NPS Form 10-900-b
(Revised March 1992)

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OMB No. 1024-0018

United States Department of the Interior
National Park Service

National Register of Historic Places Multiple Property Documentation Form

This form is used for documenting multiple property groups relating to one or several historic contexts. See instructions in *How to Complete the Multiple Property Documentation Form* (National Register Bulletin 16B). Complete each item by entering the requested information. For additional space, use continuation sheets (Form 10-900-a). Use a typewriter, word processor, or computer to complete all items.

X New Submission ___ Amended Submission

A. Name of Multiple Property Listing

Fish Culture Resources of Vermont

B. Associated Historic Contexts

(Name each associated historic context, identifying theme, geographical area, and chronological period for each.)

Fish Culture in Vermont, 1850 - 1943

C. Form Prepared by

name/title Liz Pritchett and Ann Cousins

organization Liz Pritchett Associates date October 1, 1993

street & number P.O. Box 108 telephone 802-229-1035

city or town East Calais state Vermont zip code 05650

D. Certification

As the designated authority under the National Historic Preservation Act of 1966, as amended, I hereby certify that this documentation form meets the National Register documentation standards and sets forth requirements for the listing of related properties consistent with the National Register criteria. This submission meets the procedural and professional requirements set forth in 36 CFR Part 60 and the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation. (☐ See continuation sheet for additional comments.)

Signature and title of certifying official — Date 2/2/94

Vermont State Historic Preservation Office
State or Federal agency and bureau

I hereby certify that this multiple property documentation form has been approved by the National Register as a basis for evaluating related properties for listing in the National Register.

Signature of the Keeper — Date of Action 3/24/94

Table of Contents for Written Narrative

Provide the following information on continuation sheets. Cite the letter and the title before each section of the narrative. Assign page numbers according to the instructions for continuation sheets in *How to Complete the Multiple Property Documentation Form* (National Register Bulletin 16B). Fill in page numbers for each section in the space below.

Primary location of additional data:

- ☒ State Historic Preservation Office
- ☒ Other State agency
- ☐ Federal agency
- ☐ Local government
- ☐ University
- ☒ Other

Name of repository:

Department of Fish and Wildlife

E. STATEMENT OF HISTORIC CONTEXT
Fish Culture in Vermont 1850 - 1943

National Context

The interest in fish culture in the United States evolved very early in the 19th century as fisheries were depleted or the numbers and size of fish became noticeably reduced. Construction of dams, land erosion associated with deforestation, pollution from mills, and indiscriminate fishing practices all took a toll on fish population, though these causes were not immediately understood. Efforts to restore fish stock in New England were recorded as early as 1819 when residents of Orange County, Vermont, transferred several species of adult fish from Lake Champlain into Otter Creek, hoping that natural breeding would renew fish population. Plantings such as this were not uncommon, but often proved to be counter-productive as no consideration was given to compatibility of species or the appropriate environment for fish types.

In the early 1850s two fish culture pioneers from Ohio, Theodatus Garlick, M.D., and H. A. Ackley, M.D., looked to European fish culture practice, and devised a method for stripping eggs, fertilizing them with sperm, and incubating the eggs in hatching jars producing fry. The first hatchery was established on Ackley's farm near Cleveland, and consisted of three ponds with a spawning channel between the two largest ponds and a hatch house built over a spring water supply.

Based on the success of Garlick and Ackley and inspired by Garlick's "Treatise On The Artificial Propagation Of Fish," published in 1858, several private hatcheries were established by the beginning of the 1860s. The most noted enterprise was a trout hatchery established in 1864 by Seth Green in Caledonia, New York. Green stated that his profit from the sale of 180,000 eggs in his first year of production was $1,000, and $10,000 in 1868 from the sale of 800,000 eggs. While Green was only in the fish egg business, others raised brook trout for market, which also proved to be lucrative. In 1865, a New York City fish market posted the price of trout as high as $1.00 per pound.

Concurrently, public interest was being awakened to the decline of fish resources, and several states initiated public fishery

programs. The first official "Fish Commission" was established in Massachusetts in 1856. The commission prepared a report summarizing European fish culture and assessing the condition of state fishery resources. A separate report by the "Commissioner for the Artificial Propagation of Fish" gave a detailed account of his efforts to hatch brook trout eggs, all of which died, as apparently did the commission for the legislature did not appoint another fish commission until 1865.

Similarly, the Vermont legislature in 1856 commissioned well-known Vermont naturalist, George Perkins Marsh, to investigate the decline of native fish populations. Marsh cited environmental factors combined with unsound fishing practices among the causes He recommended conservation legislation and a program of artificial propagation to reverse the trend. Like Massachusetts, the Vermont Legislature responded to Marsh's report with the decision that fish breeding was not "expedient in the present state of information upon the subject." (Details of Marsh's report follow in the Vermont context.)

Almost ten years later, in 1865, the New Hampshire Legislature adopted a resolution providing for the appointment of a commission to investigate the possibility of restoring the fish runs in the Connecticut and Merrimac Rivers. The resolution also called upon the other three states bordering those rivers to take like action. In response the states of Massachusetts, Vermont, and Connecticut appointed commissions.

The report of the four state commission was favorable towards attempting to restore migratory fish runs. Legislatures responded to the report by directing the commissioners to carry out measures necessary to realize the project. The Vermont commissioners were directed to introduce at state expense shad, salmon, and other desirable species of fish that were suited to conditions in the state. The term of office was five years and the biennial appropriation was $500. In 1868, Livingston Stone, a fish culturist from New Hampshire, secured 175,000 Atlantic salmon eggs from Canada. He sold 100,000 to the commissions of Massachusetts and New Hampshire for $1,600. Other small lots were raised by Stone and others in Massachusetts, New Hampshire, and Vermont. As a result of this first effort, 32,000 fish were planted. In 1870 the Vermont Fish Commission again obtained 50,000 eggs for $1,000.

As before, these were hatched and reared by hobbyists or commissioners on privately owned ponds.

By 1871, fish commissions had been established in the six New England States, New York, New Jersey, Pennsylvania, California, and Alabama. Fish culture was practiced in 19 of 37 states with more than 100 people involved either as a hobby or, as most were, commercially. Between 1866 and 1871, the eastern commissions stocked 20,000 Atlantic salmon fry in ten rivers and 30,000 in Lake Champlain, and the commissions of Maine, Massachusetts, Connecticut, Vermont, and New York hatched almost 200 million shad eggs for planting.

The founders of the fish culture movement were almost exclusively wealthy and educated men who could afford the time and expense to pursue what was initially a hobby, but soon developed into a lucrative enterprise. Professional status was achieved with the founding of the American Fish Culturists' Association in 1870 [forerunner of the American Fisheries Society]. Five leaders in the field--Fred Mather from New York, Dr. J. F. Slack from New Jersey, A. S. Collins from New York, Rev. William Clift from Connecticut, and Livingston Stone from New Hampshire--placed a notice in several eastern newspapers announcing a meeting of practical fish culturists to be held on December 20, 1870, in New York City. Three others answered the call: Dr. M. C. Edmunds of the Vermont Fish Commission, Dr. J. D. Huntington from New York, and B. F. Bowles from Springfield, Massachusetts. The group unanimously resolved to form the American Fish Culturists' Association (AFCA) "to promote the cause of fish culture, to gather and diffuse information bearing upon its practical success, the interchange of friendly feeling and intercourse among the members of the association, and the uniting and encouraging of the individual interest of fish culturists."

Next year, in 1871, following a concentrated lobbying effort by the AFCA, the Federal government initiated a program for fishery conservation when Congress authorized the creation of the Commission of Fish and Fisheries, appointing Spencer F. Baird as commissioner. Senator George F. Edmunds from Vermont was the primary supporter of the authorization and the $5,000 appropriation. Senator Edmunds was the cousin of Vermont Fish Commissioner, Dr. M. C. Edmunds. The joint resolution did not include authority to propagate fish until 1872, when an

additional $15,000 was appropriated to establish a hatchery on the McCloud River in California to provide salmon, and later rainbow trout eggs to all states. A second existing hatchery in Bucksport, Maine was provided funds for the purchase of adult Atlantic salmon. Between 1872 and 1880 the U.S. Commission stocked over six million salmon fry, with two-thirds distributed in the New England States. Eight million shad fry were released in the Connecticut River.

