocks, botany average, formerly one rare species, no wildness, site messy, disgusting water, no swimming or fishing, no current recreational use.

Vascular Plants of Bellows Falls and Gorge

Lonicera tartarica
Aster cordifolius
Solidago junceus
Cornus stolonifera
Thalictrum polygamum
Populus tremuloides
Athyrium filix-femina
Rubus idaeus
Lythrum salicaria
Toxicodendron radicans
Solidago graminifolia
Poa pratensis
Poa compressa
Juncus tenuis
Bidens frondosa
Cerastium vulgatum
Oxalis europaea
Erigeron strigosus
Lycopus uniflorus
Onoclea sensibilis
Eupatorium maculatum
Solanum dulcamara
Osmunda claytoniana
Panicum dichotomiflorum
Vitis riparia
Chenopodium album
Panicum capillare
Cornus rugosa
Panicum capillare
Andropogon gerardii
Populus deltoides
Solidago juncea
Apocynum sibiricum
Trisetum spicatum
Dryopteris marginalis
Thelypteris phegopteris

Report 75, Lulls Brook Gorge, Lulls Brook, Hartland, Windsor County, Vermont.

Site 958, surveyed on 3 October 1983 by P.F. Zika.

A steep-sided ravine with short sections of rock walls, and several small cascades.

Atlas map 16, Hartland 7.5' quadrangle. The gorge is west of the interstate highway, and can be reached by driving south from the center of the Village of Hartland on U.S. Route 5 about 0.3 miles. Route 5 crosses Lulls Brook at the head of the gorge.

* * *

The site is rural, with open land, second-growth woods and a few houses nearby. The slopes of the gorge are partly open, partly scrubby and partly forested with hemlocks and hardwoods.

Lulls Brook is an alluvial stream, about 20 feet wide below the gorge, with clear, cold, fairly clean water. It has some algae but appears to be well oxygenated and has aquatic insects. It may receive some sewage upstream, but so far as we can tell from maps, there are no waste treatment plants upstream.

The gorge is about 200 yards long and 30-50 feet deep, with vertical rock walls on the eastern side. The ledges on the west side are smaller and alternate with steep dirt slopes. In the upper portion of the gorge, there are three cascades from six to ten feet high, each followed by a small pool. Lower in the gorge there is a long low-angle cascade about 15 feet high. In one area the ledges are undercut a foot or two by the main channel. Towards the bottom of the gorge are the remains of a mill and a large pipe. A footbridge crosses high over the stream channel below the site.

The rock was soft phyllite from the Devonian Gile Mountain formation. It was somewhat limy. A few small potholes were seen.

No uncommon vascular plants were found. Bryophytes were common in one area but are not particularly important in the gorge as a whole. One species (*Timmia megapolitana*) was only seen at one other site in this survey and may be rare in the state.

The gorge is not much used because of the cliffs blocking access on the east and the dense brush and wet ground to the west. Only one small pool was deep enough for bathing. Fishing may be possible at the lower end of the gorge. The top of the cliff on the east side offers a nice view of the gorge, and is a local party place. Some trash was seen.

LULLS BROOK GORGE

An interesting place, bigger and more diverse than you usually find in this part of the state. No single feature is extremely fine but taken together the site is above average and we rate it as more than locally significant.

There is a proposal to build a hydropower project* here, with a 15 foot high dam just below the Route 5 bridge. The majority of the cascades would be bypassed by a penstock, although a minimum flow would be required in the bypassed area.

* * *

Summary: Rural setting, average rocks, average botany, some wildness, some trash, clean or mildly polluted water, no swimming, possibly some fishing. Threatened by a hydro proposal.

*NOTE: Hydro project under construction in 1985.

Plants of Lulls Brook Gorge

Bryophytes

Myurella sibirica	? from Pottiaceae
Grimmia alpicola	Anomodon attenuatus
Mnium sp.	Bracthythecium populeum
Timmia megapolitana	Bracthythecioum ? plumosum
Amblystegium sp.	Plagiochila asplenioides
Marchantia polymorpha	

Vascular Plants

Lonicera morrowi	Plantago major
Cynanchum nigrum	Aster umbellatus
Parthenocissus quinquefolius	Bromus ciliatus ?
Elymus riparius	Toxicodendron radicans
Solidago flexicaulis	Aralia racemosa
Galium mollugo	Aster lateriflorus
Eupatorium rugosum	Anemone virginiana
Eupatorium maculatum	Aquilegia canadensis
Taraxacum officinale	Glechoma hederacea
Cystopteris fragilis	Myosotis scorpioides
Onoclea sensibilis	Impatiens sp.
Oxalis europaea	Erigeron canadensis
Aster cordifolius	Erigeron annuus
Aster puniceus	Juncus sp.
Geranium robertianum	Tsuga canadensis

Report 76, Sumner Falls, Connecticut River, Hartland, Windsor County, Vermont, and Plainfield, New Hampshire

Site Q, visited a number of times 1981-1983 by J.C. Jenkins and P.F. Zika.

A set of rapids with several low falls, famous for rare plants.

Atlas map 16, USGS Hartland 7.5' quadrangle. Take Route 5 about one and one-half miles north of Hartland; immediately after crossing the interstate look for a dirt road to the right which leads to the falls.

* * *

The area is really a set of whitewater rapids. The site consists of low rocks and small falls in the Connecticut River. The falls are a maximum of three feet high. It is a sudden and dangerous set of rapids, probably Class IV at moderate water and Class III at low water. Boaters have been hurt here, but most of the accidents probably resulted from people encountering the rapids accidentally rather than from people deliberately seeking difficult water.

The ledges on the sides of the river are important sites for rare plants, and have been much studied. The New Hampshire side has <u>Tofieldia glutinosa</u>, several interesting sedges, and two species of <u>Astragalus</u>. The Vermont side lacks these but does have nice colonies of two asters, <u>Aster linariifolius</u> and <u>Aster tradescantii</u>.

The site is rated as high importance for the rare plants; it is also a favorite fishing and swimming spot.

* * *

Summary: Wooded site setting, interesting and dangerous rapids, average rocks, exemplary botany with many rare species, fairly wild, some trash, mildly polluted water, good swimming, popular site for boating, fishing, swimming and botany.

HIGH IMPORTANCE: Botanical site and whitewater area.

BASIN 14: Stevens River, Waits River, Wells River and Ompompanoosuc River

Including the following sites:

Lower Falls of Union Village	Ompompanoosuc River, Thetford
Upper Falls of Union Village	Ompompanoosuc River, Thetford
West Branch Falls	Ompompanoosuc River, Thetford
Covered Bridge Falls	Ompompanoosuc River, Thetford
Boltonville Falls	Wells River, Newbury
Barnet Falls	Stevens River, Barnet
Old City Falls Ravine	Old City Branch, Strafford

This is an elongated basin in eastern Vermont that combines five different watersheds between Thetford and Barnet. It is a hilly rather than mountainous part of the state with few elevations much over 2,000 feet and much of the land cleared for farming. Hence, all the falls are on middle-sized alluvial streams and not on small mountain or headwaters streams.

Most of the falls and gorges in this watershed are small or medium-sized sites. A number of them are of moderate importance because they are of high quality or have some special features. Two of them are large spectacular sites.

This basin is not one that we know well personally and we do not have any feeling for how many other sites might exist that have not been studied. The maps do not show much very steep terrain along the major streams, and therefore, large falls and gorges may be uncommon here, and most of the major sites already known.

Report 77, Lower Falls of Union Village, Ompompanoosuc River, Thetford, Orange County, Vermont.

Site E, surveyed 6 October 1983 by P.F. Zika.

Several small cascades.

Atlas map 22, Strafford 15' quadrangle. Drive north from Union Village to the Corps flood control dam. Cross the dike and turn north on a hidden road behind a brick building; 0.9 miles down this road is a turnoff to the left (west) for a picnic area. The cascades are a short walk to the west of the parking area. The property is in public ownership - The U.S. Corps of Engineers.

* * *

The site is in an open part of the river floodplain above the flood control dam and about one and one-quarter miles from Union Village. There is a picnic area, a few pines and oaks, and a big sandy bluff over the river.

The Ompompanoosuc is a medium-sized alluvial river, from 25-35 feet wide near the site. The water is fairly clean. Aquatic insects are present.

The site is about 200 feet long and consists of many small cascades from one to six feet high, interspersed with islands and low ledges. In many places the river is divided into several braided channels.

The rock is a grey-blue phyllite from the Devonian Gile Mountain formation. There are no potholes or sculptured rocks, but much of the rock near the bottom of the cascades is rippled. The rock is not limy.

The plants are ordinary. Mosses are scarce and no collections were made.

The picnic ground gets moderate use, but there is no trail from it to the cascades and they do not appear to be much of an attraction. In summer, the river is too low for swimming or fishing.

The cascades are attractive, but not special.

* * *

A hydroelectric project is proposed for the Union Village Dam; if the project is carried out, this area will be flooded.

* * *


LOWER FALLS OF UNION VILLAGE

Summary: Rural site, not near any buildings, nice rocks, average botany, moderately wild, clean site, clean water, popular for picnics, parties, spring fishing, scenery; threatened by a hydro project.

Vascular Plants of the Lower Falls of Union Village

Cornus amomum
Acer negundo
Apocynum sp.
Clematis virginiana
Agrostis sp.
Athyrium filix-femina
Hypericum perforatum
Galium mollugo
Fragaria virginiana
Aegopodium podagraria
Alnus rugosa
Carex torta ?
Corylus cornuta
Bidens sp.
Rubus idaeus
Rubus odoratus
Vitis riparia
Phalaris arundinacea
Rubus allegheniensis
Ulmus americana
Spiraea alba
Salix rigida
Salix discolor
Thalictrum polygamum
Pinus strobus
Quercus rubra
Oxalis europea
Solidago graminifolia
Solidago gigantea
Scirpus atrovirens
Viola sp.
Onoclea sensibilis
Matteucia struthiopteris
Panicum lanuginosum
Poa compressa
Tilia americana

Report 78, Upper Union Village Falls, East Branch of Ompompanoosuc River, Thetford, Orange County, Vermont.

Site F, surveyed 6 October 1983 by P.F. Zika.

Two small cascades.

Atlas map 22, Strafford 15' quadrangle. From Union Village drive over the flood control dam and turn north past the brick gatehouse. Drive two miles north to a small turnout on the left (west) side of the road. Wooden steps lead west over a small rise and to the site. The area is owned and managed by the U.S. Corps of Engineers.

* * *

The site is about two miles north of Union Village, in a wooded portion of the river valley, about 75 yards from the road. There are two old foundations, perhaps mills, on the west shore of the river.

The stream is moderate-sized, with a channel about 30 feet wide near the site. It seems well oxygenated and is clean or at most very slightly polluted. Stream insects are present.

The site contains two cascades. The upper one is three to six feet wide, and drops four feet, and has sloping rock walls ten feet high on either side of it. The water has undercut the west bank and at one point the whole stream flows under a large boulder. The channel then widens and divides. The lower cascade drops about eight feet into a large pool, and has a single vertical wall about ten feet high along the east bank.

The rock is blue-grey phyllite from the Gile Mountain formation, and is of lower Devonian age. There seem to be small amounts of lime. There are a few nice rippled rocks and a single pothole.

No unusual vascular plants were noted.

Bryophytes were almost absent from the sloping rocks of the west shore, but were present on the more vertical faces above the east shore. No collections were made.

The site seems to get moderate local use. It has a trail, steps, and a garbage can.

It takes a bit of scrambling around this site to see all the pretty angles on the cascades and rocks.

This site is threatened by a proposed hydropower project at the Union Village Dam. The project would flood most of these cascades, leaving only about four feet of the upper cascade above water.

UPPER UNION VILLAGE FALLS

* * *

Summary: Woodland setting, nice rocks, average botany, moderately wild, clean site, mildly polluted water, fair swimming, locally popular for scenery, picnics, parties, fishing; threatened by a hydroelectric project.

Vascular Plants of Upper Union Village Falls

Cornus amomum
Aster lateriflorus
Aster divaricatus
Dryopteris marginalis
Aquilegia canadensis
Betula papyrifera
Betula alleghaniensis
Acer saccharum
Fragaria virginiana
Lonicera morrowi
Athyrium filix-femina
Alnus rugosa
Galium sp.
Solidago gigantea
Solidago graminifolia
Plantago major
Poa compressa
Rubus allegheniensis
Populus deltoides
Osmunda regalis
Prunus virginiana
Tussilago farfara
Pinus strobus
Polypodium virginianum
Ulmus americana
Tilia americana
Panicum lanuginosum
Thelypteris phegopteris
Spiraea alba
Prunella vulgaris
Viola sp.
Taraxacum officinale
Pyrola elliptica
Rubus idaeus

Report 79, West Branch Falls, West Branch of the Ompompanoosuc River, Thetford, Orange County, Vermont.

Site D, surveyed 6 October 1983 by P.F. Zika.

A short series of small cascades.

Atlas map 22, Strafford 15' quadrangle. Take Vermont Route 132 north from Union Village; pass the flood control dam, go 1.2 miles, find a dirt road on the right, take it to the end and the cascades are downslope from you.

* * *

The site is a broad ravine in open pine-hemlock-hardwoods forest. There is another dirt road from the northeast. The nearest houses are about one-quarter mile away.

The West Branch of the Ompompanoosuc is a moderate-sized lowland river averaging 20-30 feet wide. It is fertile, has some algae and silt, and appears mildly polluted.

The site consists of several short cascades with drops of three to five feet each in the main channel. There is also a second channel, carved from rock, that is only filled at high water. There are many small potholes up to three feet across and low rock walls (ten feet high or less) on both shores.

The bedrock is a grey-blue phyllite from the lower Devonian Gile Mountain formation. It has nice ripples and quartz veins and appears to be slightly limy.

The vascular plants were ordinary.

