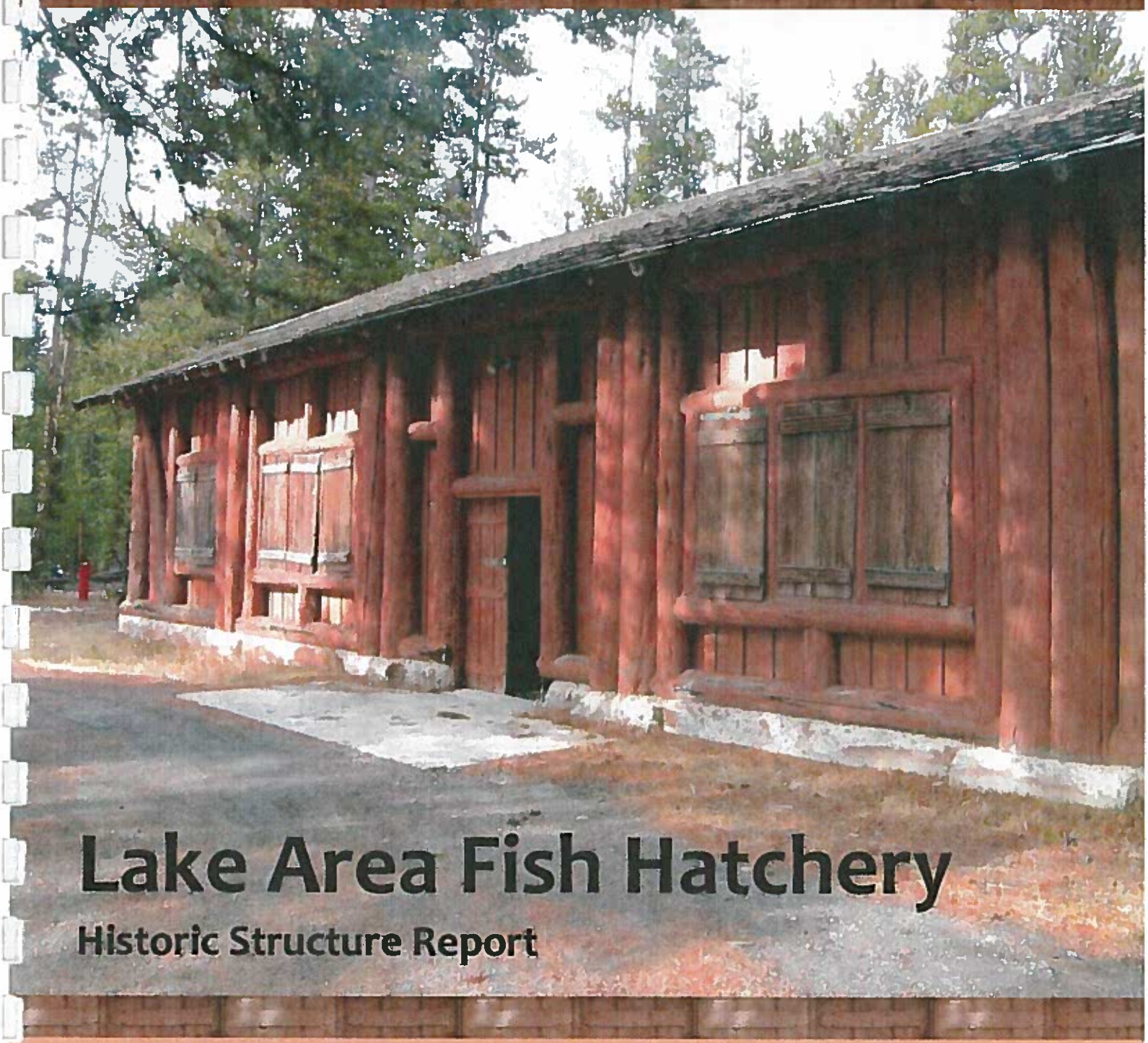
National Park Service
U.S. Department of the Interior

Yellowstone National Park



Lake Area Fish Hatchery

Historic Structure Report

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Prepared by Sievert & Sievert Cultural Resource Consultants
in conjunction with the Montana Preservation Alliance

Historic documentation and project review provided by the
National Park Service
Yellowstone National Park, Wyoming
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Executive Summary

Directive

This report was prepared under Cooperative Agreement H1233E007, by which the National Park Service (NPS) and Montana Preservation Alliance (MPA) will work closely to strategically plan for management and preservation of highly significant buildings within the boundaries of Yellowstone National Park (YNP). Under the agreement's task order, this project will define recommendations for treatment and use to be used as part of an overall strategic plan to enhance Yellowstone's historic structures associated with the core operations of the park, combined with visitor services and visitor understanding and education of the cultural development of the park's historic built environment. During the first phase of this agreement, MPA and YNP staff have begun preparation of a series of historic structure reports on historically and architecturally significant buildings within the park. Professional and technical services for this first phase were provided by Sievert & Sievert CRC, consultants in the fields of Historic Architecture, Architecture and Structural Design.

This Historic Structure Report (HSR) on the Lake Fish Hatchery is intended to provide a detailed cultural and technical evaluation of the building, to identify and prioritize the deficiencies that exist for the structure, and to derive a plan to stabilize and preserve the building for future generations and for continued use. To accomplish these goals, this report includes a statement of the historic significance of the property, a narrative history of the Lake Fish Hatchery, a condition assessment of all materials, an assessment of which materials are original, and a preservation plan that outlines care of those materials based on their originality and condition.

Methodology

The following research and documentary actions were initiated in the course of reviewing the existing condition of the property:

1. Visual on-site observations were made during several trips to the site during 2006–07. The observations were limited to what could be seen with minimal disturbance to the structure.
2. The facility was photographed during the trips as noted above. Many of those photos are contained within the body of this report.
3. Limited design drawings and drawings for proposed modifications to the building were found at the repository of the Technology Information Center (E-TIC) of the NPS Denver Service Center; drawings contained in this report are from a combination of those design drawings and field measurements taken during site visits as noted above.
4. All materials were assessed on site in regard to condition. The assessment methods and conclusions are reported on in the Evaluation/Assessment section of this report.
5. Limited structural evaluations were completed during the preparation of this report. Selected structural "safety checks" were made on typical structural framing members.
6. A building code "overview" is incorporated within this report; specifically to consider code related implications of permitting continued use of the building. Accessibility guidelines were included with the building code evaluation as they apply to the building.
7. Historic architectural and engineering methods and practices were reviewed and evaluated as they pertain to the construction of this building.
8. As further explained in the Evaluation/Assessment text, in-depth mechanical and electrical evaluations were specifically excluded from this report.
9. Existing YNP planning and National Register documents were reviewed, historic contextual information was provided by park cultural resources personnel, and additional secondary sources were consulted to supplement the existing knowledge regarding the hatchery and its broader significance.

Administrative Data

The Lake Fish Hatchery is the primary contributing structure within the Lake Fish Hatchery Historic District, as documented within the historic sections of this report. Thus it is a Historic Property of National Significance, listed in the National Register of Historic Places. Opened in 1930, the Lake Fish Hatchery raised millions of trout for stocking parks region-wide, as well as for Yellowstone Lake. The history of this property "demonstrates the changing ideas of fisheries science from the late 19th to mid-20th century," and "clearly demonstrates the national transition from recreational planning to promote national parks as sporting locations for public use to sanctuaries of native species protection."[1] Built under the supervision of Thomas Vint, chief of the Landscape Engineering and Architecture division of NPS and one of the pioneers of the Parkitecture style throughout the National Park System, the hatchery's log-framed design is indicative of the rustic architectural patterns established in the national parks during the late 19th and early 20th century.

Pertinent classification data is as follows:

- Locational references: Building Number 726; LCS #10641.
- National Register Status: Listed June 25, 1985, as a Contributing Property in the Lake Fish Hatchery Historic District.
- National Register Listing elevated to national significance: January 20, 2005.
- Category of Significance: Category 1b structures that contribute to the national significance of a historic district. However, because the Lake Fish Hatchery is the primary structure within the Lake Fish Hatchery Historic District, it is most likely also independently eligible for National Register listing and would therefore also fit the definition for category 1a properties.
- Period of Significance: 1900–?, is the period listed in the original National Register (NR) submission. Based upon historic data, the suggested period of significance for this structure are the years from its construction through its active operation: 1930–57.
- Significant Historic Contexts: Architecture in the National Parks, Conservation Policies of the NPS and YNP.
- New information and documentation generated during the preparation of this report will be housed with the YNP Cultural Resources records on this property.