While Baird was specifically commissioned by Congress to introduce "foodfishes in the waters of the United States," he interpreted his authority boldly. He initiated the landlocked salmon program, the distribution of rainbow and brook trout across the nation, and the introduction of brown trout from Germany and Scotland, all intended to benefit sport fishing. This is not to say that he ignored his responsibility to provide a source of foodfish. Baird turned to Asia and Europe where the culture of carp had been practiced for several hundred years and was a thriving food industry. After two unsuccessful attempts to transport carp to the United States, the German fish culturist Rudolph Hessel arrived at New York in May 1877, with a consignment of 345 carp. The fish were temporarily held at the Maryland state hatchery until Baird obtained a special appropriation of $5,000 and authority to construct ponds on the grounds of the Washington Monument. Five years later, in 1882, Baird reported to Congress the grand results of the carp experiment, which distributed 259,000 fish to 9,872 applicants, representing 298 of the 301 Congressional districts. The success story was short lived as public enthusiasm quickly turned to criticism. Unexpectedly, the carp displaced more desirable species, and, being bottom-runners, stirred up silt and mud turning clear waterways into murky rivers and lakes. The fault of the carp experiment was that it was too successful. From the small beginning of 345 fish in the reflecting pools of the mall to 32 million pounds of carp marketed in 1967--naturalization was complete!

From 1872 to 1943, the U. S. Government established 222 Federal Fish Culture Stations. Three were in Vermont. The first federal hatchery was established in St. Johnsbury for the propagation of trout, salmon and shad. This station ceased operation in 1960, and the property was sold to the Sabin Corporation in 1961. The Federal Commission set up a field station in 1899 at Sandy Point in Swanton. At first the Federal Commission leased land from the

State of Vermont, then they purchased the property and built a new Federal hatchery in 1916. Finally the federal government sold the property back to the State of Vermont in 1954. The state continues to own the facility, but it is not in operation. (The West Swanton Fish Hatchery is listed on the State of Vermont Historic Sites and Structures Survey, #0615-44). The Pittsford fish culture station was established by the federal government as a trout hatchery in 1909. Over the years, this large complex has raised mostly brook and rainbow trout. More recently it has had the responsibility of raising landlocked salmon and lake trout for Lake Champlain. In 1977, the White River National Fish Hatchery was established in Bethel. Located on the White River, the basic responsibility of this hatchery is to hatch, raise and imprint salmon for the Connecticut River restoration program. When operating at full capacity, this station will produce more than 1,000,000 salmon smolts each year.

Transportation

For long distances, distribution and transportation of fish stock depended on the railroad. At first, fry were transported on passenger trains with an attendant who had charge of ten or twelve 10-gallon fish cans, each containing from 10,000 to 12,500 fry. It was discovered that ice and daily fresh water provided more oxygen and increased the rate of success of live transportation. As the program enlarged, whole baggage cars were packed with fish cans with a suitable number of attendants.

In 1881, the Federal Commission purchased the first of ten specially equipped fish cars for $8,000. The cars operated throughout the United States for approximately eight months of the year, serving different hatcheries according to their individual hatching and maturity schedules. The cars were generally attached at the rear of a passenger train. The fish car carried two fish tanks or racks for transporting cans, an 1100-gallon reserve water tank, a mechanical pumping systems to aerate and distribute the water, and was equipped with modern facilities, and sleeping and eating quarters for the five-man crew. The fish cars were given free passage on all land-grant railroads. Later cars featured electrical refrigeration and aeration equipment and could carry 500,000 one-inch fish or 35,000 three-inch fish. Fish cars

remained in service until after World War II when they were slowly replaced with trucks.

Airplanes were first used to transport fish in 1928 when 27,000 trout were flown from Northville, Michigan to Dayton, Ohio. Later, planes and helicopters were used to stock remote lakes and streams. In Vermont planes were used for distribution until about 1970.

For local distribution, fish cans were shipped by rail service for longer distances and by horse-drawn wagon for shorter distances. In the 1894, the Vermont Commissioners' biennial report made special mention of "the Central Vermont Railroad Company, over whose road all cans are necessarily transported for distribution on connecting lines." Gratitude was also expressed to "the American Express Company for kind service in the transportation of empty cans parcels, etc." In 1922 the state purchased the first truck for the Bennington hatchery, and in 1931-32, the Vermont Commission purchased trucks for all of the state-operated fish culture stations.

Vermont Context

As early as the beginning of the 1800s, Vermonters noticed that fish were getting smaller and that the population was decreasing, but the causes were not readily understood. There were several early attempts to stock stream beds, often inappropriately, transferring fish to waters outside their native range. In 1819 a group of citizens from Middlebury, Salisbury, Leicester, and Whiting journeyed to Lake Champlain and caught a quantity of several species of fish, which they transported to Otter Creek. The pickerel was the only species to thrive from this early planting, much to the detriment of the trout population. About 1840, muskellunge were planted in a pond near Bellows Falls, and soon became resident in the Connecticut River.

Public concern about the diminishing fish supply mounted. At least on the legislative front, that concern was rooted in economics. In 1856, the Vermont Legislature appropriated $100 and commissioned well-known Vermont naturalist, George Perkins Marsh, to investigate the probable causes of the decline and suggest remedies. Introducing the report to the House of Representatives

on October 13, 1857, Ryland Fletcher invited "the careful attention of the Legislature, relating as [the subject] does, . . .to a valuable branch of the public economy of the State." In his report, Marsh cited deforestation, erosion, chemical and agricultural waste, and indiscriminate fishing practices as causes for the decline. He further pointed out: 1) that interstate waters, by their nature, required collective action by the states, and that the possibility of cooperation was remote; 2) that regulations on the taking of fish would be required, but he doubted their effectiveness because of the extreme difficulty of enforcement; 3) that private individuals were not inclined to spend their own money if others would reap the benefit; and finally, 4) Marsh recommended that Vermont consider a program for the artificial propagation of fish, or to subsidize private fish culturists. The Vermont Legislature responded to the report with the decision that fish breeding was not "expedient in the present state of information upon the subject."

Marsh's report is interesting for its historic and cultural references. The twenty-one page document discusses the history of fish culture dating from Imperial Rome. It documents, in some detail, fish culture practices throughout the world in the 1850s. The report is especially interesting as a reflection of mid-19th century popular Romanticism. Here Marsh expressed the benefits of "getting back" to nature, "back in the woods for exercise, hardy physical habits, quickness of eye and hand." (George Perkins Marsh' house, in Woodstock, Vermont, was listed as a National Historic Landmark, June 11, 1967.)

Almost ten years later, in 1866, The Vermont legislature passed the first law to protect fisheries, which prohibited taking trout or lunge fish except during June, July and August. At the same time, the Vermont legislature appointed Albert Hager and Charles Barrett as the first fish commissioners. They were assigned to address the diminishing fish population in Vermont and to join New Hampshire, Connecticut, and Massachusetts in an investigation of restoring fish runs in the Connecticut and Merrimac Rivers. The four-state committee discussed pollution, impassable dams for spawning, mill wheels, nets and weirs, and over-fishing at the wrong seasons. Finally, the commissioners devised a plan for obtaining salmon eggs from Canada for propagation. Letters were sent out to influential citizens at various towns asking for their

support and assistance in restocking streams with salmon, shad, herring, alewife, trout, black bass, striped bass and lamprey eel!

Private individuals, mostly wealthy hobbyists, bought eggs, often with State appropriations, from commercial suppliers or hatcheries. Between 1870 and 1875, former commissioner Albert Hager hatched from 30,000 - 40,000 salmon fry and distributed them in the West and Winooski Rivers, with the greatest number going into the Williams River at Chester. The Missisquoi River was stocked with 35,000 California salmon near Highgate, and several thousand were placed in the Connecticut River. Many thousands of shad were also placed in a variety of rivers and in Lake Champlain. Black bass were stocked in various ponds and lakes, and seemed to be prospering. Walleyed pike were successfully planted in a few ponds, and the state commissioners suggested that more receive this species.

In 1872 Commissioner of Fisheries, Middleten Goldsmith, again recommended that the state finance a fish hatchery for "sport and for sale to the public for food." His request was again rejected by the state legislature. In the meantime, fish rearing became a profitable occupation for many individuals. Childs' 1880 Gazetteer and Business Directory for Bennington County, Vermont, describes one such operation in the town of Bennington:

> "*R. Burgess & Sons Trout Fishery*, established a few year since, on road 52 [Burgess Road], has become celebrated for its productiveness. The waters of this fishery are a spring brook having its fountain head only a few rods above. The rapid descent of the stream is taken advantage of to construct distinct ponds, of small size, with screens at either end, and having a fall of about three feet between each for the purpose of purifying the water. Eleven of these ponds are constructed, all of them with covers to shelter the fish from the sun's rays when desirable. The fish are assorted, the small fry in the upper ponds, yearlings next lower down, until in the last pond all of the fish are from two to three pounds in weight. In the hatchery, trays with gravel on the bottom are so arranged that water is continually running through, though slowly. It is estimated 12,000 eggs are deposited on each eighteen inches square of gravel. Last spring, 1880, about 1,000,000 fry were hatched, and about that number, including yearlings, were sold for

stocking waters. Sluices are so arranged as to carry the surplus surface water away from the ponds. The proprietors estimate a stock of about 4,000 pounds of trout now in the ponds."