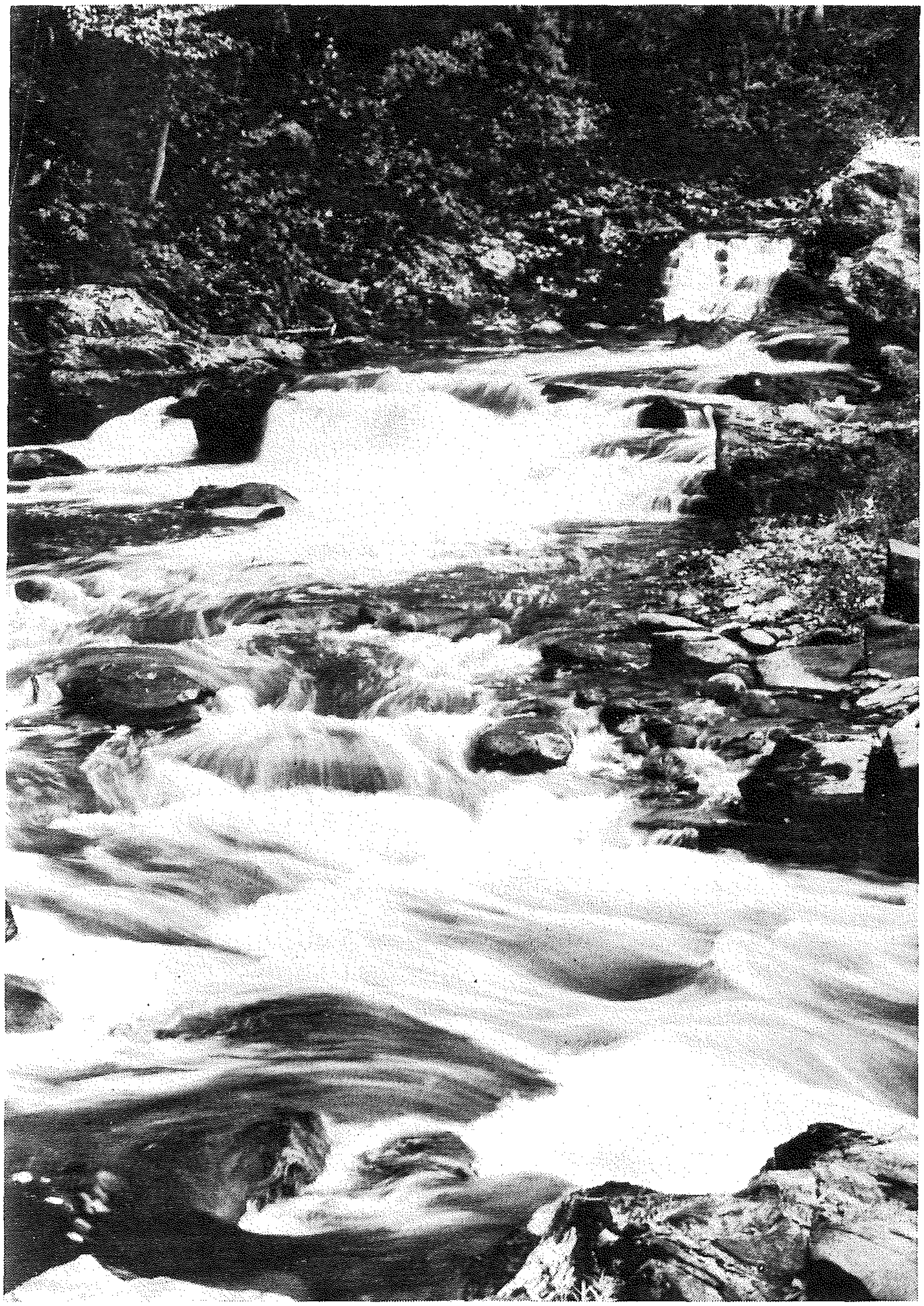
Bryophytes were common and moderately diverse. No collections were made. The site looks like a good moss area and might yield some rarities if carefully studied.

The site is a local scenic attraction, and probably a good fishing place. It is certainly swimmable but doesn't appear very deep. It is quite clean.

The proposed hydroelectric project at Union Village Dam would partially flood this site, as well as two others, one of local and one of moderate importance.

We value the site for its pretty rocks and nice open woodsy flavor; its importance comes from the seclusion, the overall prettiness, and from its local popularity.

* * *


WEST BRANCH FALLS

Summary: Open woodland setting, nice rocks, average botany but perhaps a good moss place, moderately wild, clean site, mildly polluted water, fair swimming, locally popular; threatened by a hydroelectric project.

Recommendation: We recommend that the value of the hydroelectric project at Union Village Dam be carefully evaluated to see if it is worth the loss of two waterfall sites judged important on a statewide basis.

Vascular Plants of West Branch Falls

Betula alleghaniensis
Acer saccharum
Acer rubrum
Acer negundo
Dennstaedtia punctilobula
Aster macrophyllus
Aster lateriflorus
Aster puniceus
Aster umbellatus
Aster cordifolius
Aster novae-angliae
Athyrium filix-femina
Dryopteris marginalis
Glechoma hederacea
Equisetum arvense
Glyceria sp.
Aquilegia canadensis
Fragaria virginiana
Galium mollugo
Clematis virginiana
Carex spp.
Chrysanthemum leucanthemum
Hieraceum aurentiacum
Cornus stolonifera
Lonicera X bella ?
Muhlenbergia frondosa
Silene cucubalis
Daucus carota
Lysimachia nummularia
Tilia americana
Thelypteris palustris
Solidago flexicaulis
Solidago gigantea
Solidago graminifolia
Solidago juncea
Tussilago farfara
Taraxacum officinale
Thalictrum polygamum
Phalaris arundinacea
Spiraea alba
Prunella vulgaris
Salix bebbiana
Salix rigida
Solanum dulcamara
Poa compressa
Populus tremuloides
Tsuga canadensis
Ulmus americana
Phleum pratense
Trifolium repens
Pastinaca sativa
Rubus allegheniensis
Oxalis europaea

Report 80, Covered Bridge Falls, Ompompanoosuc River, Thetford, Orange County, Vermont.

Site G, surveyed 28 September 1983 by P.F. Zika.

A series of small cascades.

Atlas map 22, Strafford 15' quadrangle. From Thetford Center take the road going west to South Strafford, go 0.3 miles and park by the covered bridge. The cascades are 100 feet south of the bridge.

* * *

The site is at the edge of the Village of Thetford, with houses, old mill foundations, the covered bridge and an abandoned dam visible from the cascades. Below the site, the stream enters a shallow ravine with young hemlock-hardwoods forest.

The river is a moderate-sized lowland stream, about 30 feet wide above the site, with an alluvial channel. It is mildly polluted, and has foam and some algae.

Below the bridge, the channel is braided and there are a number of small cascades less than three feet high and several pools about eight feet across. There are also a few small potholes.

The rocks are grey and seem to be a sandy limestone, mapped as the lower Devonian Gile Mountain formation.

No unusual vascular plants were noted.

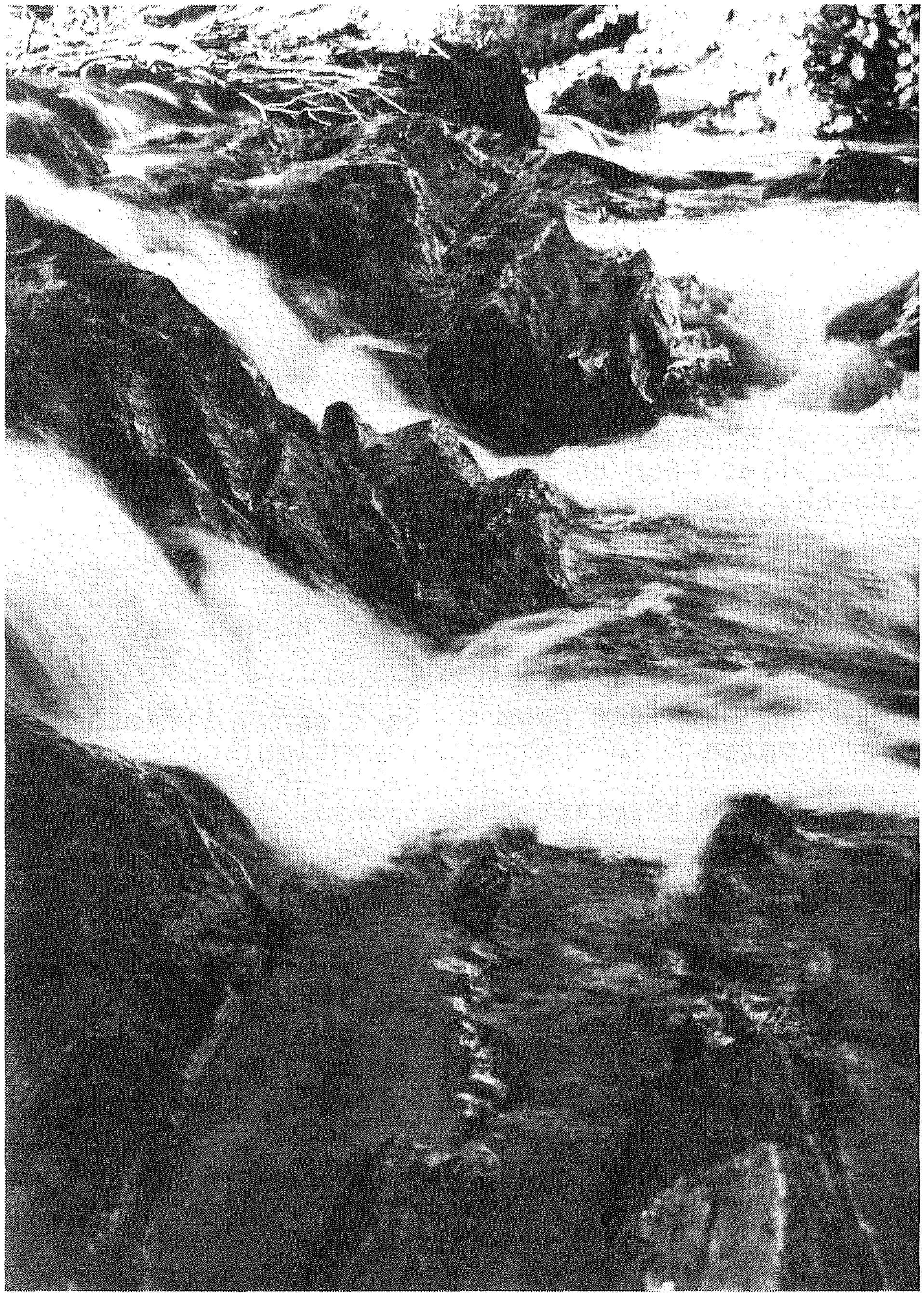
Bryophytes were not diverse or abundant. No specimens were collected.

The site gets local use. There is a parking place and a sign, possibly the only one of its kind in the state, that says there is a path where you may walk your dog. Probably average fishing.

* * *

Summary: Industrial and rural setting, average rocks, average botany, no wildness or privacy, clean site, mildly polluted water, local use for fishing and picnicking. Possibly threatened by a hydroelectric proposal.

See Appendix 4 for corrections and amplifications of this report.



COVERED BRIDGE FALLS

Vascular Plants of Covered Bridge Falls

Betula populifolia
Betula papyrifera
Betula alleghaniensis
Acer saccharum
Acer spicatum
Aster cordifolius
Aster lateriflorus
Aster divaricatus
Aster macrophylla
Aquilegia canadensis
Elymus riparius
Cystopteris bulbifera
Dryopteris marginalis
Cornus alternifolia
Athyrium filix-femina
Fraxinus americana
Impatiens sp.
Antenaria sp.
Fragaria virginiana
Cornus stolonifera
Amelanchier sp.
Alnus rugosa
Juncus tenuis
Erigeron canadensis
Tsuga canadensis
Ulmus americana
Pinus strobus
Spiraea alba
Taraxacum officinale
Rubus pubescens
Ostrya virginiana
Populus tremuloides
Vitis riparia
Parthenocissus sp.
Muhlenbergia sp.
Lonicera morrowi

Report 81, Boltonville Falls, Wells River, Newbury, Orange County, Vermont.

Site DD, surveyed 11 October 1983 by P.F. Zika.

Several small cascades and one large cascade below an abandoned power dam.

Atlas map 35, Woodsville 15' quadrangle. Take U.S. Route 302 west from I-91 and turn north at the sign for Boltonville. Within a couple hundred yards the road crosses the Wells River. The site is just downstream (east) of the bridge. Access is from the north side of the river.

* * *

The site is a former mill village with roads and houses on both sides of the river. There is an abandoned dam and penstock at the head of the cascades, and an abandoned power station below them.

The Wells River is a moderate-sized lowland river at the site, averaging 50-70 feet wide. The water looks clean but fertile and there is foam and some algae growth. It is classified as Class C.

From the bridge, the river first goes over the old dam and over some rocks and chunks of concrete, then down about ten vertical feet in a low-angle cascade, then down 25 vertical feet in a steep cascade. The last cascades narrow to about six feet wide and has 30 foot high rock walls. Below it there is a pool about 30 feet across. Below this there are ledges and wooded slopes and then the old powerhouse.