Currently, the Lake Area Fish Hatchery is being utilized as a warehouse and storage facility for fisheries and maintenance departments of NPS; particularly during the off-season. The last uses of the building for a Fish Hatchery were in 1957 and the structure has served as a support or storage building since that time.

The administrative background on the Lake Fish Hatchery from National Register listings to planning documents, reflects YNP managers' recognition of the historic and architectural importance of the Lake Fish Hatchery and the significant role it has played in fisheries management in the park and the region.

In 1993, the Lake/Bridge Bay Development Concept Plan's stated objectives included the provisions that "opportunities will be provided" and that "visitor use areas would be clearly defined and separated from administrative, maintenance, and staff residential areas." It further noted that "the overall visitor experience would be improved as a result of redesigned circulation routes, an enhanced program, and upgraded facilities." The report concluded that at Lake: "Circulation patterns are confusing for visitors, administrative and visitor areas are mixed together, and no formal interpretation is provided."

The plan addressed the Fish Hatchery Historic District and planned interpretive exhibits in the hatchery to describe the role of fisheries management at Yellowstone, along with other functions, such as offices, laboratory, housing and storage, in the surrounding buildings. At that time, the plan stated that "all buildings contributing to the historic district will be stabilized and rehabilitated to their historic appearance," while "trailers and other non-historic housing units" would be removed.[2]

In 1999, YNP issued a sweeping State of the Park report, and in its Business Plan, summarized the park administration's responsibilities and strategies for "preserving Yellowstone's historic structures." "As a way to enhance preservation," the authors stated, "making use of these structures is important, even when it may appear more efficient to construct a new building that meets the need."

The State of the Park report noted that many of the park's historic buildings required extensive work to prevent structural damage, and named the Lake Fish Hatchery buildings and a short list of others among the candidates.[3] Considering its program needs, the report cited the need to strengthen the YNP Fisheries staff and infrastructure. Specifically, the report went on to note that "old buildings in the Lake Fish Hatchery Historic District that have been traditionally used by the fisheries project staff are on the

verge of collapse. Significant restoration could make these facilities functional for fisheries management operations and return the buildings' historic value."[4]

In May 2000, the YNP Division of Interpretation released a Long-Range Interpretive Plan, and in recommendations for in-park visitor centers, it noted a need for a visitor contact station at Lake. Options included facilities in the entrance, the Lake Hotel, or suggested "as an alternative, consider locating the contact station along the lakefront. This new visitor contact facility could possibly include a sales area." The report went on to recommend that YNP "interpret the park's aquatic resources, underwater geology in Yellowstone Lake, and fisheries history including issues such as fish stocking, hatcheries, and the introduction of exotic species."[5]

Major Findings

The Lake Fish Hatchery structure has changed very little over time and retains a high degree of historic integrity; most original materials remain on site and are intact. Nearly all of the exterior materials are original to the building (or were repaired in-kind) and interior materials are original with the exception of floor covering in the office area and the introduction of a wooden storage platform in the west end of the Hatchery raceway area. Outwardly, the building continues to exhibit the "Parkitecture" architectural style that was so masterfully applied in Yellowstone National Park, and the Hatchery is an example of a historic design that blends with the Yellowstone Lake natural environment. Although the structure reflects its 1928–30 construction era in materials and finishes, the visual design character is timeless as it relates to the natural setting of Yellowstone.

- Research to date, subject to change if new information is discovered, suggests that this may be the oldest remaining log structured fish hatchery in the United States. Examples of other historic log hatcheries were found in Story, Wyoming, and at Jasper State Park, Jasper, Texas, but those examples either used log as a surfacing material, or have been altered dramatically.
- With few exceptions, this building retains exterior integrity as an example of rustic "Parkitecture" that was prevalent in western national parks during the decades following the creation of the parks.
- The interior also retains its 1930 material integrity and does not exhibit any significant changes with the exception of the storage platform (circa 1990s) constructed in the west end of the raceway portion of the hatchery. This platform could be removed with no remaining visual effect to the historic interior.
- The Lake Fish Hatchery can be assigned to new uses with additional investment and would ably meet the needs of NPS programs as described in the recent planning documents cited above. Reuse of this kind would be complementary to its design and enable interpretation of the hatchery's national significance and preservation of its values as an example of historic log architecture in the national park system, in service to, and for the enjoyment of, the American public.
- Assigning a new use for the facility will require that it be treated as a Rehabilitation of an historic property in compliance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring, & Reconstructing Historic Buildings* (1995).

In addition to the identification and significance of historic materials, this HSR looks in detail at the condition of the building. The evaluation included in-depth building code comparisons, fire ratings, mobility impaired accessibility requirements, materials conservation, and structural adequacy of supporting members. In general, the building was evaluated for a change in use from the historic hatchery role it has fulfilled, and was found to have good potential for future assembly, retail commercial or exhibit use. Work that would be required to bring this facility "on-line" for these uses was compiled within this report and is summarized below.

Recommendations for Treatment and Use

A Summary of Required Improvements to Rehabilitate the Building to Full Use:

Fundamental protection of at-risk elements

- Re-roof entire facility to historic appearance; incorporate current fire and material conservation practices of the NPS.
- Repair/replace concrete supporting elements as described in text.
- Repair/replace deteriorated wood structural elements (see text).
- Upgrade truss connections to current code stress levels.

- Complete a seismic evaluation and report; upgrade seismic brace connections.

Fire safety
- Add fire alarm and detection systems.
- Add fire suppression system (sprinklers) if warranted by new occupancy classification of building.
- Add second exit from raceway area of building if space is rehabilitated to assembly purposes.

Rehabilitation and sealing of the exterior building envelope
- Restore windows and doors.
- Restore exterior log steps.
- Replace wood snow shutters; including hardware.
- Apply caulking (sealants) throughout exterior joinery.
- Stain/paint entire exterior.

Upgrading of the utility systems
- Upgrade electrical system throughout including power, lighting, and distribution.
- Provide and install security system (subject to confirmation of selected building use).
- Provide potable water to the facility; include drain-down features.
- Provide utility systems for handling waste if warranted by usage of the facility (i.e., public restrooms).
- Replace unit heater in original office area if it is anticipated that this space will be used during the shoulder seasons.

Interior restoration
- Cleaning of the interior throughout.
- Minor repairs and painting.
- Rehabilitate existing wood flooring.
- Restore/enhance aquarium exhibit area.

Providing for ADA accessibility
- Assign ADA parking space(s).
- Establish ADA passenger load/unload zone.
- Complete ADA walkway from parking to building; remove fragments of former walks.
- Provide and install ADA ramp from walkway to entrance terrace.
- Provide for ADA hardware and signage requirements as required by IEBC building code.

Providing for changed use
- Depending on proposed uses, primary impacts to the floor plan may involve exhibitry, lighting, and sensitive changes to surface materials as opposed to heavier constructions such as walls and structure.

Other detailed recommendations that are minor in nature can be found within the Treatment and Use section of this report. These include some general clean-up and maintenance activities as well as enhancements that address what might be desired for the structure as opposed to the minimum that must be done for the building. In addition, it must be noted that a Hazardous Materials Survey was not done during the preparation of this report; if lead-based paints or asbestos materials are encountered they will have to be surveyed and abated.

The Lake Fish Hatchery demonstrates strong potential for adaptive reuse to meet changing needs in Yellowstone National Park. Its significant historic and architectural values derive from (1) its contribution to the preservation and understanding of the natural environment on a national level because of the research and production activities related to fish culture and conservation, and (2) the unique architectural style of a building that is representative of an era of development for Yellowstone National Park—a style that will not likely be built again. It is essential that the exterior appearance of this structure be maintained. The form and some of the materials of the interior are also significant and incorporating these values into new uses must be done sensitively.