In the early 1880s the German carp was extolled by the Vermont fish commissioners as an excellent source of foodfish. In 1877 the U.S. Commissioner of Fish and Fisheries introduced the carp to the United States and was actively distributing the fish across the country. By 1886 carp were stocked throughout Vermont ponds and streams. It was not until several years later that the ill effects of the project were recognized.

In 1889, Commissioners Brainerd and Atherton made another strong recommendation to build a state hatchery. The commissioners stated that it would save the state money to produce fry under state supervision. The legislature finally responded in 1890, by appropriating $2,400 for the "erection and equipment of a fish hatchery," authorized by No. 57 of the Laws of Vermont (in 1890). Several sites were considered in St. Johnsbury, Brattleboro and Pittsford. The criteria was to find a location with an abundant, pure water supply, that was accessible to rail transportation, and was affordable. The site selected was adjacent to the Central Vermont railway, on the property of Hon. E. H. Spaulding, about two miles south of Roxbury station. Through Spaulding's generosity the land, with numerous springs, was contributed to the state.

In September 1891, construction began on the 28' by 55' hatchery building. Troughs and trays were installed that could handle 1,500,000 trout eggs. The main spring was laid in "solid masonry" (probably concrete), and four small ponds were built. By the late fall 1891, the hatchery was ready for business. One thousand trout to be used as breeders were placed in the ponds. The first fry plants from the hatchery were made in the spring of 1892.

The Legislature in 1892 appropriated $5,000 more for completing and equipping the hatchery with an ice, meat and cook house, barn, and eight additional ponds. In 1894, the Legislature appropriated $7,000 to buy more property and build a 10-room house for the superintendent.

The state hatchery attracted many visitors--so that in 1901 the commissioners established a rule that visitors could only be given the liberty of the grounds on Saturdays. By their very nature, fish culture stations present a park-like setting. In the early 1900s, the department fenced in the upper end of the Roxbury yard for a deer park and secured a doe and buck, which proved to be an "interesting addition to the hatchery." In 1938 tourism was encouraged as the C.C.C. built two stone barbecues and a picnic area overlooking the ponds. Today, visitors to the Roxbury station are free to roam the yard, and there is a pellet food vending machine for feeding the fish.

Federal and State fish culture operations were necessarily cooperative. In 1899 the U. S. Fish Commission established a walleyed-pike field stripping station on the Missisquoi River, two miles below Swanton. About 650 females were stripped, yielding 38,000,000 eggs that were then sent to Cape Vincent, N. Y., to be hatched. Twenty-five per cent of the resultant fry were returned and planted in the Missisquoi River. In 1900 operations were conducted on a larger scale, but the Vermont commissioners publicly criticized the U.S. commission for removing the eggs when Swanton was a much more suitable location "for conducting the propagation of not only the walleyes, but also other commercially valuable foodfishes, such as the white-fish, commonly but erroneously called shad, mullet and sturgeon." The state established a small hatchery at Swanton about 1900 for propagating the walleyed-pike, but the biennial report in 1902 states that the Vermont Commissioners voted to abolish the Swanton site. In 1914, the U.S. commission established the Swanton Federal Hatchery, where they propagated walleyed-pike, perch and yellow perch. This hatchery was sold to the State of Vermont in 1954, but it is not currently in operation. The complex includes a hatchery building, barn and house.

The State commission continued a public-private partnership as well as a Federal-State relationship. In 1909, eyed eggs were purchased from Charles A. Wolters of Pennsylvania and from the Sandwich Trout Co., Sandwich, Massachusetts. As the fry grew, limited pond space constrained the capacity of the State hatchery, so that fingerlings were transported to private pools for rearing. Despite the Federal-State-private partnership, demand exceeded production capabilities, and the state commissioners continued to look at ways to expand production.

In 1910, a field station was established in Lyndon Center, and in 1912 the rearing pools at Roxbury were expanded in an effort to increase production. During 1910, 1911, and 1912, the Roxbury fish culture station propagated brook, brown, rainbow, and lake trout, landlocked salmon and Chinook salmon [discontinued in 1914 because it was believed that this species did not reproduce in fresh water lakes].

The State expanded its fish propagation program, in 1915 establishing a field station at Arlington, and in 1916 moved the operation to Bennington, where it became a permanent fish culture station in 1917. Also in 1915, the state established a rearing station at Vernon and a field station at White River Junction, used as a transportation holding point. This station was built next to the fairgrounds, with the plan that if the State made the fair at White River Junction a permanent one, a suitable "Fisheries Building" could be built for a live fish exhibit. In 1916, a hatchery was established at Canaan, representing a territory inaccessible from Roxbury and other distribution points, and a field station for hatching pike perch eggs was established on the wharf of the Lake Champlain Transportation Company at Burlington.

In 1917 construction began on a model brook trout hatchery at Bennington under the direction of local contractors, Lambert and Burrington. A model 72' by 28' hatchery building was erected with a concrete foundation, sewer system, and twenty-six double hatching troughs. A 28' by 28' office building / superintendent's house was built, and converted to an office after a new manager's house was built in 1940. Completing the complex were a 16' by 18' work-room, 16' by 18' tool house, and a 16' x 18', no longer extant.. Construction cost $9,000. In 1919 four state-of-the-art concrete raceways were installed for rearing brook trout fingerling, planned after the system used by the New Jersey Commission. M. J. Burrington was the project engineer.

While Roxbury was the principal State hatchery, by 1918 larger distributions were being made from the field stations at Bennington and Canaan. The Bennington hatchery distributed about 600,000 brook and lake trout in 1917. By 1920 that station was considered "in the front rank as a brook trout rearing station," according to the fish commissioners' biennial report. Part of the

reason for Bennington's success was the abundant supply of fresh water from springs and the South Stream Brook that runs along the station. Also contributing to the high yield were the modern facilities.

The automobile and tourism placed a renewed pressure on state fisheries. The 1924 biennial report states that the three trout hatcheries operated by the state were not sufficient to counteract the increase in fishing. "The automobile has made it possible for the fishermen to reach nearly every trout stream in the state, whereas, in the past there were many brook systems never visited by more than a few determined fishermen." The commission recommended that the state continue to add new stations and continue in hatchery construction. In addition to the eggs hatched in the State hatcheries, the U. S. Bureau of Fisheries secured additonal space in the Federal hatcheries at St. Johnsbury and Pittsford.

Local fish and game clubs cooperated with the pressure by purchasing brook trout eggs, hatching and rearing them, and planted the fingerlings in public waters. To avoid overcrowding and disease at the hatcheries, the Department encouraged the sportsmen's organizations in different parts of the State to construct rearing pools. The small fish, after being carried through the summer in local rearing pools, were distributed to the nearby streams with a minimum of travel and loss. Private cooperation continued in 1932 as new pools were constructed with the help of the fish and game clubs at Wallace Pond (Canaan), Derby, Richford, Hartford, and Newport. The Manchester Rod and Gun Club built seven concrete pools in Bennington adjacent to the State owned pools built by the WPA on Judy Brook.

The flood of November 1927 wreaked considerable damage to all fish propagation facilities. At Roxbury the buildings and water supply were damaged, and all equipment at the other three hatcheries was lost. Neighboring states and the Federal Commission sent eggs to the Vermont hatcheries to ease the long-term effect. That same year stripping stations at Johns River in Derby and Lake Seymour in Morgan were set up to collect brown trout spawn. In 1929 the stocking of fish included 1,000 swordfish in Lake St. Catherine, Poultney; 750 in East Long Pond, Marshfield; and 500 in Lake Ninevah, Mount Holly. It is not known

whether the spawn for this unusual species was part of the 1927 replenishment.

A general expansion of fish raising facilities was underway statewide during the early 1930s. Springs and land were purchased by the State at Salisbury in 1930, and a new 80-trough hatchery building was constructed in 1931 with an attached house for the site superintendent. The Salisbury station represents a new generation of hatcheries. For the first time proximity to a railroad was not a concern in choosing a site, rather this location was chosen for its water supply. From the beginning the water supply at Salisbury was praised for its quality and abundance. The system is closed, that is, all water is ground water from wells and springs without surface water. In a report by Commissioner James Brown for the period ending June 30, 1932, he commented: "The results from this new station have exceeded our expectations. With an apparently unlimited supply of water at an even temperature of 46 degrees the year round, this station is producing the finest fish ever raised in Vermont."