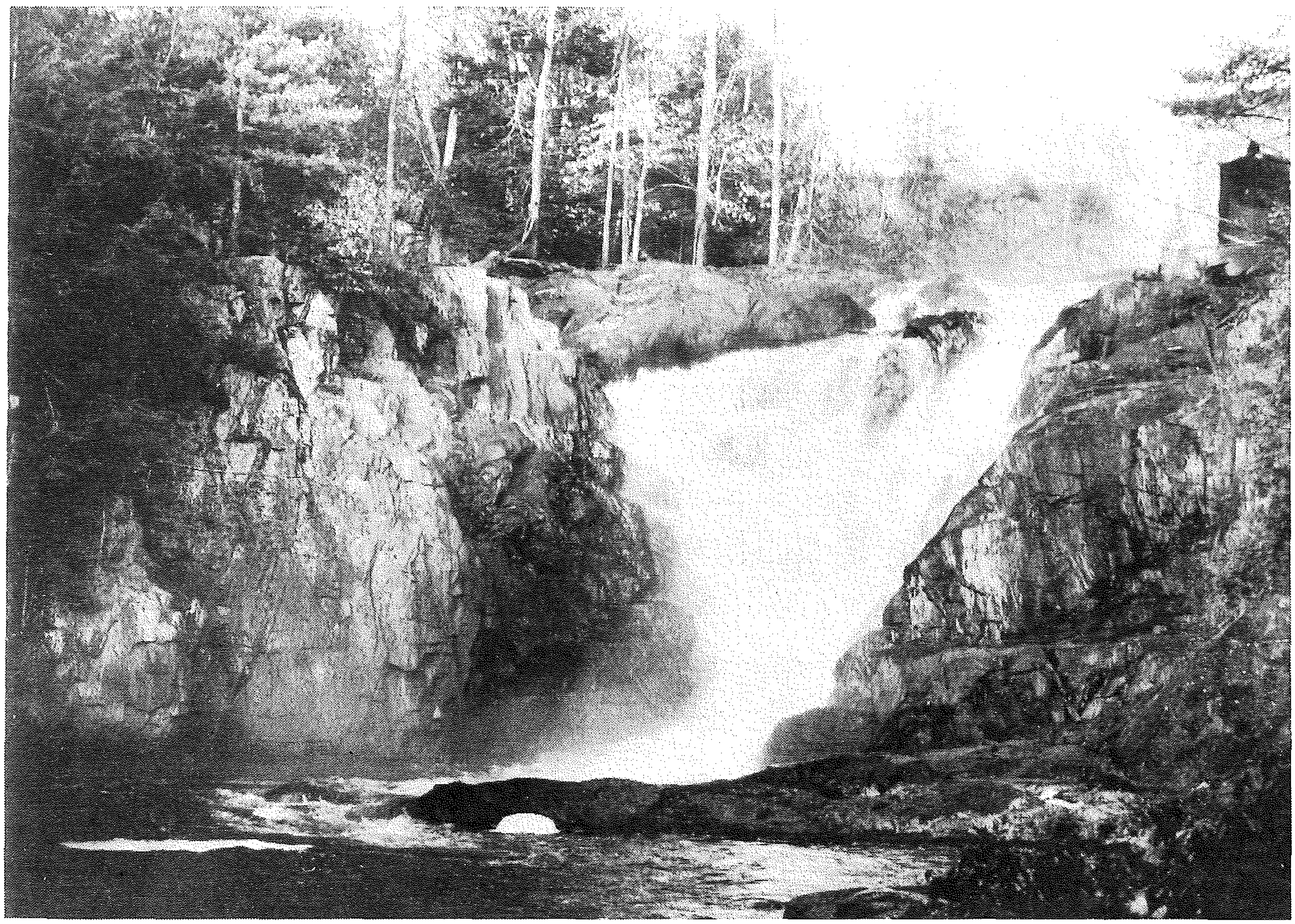
The rocks are mapped as schistose phyllite from the Albee formation, of Ordovician age. They are blue-grey, not limy, and bedded vertically. There is some ripple rock above the main cascade but no potholes or sculpture.

The vascular plants of the site are quite ordinary; only a very few species actually live on the rocky parts of the site.

The bryophytes were scattered and tended to be in inaccessible places. No specimens were collected.

The site receives some recreational use for swimming and fishing.

The main cascade is quite striking, especially for the way it narrows at the bottom. The site as a whole is marred by the old dam and the concrete in the river, but if it were cleaned up a bit and a good trail provided it might be a scenic attraction.



BOLTONVILLE FALLS

The power dam is currently being repaired, and should be in operation by May, 1984. The old penstock was replaced by a new one. The minimum flows required by the permit are said to be low, and hence, the cascades will no longer flow very much, except at high water.

* * *

Summary: Industrial setting, average rocks but an impressive cascade, average botany, no seclusion, some trash, local use for scenery, fishing, parties, and picnics. Flows threatened by a dam.

Vascular Plants of Boltonville Falls

Ulmus americana
Betula papyrifera
Populus tremuloides
Pinus strobus
Tsuga canadensis
Acer saccharum
Erigeron canadensis
Agropyron repens
Bromus inermis
Phleum pratense
Eupatorium maculatum
Eupatorium perfoliatum
Aster umbellatus
Melilotus alba
Galium mollugo
Salix rigida
Solidago spp.
Solidago rugosa
Solidago juncea
Muhlenbergia frondosa
Scirpus atrovirens
Calamagrostis canadensis
Phalaris arundinacea
Solanum dulcamara
Poa compressa
Quercus rubra
Achillea millefolium
Fragaria virginiana
Hypericum perforatum
Comptonia peregrina
Chrysanthemum leucanthemum
Acer rubrum
Salix alba or fragilis
Lonicera X bella
Antennaria sp.
Amelanchier sp.
Spiraea alba
Alnus rugosa
Salix discolor
Aegopodium podagraria
Aster cordifolius
Clematis virginiana
Abies balsamea
Cornus amomum
Elymus riparius
Rubus odoratus
Panicum lanuginosum
Solidago rugosa
Tilia americana
Corylus rostrata
Juglans cinerea
Viburnum lentago
Thalictrum polygamum
Mentha piperita
Thuja occidentalis
Vicia cracca
Rubus occidentalis

Report 82, Barnet Falls, Stevens River, Barnet, Caledonia County, Vermont.

Site N, surveyed 11 October 1983 by P.F. Zika.

Several small drops ending in a long and narrow shallow-angle diagonal cascade passing through the center of town. A unique site.

Atlas map 35, St. Johnsbury 15' quadrangle. The cascade is right in downtown Barnet. The best view of the long lower cascade is from the road running south from U.S. Route 5 on the east side of the stream. To get to the ravine below the cascade, you have to go through a yard and down a wet brushy slope.

* * *

The cascade is surrounded by houses and roads and has two bridges over it and two old mill foundations at the base of the ravine below it.

The Stevens River is a lowland stream with an alluvial channel ten to 15 feet wide below the cascades. The water is clear and perhaps mildly polluted at the site. Aquatic insects are present and some algae grow in the channel.

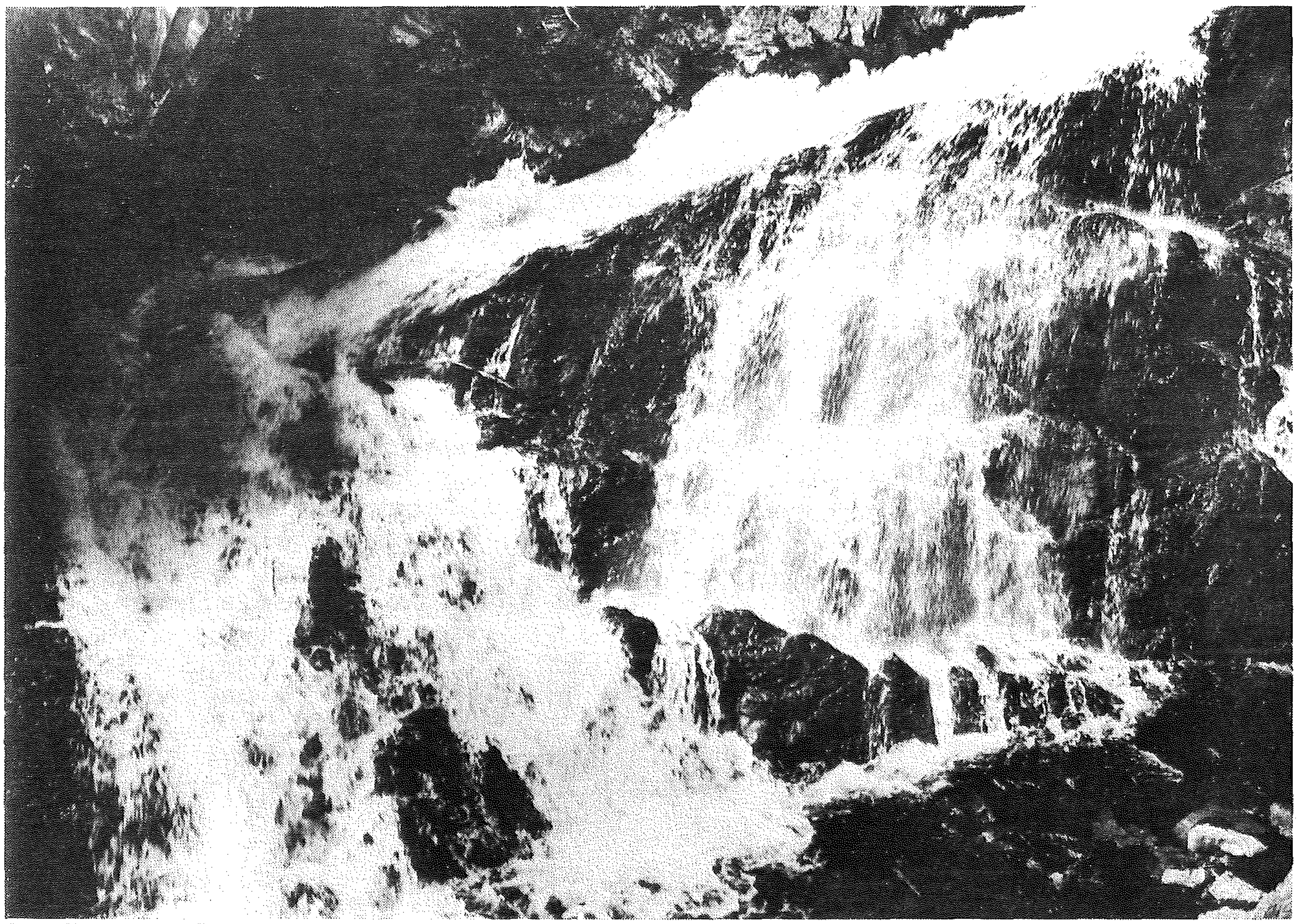
From the upper bridge, the stream descends through a few small cascades and then enters a 200 foot long rock chute that has cut diagonally across a large cliff. The chute is three to six feet wide. At the bottom of the chute, it spills sideways into three steep cascades, the largest of which is about 25 feet high. It then passes the mill sites and into the floodplain of the Connecticut River.

The rocks appeared to be a slatey phyllite and are mapped as Lower Devonian Gile Mountain formation. (Possibly the Meetinghouse member of the same formation is also present.) The bedding is nearly vertical. There are no potholes or sculptured rocks and no lime.

The vascular plants are ordinary. Bryophytes are common and moderately diverse in the ravine below the cascades. No collections were made.

The cascades are a popular scenic attraction. There is no swimming or fishing.

The main cascade is a unique and striking feature. So far as we know, there is no other long rock chute anything like this in the state. The site is not wild, but think what an exciting thing it is to have something like this in the center of town!


BARNET FALLS

A hydropower project is proposed for the site. We don't know what sort of development is planned but note that reducing the flow would reduce the visual impact and interest of the cascade*.

* * *

Summary: Urban setting, average rocks, spectacular and unique cascade, average botany, not secluded or wild, some trash, water mildly polluted, no swimming, popular scenic attraction, threatened by industrial development.

HIGH IMPORTANCE: Unique formation, very exciting and dramatic, popular scenic attraction.

*Note: The Barnet hydro project is presently (Summer, 1986) under construction. The project's minimum flow requirement over the falls should maintain some of their aesthetic value.

Vascular Plants of Barnet Falls

Rubus occidentalis
Rubus odoratus
Erigeron canadensis
Aster simplex
Aster cordifolius
Aster umbellatus
Aster lateriflorus
Solidago flexicaulis
Campanula rotundifolia
Phleum pratense
Agropyron repens
Erigeron strigosus
Thalictrum polygamum
Rorripa sylvestris
Barbarea vulgaris
Epilobium glandulosum
Lysimachia nummularia
Sagina procumbens
Mentha arvensis
Myosotis scorpioides
Muhlenbergia frondosa
Taraxacum officinale
Tussilago farfara
Eupatorium maculatum
Prunella vulgaris
Cornus amomum
Polygonum cuspidatum
Quercus rubra
Thuja occidentalis
Ulmus americana
Populus tremuloides
Tsuga canadensis
Betula papyrifera
Fraxinus americana

Report 83, Old City Falls Ravine, Old City Brook, Strafford, Orange County, Vermont.

Site 393, surveyed 12 October 1983 by P.F. Zika.

A large waterfall and several small cascades in an undisturbed wooded ravine.

Atlas map 28, Strafford 15' quadrangle. From the center of Strafford (a pretty town) take the right fork and head north; after a one-half mile turn right and follow that road uphill about 0.7 miles to a fork. Go left (northwest) and cross Old City Brook. A dirt access road on the left leads to a parking area and picnic ground. There is a sign for the trail to the falls.

* * *

The ravine is in deep hemlock woods, about 100 yards below the road and bridge. There are no houses nearby.

Old City Brook is a mountain stream, averaging about 15 feet wide, with clean cold water.

Descending the ravine from the road there are several small cascades about five feet high, then a falls about 20 feet high, then a steep cascade about 12 feet high, then a large pool, then a narrow rock chute about 30 feet long, and then another pool. There are rock walls 50-80 feet high on either side of the falls, forming a short, narrow (about 30 feet wide) rocky gap, that we choose not to list as a gorge simply because it is short.

The bedrock is mapped as the Waits River formation, of Devonian age, and may include volcanic material from the Standing Pond member of the formation. The rock is quite limy in places.

No unusual vascular plants or bryophytes were noted, but the rock walls where many of the mosses grow are inaccessible without a rope and need to be checked more thoroughly for rare species.

The falls receive heavy use by locals and tourists. The site is a popular recreation area, with picnic tables and trash barrels at the parking area, shelter from the rain, and a marked trail to the falls. Below the cascades, there are places to cool off in the water but no really fine swimming. The site was clean.

The site is close to the road but seems private and remote because of the deep woods. The falls and rock walls are very impressive and rank among our best four or five woodland falls.

* * *

Summary: Woodland setting, fine rocks, average botany, moderately wild and secluded, clean site, clean water, fair swimming, popular tourist area, good picnicking.

HIGH IMPORTANCE: Beautiful falls and rock walls, popular recreation site, undisturbed mountain woods.

Vascular Plants of Old City Falls Ravine

Tsuga canadensis
Plantago major
Aster cordifolius
Polystichum acrosticoides
Cystopteris bulbifera
Aegopodium podagraria
Heracleum maximum
Toxicodendron radicans
Thalictrum polygamum
Tussilago farfara

Basin 15: Passumpsic River and Moose River

Including the following sites:

Emerson Falls	Sleepers River, St. Johns
Mill Brook Cascades	Mill Brook, East Haven

This watershed is in northeastern Vermont and extends from Barnet to Newark and from Sheffield to Granby. Only two waterfalls are currently reported from Basin 15, but it is good mountainous rocky country and with the same schists and granites that produce good falls in other places. We assume that there are a number of falls here that have not been mapped yet.

Report 84, Emerson Falls, Sleepers River, St. Johnsbury, Caledonia County, Vermont.

Site not numbered by the state, visited on 21 July 1984 by P.F. Zika.

A large wide cascade below an inconspicuous concrete dam.