Part 1. Developmental History

Historical Background and Context: Significance

The Lake Fish Hatchery, along with the surrounding Lake Fish Hatchery Historic District, has been determined significant on a national level under National Register Criterion A for its role in the conservation policies of the National Park Service and as the source of wild cutthroat trout that were planted in lakes and rivers throughout the west. As a primary building in the Hatchery Historic District, its architectural values were recognized under criterion C on a local and state level as an exemplary structure reflecting the rustic log building patterns common throughout the national parks. Although not specified in the original National Register documentation, the appropriate period of significance for the Lake Fish Hatchery and the Lake Fish Hatchery Historic District is 1930 (when the hatchery was completed) to 1957 (the year the hatchery closed).

In the history of the Yellowstone fisheries, the Lake hatchery was central to Yellowstone fishery operations for 27 years (1930–57), and today is the only physical remnant of Yellowstone's long history of active fishery manipulation.

From a national perspective, from 1928, when the building's construction began, until 1957, the Lake Fish Hatchery played a prominent role as the source for millions of trout that were raised and stocked in parks throughout the western region. The history of the hatchery and its management reflects "changing ideas of fisheries science from the late nineteenth century through the twentieth century. This world view started with the stocking of nonnative species of fish, such as lake trout for recreational purposes, until late in the 20th century [when] there was the realization that the early, well-intentioned actions of the Fish and Wildlife Service and the National Park Service were disastrous to native fisheries."[6]

The Lake Fish Hatchery, like other hatcheries that produced fish that were destined to become potentially harmful exotics when they arrived at their eventual destinations, "was the source of many, many harmful infestations of Yellowstone cutthroat trout beyond the park waters."[7] For instance, Yellowstone cutthroat trout from the Lake hatchery were often introduced into waters populated by westslope cutthroat trout vulnerable to such nonnative competition. In fact, it is possible that the hatchery was detrimental even to the park's own Yellowstone cutthroat trout population. Though they were native to the park, hatchery fish were not necessarily returned to the same park waters from which they had originated. In any aquatic environment, one potential result of such actions can be the loss of genetic information programmed into fish subpopulations historically associated with a natal stream. The hundred or so active spawning streams that feed into Yellowstone Lake are subject to local variations that might have affected their natal subpopulations in the long term, had the hatchery era not potentially scrambled those natural distinctions.

Fish Stocking in the Western United States

According to fisheries scientists, until the arrival of European Americans, many of the West's mountain lakes were barren of fish, due to their isolation and geological origins. Scoured out by glacial activity during the Pleistocene era, thousands of western lakes are located high in alpine environments where there were no natural waterways to carry and spread fish into these waters. It was not until the 1800s that miners, ranchers and sport fishermen began the practice of dropping live trout and other fish species into fishless waters to plant new populations in places they had never existed.[8]

Elsewhere, in places where native fish populations did exist, anglers and government officials began to think in terms of managing fisheries and restoring healthy fish populations to lakes and rivers where mining, logging and other intensive development had impacted fish numbers. In 1871, the United States Congress appointed a Com-

mission of Fish and Fisheries to develop a fish culture program. That same year, the American Fish Culturist Association was organized and, in 1872, lobbied Congress to authorize the United States Commission to restore fish to depleted rivers. Over the decade that followed, just under half a million dollars was committed to this effort and through emerging state and federal fisheries programs, anglers and scientists supported and encouraged the expansion of popular fish species throughout the West.

The first fish to be transported long distance by the newly established U.S. Fish Commission was a shipment of shad sent to California in 1874. During the early years, fish were contained in open milk cans that had to be intensively managed, with water changes and additions of ice to maintain water conditions over the several day trip.[9]

In 1889, rainbow, brown, brook and lake trout were shipped from the Midwest to this region, and Yellowstone National Park was the first site to receive the stock. According to Montana fisheries biologist Bill Alvord, prior to this time only the Yellowstone River and Gibbon River had reported fish populations. The chart below chronicles the initial stocking of these lakes and rivers.[10]

In 1896, Congress approved construction of a fish culture station in the Black Hills and in 1901, the new Spearfish National Fish Hatchery established an egg-gathering substation in Yellowstone National Park. Located at West Thumb on Yellowstone Lake, the substation primarily collected black-spotted trout eggs and shipped them to Spearfish for hatching and distribution to other western waters.[11]

For the first decade of the 20th century, Spearfish hatchery staff traveled overland to Yellowstone Lake to collect the eggs and take them back to Spearfish. The expedition traveled by rail as far as possible, but "the last portion of the journey was made by wagon, with the wagons piled high with boats, nets, troughs, and other equipment." After 1911, the Montana State Hatchery at Bozeman, assumed responsibility for the Yellowstone egg-gathering and hatching operations.[12]

Fish were transported and planted by a variety of modes. Early on, packstock carried satchels of live fish to plant in alpine lakes. Fishing enthusiasts and sportsman's clubs sometimes took the initiative to plant fish into their favorite fishing holes. As large fish hatchery programs came on line, government fish cars carrying millions of fingerling trout were hauled by railroad and distributed through young federal and state fish and wildlife programs. And by the mid-20th century, hatchery fish were dropped from airplanes to restock lakes on a regular basis.

Date	Water	Species	Number
September 22, 1889	Gardner River	Brook trout	4,975
September 22, 1889	Gardner River	Mountain trout	968
September 22, 1889	Gibbon River	Rainbow trout	990
September 22, 1889	Firehole River	Loch Leven trout	995
October 15, 1889	Yellowstone River	Native whitefish	980
August 9, 1890	Shoshone Lake	Lake trout	18,000
August 15, 1890	Yellowstone River	Native whitefish	5,000
August 23, 1890	Lewis Lake	Lake trout	7,262
August 23, 1890	Shoshone Lake	Lake trout	7,263
September 2, 1890	Lewis Lake	Loch Leven trout	3,350
September 2, 1890	Shoshone Lake	Loch Leven trout	3,350
September 2, 1890	Lewis Lake	Lake trout	4,750
September 2, 1890	Shoshone Lake	Lake trout	4,750
September 11, 1890	Yellowstone River	Native whitefish	5,000
September 15, 1890	Nez Perce Creek	Von Behr trout	9,300
September 15, 1890	Gardner River	Brook trout	7,875
October 3, 1890	Twin Lakes	Native whitefish	2,000

Fish stocking in Yellowstone's lakes and rivers, 1889–1890.

Chronology of Development and Use[13]

Fishery Operations and the Lake Fish Hatchery in Yellowstone National Park

> "...for I have been unable to live in the beauty of Yellowstone without feeling the touch of fairies' wings as they flitted from flower to flower."
> —Howard Back, *The Waters of Yellowstone With Rod and Fly*, 1938.

Writing in 1938, angler/writer Howard Back gave us the background for his love of fish and fishing in Yellowstone National Park, sharing park beauty and fishing tips while also discussing some history of the Yellowstone fishery. This fishery history began in 1870 with the explorations and writings of the Washburn-Langford-Doane expedition. Historian Paul Schullery has chronicled it in his article "Their Numbers Are Perfectly Fabulous."[14] While members of the Washburn party were not the first to fish in Yellowstone—archeological evidence indicates that Native Americans fished there long ago and that later fur trappers or prospectors may also have done so—party members of 1870 were the first to write about it.