The Depression brought a mixed effect on fish propagation in Vermont. While tourism pressures diminished, foodfish concerns increased. From 1931-33 the department planted trout, salmon, and bass. In 1934 they planted walleyed-pike fry, yellow perch fry, and pickerel in addition to the trout, salmon, and bass. The work of the W.P.A. and C.C.C. resulted in a number of improvements to the State rearing facilities. At Roxbury a storage barn was built through the aid of the C.C.C. in 1936, and in 1938 a concrete raceway and a picnic area with tables and barbecues were added. A modern residence was built in Bennington for the Superintendent with materials and supervision furnished by the Fish and Game Service, and the labor provided by a W.P.A. project. New pipe line was laid, five new rearing pools added on the Judy Brook with the aid of the W.P.A., and a service drive was constructed to aid in caring for the fish.

In 1939 legislative recommendations were made for the improvement of fish and game management. The Commission decided to distribute fish by watersheds rather than counties, as had previously been the policy. The names of twelve areas of distribution were derived from the main river in that watershed. This distribution method, that remains in effect today, allowed for species most suitable for certain areas to be distributed in that particular

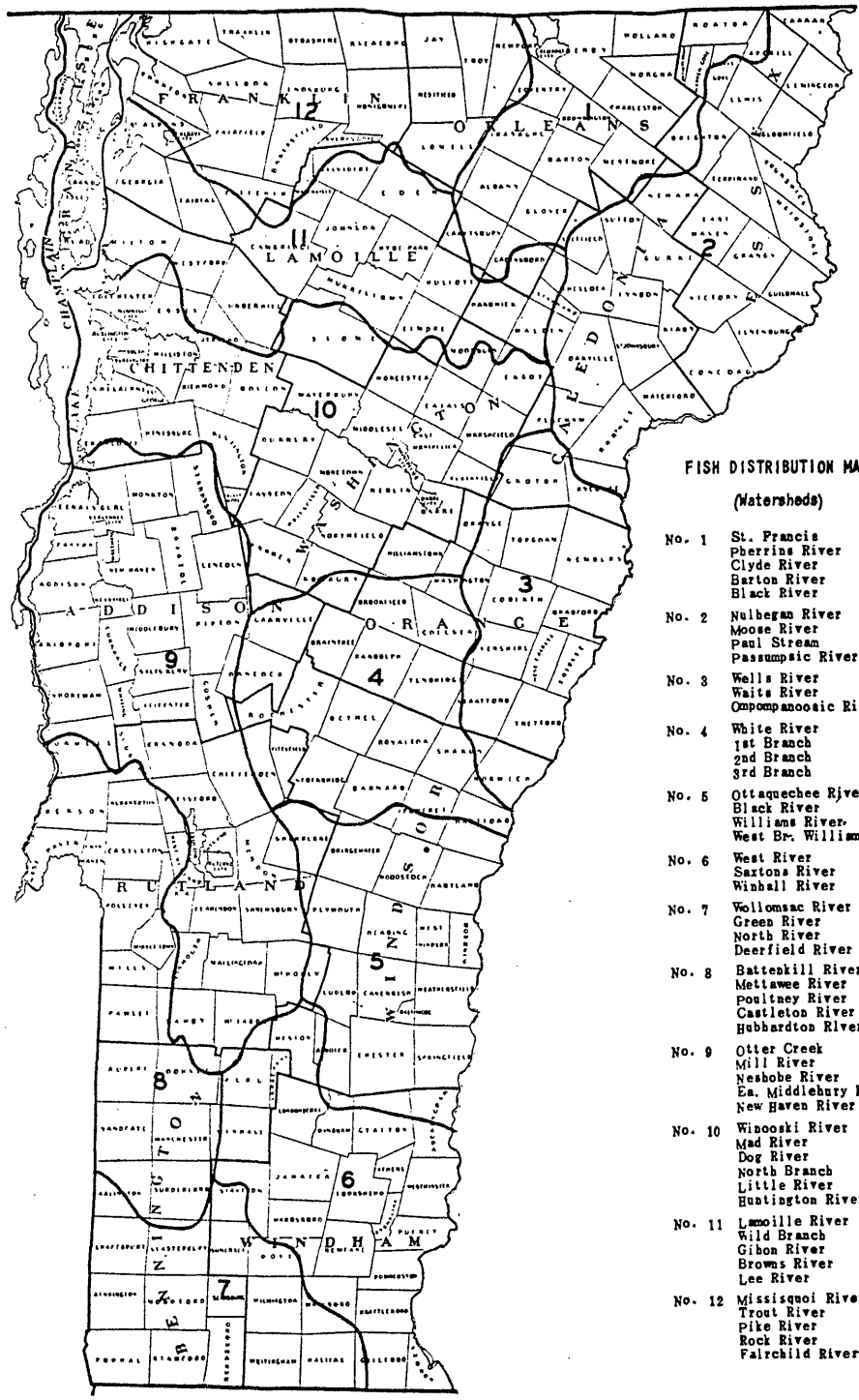
water system, and eliminated the sometimes wasteful policy of equitable distribution based on political boundaries rather than need. (A map of the watershed is attached).

The war years called to a halt much of the work done by the Department to enlarge and improve State fish culture facilities. Many personnel were in the service. A large decrease in fishing pressure was noted due to restriction of gas for travel.

In 1940, the Vermont Fish and Game Service started development of the Bald Hill Rearing Station by acquiring land and water supplies in the town of Newark and Westmore, under the guidance of A. H. Dinsmore, who prior to that time had been connected with the U. S. Bureau of fisheries. Two rearing ponds were built as C.C.C. projects, but due to the acute shortage of building supplies during the war years, construction of the hatchery building was postponed until 1946. By 1951 eight concrete raceways had been installed and a house was constructed for the station superintendent, Hugh Gregory, father of the current manager. The hatchery, with 1,000 acres of land, specialized in brood salmon stock, and that first summer they planted 200,000 fish.

By 1943 there were five state-operated fish culture stations located at Canaan, Roxbury, Salisbury, Bennington, and Newark. The Canaan site was sold to a private fish and wildlife club, but the other four hatcheries are still operating. On an annual basis, Roxbury (opened in 1891) produces 18,000 pounds of brook trout plus up to 100,000 Atlantic salmon fry for the Connecticut River. Bennington (opened in 1916) produces 32,000 to 62,000 pounds of brook, brown and rainbow trout. Salisbury (opened in 1931) produces 24,000 to 32,000 pounds of brook, brown, rainbow, steelhead and lake trout. This station is being converted to a brood-stock rearing facility to provide eggs and sperm for hatchery production. Bald Hill hatchery in Newark (opened 1940) produces 4,000 to 11,000 pounds of salmon, steelhead and brown trout. This facility will probably be converted to cool-water species such as walleye and muskellunge, both of which are doing poorly in the wild, and possibly lake sturgeon, a state endangered species. In 1991 a fifth station opened at Grand Isle. This $11 million, computer-age hatchery raises up to 750,000 landlocked Atlantic salmon and rainbow, brook, brown, lake and steelhead trout a year for stocking statewide. Besides the state hatcheries, there are two federal hatcheries operating in Vermont.

The White River hatchery at Bethel produces 8,000 to 15,000 pounds of Atlantic salmon smolt and fry for the Connecticut River Atlantic salmon restoration project. The Pittsford federal hatchery produces 50,000 lake trout and 100,000 landlocked Atlantic salmon fingerlings for Lake Champlain and the Connecticut River.



FISH DISTRIBUTION MAP

(Watersheds)

No. 1 St. Francis
Pherrins River
Clyde River
Barton River
Black River

No. 2 Nulhegan River
Moose River
Paul Stream
Passumpsic River

No. 3 Wells River
Waits River
Ompompanoosic River

No. 4 White River
1st Branch
2nd Branch
3rd Branch

No. 5 Ottaquechee River
Black River
Williams River
West Br. Williams River

No. 6 West River
Saxtons River
Winhall River

No. 7 Wollomsac River
Green River
North River
Deerfield River

No. 8 Battenkill River
Mettawee River
Poultney River
Castleton River
Hubbardton River

No. 9 Otter Creek
Mill River
Neshobe River
Ea. Middlebury River
New Haven River

No. 10 Winooski River
Mad River
Dog River
North Branch
Little River
Huntington River

No. 11 Lamoille River
Wild Branch
Gibon River
Browns River
Lee River

No. 12 Missisquoi River
Trout River
Pike River
Rock River
Fairchild River

F. ASSOCIATED PROPERTY TYPES

I. Name of Property Type: Fish Culture Station

II. Description:

Overview

Fish Culture Stations have been an important part of Vermont agriculture since the first private hatcheries were built in the mid-nineteenth century. Their physical and associative characteristics have evolved over time, reflecting both the architectural fashions and technological advances of the eras in which they were built.