Atlas map 41, USGS St. Johnsbury 15-minute quadrangle. From the junction of Route 2 and I-91, east of St. Johnsbury, follow the interstate signs north and continue past the entrance ramps for the highway. After 0.1 mile turn at the first right (southeast). Follow this dead-end road about one-quarter mile and park at the pulloff on the left (northeast). If there are too many cars there try parking about 100 yards further down on the left, behind the old Bible Institute. The cascade and river are close to the road between the two parking areas.

* * *

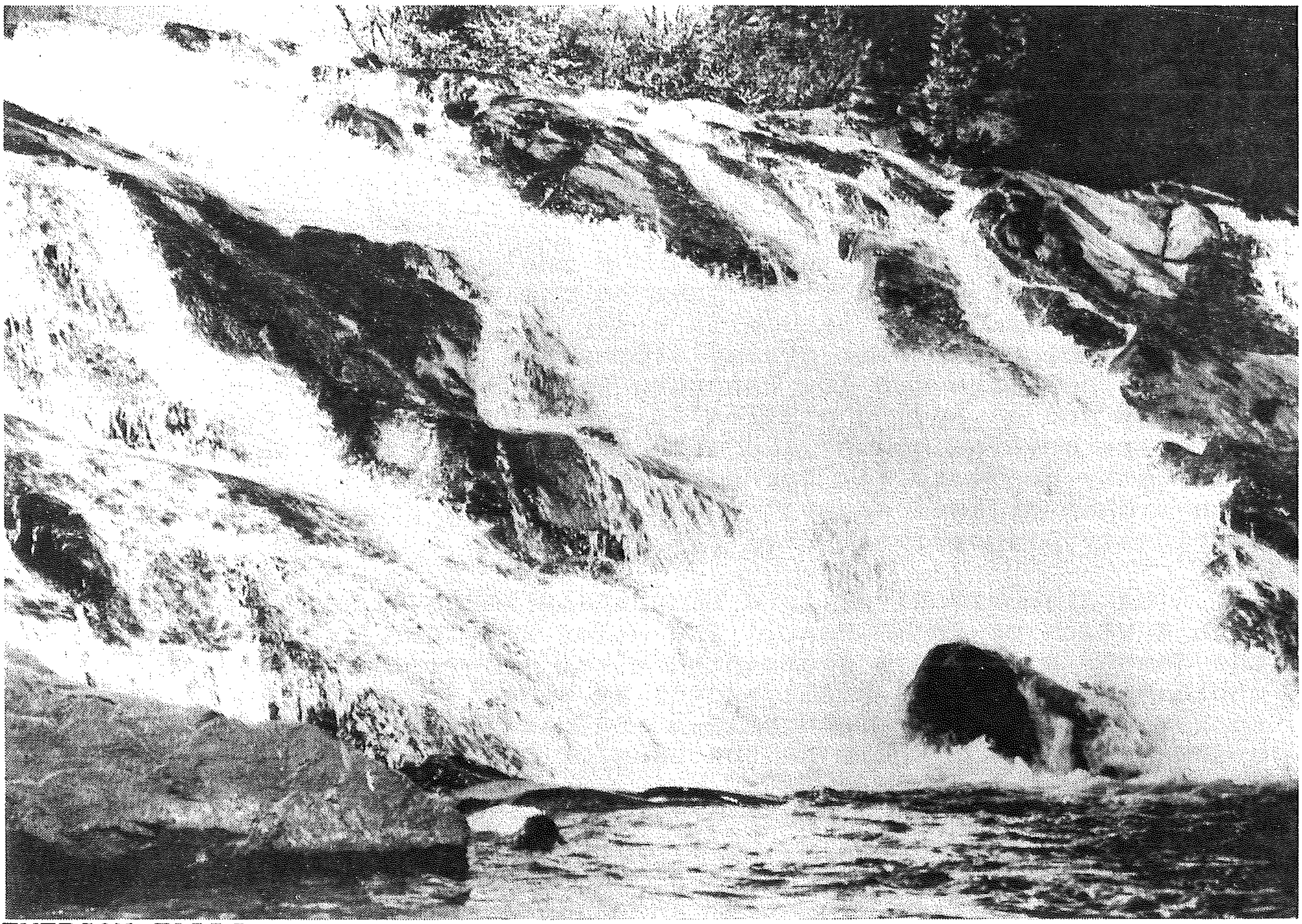
Emerson Falls are located about one-quarter mile northwest of the right-of-way of I-91, just to the west of St. Johnsbury. The north side of the stream is a dense, mixed conifer forest; the south bank has some grassy slopes and ledges with white cedar. There are two low concrete weirs near the top of the cascades and a gauging station 50 yards upstream. Downstream there are several houses, an abandoned Bible Institute which is reportedly going to get turned into an apartment complex, and then a channellized segment where the stream crosses the heroically proportioned I-91 corridor.

The Sleepers River is a moderately large alluvial stream with a width of 25-30 feet. The water is clear and clean, and in the deeper pools have a greenish tint. There is no odor or unpleasant taste. A small amount of algae grows on the riverbed rocks. The larvae of stoneflies and caddisflies were observed under a number of rocks at the base of the cascade.

About 40 yards upstream of the site is a weir made of concrete. Ten yards below this, there is an angled concrete dam with an intake for the old U.S. fish hatchery. Below this, there is a pool 25 feet in diameter, and then a steep cascade about 40 feet wide and 35-40 feet high. In the summer, the flow over the cascade breaks up into many separate small cascades, all very noisy and pretty.

At the base of the main cascade, the water runs around an island and runs through several low cascades about three feet high, and into deep pools.

At high water the flow apparently expands and the width of the main cascade is doubled.


EMERSON FALLS

The bedrock at the cascade is a resistant grey quartzite called the Crow Hill member of the Devonian Waits River formation. From the plants, we judge that there is some lime mixed with the quartzite. The rock tends to disintegrate in chunks, leaving jagged corners for the river to tumble over and supplying bathers with zig-zag staircases between the pools at the upper and lower ends of the site. The river has not smoothed the bedrock much, and there is little sculpture save for some rippled rocks and a few potholes about a foot in diameter.

The vascular plants and bryophytes at Emerson Falls are typical of wet limy sites in this part of the state. No unusual species were observed.

At the time of the visit, several families with small children were bathing in the pools, and a number of other people were sunning themselves on the ledges. From below some of them resembled walruses. There are a few fire rings around the perimeter of the site, and the island at the base of the main cascade is well trampled, suggesting that the site is popular for picnics and parties. The stream is used by fishermen. The parking area would benefit from a trash barrel.

Despite the weir above and buildings below, the cascades are very natural-looking, and quite pretty. The water quality is quite good, and the site is a fine and popular swimming hole. We rate it as highly important as a natural feature and recreation area.

This is one of the few large cascades in the state offering such clean river water for swimming so close to a municipal center. Emerson Falls is only a five minute drive from downtown St. Johnsbury, but it is unmarked and unpublicized, so apparently only the locals know which dead-end road to turn down to find it. If the land could be purchased it would make a small but effective municipal or state park.

The site is threatened with a hydro power proposal. Any decrease in the summer flows and any construction along the bank of the river would have a severe impact on the recreational value of Emerson Falls. In addition, lowered flows would probably have an adverse effect on the downstream fishery. The Water Resources Department has issued a "401" permit for this project, which provides for minimum flows to protect the fishery. How much this will effect the swimming we are unable to say.

Recommendations: Install a trash barrel. If possible, convert this into a formal scenic and recreation area.

* * *

Summary: Rural setting, average rocks, average biology, not wild or secluded, but rather a nice family swimming hole, some trash, clean water, good bathing, popular for picnics and parties, a local scenic attraction, a nice place to sit and sun, threatened with construction and flow decreases.

HIGH IMPORTANCE: Clean water, excellent swimming hole, large handsome cascade, pretty place.

Note: Hydro project has been developed since this was written.

Vascular Plants at Emerson Falls

Thuja occidentalis
Tsuga canadensis
Betula alleghaniensis
Populus tremuloides
Acer spicatum
A. rubrum
Alnus rugosa
Corylus cornuta
Salix rigida
Equisetum variegatum
Hieracium piloselloides
Amphicarpa bracteata
Hypericum perforatum
Centaurea sp.
Festuca rubra
F. pratensis
F. ovina
Dactlyis glomerata
Phalaris arundinacea
Elymus sp.
Anthozanthum odoratum
Calamagrostis canadensis
Parnassia glauca
Thymus serpyllum
Vicia cracca
Solidago canadensis
S. juncea
Crataegus sp.
Zizea aurea
Thalictrum polygamum
Fragaria virginiana
Aquilegia canadensis
Pinus strobus
Tilia americana
Ulmus americana
Fraxinus nigra
Cornus stolonifera
Lonicera canadensis
L. X bella
Rubus occidentalis
Prunus virginiana
Cystopteris bulbifera
Smilacina racemosa
Ranunculus acris
Daucus carota
Carex aurea
C. flava
C. hystericina
C. granularis
Agrostis sp.
Poa compressa
Juncus dudleyi
J. sp.
Sphenopholis intermedia
Lobelia kalmii
Chrysanthemum leucanthemum
Taraxacum officinale
Tussilago farfara
Lysimachia nummularia
Aster umbellatus
A. puniceus
A. macrophylla
Eupatorium maculatum
Trifolium pratense

Report 85, Mill Brook Cascades, Mill Brook, East Haven, Essex County, Vermont.

Site not numbered by the state, visited on 27 July 1984 by P.F. Zika.

A long series of small cascades and pools. No dam.

Atlas map 50, USGS Burke 15-minute quadrangle. From the Town of East Burke, take Route 114 north to Lost Nation Road, which is the first right after passing the boundary between East Haven and Newark. A short distance down this dirt road, cross the bridge and park. The cascades are a short distance upstream. There is an old logging road and fisherman's path on the east side of the stream.

* * *

The land surrounding Mill Brook Cascades is dense boreal forest, used for pulp production, hunting, and fishing. Currently there are no farms, although there is an old barbed wire fence at the top of the cascade. Except for the road and some mossy stumps from an old cut, there are few traces of man here.

Mill Brook is a small stream, about five to 12 feet wide at the site. At the time of the visit, the water was a bit brownish, perhaps because of a recent rain. There is a moderate amount of algae on the rocks near the top of the cascade, and lots of moss on the rocks in the channel. Stonefly and mayfly larvae are present at the base of the cascade series and blackflies are abundant. The water tastes good. In dry weather, the stream must get very low.

The site consists of a series of low-angle cascades with pools up to 12 feet across, with a total drop of some 150 to 200 vertical feet. At various points there are low rock walls on one side of the brook, but these are never more than about six feet high. The bed of the stream is mostly bedrock. In contrast, the banks are mostly a rough till with numerous angular and loose stones protruding, and this makes walking along the stream difficult in places.

The bedrock at Mill Brook Cascades is variable and is probably a contact zone between two or three rock types. Metamorphic layered rock near the top of the cascades (especially on the banks) is Lower Devonian phyllite or schist from the Gile Mountain or Waits River formations. A reddish, blocky stone is prominent in many places, with concoidal fractures and small caves. It is possibly greywacke or quartzite from the two previous formations, or, more likely, Devonian Standing Pond Volcanic member hornblende or lava.

The plants of Mill Brook Cascades are the normal species of northern spruce woods. Bryophytes are abundant as a ground cover in the forest. The species seen are tabulated at the end of this report.

Mill Brook is accessible by road, but it is in a part of the state distant from population and tourist centers, and is unknown and unlikely to ever receive much use. Several of the pools are deep enough for shallow bathing. There is a bit of fishing above the falls according to the report filed by the Department of Fish and Game, and it is possible that brook trout reproduce in some of the pools.

It is an attractive site. No single feature is spectacular, but the site is completely undeveloped and feels remote and undisturbed. We rate it as moderately important; there are only a few major cascade chains in the state, and while it is possible that there are others like the Mill Brook cascades in this portion of the Northeast Kingdom, until we have explored and mapped others, we have to regard it as a unique feature in this part of the state.

The site is threatened by a hydro proposal: we oppose this until we know more about how many sites of this type there really are.

* * *

Summary: Woodland setting, average rocks and biology, wild, private, clean site, clean water, seldom visited, threatened with a dam.

Vascular Plants of Mill Brook Cascades

Betula alleghaniensis
Fraxinus nigra
Tsuga canadensis
Picea rubens
Populus grandidentata
Acer pensylvanicum
A. spicatum
A. rubrum
A. saccharum
Thuja occidentalis
Prunus serotina
Vaccinium myrtilloides
Viburnum alnifolium
Taxus canadensis
Athyrium filix-femina
Cystopteris bulbifera
Polypodium virginianum
Osmunda claytoniana
Thelypteris phegopteris
Polystichum acrosticoides
Gymnocarpium dryopteris
Prunella vulgaris
Prenanthes altissima
Oxalis montana
Streptopus roseus
S. amplexicaulis
Clintonia borealis
Trillium undulatum
Tiarella cordifolia
Rubus pubescens
Thalictrum polygamum
Actaea rubra
Veratrum viride
Brachyeletrum erectum
Medeola virginica
Chimaphila umbellata
Trientalis borealis
Cypripedium acaule
Monotropa uniflora
Viola sp.
Galium aparine
Pyrolla elliptica
Elymus virginiana
Goodyera tesselata
Mitella nuda
Aster acuminatus

Some Bryophytes of Mill Brook Cascades

Bazzania trilobata
Ptilimnium crista-castrense
Dicranum spp.
Hylocomnium splendens
Climaceum sp.

Basin 16: Upper Connecticut River and small tributaries.

Including the following sites:

Sutton Brook Falls	Sutton Brook, Barnet
Glen Falls	Glen Falls Brook, Fairlee

See the appendix for:

McIndoe Falls	Connecticut River, McIndoe VT, and Monroe, NH
Cow Meadow Ledges	Dieing Branch, Barnet

Basin 16 extends for about 120 miles along the Connecticut River in northeastern Vermont. All the sites we looked at are in the south half of the basin; at present the north half is unknown. Some of the most remote and untravelable mountain country in Vermont lies in the upper Nulhegan watershed in the upper part of this basin, and it is possible that there are a number of interesting sites in the basin which haven't been found.

Report 86, Sutton Brook Falls, Sutton Brook, Barnet, Caledonia County, Vermont.

Site 992, surveyed 11 October 1983 by P.F. Zika.

A series of small falls and cascades crossed and altered by Interstate 91.