Following the Washburn party, fishing in Yellowstone was a continuous activity. The 1870s Hayden survey members wrote quite a lot about fish and fishing, and both the Earl of Dunraven in 1874 and General William Strong in 1875 experienced angling in the park. A review of Forest and Stream magazine issues from 1874 to 1890 reveals numerous pieces written about fish and fishing in the new park.[15]

Early officials had the inclination to tinker with the park's fishery. The earliest actual fish stocking by managers in Yellowstone National Park occurred in 1881, when park superintendent P.W. Norris moved some native trout from Trout Lake to nearby ponds, probably those small lakes known today as Buck Lake and Shrimp Lake. Norris also talked about trying to introduce non-native carp into park waters, so he was envisioning making modifications to the fishery before he had the personnel or money to do it.[16] Investigators David Starr Jordan, Barton W. Evermann and S.A. Forbes of the U.S. Fish Commission began the stocking of park lakes and streams with exotic trout, and produced early government reports (1889–1893) about the park's fishery.[17]

After 1888, park officials attached to the U.S. Army began to develop the Yellowstone fishery program, deciding officially to tinker with the system of fish and their habitats. During the period 1901 to 1953, Yellowstone National Park became the largest single source of wild cutthroat trout eggs in the United States.[18] Fishery management operations at Yellowstone Lake began at West Thumb shortly after 1900. Although manipulating fish populations of park lakes and streams began in earnest in 1889 when the U.S. Fish Commission decided to stock various fishless waters,[19] no actual shipping of Yellowstone fish eggs to locations outside the park began until 1901. An 1898 suggestion by Captain J.B. Erwin that a fish hatchery be established in the park had, according to a person who worked at the 1920s hatchery, "far reaching effects [that] would forever alter the natural state of the Park."[20]

A pro-fish-hatchery outlook permeated the thinking of just about all nature managers in those days. "It was believed," declare fish historians John Varley and Paul Schullery, "that nature often needed human 'help' to make fisheries better."[21] Or as another fishery expert noted, the purpose of establishing fish hatcheries in Yellowstone was "to assist nature with a job she had been doing adequately for thousands of years."[22] Managers believed that fish should be heavily stocked into all available waters in order to have the best possible sport fishing ("the best possible campfire meal," says expert John Varley), and they believed that fish eggs should be harvested and shared in great numbers with other locations around the nation and the world.

No doubt they witnessed the depletion of natural fish populations throughout the West due to mining, irrigation, over fishing, and were concerned that the supply of trout in the park might decline due to fishing pressure. In 1908, harvest limits were enacted in Yellowstone National Park, to offset the impacts of tourist fishing and commercial harvesting to feed the tourists.[23] "The hatcheries are maintained," explained Hugh Smith and William Kendall in 1921, "for the purpose of keeping up the supply of [cutthroat] trout."[24] Finally, managers believed that many fish eggs were lost naturally and that that "unfortunate" event could and should be prevented.[25]

In accordance with these theories, the U.S. Bureau of Fisheries, Department of Commerce, made an initial egg taking on May 15, 1901, at West Thumb.[26] Howard Back explained the egg-taking process in his 1938 book: "fish are trapped as they run up-stream and stripped of a large part of their spawn, which is then hatched out... This hatching is done in two stages. In the local hatchery

the eggs are ripened until they reached the stage known as 'eyed ova,' which means that through the transparent skin of the egg you can perceive the black spot of the embryo fish's developed eye. At this stage they are dispatched to 'feeding hatcheries,' where they are brought to full development. They are then and from there redistributed as fry, under the direction of the Bureau of Fisheries, to the points where they are most needed."[27]

D.C. Booth, superintendent of the national fish hatchery at Spearfish, South Dakota, conducted this operation, assisted by four U.S. army soldiers. Booth removed an estimated one million fish eggs from Yellowstone Lake in 1901 alone, the Spearfish hatchery's first year.[28] To support this activity, workmen erected a hatchery building on Little Thumb Creek in 1903 and enlarged it in 1906 and 1912.[29]

D.C. Booth reported in 1909 that the West Thumb station was the "greatest collecting center for [cutthroat trout] in the United States."[30] Park fishery operations were limited to the West Thumb area until 1909, when a small cabin and hatching troughs were erected at Clear Creek and egg collecting was performed at Cub Creek.[31] Eventually fishery workers set up fish traps at numerous streams and lakes and other small hatcheries at Soda Butte, Trout Lake, and Grebe Lake.[32]

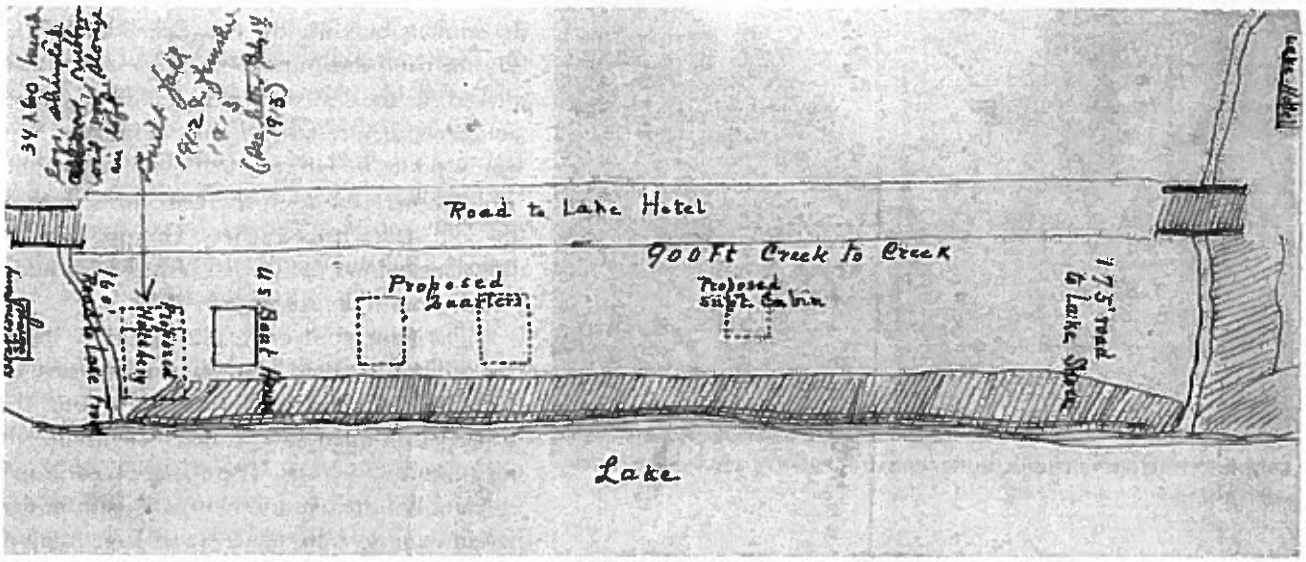
But what was to become the real center of the park's fish culture operation for the next forty years was planned for a location at Yellowstone Lake, near Lake Hotel. W.T. Thompson, superintendent of Yellowstone fishery operations, asked the Commissioner of Fisheries in 1912 for permission to erect four buildings on the shore of Yellowstone Lake at a location one-half mile west of Lake Hotel. A log house was all that was "here now," opined Thompson, along with "a few open air [fish] troughs subject to depredation by the bears." He regretted that "the men cook and eat in the open." Thompson asked for 1) a 30- by 60-foot hatchery, 2) a central storehouse, 3) a mess building with quarters in it, and 4) a cabin/office for himself, the fishery superintendent.[33] He needed these facilities, explained one of Thompson's supervisors, "in order to facilitate fish cultural operations in the Yellowstone Park and [to] extend its present field operations."[34]

A month later, Thompson was pleased to learn that Interior had authorized construction of his buildings. The buildings "will all be located on the narrow strip of lake front," he noted definitively, "betwixt the very small creek into which the Lake Hotel sewers drain [Hotel Creek] and the next small creek S.W. [Hatchery Creek] on the banks of which our boat house and temporary hatchery now stand." Finished Thompson, "the [new] hatchery building will be located between the present boat house and the creek."[35] He included a hand drawn map for the files that clearly showed the locations of the current and proposed buildings.[36]

Workmen commenced construction on these buildings and completed them in 1913—a hatchery (34 by 60 feet), a messhall, a bunkhouse, and a shop. Laborers also installed a small dam and pipeline to ensure an adequate water supply to the complex. They erected new fish troughs, so that the complex soon boasted twenty-six doubles and two single troughs, each with eight compartments of 14 by 18 feet each. Each trough could hold 500,000 fish eggs.[37] In 1914, workmen added a bungalow and a four-horse barn at the complex.[38] "The workings of the plant have become a matter of interest to so many tourists," proclaimed the park superintendent that year, "as to require at times the services of one of the attendants constantly in showing them around."[39]