The name Fish Culture Station became the preferred name around 1987, replacing the former term Fish Hatchery. In the nineteenth century the name Fishery was used as well, but it was not as common after 1900.

Since the mid-nineteenth century, private fish hatcheries were built adjacent to and below an ample stream or spring fed brook, as a gravity fed water source was of prime importance. Early hatchery buildings were of wood frame construction, and often were part of a larger diversified farm complex, similar to small, 1 1/2-story, gable roof barns. One such hatchery building, in Bristol, Vermont, was located over a stream. Very few early, pre-1890s hatchery structures are known to exist today, and no known private historic (pre-1943) hatcheries are currently in operation in Vermont.

The function of historic hatchery structures has not significantly changed in Vermont since the nineteenth century. For example, the description of an 1880s fishery, having a series of fish rearing pools, each pool separated from the next by a screened header, with the youngest fish in the cleaner water of the pools upstream, is basically the same rearing technique used today at Vermont's historic hatcheries.

When the State of Vermont built the first state hatcheries, the Vermont Fish and Game Commission was concerned not only with rearing fish, but also with fish and egg distribution. The first state hatchery was built in 1891, in Roxbury, adjacent to a good water source, and along a railroad line for ease of fish distribution throughout Vermont. Since the 1930s trucks have replaced the railroad for fish distribution in Vermont.

A fish culture station is a complex of buildings and structures constructed for the purpose of rearing and distribution of healthy fish. Activities at a hatchery or fish culture station include breeding fish, the incubation and distribution of eggs, and the rearing and distribution of fry, fingerlings or adult fish, either to other fish culture stations or to lakes, ponds and streams in Vermont. Not all fish culture stations handle all phases of fish rearing, and not all types of fish are raised in each facility. The basic requirement for a fish culture station is a sufficient source of high quality water, either from lakes, streams, springs or wells, to meet the needs of the fish being reared.

A fish culture station is designed to receive water either by gravity flow and/or pumps from adjacent water sources. The water generally passes through an aeration house for oxygenation, and more recently, for removal of nitrogen (for well and spring water); in some facilities this water processing may be done in the hatchery itself. The processed water is delivered by gravity flow to different rearing units, in the hatchery building or the ponds and raceways, depending on the rearing cycle of the fish. Before the water is returned back to the environment -- either a lake, pond or stream -- the water passes through a settling basin or pond to remove waste materials.

The life cycle of a fish in a fish culture station is roughly an eighteen month production cycle, geared to produce a stockable-sized fish. Beginning in the fall, the freshly spawned eggs are either produced at the hatchery, or brought from other fish culture stations or other sources. The eggs are held in the incubation area of the hatchery in a series of vertical tray incubators with water flowing constantly over them. The eggs are minimally handled until the embryo begins to develop eye color within the egg. The eggs hatch after four to eight weeks, depending on the species and water temperature.

Once hatched, the fry are transferred to the start tanks or troughs in the hatchery where water flows constantly through the tanks. The fry are feed a nutritionally balanced food. They are fed frequently, first by hand, and later automatic demand feeders supplement hand feeding. The juvenile fish, or fingerlings, remain in the start tank area until late spring, when they are transferred to the larger rearing units -- the ponds or the raceways. (Rearing units where young fish are raised are also called nurseries.) Once in the raceways and ponds, the fingerlings are grown for eight to ten months to the desired size for stocking.

The design, construction, and physical history of any fish culture station are conditioned by many factors, such as the character of the site (the water source, water quality and temperature), available construction and equipment technology, and the type and volume of fish culture work conducted at the station. Another important factor is the amount of money available to do the work, since financial considerations often affect the types of material used and kinds of equipment installed. Management decisions may also affect decisions leading to expansion, reconstruction or abandonment of a particular facility. Thus each fish culture station in Vermont is unique, and each fits into a larger context of fish culture stations in the state and the nation.

Property Subtypes

A fish culture station in Vermont consists of a number of property subtypes, which are grouped relatively closely together in a meaningful way depending on their specific function in the process of fish rearing. The physical arrangement of the subtypes does not vary extensively, and all historic Vermont hatcheries are arranged in a roughly linear fashion, adjacent to the original water source. The water is piped into one end of the hatchery building, and the raceways and ponds usually extend from the opposite end of the hatchery in the direction of the water flow. As the water passes through the hatchery, ponds and raceways, it continues downstream into a stream or brook. (Additional water from springs and wells often is piped or pumped to the hatchery.)

All known historic fish culture stations in Vermont contain the following five subtypes: a water source, a hatchery building, ponds, raceways, and a superintendent's house. Other known historic subtypes are dams, intake/valve house, spring house, settling basin, meat house/ice house, barns, garage, guardhouse, and landscaped grounds. A number of non-historic subtypes have been built since 1943, including a service building, aeration house, research laboratory, and an informational kiosk. At some fish culture stations, historic structures have been lost due to age, fire, or other causes and have been replaced by new structures.

Water source

A water source is judged by three important variables: temperature, purity, and volume. Ideal water ranges from 46 to 60 degrees fahrenheit, is free from disease causing pollutants, and is abundant enough to supply the facility according to its size, and have enough flow to carry away waste matter. Ample volume is important, as a

twelve to twenty minute turnover of water is essential for raising healthy fish. The water source may be an underground spring, a stream, a well, or a combination of the three. A closed system, meaning ground water from underground springs and/or wells only, is considered ideal as it maintains a relatively even 48 - 50 degree temperature year around. An open system consists of above ground surface water from streams or brooks. Current fish culture managers state that although an open system is often convenient, it is rarely of good quality, having problems with turbidity, natural pathogens and temperature pollution. Well water and spring water are the best sources as they are disease and turbidity free and generally have the appropriate amounts of oxygen.

Water was first conveyed by 3 inch cast iron pipes or wooden pipes. Some wooden pipes are still in use in Bennington but must be kept continually wet or they will deteriorate. Around 1940, eight inch metal pipes replaced many of the earlier wooden and metal pipes. Around 1900, aqueducts or "plank flumes" with wooden covers about 12 inches high and 24 inches wide, often were used to convey water from streams and springs to the raceways; these aqueducts are no longer in use. After around 1940 the availability of electric water pumps made well water a feasible water source in fish culture stations.

To determine whether a site has an adequate water supply, at least a year of experimentation at the site is necessary. When the Arlington Fish Culture Station failed in 1915, due to an unsatisfactory water supply for rearing fry and fingerling, the Vermont Fish and Game Commission reasserted its policy that a site must pass through a full year of testing before it is confirmed.

Water temperatures can be blended to provide the right temperature for rearing different types of fish. The water is often blended in the hatchery building where today modern equipment may also be used for the processes of filtration, disinfection, and oxygenation. Also, modern hatcheries now have advanced water treatment facilities, which process the water before it flows back to the adjacent lakes or streams. The water is tested monthly for pollutants.

Hatchery Building

The hatchery building, also called a hatch house, is used for the early phases in the cycle of fish rearing from egg incubation to the

rearing of the fry and young fingerlings. In Vermont the historic hatchery buildings are vernacular style, one and one-half story, wood frame, gable or hip roof, long, rectangular shaped buildings. Early hatcheries had wooden floors. After 1900 a concrete slab foundation was preferred; it often extended up the walls as high as the window sill. The entrance to the hatchery is generally on the gable end and a shed roof porch may span the entrance side of the building. Some hatchery buildings have small, shed roof, single room office or storage additions off the eave sides. Simple paneled pedestrian doors generally are on the gable ends of the building and a row of single or paired double hung, multi-light sash windows line the eaves sides of the hatchery. Asphalt shingles cover the roof, and as many as three metal or wooden ventilators line the roof ridge. A valve box to house the water controls is generally constructed of poured concrete and is located along one side of the hatchery building. Brick wall and interior chimneys for early wood or coal stoves still exist on some of the hatchery buildings, although now the buildings are heated by more modern oil or gas furnaces. The hatcheries were electrified around the 1930s.

Inside the entrance door, the hatchery may have one or two small office/ conference rooms. Varnished natural pine trim and beaded board cabinets are common interior features in these rooms. One or two bathrooms in this area were generally added after 1940. The majority of the hatchery interior consists of one large hatch room where the rearing operations take place. The concrete floor of the hatch room is slightly below grade to better take advantage of gravity for water intake in the building. The c. 1950s and 1960s concrete, double rearing troughs fill most of the hatch room and are arranged side by side, nearly spanning the width of the room. The troughs are raised on bases off the floor and water is piped in one end and flows out the other. Enough space is allowed between the rows of troughs and at the ends of the troughs along the walls for the hatchery workers to walk around them. Slightly raised wooden walkways between the troughs allow for dryer and warmer feet. The troughs are divided lengthwise and have several width dividers, which allow fish to be separated by size, and ease cleaning efforts. Early troughs were made of wood, and in recent decades some concrete troughs have been replaced by fiberglass tanks. The wooden and concrete troughs were painted to make cleaning easier and prevent abrasive damage to fish. The troughs are sterilized before use, and are disinfected when fingerlings are taken out in the spring.