Atlas map 35, USGS St. Johnsbury 7.5' quadrangle. From the Town of Barnet, go north on U.S. Route 5 about 1.5 miles, and at the second I-91 overpasss, you take a secondary road west. The cascade is on the south side of this road. Part of it is above I-91, part replaced with a culvert, and part below I-91.

* * *

The site is in open birch-hemlock woods, with no houses near. There are excellent views of the highway embankments and culverts.

Sutton Brook is a lowland stream averaging two to five feet across, with a narrow floodplain below the lower falls. The water is clear and odorless and seems to be clean, but no insects other than caddisflies were found.

Above the interstate, there is a 20 foot high cascade; below it there are several low cascades and a seven foot high falls with a 20 foot pool below it.

The rocks are micaceous schist with almost vertical bedding, mapped as the Gile Mountain formation, of lower Devonian age. There are no potholes, rippled or sculptured rocks. The rock is slightly limy.

The vascular plants at the site itself are quite ordinary and not diverse. On a sandy bank 30 yards above the brook <u>Aster undulatus</u> and <u>Lechea intermedia</u> occur in good numbers. Both are uncommon in northern Vermont.

Mosses were common and moderately diverse. No rare species were seen.

The upper site is rather ugly because of the logging and the highway, and does not seem to receive much use. The lower site is cut off from the surface roads by the highway and is only lightly used by fishermen and hunters.

* * *

Summary: Woodland setting, poor rocks, average botany, varying from no seclusion or wildness at the upper site to moderately wild below the highway, clean site, clean water, no swimming, barely used.

SUTTON BROOK FALLS

Plants of Sutton Brook Falls

Bryophytes

Myurella sibirica
Brachythecium oxycladon
Pohlia wahlenbergii
Amblystegium riparium
Unknown fron Dicraniaceae
Coniocephalum conicum
Mnium sp.
Climacium dendroides
Thujidium sp.
? Isoptyrigium sp.
Eurynchium riparioides
Brachythecium sp.
Dicranum fuscescens
Cephalozia sp.
Plagiochila asplenioides

Vascular Plants

Tsuga canadensis
Betula alleghaniensis
Acer spicatum
Pinus strobus
Solidago flexicaulis
Aster puniceus
Eupatorium maculatum
Scutellaria lateriflora
Cystopteris bulbifera
Barbaria vulgaris
Rubus odoratus
Polypodium virginianum
Dryopteris marginalis
Oxalis montana
Plantago major
Chrysanthemum leucanthemum
Taraxacum officinale
Poa pratensis
Aster cordifolius
Dryopteris intermedia
Epipactis helleborine
Myosotis scorpioides

Report 87, Glen Falls, Glen Falls Brook, Fairlee, Orange County, Vermont.

Sites II and JJ (the Vermont Atlas incorrectly implies there are two waterfalls on Glen Falls Brook), surveyed 28 September 1983 by P.F. Zika.

A short gorge and large high-angle cascade.

Atlas map 28, Mt. Cube 15' quadrangle. From the fishing access on the west side of Lake Morey walk south past a gravel pit on the right (west) to a tennis court on the left (east). Opposite the court are two converging paths leading west 0.1 mile to the the falls.

* * *

The site is a wooded mountainside ravine, in hemlock forest, about 200 yards from the shore of Lake Morey. There is a small water supply dam above the ravine and there are many summer camps on the lake.

The brook is a tiny mountain stream, mostly under three feet wide, with clean cold water.

In the ravine and below the dam there is a gorge about 100 feet long by 40 feet wide with jagged vertical walls 20-30 feet high. Near the bottom of the gorge, there is a steep cascade (almost a falls) 25 feet high with a shallow pool ten feet across at its base.

The rock is schist, and is mapped as the Meetinghouse member of the Gile Mountain formation, described as schistose quartzite of lower Devonian age. It is not limy, and has no potholes or sculpture.

The site is very dark and there are only a few higher plants.

Bryophytes were moderately common along the stream and on the gorge walls. No collections were made.

The site does not have an obvious access trail and appears not to get too much use. There is no fishing or swimming, but there are some nice views from the edge of the gorge.

A pretty place, quite undisturbed, and probably impressive at high water.

* * *

Summary: Woodland and mountain setting, average rocks, average botany, moderately wild and private, clean site, clean water, no swimming or fishing, amount of local use unknown, large cascade in a natural setting.

Vascular Plants of Glen Falls

Tsuga canadensis
Betula alleghaniensis
Acer pensylvanicum
Dryopteris intermedia
Lonicera canadensis
Aster cordifolius
Aster divaricatus
Hamamelis virginiana
Polystichum acrosticoides
Solidago caesia

GLEN FALLS

Basin 17: Lake Memphremagog Basin

Including the following sites:

Falls of Black River	Black River, Coventry
Willoughby River Falls	Willoughby River, Barton
Great Falls of the Clyde	Clyde River, Charleston

This basin includes the watersheds of the Black, Barton, Clyde, Willoughy, and Coaticook Rivers in far northeastern Vermont. Much of the basin is remote, mountainous and poorly known. The three sites we studied are all in lowland portions of the basin, and it is quite likely that there are a number of unknown sites in the uplands.

Report 88, Falls of Black River, Black River, Coventry, Orleans County, Vermont.

Site N2, surveyed 6 October 1983 by J.C. Jenkins.

A small falls in a short wooded ravine.

Atlas map 56, USGS Irasburg 15' quadrangle. Visible from Route 14 about 14 miles north of Coventry.

* * *

Site is in rural countryside, 50 feet from the road, in a wooded ravine about 50 feet deep. There are no buildings near but there are some large chunks of concrete left over from a former bridge near the falls.

The river is a medium-sized alluvial river, averaging 50-75 feet wide, carrying agricultural run-off, but supposedly no municipal pollution.

There is a single falls about five feet high and 60 feet wide. The rock is blue schist (Cambrian Hoosic schist); there are a few rock walls to ten feet high along the banks of the ravine and a few ledges near the stream but, by and large, the area is not rocky.

The gorge has young second-growth woods of cedar, pine, hemlock, elm and birch; older woods occur upstream. There is not much habitat for plants around the falls and only a few species occur, none of them rare or distinctive. No lists were made.

There is a path to the falls and some litter; I think they are used for a fishing and swimming place. They are nice but not of striking beauty or attractiveness.

* * *

Summary: Rural falls, average rocks, poor botany, no seclusion, largely unlittered, clean water, fair swimming, probably good fishing, not threatened.

Report 89, Willoughby River Falls, Willoughby River, Barton, Orleans County, Vermont.

Site H, surveyed 6 October 1983 by J.C. Jenkins.

A small cascade with some pretty rocks at the edge of the Village of Orleans.

Atlas map 56, USGS Memphremagog 15' quadrangle. The falls are just upstream from where the river crosses a side street east of the settled part of Orleans.

* * *

The site is in a rural area at the edge of Orleans; it is in second-growth hardwoods in a shallow ravine (about 20 feet deep); there are houses within 100 yards of the falls but not directly visible; and there is a paved road 50 yards away and a dirt road right beside them.

The stream is a medium-sized alluvial river about 30 feet wide near the falls. It does not receive any official pollution (that is pollution for which the state has given a permit) but looks a little suspicious and in the past has had occasional high coliform count and may receive raw sewage and agricultural wastes here and there.

The cascade is about 100 feet wide, 30 feet long, and four feet high. It is formed by ledges angling across the stream. Below them is a chute about 100 feet long with some separated ledges and rock faces to ten feet high along the west side. The whole area is about 200 feet long.

The rock is a dark gritty limestone (Barton member of the Devonian Waits River limestone) with beds of phyllite. There are no major potholes or sculptured features, but the rocky surface is nicely rippled and rather handsome.

Most of the rocks are covered at high water and there are comparatively few good places for plants to grow so there are only a few species despite the lime. No rarities were seen, and the diversity is low.

In the spring, rainbow trout from Lake Memphremagog migrate up the Willoughby, and many people come here to watch them jump the falls.

The falls seem to be a popular picnic, swimming and fishing place. Visually, they are pleasant but not striking, a nice place for the edge of town but not exceptionally beautiful or dramatic.

* * *

Summary: On the edge of town, average rocks, average botany, no seclusion, fairly clean, mildly polluted water, used for fishing, swimming and picnics; very popular spot for watching the spring migration of rainbow trout.

Plant Lists for Willoughby River Falls

Vascular Plants

- Betula populifolia
- Acer saccharum
- Phleum pratense
- Agrostis sp.
- Poa compressa
- Populus deltoides
- Rubus flagellaris
- Fragaria americana
- Acer rubrum
- Ulmus americana
- Carex torta
- Taraxacum officinale
- Salix rigida
- Cornus stolonifera
- Athyrium filix-femina

Mosses

The collections seem to be lost. We recall the following:

- Hygrohypnum sp.
- Grimmia sp.
- Ceratodon purpurreus
- unknown from Pottiaceae

A fairly small and ordinary moss flora.

Report 90, Great Falls of the Clyde, Clyde River, Charleston, Orleans County, Vermont.

Site 150, surveyed 6 October 1983 by J.C. Jenkins.

A large vertical-walled gorge in limestone, with several waterfalls, damaged by a dam and powerplant.

Atlas map 57, USGS Memphremagog 15' quadrangle. Immediately upstream from Lubber Lake and accessible from the road to the hydroelectric plant.

* * *

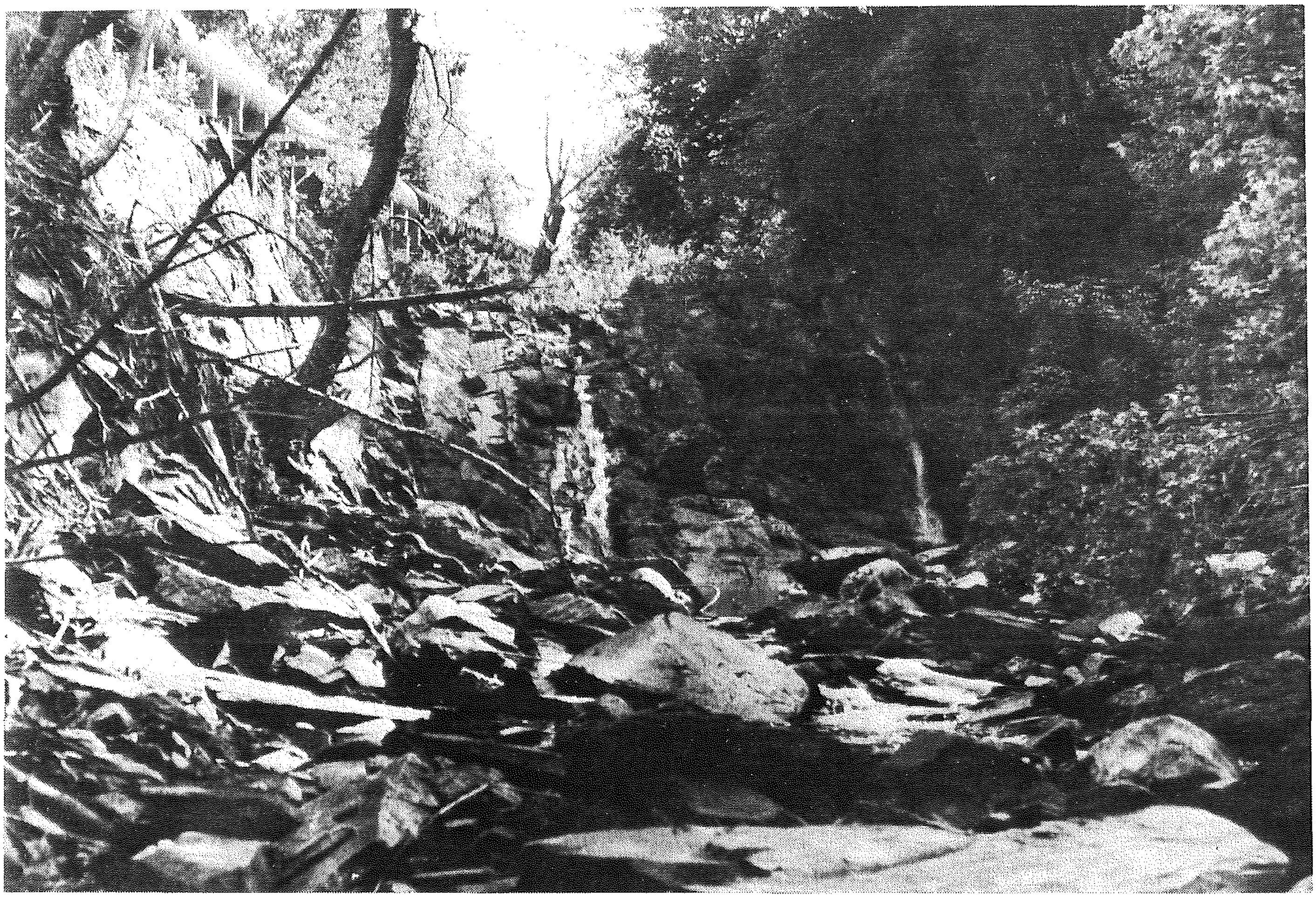
The site is in a rural area; the surrounding land is partly woods, partly fields. The mouth of the gorge opens into Lubber Lake. There is a dam (eight feet high by 40 feet long) at the head of the gorge that diverts water into a penstock. The penstock (part wood, part replaced with steel) runs right along the east side of the gorge and in places, the gorge wall was blasted away to provide an even grade. There is a powerhouse at the foot of the gorge, a second building for diesel generators, a large surge tank, an oil tank, roads, fences, etc.

The Clyde River is a small or medium-sized stream, averaging 15 feet wide in the gorge. It receives treated wastes from Island Pond and agricultural runoff along its length. The water appears clean but there is much algal slime on the rocks in the channel.

The gorge is 800 feet long, 40-60 feet wide, and 40-60 feet deep. It has vegetated rock walls 20-50 feet high. Starting from the dam and descending the gorge there is a low-angle cascade about 200 feet long, a falls or steep cascade about 20 feet high, a pool about 20 feet across below the falls, and then a series of boulders and small pools to the mouth. The total drop is about 75 feet. It is an interesting place, with some nice rocks, but certainly not beautiful.

The rock is a gritty black limestone mixed with phyllite (Barton River member of the Devonian Waits River limestone). It is rippled in a few places, but mostly breaks off in small, sharp-edged chunks rather than wearing away and forming sculptured surfaces.