Apparently Thompson's buildings were not built well, for by the late 1920s, park officials were describing the hatchery building at Lake as old and decrepit. Yellowstone was now under the management of the recently established National Park Service, and park officials took steps in 1928 to build another hatchery. Workmen erected most of the new building that summer and added interior details in 1929, so that the main building was ready for occupancy in 1930. Also erected that summer were a bunkhouse and mess house. These buildings were of frame and log construction of the type then being approved by the Landscape Engineering Division of the National Park Service.[40]

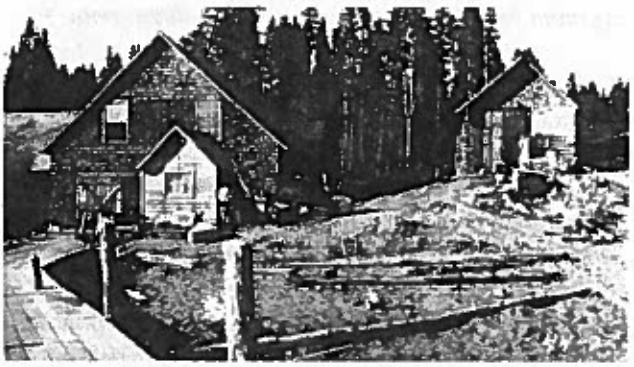
The new hatchery building was 42 by 108 feet and contained an office for the hatchery superintendent, a main room of 42 by 68 feet[41] for hatching and packing eggs, and an aquarium room "with seven large tanks" containing native park fish so that the public could view them at a lower level through glass windows. A balcony, accessible via a stairway at the front of the building, allowed visitors to look down on workers at the hatching troughs without allowing entrance to the room. Workmen soon "wrecked" the old hatchery building, which was described as "very unsightly and in a very poor state of repair." "All in all," declared the report, "the [new] hatchery building is one of the most modern in the western part of the country, with a capacity of about 25 million or more eggs per year."[42] The Monthly Report of the Superintendent for July 1929 (p. 12), was even more emphatic, stating that "37 men are working [on the new building], and by the end of



Thompson's hand-drawn map plotting existing boathouses, and quarters along Lake Yellowstone shoreline.

the season, the Lake Fish Hatchery will then be the finest and most up-to-date hatchery in the United States."

Design of the burgeoning hatchery complex also included three new rectangular rearing ponds, located on nearby Hatchery Creek about 75 yards west of the new building. The ponds were 112, 108, and 98 feet long respectively, by 5 feet wide each. Workers stocked the ponds with small fry (young fish), which were held there and fed before being planted in park waters. "This improvement," explained the report "is a decided advantage in the propagation of fish at the Yellowstone Lake plant, as previously it was necessary to plant fish direct[ly] from the hatchery[,] which resulted in serious loss[es]."[43]



1913 Hatchery and 1912 (?) U.S. Bureau of Fisheries Boathouse still in existence in 1928. Other structures in the background are probably the shop, mess house, and bunkhouse.

East of the new building, workmen built an exhibit pond, sixty-five feet long and five feet wide where mature fish could be kept for exhibition.[44]

A new bunkhouse and mess house were located nearby. The bunkhouse, completed in 1930, was 86 by 27 feet with a recreation room, a bathroom, and fifteen individual rooms for employees. The mess house, constructed in 1929 and 1930, was 56 by 24 feet in size with a large dining room, kitchen, pantry, and living quarters for the cook. A small woodshed built at the rear of the mess house was 15 by 20 feet in size.[45]

Also during this period 1928–30, the Bureau of Fisheries reconditioned and extended its nearby boat dock, from which three 33-foot launches and several smaller boats operated during summer months.[46]

William E. Corey of Pittsburgh, Pennsylvania, made the private donation of $15,000 in October of 1926 that made this hatchery construction possible. The Bureau of Fisheries matched these funds, so that the final result was to "enable the Bureau to properly handle fish propagation and planting in Yellowstone National Park."[47]

With regard to the eventual color of the buildings, ten years later NPS officials ordered the Bureau of Fisheries Regional Director to paint all new buildings at Lake in a gray-green color and to include the existing fish hatchery buildings in that order.[48]

Over the years there was a series of boathouses at Lake that supported the hatchery and its activities. There was a boathouse present at the Lake hatchery in 1912, but a

Lake Fish Hatchery building under construction in 1928 viewing back wall upslope.

Lake Fish Hatchery Building shortly after construction was finished (note construction materials still in foreground of building) which has been shuttered for the winter of 1928–29.

more substantial one was apparently built in 1930. Assistant superintendent M.S. Daum stated in 1929 that two buildings remained to be erected at the new hatchery, including a new boathouse to be built on the "end of the dock on the site of the old fish hatchery." This boathouse appeared in the park's 1941 master plan, but little else about it has been found, other than what appears in this footnote.[49]

A note in the park library's history card file, compiled in the 1920s by Superintendent Horace Albright, states that an old boathouse was torn down and replaced at Lake in 1926. It appears that this refers to the YPBT Co. Boat House that was built on this location in 1926, and most likely replaced an old boathouse that was a concessions-related structure (not the log structure shown in the 1928 photo of the old hatchery installation, torn down by workers building the new Lake Hatchery).[50] On the hand-drawn map, to the west of the site picked for the 1913 hatchery building, there is another structure labeled Boat Company Storage. A photo in Tainter and Tanner taken about 1928 shows a piece of the boat house next to the "old" Lake Fish Hatchery. This photo is captioned as follows: "to the left is the boat house[,] which was still in existence in 1926."[51]

The completion of the complex of the hatchery and its associated boathouse at Lake gave the park fishery operation the "shot in the arm" that it needed in order to operate efficiently for the next twenty-five years. The operation continued to plant both native and non-native fish in park streams and to collect and export large numbers of trout eggs. Angler Howard Back described how the operation worked in 1938:

"The hatchery at Lake Junction on Yellowstone Lake confines itself to the stripping of cutthroat trout, and large demands for these fish are satisfied from this origin. The Park, in return for supplying the eyed ova, has a first call on the hatched fish to the extent of its own requirements. The Lake Junction hatchery, which is open to the public, and which you [the visitor] certainly ought to visit, is fed from traps on eleven different streams[,] which run into the lake. In 1937 an all-time record—in fact a world record—for one hatchery was set. No less than forty million eyed ova were handled and passed out in good condition to the feeding hatcheries, almost one hundred per cent arriving in a perfect state at their destination, so skilled is the work of dispatch... I confess that my mind boggles at the thought of forty million trout."[52]

During the period 1930–57, the National Park Service gradually changed its mind about earlier policies that manipulated natural conditions in the park, thus making substantial strides in fishery science and ecosystem management and marching toward the keep-it-natural philosophy that is in place today. For example, in 1936 the NPS decreed that no exotic fish were to be planted in waters that contained only native fish, that wider distribution of exotic fishes were to be prohibited, that artificial improvements on lakes and streams were to be avoided, that exotic fish food was to be prohibited, that fishless waters might be best left fishless, and that propagation of native fish was to be encouraged to the greatest possible extent.[53]

In 1949, the National Park Service sought the advice of a team of fishery research biologists from the U.S. Fish and Wildlife Service (USFWS) as to what influences egg-taking operations were having in the ecological balance of the Yellowstone Lake fishery. As early as 1953, these biologists learned that egg taking and restocking were not necessary to maintain the fishery. "In fact," noted Phillip Sharpe, "they found [that] the excessive removal of eggs was detrimental to reproduction." The hatchery program, it was learned, posed an actual threat to the lake's cutthroat trout population.[54]

Thus in the 1950s, NPS officials made dramatic curtailments to manipulative park fishery operations. The last substantial collection of eggs from Yellowstone fish occurred in 1953. The last fish stocking for the benefit of anglers occurred in 1955. The NPS closed all park fish hatcheries in 1957 and made plans to return the entire park fishery to its original self-sustaining basis. In 1961, the advisory fishery research biologists left the park and workers from the Bureau of Sport Fisheries and Wildlife replaced them. These workers began long-term research on all park waters so that the park fishery could be learned about and monitored to aid management. Fisheries management was shifting more toward protection of native species and general research and less toward "aiding" (artificially) the fishery. Worries about angler pressure on waters and the idea of returning fish unkilled to the water were also becoming forefront considerations.[55]

Conclusion

Many of the buildings in the Lake Fish Hatchery Complex have continued through the years to be used for park housing, fisheries science office space and laboratories, although the main hatchery building itself has been used for storage for many years. The hatchery building has strong potential to be stabilized, restored and reused by the National Park Service. Celebrating a time in the national park when natural processes were subordinated to the will of humans, the hatchery offers the opportunity to interpret the fascinating history of Yellowstone fishery operations and human impacts on the region's natural fisheries over the past century. The hatchery today remains an integral element of the cultural resources that supported the park's natural resources—the "freshwater wilderness" celebrated by John Varley and Paul Schullery.