At one end of the room, vertically arranged incubation trays hold

the fish eggs. Eggs are incubated in darkness with a constant flow of fresh water. Hatching trays were first made of wood. The trays had wire mesh bottoms lined with gravel, and were often painted with aluminum paint. The approximately 18" square trays contained about 12,000 eggs per tray, and water continually and slowly flowed through the mesh bottoms. Later, glass jars were used for hatching. A 1" pipe, with a perforated bottom end placed in the center of the jar, was used to gently flush water over the eggs. As the eggs hatched they would rise to the top of the jar and flow out a spout into a rearing trough. Since around 1960, fiberglass hatching trays have been used. The incubation water is often heated, or, spring or well water is used, which is warmer during the cold months of the incubation period than the surface water of brooks and streams. A small fish culture laboratory with microscopes and other fish culture equipment is located in a corner of one of the front rooms, or in an area along one wall of the hatch room. Here, charts are maintained daily with records for death rates, water flow (GPM), morning and evening water temperatures, water Ph, pounds of feed given, etc.

Ponds

Ponds have been part of fish rearing stations since the earliest hatcheries were built in Vermont. Hatchery ponds have not changed over the years to a great degree. Their shape has remained either round or oval, with a diameter of about four feet to eighty feet, and a depth of about 1 1/2 feet to 5 feet. Ponds have been built with dirt, gravel or rubble bottoms, and some early ponds had side walls constructed of fieldstone topped with granite slabs, similar to a basement foundation wall in a domestic building. During the twentieth century some ponds were built of concrete. At first ponds were gravity fed by a stream or brook, and constructed adjacent to the water source, with a sluice to carry the surplus surface water away from the ponds. By the end of the nineteenth century, wooden and cast iron pipes, or wooden aqueducts (also called plank flumes) conveyed water to the ponds. Even the early ponds were divided by headers that were constructed of wire mesh screen and/or vertical wooden slats to prevent fish from passing through to an adjacent pond. Since about the 1930s, header screens have been held in place by small concrete abutments in the banks of the pond openings. Early hatcheries had as many as eleven ponds; by the twentieth century twenty ponds were common at a hatchery. Procedures common in the nineteenth century, and still followed today, include the use of wooden covers for the ponds (or sections of the ponds) to prevent sunburn, and the division of the fish by age and species in various ponds, with the younger, less disease resistant fish in the cleaner

water of the ponds upstream. Quarantine ponds were separate from the other rearing ponds and were used for temporary holding of fish brought in from other locations, to determine if these fish were healthy and disease-free, before they were placed with the other stock. Early automatic feeders over ponds were often clever, but not sanitary by today's standards. One such feeder contained deer parts that decayed, became fly infested, and overflowed with maggots, which fell into the pond as fish food.

Raceways

Raceways have been used in hatcheries since the nineteenth century. Like rearing troughs and ponds, raceways are used for rearing, sorting, inventorying, and controlling disease among various species of fish. Built as outdoor rearing structures, they are filled with water by pipe or aqueduct. In more recent years the water from different sources is mixed at the top of the raceways in head boxes to provide a more suitable temperature for the fish. Raceways are constructed as long, narrow channels, although some early raceways were rectangular in shape. Early raceways were earthen; by the 1920s, raceways in Vermont were being constructed of concrete. The special concrete mix contains chloride which, coupled with the frequent freeze-thaw cycles during Vermont winters, results in deterioration of the concrete. Most existing historic raceways in Vermont are approximately 30 inches wide and extend up to 50 feet long, with a 6 foot depth at the top end where the water enters, becoming shallower at the far end with a depth of about 1 foot. The raceways often have a center divider running the length of the structure. Headers, regularly spaced, and perpendicular to the long sides, further divide the raceways into several sections. Raceways are often arranged parallel to one another and grouped as a series in a large rectangle. Hatcheries may have up to 50 raceways, in variously grouped arrangements adjacent to the hatchery and the water sources that supply them with water. Some raceways have at least partial covers for sun protection as sunburn makes fish susceptible to bacterial infections. As with ponds, the oldest and hardiest fish, which are often the brood stock, are generally kept at the lower end of the raceway series, closest to the settling pond.

Superintendent's House

The Superintendent's House at a Fish Culture Station may be a dwelling built on the site prior to the establishment of the hatchery, or it may have been built for the manager after the facility was established. The houses are located close to the hatchery building, ponds and raceways, so that the managers can keep

close watch on the operations and be nearby if problems arise. The existing historic, 20th century Superintendent's houses at the Vermont fish culture stations, were built to provide comfortable, modern living quarters for the hatchery manager and his family. They are small, vernacular style, wood frame, one or one and one-half story, hipped or gable roof, clapboard-sided dwellings with Colonial Revival and Bungaloid style details common to the architectural eras in which they were constructed. Colonial Revival style features include a Cape form (Bennington), a hipped roof square form (Bennington), double hung sash windows with multi-light upper sash, and cobblestone wall chimneys. Bungaloid features include exposed rafter tails. Historic roofing includes both slate and asphalt shingles. Other features include a poured concrete foundation, and new metal storm windows. A simple front porch with square posts, may span at least part of the front facade. The houses are painted white, and the trim details sometimes are painted green. The interior floor plan is generally typical of early twentieth century housing, with a living room, dining room, kitchen, bathroom and several bedrooms.

Dams

Dams provide water for the hatchery operations, and prior to electricity, often provided water power to grind meat for fish food. The dam (or dams, as occasionally two were built) span a brook or stream at a location, [illegible] for adequate gravity flow, at a higher elevation than the rearing units. The first dams were constructed of stone. Since the 1930s and possibly earlier, dams have been constructed of reinforced poured concrete. The water is diverted from the dam at an intake area built with stone, or later, concrete block side walls and sheltered by a wooden cover. A metal or wooden screen prevents debris and fish from entering the wide intake pipe. The water passes from the intake area through either pipes or formerly an aqueduct. Recently, vertical concrete abutments on the banks of the stream have replaced former stone abutments.

Intake House

The intake house, also called a valve house, at Vermont fish culture stations is located near a water source and regulates the conveyance of water to the hatchery house, ponds and raceways. Water is piped to the intake house from the water source; from the intake house the water is conveyed through pipes to the hatchery operation. An intake house is a small, low, wood frame structure, consisting of an open, deep concrete-lined, below grade space, with short, novelty or clapboard sided walls and a gable roof covered with rolled roofing. A slightly raised, shed roof opening similar

to a roof dormer, above a wall opening, allows for access to the one-room interior.

Spring House
Spring houses are small to medium-sized structures built to shelter and protect a spring source from debris and contamination. Early spring houses were built of stone with wooden or metal roofing. Around the turn of the century, concrete spring boxes were often constructed to replace the earlier stone and wood structures.

Settling Basin
A settling basin, also called a settling pond, is located downstream from all other ponds and raceways at a Hatchery. It serves to remove solid waste matter from the water before it passes out of the hatchery facility. Waste water from the hatchery operation flows through an intake bypass into the settling basin where solid waste settles before the water passes downstream into a pond, stream or lake adjacent to the hatchery. Settling basins were not common in hatcheries until the 1930s and 40s, when the state and the public became more concerned with water pollution and the protection of natural resources. Early settling basins were generally large gravel bottom ponds, with a diameter of 40 to 80 feet or more. Since the 1940s they have been built in a smaller, rectangular configuration, with concrete sidewalls and bottom, and a depth of about 5 feet. To clean the settling basin, generally an annual task, the basin is drained and the waste matter is allowed to dry for two weeks before it is removed with a bucket loader.

Meat House/Ice House
Generally the meat house and ice house were built as one medium-size structure that was used as cold storage for the meat organs and grain used as fish food at the hatchery. It was located near the hatchery building. Usually a meat/ice house had at least two rooms -- one for meat storage and one for ice, which was cut from the ponds, stored in the building, and used to refrigerate the building. Generally the meat/ice house was a simple, vernacular style, rectangular shaped, wood frame, one and one-half story, gable roof structure with clapboard siding, and metal or asphalt shingle roofing. Features of an ice house include louvered vents in the walls either in the gable peak or just above the foundation, thick walls (often 12" deep and filled with sawdust, and later cellulite for insulation), and a concrete foundation after around 1930. Most hatcheries had water or gasoline-powered meat grinders. In the 1930s, electrically powered refrigeration units were often installed in the ice/meat houses. The refrigeration units were shut down in

the early 1960s, no longer needed after fish meal and meat meal pellets were introduced as a more economical and productive fish food in the late 1950s. The fish pellets may still be stored in the buildings, which are generally no longer refrigerated. Lean-to additions along the eavesides of the ice/meat house were often added for storage or as work space. Double doors for loading ice and meat/grain, paneled pedestrian doors and an occasional double hung sash window are located most often on the gable ends.