The gorge is most notable for the plants. It has no rare species but there are striking displays of ferns and mosses on moist walls on the west side. The diversity of mosses is good; 30 species were recorded and others are doubtless present. This is a good number for a relatively small site, and places the gorge among the 15 richest sites noted in this survey.


GREAT FALLS OF THE CLYDE

The gorge gets no use. It is an attractive place (more for the vegetation than the rock, though the black limestone is unusual), but suffers from the low summer flows which dry it out, and the clearing and blasting of the east side to install the penstock. (Which might have been averted if the engineers had been sensitive to the natural beauty and willing to pay the price of a more indirect line for the penstock.) It must have been a very striking place before it was developed.

* * *

Summary: Industrial setting, average rocks, exemplary botany, no trash, no wildness or seclusion, no users, degraded from former condition by construction of hydroelectric project. Large limestone gorges are rare in Vermont and this one is important because it has an excellent flora; the site is altered and not very wild, but the gorge is valuable nonetheless.

Plants Seen

Mosses and Liverworts

Brachythecium sp.	Brachythecium salebrosum
Grimmia alpicola	Eurynchium riparioides
Plagiochila asplenioides	Preissia quadrata
Drepanocladus adjuncus	Ceratodon purpureus
Fissadens taxifolius	Campylium sp.
Myurella sibirica	Climacium dendroides
Bryum sp.	Amblystegium tenax
Coniocephalum conicum	unknown from Pottiaceae
Hypnum lindbergii	Thujidium sp.
Hedwigia ciliata	Mnium punctatum
Mnium sp. (single-tooth)	Porella platyphylloides
Tortella tortuosa	Amblystegium riparium
Amblystegium ? fluviatile	Anomodon attenuatus
Bryum pseudotriquetrum	

Vascular Plants

Adiantum pedatum	Lycopus uniflorus
Fragaria vesca	Hypericum virginicum
Aralia racemosa	Prenanthes sp.
Cerastium vulgare	Galium sp.
Salix bebbiana	Cirsium vulgare
Muhlenbergia mexicana	Cornus amomum
Solidago flexicaulis	Cystopteris bulbifera
Thelypteris phegopteris	Thuja occidentalis
Bidens cernua	Mentha arvensis
Athyrium felix femina	Osmunda regalis
Osmunda claytonii	Thalictrum polygamum
Agrostis sp.	Aster lateriflorus
Dryopteris marginalis	Solidago caesia
Clematis virginiana	Pilea pumila
Ulmus americanum	Acer rubrum
etc.	

APPENDIX 1

List of Sites Searched For But Not Located

Roaring Branch Falls	Roaring Branch, Sunderland (See Appendix 2)
Bailey Falls	Hancock Branch, Hancock
Cow Meadow Ledges	Newbury, site FFF
Mill Brook Falls	Westfield

APPENDIX 2

Sites Not Qualifying as Waterfalls, Gorges or Cascades.

Including the following sites:

Hemlock Gorge	Potter Hollow Brook, Pownal
Imaginary Falls of the Roaring Branch	Roaring Branch, Sunderland
Gully Brook Ravine	Gully Brook, Castleton
Big Branch Ravine	Big Branch, Mt. Tabor
Troy Four Corners Swimming Hole & Jay Branch Gorge	Jay Branch, Troy
Cady Falls	Lamoille River, Morristown
Bethel Falls	White River, Bethel
Wardsboro Brook Ravine	Wardsboro Brook, Jamaica
McIndoe Falls	Connecticut River, Barnet, VT and Monroe, NH

These are sites that were surveyed and found not to contain waterfalls or gorges in our sense of the word. Some of them are important natural areas. The Big Branch and the Roaring Branch are both very pretty places and popular hiking and camping areas. The Wardsboro Brook Ravine is a similar place that is used locally for bathing and swimming. The Jay Branch Gorge doesn't appear to have a waterfall or dam but is a pretty place with good swimming and a nice local natural area.

Report 91, Hemlock Gorge, Potter Hollow Brook, Pownal, Bennington County, Vermont.

Site 622, surveyed 17 October 1983 by J.C. Jenkins.

A wooded ravine with limestone outcrops; not a rock-walled gorge and so briefly noted here.

Atlas map 1, USGS North Pownal 7.5' quadrangle. Take Skipparee Road north from North Pownal, keeping to the left to enter Potter Hollow. Gorge (assuming that we were given the correct location) lies about one-half mile west of the road, below the point where the brook crosses the road.

* * *

The site is in a small wooded ravine in farm country.

The stream is a small mountain brook under ten feet wide. The water is clean.

There is a wooded ravine about 50-100 feet deep with hemlocks and hardwoods. In places there are limestone outcrops under five feet high or flat exposures of limestone in the stream bed. There are no falls or large pools.

A quick survey of the vegetation didn't yield any rare species. No lists were made.

Area is used by cows and fishermen. It is pretty but not striking, and similar to many other sites. It is a nice place to walk.

* * *

Summary: Wooded gorge without rocky walls, really not eligible for this study: rural-woodland setting, hardly any rocks, average botany, moderately secluded, no trash, clean water, barely used.

Report 92, Imaginary Falls, Roaring Branch, Sunderland, Bennington County, Vermont.

Site DDD, surveyed 9 October, J.C. Jenkins.

A place where a falls was supposed to be but wasn't.

Atlas maps 5-6, USGS Sunderland 7.5' sheet. North of Kelly Stand road.

* * *

The site is in a steep wooded mountain ravine. The Roaring Branch is a mountain stream about ten to 25 feet wide with very clean water and a boulder-filled channel, in hemlock-hardwood woods. There was supposed to be a falls along the road but I made two attempts and never found it. A pretty stream, jumbled and sparkling, in National Forest, a favorite camping place, boulder pools to swim in, but no real cascades or drops that I have found.

* * *

Summary: Woodland setting, nice rocks, no falls or gorges, average botany, wild but not secluded, very little trash, very clean water, much used for fishing and camping, not really eligible for this study.

IMPORTANT RECREATIONAL AREA.

Report 93, Gully Brook Ravine, Gully Brook, Castleton, Rutland County, Vermont.

Site 859, surveyed 27 July 1983 by P.F. Zika.

A mountain ravine with a very small cascade on an intermittent stream.

Atlas map 13, Poultney 7.5' quadrangle. Take Vermont Route 4A west from West Rutland, go 3.5 miles, take the second left; cross the Castleton River (a creek), go a mile; there are new roads and some development on the left and a farmhouse on the right. Ask at the farmhouse and walk west across the field to the ravine.

* * *

A nice mountain ravine, thickly wooded and private, with a small clear stream and very clean water and a very small cascade. The site is not a gorge and the cascades are too small to qualify for this study.

No unusual vascular plants were seen at the site.

Bryophytes were common on rocks in the channel and on low outcrops.

The falls receive light use by bushwhackers, hunters, and the like. The shallow water would prevent any swimming or fishing. Very little trash was seen. Some of the slopes had been logged within the last fifteen years.

* * *

Summary: Mountain setting, poor rocks, average botany, very wild and private, clean, very clean water, no swimming, not used.

Vascular Plants of Gully Brook Ravine

Cryptotaenia canadensis
Cystopteris bulbifera
Eupatorium maculatum
Fragaria virginiana
Dryopteris marginalis
Acer saccharum
Betula alleghaniensis
Tilia americana
Thelypteris phegopteris
Acer pensylvanicum
Laportea canadensis
Actaea sp.
Oxalis montana
Fagus grandifolia
Arctium sp.
Polypodium virginianum
Prunella vulgaris
Tussilago farfara
Solanum nigrum ?
Trifolium repens
Crataegus sp.
Aster lateriflorus
Solidago rugosa
Solidago juncea
Matteucia struthiopteris
Athyrium filix-femina
Panicum lanuginosum
Amphicarpa bracteata
Erigeron annuus
Plantago rugelii
Cystopteris bulbifera
Prenanthes altissima
Cystopteris fragilis
Asplenium trichomanes
Agrostis sp.
Solidago gigantea
Phalaris arundinacea
Galium triflorum
Fraxinus americana
Betula lenta

Report 94, Big Branch Ravine, Big Branch, Mt. Tabor, Rutland County, Vermont.

Site 611, surveyed 9 October 1983 by J.C. Jenkins.

Large mountain stream in very large wooded ravine; not a falls or a gorge, but a striking place anyway.

Atlas map 10, USGS Wallingford 15' quadrangle. You can enter the ravine from below where it crosses the National Forest road, or bushwhack down to it from further up the road.

* * *

The ravine is a major cleft, about 700 feet deep, in the western scarp of the Green Mountain Plateau. The surrounding land is all National Forest. The National Forest road runs along the north slope of the ravine; it crosses the stream near the bottom of the ravine and then parallels it for two miles, running about one-quarter to one-half mile north of the stream and about 200 feet upslope.

The river is a large mountain stream over 25 feet wide, with a uniform boulder-filled channel and very clean water. A few ledges ten to 25 feet high occur along the edges but in general the ravine is wooded rather than rocky. The stream bed is almost entirely of boulders from three to 15 feet high, averaging five to eight feet high. There are only a few cobble bars, and almost no sand or gravel deposits at all. It is one of the most consistently rocky streams I have seen in Vermont.

The rock is principally the Cambrian Cheshire quartzite, with small exposures of dolomite near the bottom. Many of the boulders are schists and gneisses carried down from above.

There are no major falls or cascades. Small pools (ten to 20 feet by two feet deep) are common and there are small falls where the boulders are piled up. The height of these falls would vary with the amount of water; at low water they were under two feet high.

At the lower end of the gorge, flat slabs of quartzite tilted at 45 degrees are exposed; they look like a series of saw-teeth pointing upstream.

The quartzite breaks off in chunks but does not wear away: the ravine has chunky walls and rounded boulders but no potholes or concave or rippled surfaces.

There are comparatively few vascular plants in the ravine, owing to the scouring, lack of sand or gravel, and the way the woods come right down to the edge of the stream. I noted a few asters and grasses; the list could be lengthened by more searching, but this is an inhospitable place for higher plants.

The moss flora is also limited. The ravine as a whole is not mossy - it is mostly woods and boulders, and so good habitat is limited - but where moist vertical rocks occur, there are good colonies of a few species. Altogether, about 20 species were recorded, all common ones.

The ravine is an important recreation area; it is big, rugged, more or less trailless, sunny, private, handsome, and actually not far from a road. Hence, it is a favorite with backpackers and fisherman that want to get a little bit away from the trails and shelters and have a place to themselves. It probably doesn't get very heavy use and is quite clean.

It is also a very enjoyable place: you stand there and are impressed by the simplicity of the idea - a lot of trees and a big mountain and a lot of round rocks - and enjoy all the water and have the place to yourself, and have the sense that it reaches up into the mountains and you can keep going for an hour or so and it will look just the same and you don't have to worry about coming out in a picnic grounds or forest-improving clear cut or remote lake with 50 camps and waterskiers.

Land owned by National Forest.

* * *

Summary: Mountain setting, fine rocks, average botany, moderately to very wild and private, no trash, very clean water, light but very enthusiastic use by campers and fishermen.

HIGHLY IMPORTANT NATURAL AREA (though not a waterfall or gorge): wild spectacular place, popular with hikers and fishermen.

Plants From Big Branch Ravine

Mosses and Liverworts

Pogonatum alpinum	Mnium punctatum
Plagiochila asplenioides	Scapania nemorosa
Ptilidium pulcherrimum	Thujidium sp.
Coniocephalum conicum	Grimmia alpicola
Mnium (double-tooth)	Lejunea cavifolia
Plagiothecium laetum	Hygrohypnum molle
Hypnum curvifolium	Bracthythecium ssp.
Dicranum montanum	Dicranum sp.
Anomodon attenuatus	Platydicta ? jungermannioides

Vascular Plants

Hemlock-northern hardwoods forest

Aster umbellatus	Aster divaricatus
Agrostis sp.	Carex torta
Aster acuminatus	etc.

Report 95, Troy Four-Corners Swimming Hole and Jay Branch Gorge, Jay Branch, Jay and Troy, Orleans County, Vermont.

Site 579, surveyed 7 August 1983 by P.F. Zika.

A ravine with a pretty dam. According to the state map, there is supposed to be a waterfall here, but none was found.

Atlas map 55, Irasburg 15' quadrangle. Drive north on Vermont Route 101 four miles beyond Troy. Cross Jay Branch and take the next left (west) turn. The waterfall is supposed to be three-quarters of a mile upriver and just south of the road. No waterfall was found here. The old abandoned dam is downstream, about 100 yards west of where Route 101 crosses the Jay Branch.

* * *

The area is wooded. The banks of the stream were steep soil or ledges less than 15 feet high. Most of the channel was cobble. Some pools deep enough to allow bathing were seen. The water was clean and cool.

The drop over the old dam is about 15 feet and really quite pretty. It is set in a short stretch of rocky shore, in a hemlock grove. It is not evident that the falls are artificial until one gets quite close to them.

Three unusual vascular plants were found at the upper site where the waterfall was supposed to be. About 30 plants of <u>Vaccinium caespitosum</u>, a bilberry restricted to river gorges and alpine zones, were found on a mossy rock by the stream. About 50 plants of <u>Aster tradescanti</u>, another river gorge species, occurred on ledges nearby. And finally a small grass that may be the rare alien <u>Agrostis canina</u>, currently known from a single station in Vermont, was found on a single boulder in the stream channel. <u>A. canina</u> is known from a single site in Vermont currently. No unusual plants were seen at the dam in Troy.

This is a very pretty site and certainly a locally important natural area.

* * *

Recommendations: This site should be rechecked next year with more precise locality information to see if there are really some natural falls, natural area, two rare plants and one scarce plant.

Broyphytes From Troy Four-Corners Swimming Hole

Pogonatum urnigerum
Bryum sp.
Ceratodon purpureus
Climaceum sp.
Dicranum sp.
Thuidium delicatulum
Fissedens adianthoides

Report 96, Cady Falls, Lamoille River, Morristown, Lamoille County, Vermont.

No site number; surveyed 28 September 1983 by J.C. Jenkins.

Not really a falls but rather a cascade over flat ledges below a dam on the Lamoille River.

Atlas map 47, USGS Hyde Park 15' quadrangle. Located below the dam at Lake Lamoille.