Chronology of Use

The chronology of the Lake Area Fish Hatchery is as follows:

- 1928—Construction of the hatchery begins.
- 1930—The hatchery is fully operational.
- 1930 to 1957—the Lake Fish Hatchery played a prominent role as the source for collecting and exporting millions of cutthroat trout eggs, as well as participating in the planting of both native and non-native fish in park streams.
- 1957—NPS closed all park fish hatcheries.
- 1957 to 1961—The hatchery was used as part of the work of advisory fish research biologists from USFWS.
- 1961—Advisory fishery research biologists left the park and workers from the Bureau of Sport Fisheries and Wildlife replaced them.
- 1961 to 1993—Until 1993 (date of the DCP/EA referenced under the 'Treatment and Use' portion of this report) USFWS was still involved with the park fisheries program. The exact date when the hatchery was assigned to storage use has not been determined but it is assumed that the hatchery building continued to be utilized as part of overall fisheries research during part of this time period.
- 1990s—The mezzanine storage platform was added into the west end of the hatchery floor after the building ceased to be used for the fisheries program.
- 1990s to Current—The Lake area Fish Hatchery is being utilized as a warehouse and storage facility for fisheries and maintenance departments of NPS; particularly during the off-season.

From the date of its construction until the 1990s the primary use of the hatchery has been related to fish production or research, as reiterated above. Construction changes to the structure have been minimal resulting in a historic property with an exceptional degree of original integrity.

Archaeological Considerations

In addition to presenting the documented history of the Lake Fish Hatchery this report is intended to raise the awareness of all cultural values and to create a foundation for continued research into the building; its occupants, designers, and founders; its site or location; and the history of events surrounding the building. Although not the primary purpose of an Historic Structure Report, it must be recognized that understanding the occupation of the site over time has the potential to yield additional information that can contribute to the story of this loca-

tion from both the standpoint of pre-history as well as history. For this reason it is recommended that all ground disturbing activities be observed with sensitivity regarding archaeological values.

In the case of the Fish Hatchery it is known that rearing ponds were located near the hatchery during the period of written history and documenting their location is warranted.

If buried features related to pre-history are encountered or if artifacts are unearthed that are thought to have the potential to add to the history of the facility or occupation of the site prior to construction of the building we recommend consultation with the Park Archaeologist, Historian, or Historic Architect.

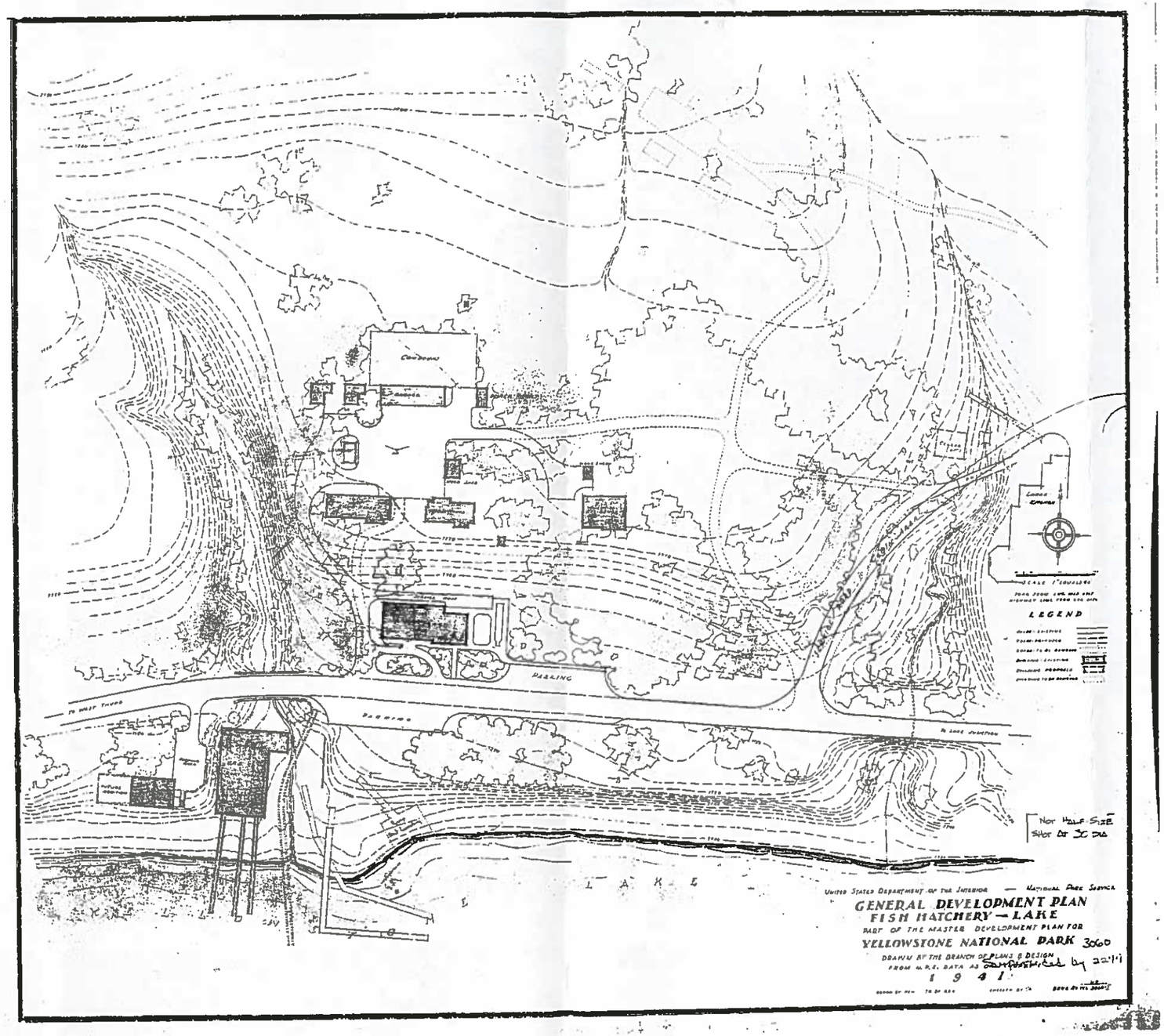
Identified Archeological Sites

Two archeological sites were listed in the 1992 DCP, following archeological surveys in 1958 and 1959. Site 48YE379 is located along the lakeshore west of the Lake Hotel, directly opposite the hospital and its parking lot (fairly close to the Hatchery) and the extent of the site is unknown, (it may have been impacted by the original construction of the Grand Loop Road and further modifications, and may have experienced impacts from shore erosion). Site 48YE380 is nearby, also along the lake shoreline, but east of the Lake Hotel. This site is a large site extending back from the lake over several acres. Neither site would be adversely impacted by the reuse of the Lake Fish Hatchery.

Additional archaeological investigation is, and has been, ongoing and verifying current conditions with the Yellowstone Center for Resources (NPS) will be necessary as development in the proximity of the hatchery occurs.

Historic Plans and Materials

Historic plans and materials are found on pages 13–32.