Barns

Barns were generally part of a nineteenth or early twentieth century hatchery when horses were still used to haul ice from the ponds and pull wagons for fish distribution purposes. Barns housed horses, harnesses, wagons, carts, and sleds used in the transportation of eggs, fingerlings, adult fish, and hatchery equipment. The barns were characteristic of the era in which they were built. Mid-nineteenth century barns would have post and beam framing; after around 1850 milled dimension lumber was typical. Carriage barns came in toward the late nineteenth century and the interiors had individual stalls and space for carriage storage. Barns, as part of fish culture stations in Vermont are medium-size, rectangular, one and one-half story, gable roof structures with clapboard siding, double hung multi-light sash windows, asphalt shingle roofing, and often have a hay door in the second story. Historic double leaf carriage barn doors may have been replaced with hinged, multi-leaf, folding garage doors, or more recent overhead garage doors. Lean-to projections along the eaves sides may be later additions.

Garage

Truck garages: The need for a garage at Vermont fish culture stations originated in the early 1930s when trucks replaced horse drawn wagons at the hatcheries. At first carriage barns often housed hatchery vehicles, and the double leaf carriage barn doors were replaced by more modern folding garage doors. The early truck garages were constructed as small wood frame, one-story structures built to house the trucks. No early garages are known to exist at Vermont hatcheries. In the mid 1940s the garage was combined with a service building.

Automobile garages: By the late 1930s, a separate small, vernacular style, one-story, one-bay, wood frame, gable front garage may have been built to house a vehicle for the superintendent. These automobile garages would be stylistically similar to garages built in the different architectural eras. Features characteristic of many vernacular style garages built in the 1930s and 40s include

clapboard siding, asphalt shingle roofing, folding historic garage doors, and double hung windows.

Guard House
The guard house is a rare subtype, and is no longer known to exist at any Vermont fish culture stations. A guard house is shown in early photos at the Roxbury hatchery, as a small, square, hip roof, open, wood frame structure, raised on wooden posts. A bell, hung in the open area, was possibly used to alert employees of predators, poachers, or mechanical problems with the water supply, which would require prompt attention.

Landscaped grounds
Landscaped features are mentioned in Fish and Game biennial reports as early as 1920 when grounds (at the Bennington hatchery) were graded, and walks and drives were graveled. Trees, such as the pines planted at Bennington, were added to the landscape in the early 1930s. Wooden fencing around the facilities was common for protection against predation and poaching from the late nineteenth to the twentieth century.

Fish hatcheries were important for Vermont tourism; the hatcheries not only raised fish for anglers, but they also became a tourist attraction. Landscape amenities for tourists, such as picnic areas with wooden tables and cobblestone fireplaces, were built. In the late 1930s and early 40s the CCC built some of these picnic areas.

Service Building
The service building is a non-historic subtype, as the first known service building was constructed in 1946. The service building replaces the earlier meat/ice house as its contains a meat grinding room, and cold storage room powered by electricity. Two types of walls built to insulate the cold storage units are a) 1/2 inch thick concrete walls built up over chicken wire, or b) 12 inch walls filled with cork. Often a shop or service area for working on hatchery vehicles and storage area for equipment used at the hatchery is included in a service building. As utilitarian structures, service buildings are vernacular style, wood frame, gable roof, one to two-story structures with simple trim details, and double hung windows.

Aeration House
An aeration house is located near a water source. It is a vernacular style, medium-sized, rectangular, gable roof, one-story, one-room structure with asphalt shingle roofing, simple trim such as

exposed rafter tails, weatherboard or novelty siding, and a deep concrete block foundation. Ventilators are generally placed along the roof ridge and the short side walls have hinged openings so that the structure may be well ventilated. The open interior is a deep, below grade space, with a gravel floor. Aeration houses originally were built to oxygenate water. Later, the benefit of nitrogen removal was recognized, and a nitrogen removal system was installed in the intake pipes, which are generally a 3 foot long, vertically aligned PVC pipe.

Research Laboratory
The research lab, as a separate building, is a recent subtype, dating from the 1960s. Only one research lab exists as a separate building at the historic Vermont fish culture stations (at Roxbury). This structure is a medium-size, rectangular, one-story, gable roof, ranch style building with asphalt roofing shingles and synthetic siding.

Informational Kiosk
The informational kiosk is a recent addition to Vermont fish culture stations. Each historic Vermont hatchery has one kiosk located near the visitor's parking area. The kiosks are simple, free-standing wood frame structures, about 4 feet wide, and 8 feet tall, with a clear acrylic covered double display panel on one side and a gable roof protecting the display area. They are used to display recreational and historical information relating to fish culture in Vermont.

III. Significance

It is expected that fish culture stations will be individually eligible for the National Register primarily under Criterion A for their associations with the broad patterns of the history of agriculture in Vermont, and Criterion C for their distinctive characteristics of their periods and the property type. Further research may show that some fish culture stations may be eligible under Criteria B and D.

It is most likely that fish culture stations will be nominated under the areas of significance of agriculture and architecture. It is expected that the level of significance will be state and/or local.

The historic context and significance of fish culture stations is described more fully in Section E, Statement of Historic Context, and is summarized below.

Fish culture stations are clearly reflective of Vermont's history of fish rearing and fish culture, and its trends. The historic fish culture stations were and still are important fishing facilities with distinctive buildings and structures. They played significant roles in their towns and in Vermont, as they not only reared fish for the sport of fishing, but they also were part of local, state and national concerns for the environment, and the preservation of our natural resources.

Part of the appeal in building hatcheries was an economic one, as good fishing attracted tourists. In Vermont, as early as the 1890s fishing was considered the second most profitable agricultural enterprise after the dairy industry (Perry, p. 17).

Vermont's earliest fish culture stations were part of a larger national trend that evolved as a result of exploitation of biological and natural resources of waterways. In 1856, Vermont naturalist George Perkins Marsh was commissioned by the Vermont Legislature to investigate the decline of native fish. (Other states commissioned similar studies.) Marsh listed deforestation, erosion, chemical and agricultural waste and indiscriminate fishing practices as causes for this decline.

The first hatcheries in Vermont were private ones. Early fish culture stations collected, incubated and hatched eggs from wild fish, or purchased the eggs from out of state. In addition to the native brook trout and salmon, new species such as rainbow and brown

trout, were introduced to Vermont lakes by the 1890s.

Much of the early technology established for fish rearing is still used today, but with more sophisticated equipment. Header screens, sun protection, aerated water, and various rearing units for different ages of fish, were part of the process in the late nineteenth century, and are still recognized today as important to the process.

Starting in 1872 the Federal government began to establish federal fish culture stations in all states. Soon after this, the states began to construct their own hatcheries. The first state-owned Vermont hatchery was built in the town of Roxbury in 1891. That year 553,500 trout and salmon were distributed from the Roxbury hatchery.

A second hatchery was started in Arlington in 1915, but it failed due to an insufficient water source. The Arlington equipment was moved to a site in Bennington, where after a year of experimentation, the water supply proved to be adequate and construction began on a permanent facility.

The Bennington State Fish Hatchery grew from a small experimental station to a model hatchery by the 1930s. Its large hatch house with rows of concrete troughs, the Colonial Revival style Superintendent's House/Office, and its numerous concrete raceways modeled after those built by the New Jersey Fish and Game Commission, were to set the standard in Vermont for other hatcheries, such as the one in the town of Canaan built by the early 1920s.

As early as 1924, the Vermont Fish and Wildlife Biennial reports informed Vermonters that streams and ponds were under stress of being fished out unless heavy restocking with hatchery reared fry and fingerlings could be accomplished. Industrial pollution continued to cause poor water quality in lakes and streams, and deforestation resulted in erosion and fluctuating water levels where the spongy forest floor was gone.

In an attempt to meet increased distribution needs during the 1920s, more eggs were hatched at the three state hatcheries operating in the towns of Bennington, Roxbury and Canaan. The Vermont Department of Fish and Game then became concerned with overcrowding of fingerlings and fry in the three hatcheries. To eliminate overcrowding and disease in the hatcheries, as well as to grow

larger fish before distribution, many trout fry were transferred to the South Vernon station, which was operating as a rearing station during summer months. In addition, sportsmen's organizations were encouraged to construct rearing pools around the state, with later distribution of the fingerlings to nearby streams.