* * *

Site is not really a falls or gorge and so briefly noted. There is a dam 18 feet high by about 175 feet long feeding an abandoned powerstation one-quarter mile downstream by a penstock. Below the dam, the river cascades over flat ledges for about one-qiarter mile in a wooded gorge 30-60 feet deep. The river looks seriously polluted, though officially it shouldn't be. The site is industrial and not very attractive. The cascade has comparatively few species of plants and none of these are of interest except a small aster that grows on the ledges and needs checking next season. It might be <u>Aster</u> <u>tradescantii</u>, a rare and somewhat ill-defined species, but it also might be a dwarfed form of a common species.

Report 97, Bethel Falls, White River, Bethel, Windsor County, Vermont.

Surveyed 12 September 1983 by J.C. Jenkins.

A messy site below a dam, without any falls to speak of.

Atlas map 20, USGS Randolph 15' quadrangle. Site is right in the middle of town.

* * *

The White River runs in a ravine about 100 feet deep through the Town of Bethel; in the middle of town there is a dam about 15 feet high by 70 feet long. Below the dam are a few rocks which form a cascade perhaps 20-30 feet long; this was the closest thing to a falls there. The rocks are slimy and smell. There is no official discharge of sewage or treated waste in the vicinity, but clearly there are some pipes going into the river, and unofficially the water is a mess.

The rock is a quartzite, mapped as the Harlow Bridge member of the Ordovician Missisquoi formation. Nothing much grows there.

Report 98, Wardsboro Brook Ravine, Wardsboro Brook, Jamaica, Windham County, Vermont.

Site OO, surveyed 9 October 1983 by J.C. Jenkins.

Wooded ravine with boulder-filled channel, not rock-walled.

Atlas map 7, USGS Saxtons River 15' quadrangle. About one-half mile upstream from the confluence of Wardsboro Brook and the West River.

* * *

Wooded ravine at the edge of the West River Valley, about 50-100 feet deep, with pines, oaks, hemlocks, hardwoods. Road from 100-300 feet away upslope. Houses near but not in sight.

River is a medium-sized upland stream, over 25 feet wide in the ravine, with very clean water.

Site is not properly a rock-walled gorge or cascade or falls. It is a rather wide, flat section of the river just above where it enters the floodplain of a larger river, and where it has already decreased its slope and so is depositing all the pieces of mountains it brings down in the spring. There are individual boulders to ten feet in diameter, numerous boulders to four feet in diameter, and bars of stones about four to eight feet long. Most of the rocks are freshly ground and clean and showy; all different schists, quartzites and gneisses occur, and there is probably a piece from every formation in the southern Green Mountains somewhere here.

There are few bedrock exposures; at one point there is a flat cascade about 100 feet long with a few shallow pools, but otherwise it is a boulder rather than a bedrock channel. No falls or major pools occur.

There are comparatively few plants, probably because the area is battered and scoured in the spring; the major species noted were:

Elymus riparius	Apocinum cannabinum
Agrostis sp.	Aster puniceus
Aster simplex	Aster lateriflorus
Aster umbellatus	Muhlenbergia frondosa
Carex torta	Osmunda claytoniana
Solidago rugosa	Solidago gigantea
Athyrium filix-femina	

All of these are very common species.

Very little moss habitat: species diversity low, no rarities noted, no list made.

Good bathing and probably a popular but not heavily-used recreation area. No garbage.

Not really eligible for the gorge listing but still an interesting area, one of the sorts of places that is very characteristic of the southern Green Mountains. Nice and sunny, and might be good whitewater in the spring. I especially liked all the different colors of rocks.

This is the bottom pitch of an important Class IV whitewater run. See the 1985 report <u>Vermont's Whitewater Rivers</u> by Jenkins and Zika for details.

* * *

Summary: Woodland setting, nice rocks, average botany, some seclusion, no trash, very clean water, probably light to moderate recreational use, part of an important whitewater run, natural area, high importance as part of a whitewater run.

Report 99, McIndoe Falls, Connecticut River, Barnet, Caledonia County, Vermont, and Monroe, Grafton County, New Hampshire.

Site U, surveyed 11 October 1983 by P.F. Zika.

A hydropower site; the falls have been obliterated.

Atlas map 35, St. Johnsbury 15' quadrangle. From U.S. Route 5 turn east to the Village of McIndoe Falls and cross the river into Monroe, New Hampshire. Just over the bridge is a small gatehouse and road leading south along the river. All of the rocks in the riverbed below the dam are accessible from there at low water.

* * *

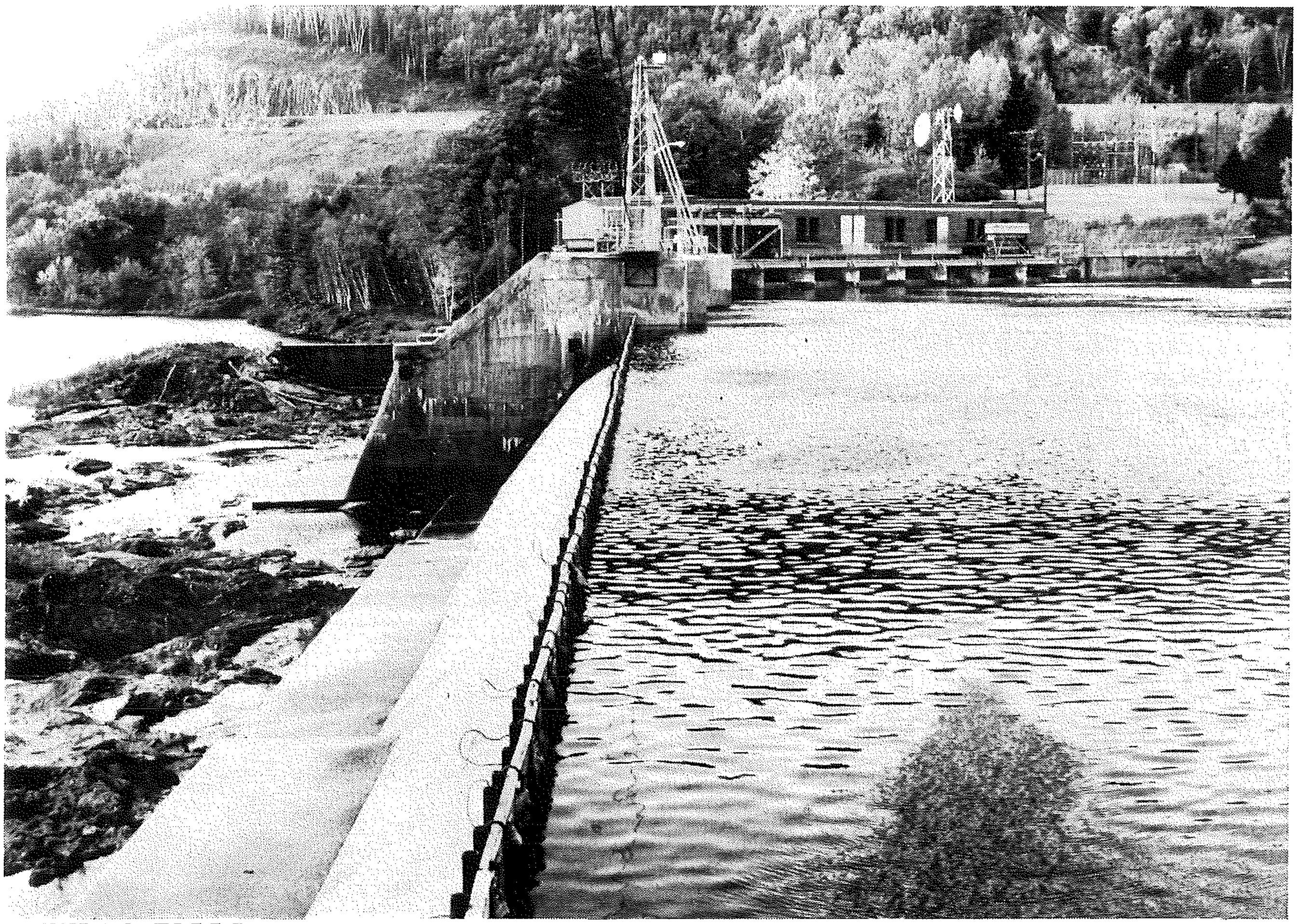
An industrial site in agricultural countryside on a big river.

Below the dam, a 70 to 100 foot wide ledge runs from a concrete wall on the New Hampshire shore to the outlet from the powerhouse on the Vermont side. Ninty-five percent of the river flow during the visit was through the powerstation. The only evidence of the former falls is some ripple rock in the center of the river, below the floodgates.

The vascular plants are characteristic of limy cobbles and ledge along the Connecticut River. Most of the species reported are from the sandy shore or crevices of the rocky island just east of the powerstation. The rare vetch <u>Astragalus alpinus</u> was collected in Barnet at the turn of the century, possibly at this site. Although suitable habitat was present, no individuals were found. Currently there are no known stations for <u>A. alpinus</u> in Vermont.

* * *

Summary: Industrial setting, average rocks, average botany, no seclusion or wildness, some trash, mildly polluted water, ? fair swimming, some fishing, lots of boating, not scenic.



McINDOE FALLS

APPENDIX 3

Waterfalls and Gorges That Have Not Been Surveyed

1. Sites from the state waterfall list not reached in the 1983 survey.

Downer Glen	Bourne Brook, Manchester
Mill Brook Falls	Mill Brook, Westfield (not located 1983)
Warren Falls	Mad River, Warren
Bailey Falls	Hancock Branch, Hancock (not located 1983) (possibly on Robins Branch)
Potters Pond Falls	? Potters Pond Brook, Irasburg (mismapped, real location unknown)
Abby Pond Falls	Ripton
Lewis Creek Gorge	Starksboro

2. Additional sites reported during and after the study.

Putnamville Falls	Middlesex
Bittersweet Falls	Weybridge
Pauls Falls	Hinesburg
Rocky Dale Falls	Starksboro (may = some site we have done)
Bristol Cliff Falls	Bristol
Web Falls (two sites)	Granville
Riverton Falls	Berlin
Site for Anemone multifida	Burlington and Colchester
Site for Astragalus robbinsii	Colchester and South Burlington
Shepherdia Gorge	Williston
Lye Brook Falls	Manchester
Huntington Falls	Weybridge & New Haven
Vergennes Falls	Vergennes
Intermittent falls at important botanical sites	Smugglers Notch
	Job's Pond
	Willoughby
	Mt. Equinox
Beldens Ravine	Otter Creek, New Haven
Falls on Hancock Brook	Worcester
The Flues	Shepherd Brook, Fayston
Cow Meadow Ledges	Newbury (Site FFF)
Dewey's Mills	Cascade at head of Quechee Gorge
Tabor Branch of the Waits	East Topsham
East Putney Falls	Putney (GGG)
Kingsbury Branch	East Calais (HHH)
Sacketts Brook	Putney
Thatcher Brook	Waterbury
Halifax Falls	

Mill Brook Falls	Westfield (Site L)
Black River	Irasburg, Intersection Routes 14 and 5
Cascade in Montgomery	
Butternut Hill Cascade	Warren
Mill Brook headwaters	Fayston, Mad River Glen Ski Area
Stone Arch	Mad River, Warren
Halls Brook	Concord
Beaver Brook Gorge	Wilmington, Beaver Brook
Cascading Waterfalls	Dover
Adams Hole, Joes Brook	Danville
Mill Brook	Between Long Pond & Willoughby
North Branch Winooski	Worcester
Unnamed Stream (tributary of Winooski)	Middlesex (near Route 2, State Highway garage)
Browns River Falls	Westford Town
Middlebury Falls	Middlebury (Otter Creek)--"Frog Hollow"
Mill Brook	Danby Village
Mill Brook	Danby Four Corners, at the high bridge
West Hill Covered Bridge	Montgomery
Rock River Falls	Williamsville
Falls Brook	Williamstown
Cascades	Carinthia Ski Area, West Dover
Hartshorn Falls	Lincoln Brook, Warren
Waterfall on the Upper Mad River	Warren (just above juncture with Austin Brook)
Folsom Brook Waterfall	Waitsfield (below Bundy Art Gallery, behind Madbush Chalet)
Waterfall on unnamed tributary of Mad River	Waitsfield (at Lareau's swimming hole)
Slide Brook Waterfalls and water slides	Warren
Lincoln Brook Waterfall I	Warren (200' above confluence with Mad River)
Lincoln Brook Waterfall II	Warren (1 mile north of Lincoln Gap Road, north of Hanks Brook)
Lincoln Brook Waterfall III	Warren (1/10 mile above #II)
Lincoln Brook Waterfall IV	Warren (1/10 mile east of Addision/Washington county line)
Stetson Brook Waterfall	Warren (1/4 mile west of Rte 100)
Mills Brook Waterfall	Warren (1/4 mile above confluence with Mad River)
Sterling Brook Cascade	Stowe, ("good hike" above Sterling Brook Gorge)
"Cueto" Falls	Tucker Brook, Hardwick (just above confluence with Alder Brook), north of Hardwick Lake

APPENDIX 4

Corrections and Amplifications

Thetford Center Falls

Jerry Jenkins, November 18, 1986

1. Introduction

The following document is a review of the features and comparative importance of a waterfall in Thetford Center, Orange County, Vermont. It was prepared at the request of Steve Sease of the Vermont Agency of Environmental Conservation, for reasons explained below.

* * *

Thetford Center Falls is on the main stem of the Ompompanoosuc River, 0.2 miles southwest of Thetford Center on the Rices Mills road. It is the same as the 'Covered Bridge Falls' of the report, The Waterfalls, Cascades and Gorges of Vermont (Jenkins & Zika, 1983).

The falls are a steep cascade about 45' high. There is a low dam about three feet high at the crest of the falls, and the foundations of a 19th century mill on the east bank. The west bank is wooded, and there is a path here that is used by walkers and fishermen. Some of the land, on one or both banks, is owned by the state and used as a recreation area. The Sayers Bridge, a covered bridge built sometime after 1839, is about 25 yards above the falls.

The dam, which is said to have been breeched in the 1927 flood, formerly raised the water level some two to three feet above the current summer level.

The falls were used for hydropower early in this century. The power plant was at the old mill site, and seems to have had a single small turbine. It was abandoned after the 1927 flood, and the site has been unused since then.

There is a proposal currently before the Federal Energy Regulatory Commission to restore the dam to its former height, place a buried penstock on the west side of the stream below the falls. I have not seen any detailed plans, but have been told that the proposed power station would have a peak capacity of 300kw, and would be operated as a 'run-of-the-river' plant which would maintain a constant level in the impoundment and do only limited generation during the summer months.