PARKING
LAKE
LEGEND
Not Half Size
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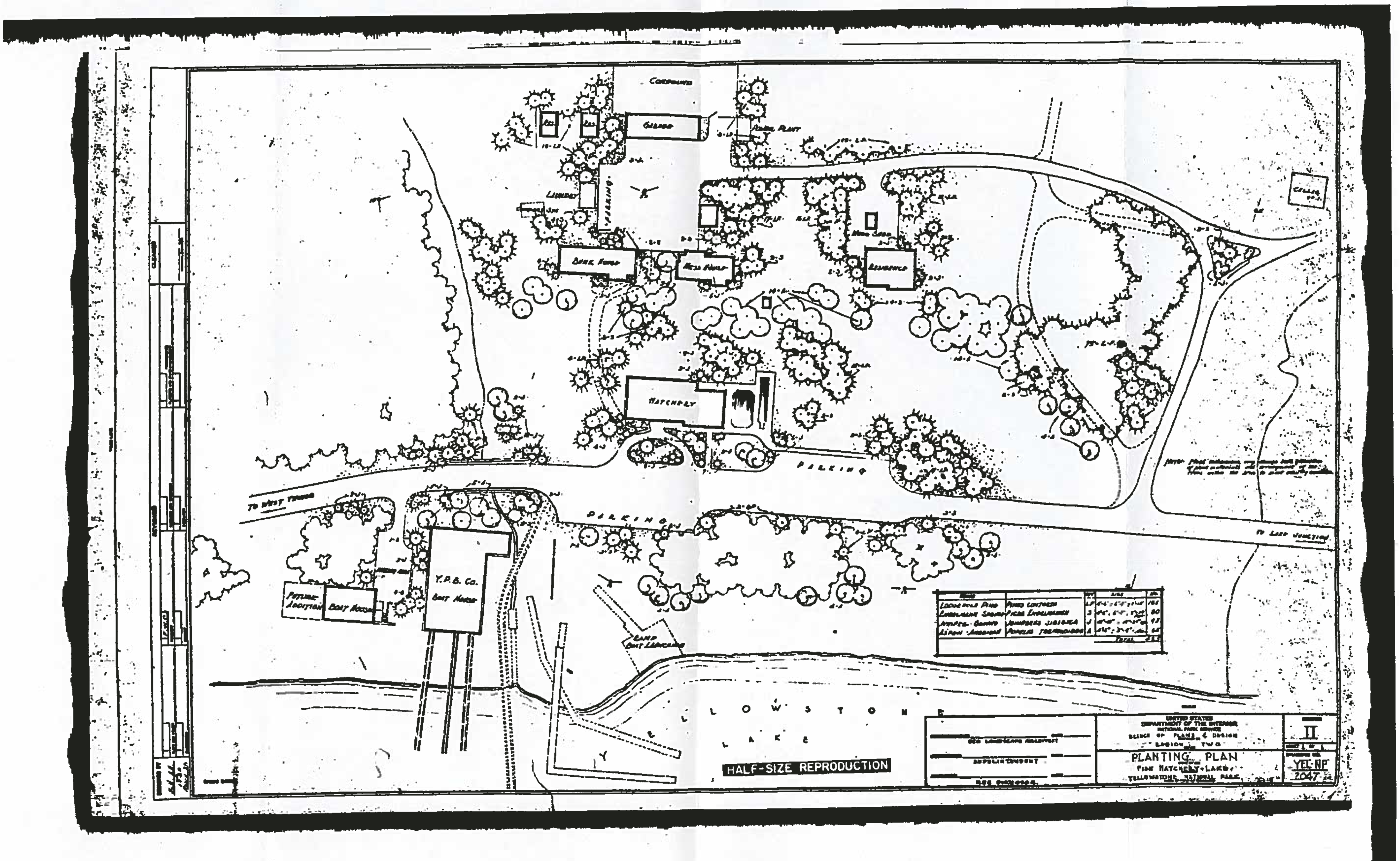
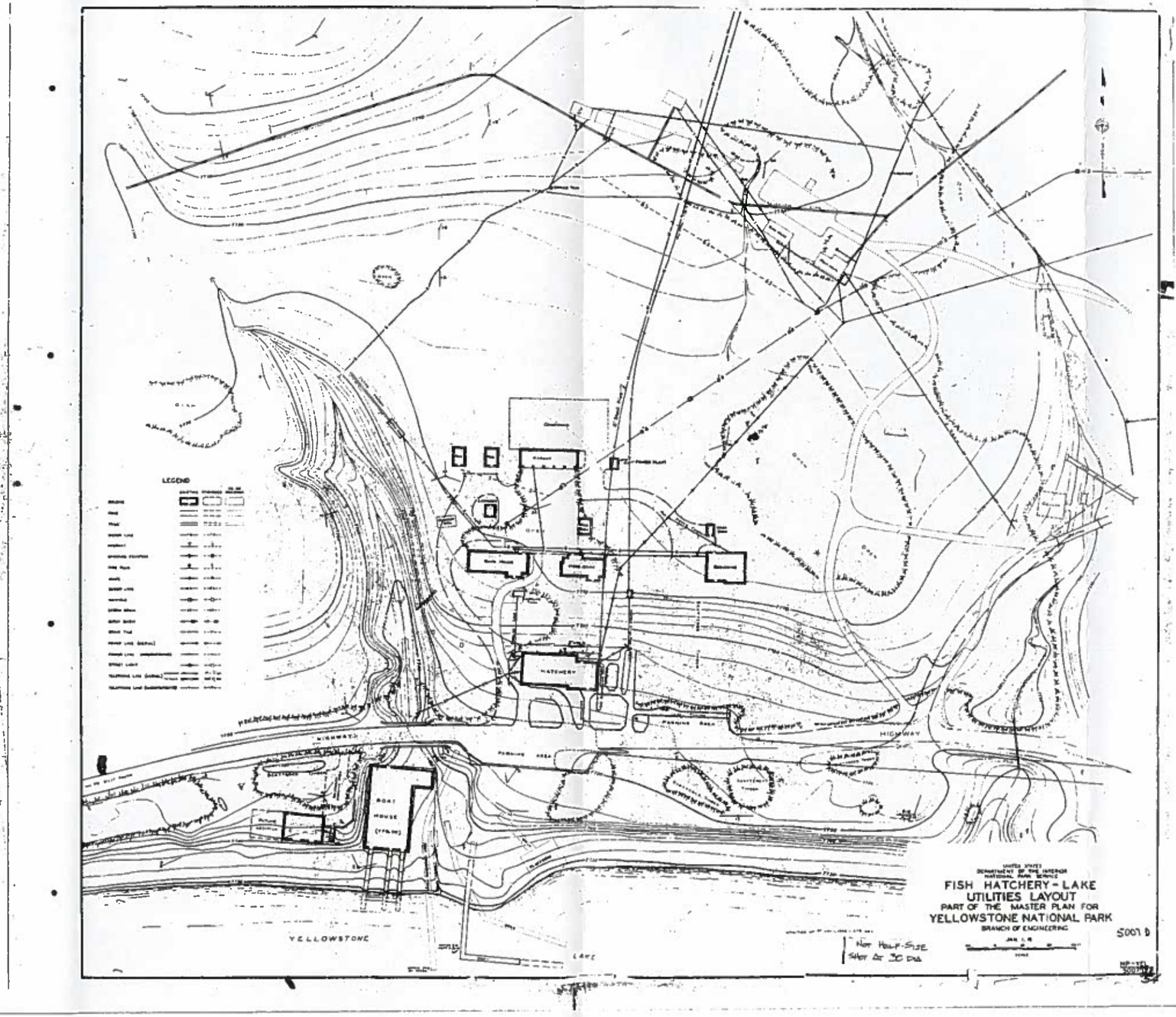
UNITED STATES DEPARTMENT OF THE INTERIOR — NATIONAL PARK SERVICE
GENERAL DEVELOPMENT PLAN
FISH HATCHERY — LAKE
PART OF THE MASTER DEVELOPMENT PLAN FOR
YELLOWSTONE NATIONAL PARK 3060
DRAWN AT THE BRANCH OF PLANS & DESIGN
1941


COMPOUND
GARAGE
LAUNDRY
BUNK HOUSE
MESS HALL
RESIDENCE
HATCHERY
PARKING
PARKING
TO WEST THUMB
TO LAKE JUNCTION
FUTURE ADDITION
BOAT ROOMS
Y.P.B. Co.
BOAT HOUSE
CAMP BOAT LANDING
YELLOWSTONE LAKE
HALF-SIZE REPRODUCTION
PLANTING PLAN
YELLOWSTONE NATIONAL PARK
YEL-HP
2047