The 1930s were years of growth and expansion of fish culture in Vermont. A stripping station for brown trout and landlocked salmon was built in the town of Newport, and an eyeing station was built in the town of Morgan. A fourth state hatchery was built in the town of Salisbury in 1931. During this decade the railroad was no longer needed for egg and fish distribution, as trucks were purchased for most stations. Electrification also came to the hatcheries by this time, and ice houses became obsolete at those facilities that could obtain an electrified refrigeration unit for storage of meat and grain used as fish food.

Despite the construction of new fish culture stations in Vermont during the 1930s, disbursements and fish distribution were down from the 1930s to the mid-1940s, due to the sagging economy during the depression and the war effort. Few new hatchery buildings or structures were constructed during these years. Those that were built had the assistance of the WPA and CCC.

After 1945, rations were lifted, manpower was available again, and activity resumed at the state hatcheries, along with a sudden rise in fishing licenses. By the 1950s salaries rose at the hatcheries, maintenance and expansion programs were established, and additional raceways and ponds were built.

In 1946 over 9 million fish were distributed in Vermont (mostly brook and brown trout and pike perch fry, with lower figures for rainbow and lake trout, and Atlantic and landlocked salmon). The next year 12 million fish were distributed but by the 1950s the annual distribution figure fell to about 8 million fish. This decline in figures may be the result of efforts to distribute larger, older and healthier, but fewer fish, with the aim of reducing die-off rate once the fish were relocated in their new environment.

In the 1960s, the renewed national awareness of environmental issues urgently focused on problems of pollution and depletion of natural resources. To assist in these environmental efforts, the state hired at least eight new biologists to its Department of Fish and Game, and hatchery managers begin to receive professional training in fish

culture and treatment of diseased fish.

At the Vermont hatcheries environmental concerns coupled with improved purification systems helped protect natural resources. Water quality and lack of chemical pollutants was an increasing concern at all Vermont hatcheries, not only for incoming water but for the water released to the streams after being used in the hatchery operation. By the mid-1960s the Biennial reports state that water quality in Vermont's streams and ponds was steadily improving.

In 1961, the State of Vermont joined with the US Department of Fish and Wildlife and adopted a procedure for research and evaluation of fish habitat. This program became an extension of the watershed study begun in 1952 by state and federal biologists. A cooperative effort between biologists, hatchery superintendents and game wardens worked to determine stream conditions and the amount of fish a body of water could support. The result was a plan for fish distribution based on appropriate habitat (rather than the previous method by county), which was established to prevent die-off of fry and fingerlings.

The goal of Vermont fish culture, established in the late 19th century, was to rear large, healthy, disease free fish in the state hatcheries. Vermont's historic fish hatcheries, in the town of Bennington, Roxbury and Salisbury, continue to work towards fulfilling the goals of successful fish culture in Vermont. The historic buildings are being updated with newer equipment, and the raceways and ponds are being redesigned to raise healthier, larger fish. Other hatcheries, in the town of Morgan, and the new extensively modern facility at Grand Isle, are all part of Vermont's State fish culture program.

The architectural characteristics, including scale, materials, and style, of historic fish culture stations, as well as their setting and location are described in the fish culture property type description section. It is known that some fish culture stations were built by local contractors and engineers, but further research needs to be done in this area. Fish culture stations are clearly reflective of vernacular architectural trends and contemporary construction methods. They usually were built of local materials--wood and stone -- and are important physical evidence of the development of Vermont's architectural heritage.

IV. Registration Requirements

The physical characteristics and design integrity of fish culture stations are as stated in the property type description.

In general fish culture stations will meet the registration requirements because they reflect trends and influences significant to the history of agriculture in Vermont and/or because of their distinctive architectural form and character. Fish culture stations should retain the form and materials that reflect their historic use, period of construction, and, if applicable, later historic changes or modifications.

It is expected that historic fish culture stations will remain on their original locations, and that the structures and buildings will remain grouped relatively close together in a meaningful way depending on their specific function in the process of fish rearing. Integrity of location and setting are important as large parcels of land were often required to satisfy water requirements. It is acceptable if a historic structure is moved to another location on the property during the historic period of this context, as long as the building retains its integrity of location within the complex. Fish culture station structures moved after the historic period must meet National Register Criteria consideration B.

It is recognized that many historic hatchery structures in use for fish culture after the period of this context have been altered and added to since the time of original construction. Some of these additions and alterations, such as handicapped access ramps, fuel storage and work sheds, bathrooms, climate control equipment and other mechanical equipment, will have been made in order to comply with state and federal health and safety codes. Such mandated alterations are acceptable, provided they do not significantly detract from the historic architectural integrity of the building or structure. Updated fish culture equipment within the facility buildings is acceptable since new technology is necessary for a successful fish culture station.

Major additions to expand fish culture facilities, such as wings or sheds on buildings, and altered ponds and raceways, have also been made. Such changes made before 1944 are acceptable. Ponds and raceways built after 1943 are not considered historic and do not meet the registration requirements. Ponds and raceways altered after 1943 were done to improve the workings and continued use of

the facility, and are acceptable if the profile, configuration, and materials of the structure are not significantly changed. Post-1943 additions to structures may also be acceptable if these additions are compatible in scale and sympathetic to the historic structure and its character, and do not obscure and are not adversely disproportional in size to the historic form and function of the structure. For example, the fenestration pattern, which is distinctive on historic fish culture station buildings, should be clearly readable. Over time it is possible that there may be some loss or deterioration of windows. Covers over ponds and raceways are historically accurate features.

Distinctive historic features such as porches, cupolas, siding, stone chimneys, and attached appendages on the related subtypes of fish culture stations -- the superintendent's houses, garages, barns, sheds, intake houses, etc. -- are part of the building's historic characteristics and need to be retained as much as possible.

The cumulative effect of changes to historic features should not compete with the historic character of the building or structure. There should be no major changes to the roofline of buildings, such as dormer windows, that negatively affect the historic appearance of the building from the public right of way. Such additions that are generally small and to the rear of the building may be acceptable, as would be skylights if they are flat.

Interiors should maintain in large part the sense of their defining historic characteristics. Important interior features that characterize historic fish hatchery structures include woodwork, flooring, ceilings (plastered, board, or possibly pressed metal), wall surfaces, stone fireplaces, and sometimes picture rails and support posts. Features such as flooring and ceilings may be covered by non-historic materials.

Changes made after 1943 to the interiors of historic hatchery structures in use since 1943 may also be acceptable. The extent of such acceptable changes depends on the size and character of the building under consideration and the purpose of these changes. The hatch room of a hatchery building is perhaps the most significant interior space of a fish culture station. The partitioning off of small spaces for restrooms, storage closets, mechanical systems and/or offices is acceptable providing that the sense of the historic open space of the hatch room remains.

Hatcheries are districts, and the interior features of individual buildings need not remain as intact as the exterior features. For buildings whose exteriors have significant architectural character, their exterior qualities may outweigh negative interior changes. Large hatchery buildings (hatch houses) should retain a sense of their important historic interior hatch room characteristics.

G. GEOGRAPHICAL DATA

The geographical area is the State of Vermont.

H. SUMMARY OF IDENTIFICATION AND EVALUATION METHODS

The multiple property listing for fish culture is based on a preliminary survey of fish culture stations in Vermont. This survey reviewed four state-owned fish culture stations in the towns of Bennington, Salisbury, Roxbury and Morgan to determine their eligibility status for the National Register of Historic Places. Architectural historians Ann Cousins and Liz Pritchett conducted the preliminary survey, and prepared the National Register and MPDF documentation.

The geographic area for this context was determined to be the entire state because fish culture stations have been and are located throughout the state. The time period is from 1850 to 1943, as Vermont's earliest known participation in fish culture begins in the 1850s, and some early private hatchery buildings appear to date from around 1850.

The initial property type documented in the multiple property listing is fish culture stations. These fish culture stations historically hatched, reared and distributed fish to Vermont's streams and ponds. To provide further information on how the form of fish culture stations developed, the property type description also includes information on a number of subtypes of fish culture stations. The initial typology for the subtypes within the property type is based on the information gathered in preparing the three above-mentioned National Register Nominations. All three fish culture stations were analyzed and their buildings and structures were placed into subtypes. The subtypes are based on factors of function, physical appearance, style, date, and historic association. Further study may reveal additional subtypes of fish culture stations.

The standards of integrity were based on the National Register of Historic Places standards for assessing integrity. Information from the National Register nominations for the three historic fish culture stations and knowledge of the condition of the existing properties was used to determine the degree to which allowances should be made for alteration and deterioration.

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