The federal licensing process requires that Vermont certify that the proposed plant will meet the state's water quality standards. Recently the state refused this certification, arguing that the site was unusually scenic, and that the proposed plant would do unacceptable damage to its aesthetics. This is the first time that the state has refused a water quality permit on aesthetic grounds alone.

The site was examined in September 1983 by my colleague Peter Zika. He visited it at low water, and considered it a series of small separate cascades, without features of great scenic or biological interest, and close enough to a settlement that it was not important as a wild site.

When it was re-examined by the Vermont Environmental Agency in connection with the proposed power plant they noted that at higher water the cascades merged and became an impressive continuous cascade. They also were impressed by the juxtaposition of the falls and covered bridge, and considered that the nearness to the village center and the existence of state-owned land at the site made it important for recreation.

Currently the state's denial of a water quality permit is being appealed. To aid them in preparing for the appeal the Environmental Agency asked me if I would review the site, and determine how many known sites were comparable to it. To do this I visited the site, reviewed the notes that Peter Zika and I have collected on some 70 other Vermont waterfalls, and visited eight other waterfalls in Windsor and Orange Counties in order to make direct comparisons.

2. Observations on the Thetford Center Falls

The cascade is between 40 and 50 feet high; the slope declines gradually at the bottom, and so the exact boundaries are hard to fix. The rocks are massive, jagged, and angular, with very little sculpture. From the east bank the mill foundations and an island interfere with the view and you can only see a part of the cascade any time. From the west bank the view is much better and from here the cascade and bridge are well displayed and quite handsome.

The cascade is in fact interrupted in several places, but from below it appears continuous, and it certainly falls within the limits of what we have called single cascades elsewhere. The description of it in the waterfall and gorge report as a series of small cascades was based on observations at low water and is incorrect. Cascades of this size are unusual features, and as such it must automatically be considered of either moderate or high importance in the state.

The Ompompanoosuc is a moderate sized stream: the drainage area at the site is about 60 square miles.

The general setting of the cascades is rural, with several houses and a moderate amount of cleared land nearby. There are woods above the bridge and on the west bank, but the site is open enough that there are nice views of the valley and the adjacent hills. Thus this is what we have called an 'open site', where you have long views and a sense of the surrounding lands and where the falls can be seen from some distance away. Such sites contrast with closed or forested sites where a falls is completely in the woods and usually commands no view and often cannot be seen itself until you are right at its base.

I am not certain how much of the site is flooded by the flood control dam at Union Village. I have been told that the pool extends only to the base of the falls, but the USGS map (South Strafford 7.7 foot quad) shows a pool of 564 feet, which is about five to ten feet higher than the crest of the falls. Sediment and flood-carried debris are deposited in the stream channel for at least a mile above the dam, and hence it appears that the site and the stream above have been flooded at times, even if only occasionally.

It is worth noting that the four miles of the Ompompanoosuc above the cascades are a well known Class II-III whitewater run, with challenging water and exceptionally undisturbed and attractive surroundings.

The cascades themselves lie in a wooded ravine. The east bank, where the mill foundations are, was formerly cleared, and has now reverted to briers and honeysuckle and young hardwoods. It is a thickety place at present and hard to get around in; with time it will be more open and the vegetation more attractive. The west bank, which is quite steep, has a natural hemlock hardwoods forest. An old road runs along this bank, and seems to be the path generally used by fishermen and visitors. It leads to some very pleasant places at the foot of the falls. There are no pools for swimming, but there are nice places to sit and fish.

I do not know how good the fishing is. The stream receives some drainage from copper mines and is said to suffer from high summer temperatures.

The covered bridge - restored in the sixties but currently in somewhat poor repair - is of an unusual type, the Haupt Truss, which contains a three course, laminated wooden arch through which both the vertical and diagonal members of the truss pass. The truss beams are rabbeted - and hence have their strength reduced by about 2/3 - where they pass through the arch, a unique and un-settling design feature which may explain why only three such bridges currently exist. The Haupt truss was designed in 1839; the construction date of the bridge seems to be unknown.

The mill foundations are made of local stone, mostly laid without mortar. No machinery seems to remain. They are overgrown with shrubs and young trees, and, if not exceptionally picturesque, are not obtrusive.

Though this report is primarily concerned with the uniqueness of the site, I would like to make on observation on how the hydropower development would alter the site.

The west bank, where I was told the penstock will go, is the area that is most used for recreation, and is the most natural part of the site and affords the best views of the falls. It is steep and ledgy. I am not sure how much blasting or construction will be involved; but any substantial amount of cut and fill here cannot help but decrease the naturalness, and hence part of the current attractiveness, of this part of the site.

3. <u>Comparison of Other Vermont Waterfalls</u>

For purposes of comparison the salient features of the Thetford Center Falls are these:

a) a steep cascade, with a more or less continuous drop of some 40 feet high or more.

b) a medium-sized stream, resulting in a cascade some 25 feet wide at the crest.

c) undeveloped, with no diversion of flow and no recent structures.

d) old mill foundations which are neither exceptionally attractive or disturbingly ugly.

e) a site that is near a village center, and is partially open, with long views.

f) a hemlock-hardwoods forest on the right bank which provide a nice place to walk and sit, and good views of the falls.

g) a covered bridge at the head of the falls.

I was asked to determine how unique these features are in Vermont. I will do this by a series of comparisons, contrasting this site to all other large falls in Vermont, to other falls near towns and villages, to other falls by covered bridges, and to five other falls which occur in the same general area as the Thetford Center Falls.

a. Large Falls & Cascades

If we count both intact falls and falls that have been incorporated into dams there are about twenty-five known Vermont falls that are 20 feet or more high. These can be divided into groups. The first group contains the falls on small streams, mostly in wooded ravines in the mountains. Few of these falls were good mill sites, and so comparatively few have been cleared and dammed. Hence most of the falls in this group are still more or less natural.

Large Falls and Cascades on Small Woodland Streams

Glen Brook (Fairlee): tiny stream, 25 feet.
Baldin Brook (Wolcott): tiny stream, 50 feet high, dammed.
Crystal Cascade (Weathersfield): woodland site, tiny stream, 70 feet high.
Thundering Falls (Sherburne): woodland site, small stream, 75 feet high.
Old City Falls (Strafford): small stream, 45 feet high.
Benjamin Falls (Berlin): small stream, many cascades totaling over 200 feet high.
Moss Glen I (Granville): small stream, 30 feet high.
Moss Glen II (Stowe): small streams, cascades total 100 feet high.
Molly's Falls (Marshfield) small stream, ca. 100 feet high, dammed and dry.
Web Falls (Granville): small stream, 25 feet high.
Hamilton Falls (Jamaica): small stream, ca. 60 feet high.
Bingham Falls (Stowe): small stream, 20 feet high
Emerson Falls (St. Johnsbury): open site, 40 feet high, undammed.

Since the first group comprises falls on small streams that are enclosed in the woods, none of these falls are really comparable in width or surrounding landscape to the Thetford Center Falls.

The second group contains falls on larger streams; most such falls have been developed as mill or hydropower sites at one time or another, and so essentially all of these sites are in the open. This group contains both sites on medium-sized streams like the Thetford Center Falls, and sites on large streams and major rivers like Woods Falls and Huntington Falls.

Large Falls on Medium and Large Streams,
Mostly in Open Landscapes

Thetford Center Falls: 40 feet, not dammed.
Big Falls (North Troy): 25 feet, not dammed.
Woods Falls (Milton): ? 20 feet, dammed.
Pierce Mill (Troy): 25 feet, dammed
North Hartland: 25 feet, dammed.
Boltonville Falls: 35 feet high, dammed.
Fairfax Falls (Fairfax): 60 feet high, dammed.
Bolton Falls (Duxbury): 30 to 40 feet ?, dammed.
Carver Falls (Fair Haven): 120 feet total, dammed.
Sutherland Falls (Proctor): 60 feet dammed.
Beldens Falls (New Haven): ca. 50 feet, dammed
Huntington Falls (New Haven) ? 30 feet, dammed.
Sheldon Falls (Sheldon) 30 feet ?, dammed.

(Some of the heights are uncertain because the falls have been incorporated into dams.)

Of the 13 sites in this group, 11 have dams. In some cases these dams are comparatively unobtrusive and divert little water, but in the majority of cases the landscape around the falls has been considerably altered and substantial amounts of water have been diverted. Hence at the majority of these sites you do not see natural flows over the falls in the spring, and in addition the overall naturalness of the site and often the opportunities for recreational use have been impaired.

The Thetford Center Falls stand out within this group; they are the largest undammed falls in an open landscape in the state.

b. Falls Near the Center of Towns and Villages

Many mill villages in Vermont were built around falls, so the feature is not by itself unusual. What is rare is to find an undammed fall of major size in a settled area.

The following table gives a fairly complete list of substantial falls in the center of towns and villages.

Falls and Cascades Located in Towns and Villages

Thetford Center Falls: undammed, ca. 40 feet high.
Benjamin Falls: very large cascade chain near Montpelier.
Winooski Cascades: series of low edges but very impressive.
Quechee Village Falls: small falls at head of Quechee gorge, dammed.
Barnet Cascade: unique, low angle cascade immediately below town.
Sutherland Falls: large falls, dammed and industrialized site, in Proctor.
Shelburne Falls: low cascades ca. 20 feet high in La Platte River.
Highgate Falls: cascades ca. 20 feet in town, dammed.
Richford Cascade: series of ledges ca. 15 feet high, in town.
South Londonderry Ledges: series of ledges ca. 15 feet high, in town.
New Haven River cascades: small falls and sloping cascades, in Rocky Dale.
Sheldon Falls: large falls (20 to 30 feet high) in Sheldon Springs, dammed.
Woods Falls: large falls in Milton, dammed.

The majority of these sites are either quite small, or dammed and altered, or both. Besides Thetford Center only one site - Benjamin Falls - is both large and in its natural state. Hence there are only two large falls in the state that are both near a town or village and still more or less in their natural state.

c. Association with a Covered Bridge

The Vermont Atlas lists 108 covered bridges, and I think they missed one, making 109. Checking the Atlas maps against the The Waterfalls, Cascades and Gorges of Vermont report and field notes, I find that there are only three places in the state where there is either a waterfall or a set of ledges ten feet high or more near a covered bridge.

Waterfalls and Cascades near Covered Bridges

North Hartland Falls (25 feet high cascade, major hydro site.)
Cox Cascades (Northfield Falls; low cascade ca. 15 feet, dammed.)
Thetford Center Falls (40 to 45 feet high, undammed.)

The Hartland site commands a spectacular view of the Connecticut Valley, and has very fine rock formations and a large (100 foot) covered bridge. A 0.5mw hydro plant was built there in the late 1970's; currently a second powerhouse is being built which will increase the capacity to 2mw. The site is about 300 yards downstream from Interstate I-91, and the interstate bridges and traffic are in full view. It still is a fine place, but one that has been considerably altered.

Cox Cascades were surveyed by Peter Zika in 1983; he reported them to be a somewhat junky set of small cascades. I have not looked at them but note that Peter is extremely fond of rivers and equally intolerant of even small amounts of concrete or junk, and they may be prettier, especially at highwater, than his report suggests. But they are definitely quite small.

Thus of the three Vermont falls associated with covered bridges, only those at Thetford Center are both of large size and unaffected by damming and nearby construction.

d. Comparison with Adjacent Falls

The Thetford area is unusual in that three adjacent towns contain six falls. (This is without parallel in the state: on the average we probably have something like one set of falls for every two to four towns.)

None of the five other falls are similar to the Thetford Center Falls, the others being either substantially smaller, or on small woodland streams without views, or both. The following table summarizes the features at these other local falls.

Other Falls in the Thetford Area

Glen Falls: a large arching falls some 25 feet high on a tiny mountain brook. It is set in a steep wooded ravine above Lake Morey, and is not visible until you get to the base of the falls.

Old City Falls, in Strafford: a large two-stage falls in a wooded ravine. Like Glen Falls it is completely enclosed by the trees and cannot be seen from elsewhere. It is a very handsome falls that receives much recreational use.

West Branch Falls, on the West Branch of the Ompompanoosuc in Thetford: a pair of low cascades on either side of an island. They are set in open woods, and have a view down into the open lands associates with the Union Village Dam. The cascades are comparatively small - a third the height of those at Thetford Center or less - but are very pretty.

Upper Union Village Falls, on the Ompompanoosuc about a mile below the Thetford Center Falls: a miniature gorge, scarcely 12 feet wide, with a low, sloping cascade that has carved two channels into the rocks. The site is completely enclosed in the woods and less than 100 feet long. It is a delicately made place at low water, but must be very intense at high water. The total drop here is less than ten feet.

Lower Union Village Falls, about 1/2 mile below the upper falls: a low-angle cascade some 50 yards long, with a total drop of perhaps six feet. It is next to a campground and is popular for wading and bathing, but is not particularly dramatic or well made, and in fact barely qualifies as a falls at all.

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5. Summary and Evaluation

The Thetford Center Falls are of large size, are on a medium-sized stream, near the center of a village, and command a view of open country.

About 13 falls in Vermont are approximately equal in height or larger. All the others are either dammed or altered by industrialization, or are on small mountain streams and so are not comparable in width to these falls and do not possess a view.

Further, considering all the falls in the state 20 feet high or more, besides Thetford Center there is only one other undammed site on a medium or large stream.

So far as we know there are only three falls or cascades near covered bridges in the state. The Thetford Center Falls are the largest of these, and the only one at a site that is still largely natural.

In The Waterfalls, Cascades and Gorges of Vermont report, we designate features of moderate importance if they were clear, of unusual size or structure or receive substantial amounts of public use. We designated features of high importance if they were of great beauty, or clearly unique, or were major recreational sites.

In making these distinctions, we emphasized that the distinction between a highly important site and a moderately important one is subjective and does not mean too much: both highly and moderately important sites are very scarce, and deserve to be protected wherever possible.

After reviewing Thetford Center Falls, I would rate it as a moderately important site, noting that the cascade is of impressive size but that in itself it is not as exceptional as those we rated highly important. I would further note that the presence of the covered bridge at an open, largely unaltered site is unique in the state, and would probably make the site rate highly in an inventory of scenic or historic landscapes. Our inventory was, by policy, an evaluation of natural features in themselves, and our rating of moderate importance does not take into account the bridge or the surrounding settlement.