LEGEND
HATCHERY
BOAT HOUSE
YELLOWSTONE LAKE
HIGHWAY
FISH HATCHERY - LAKE
UTILITIES LAYOUT
PART OF THE MASTER PLAN FOR
YELLOWSTONE NATIONAL PARK
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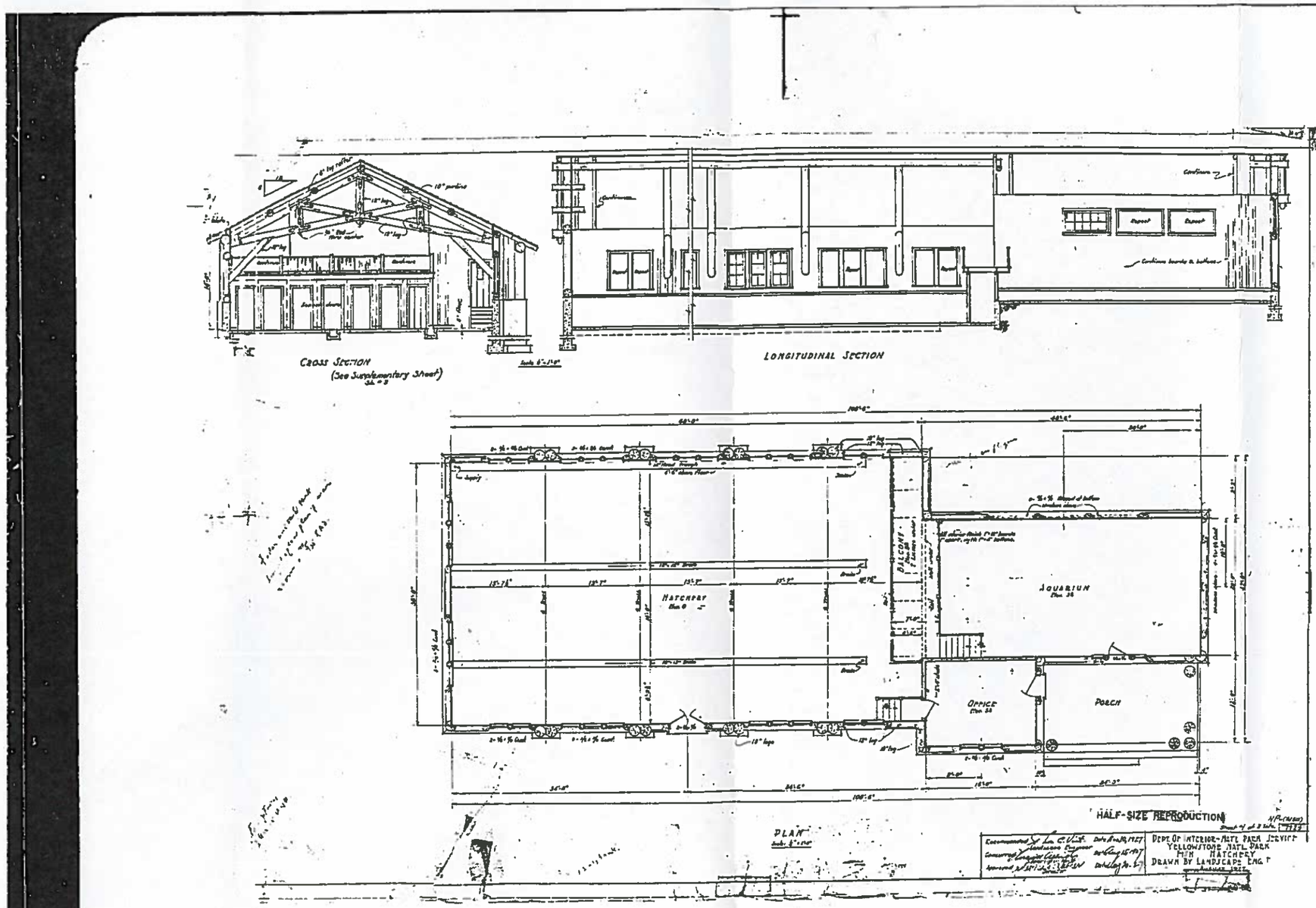
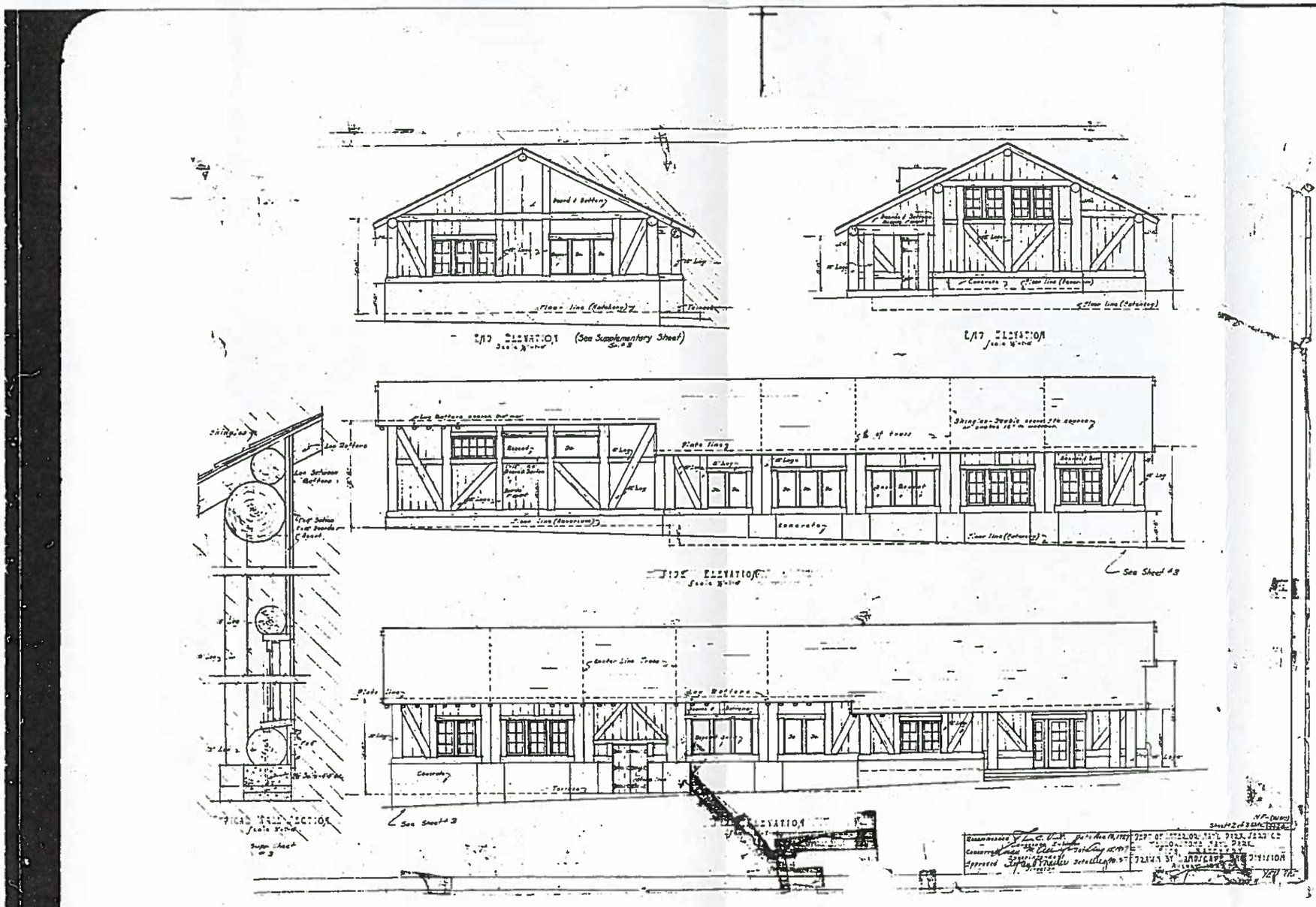
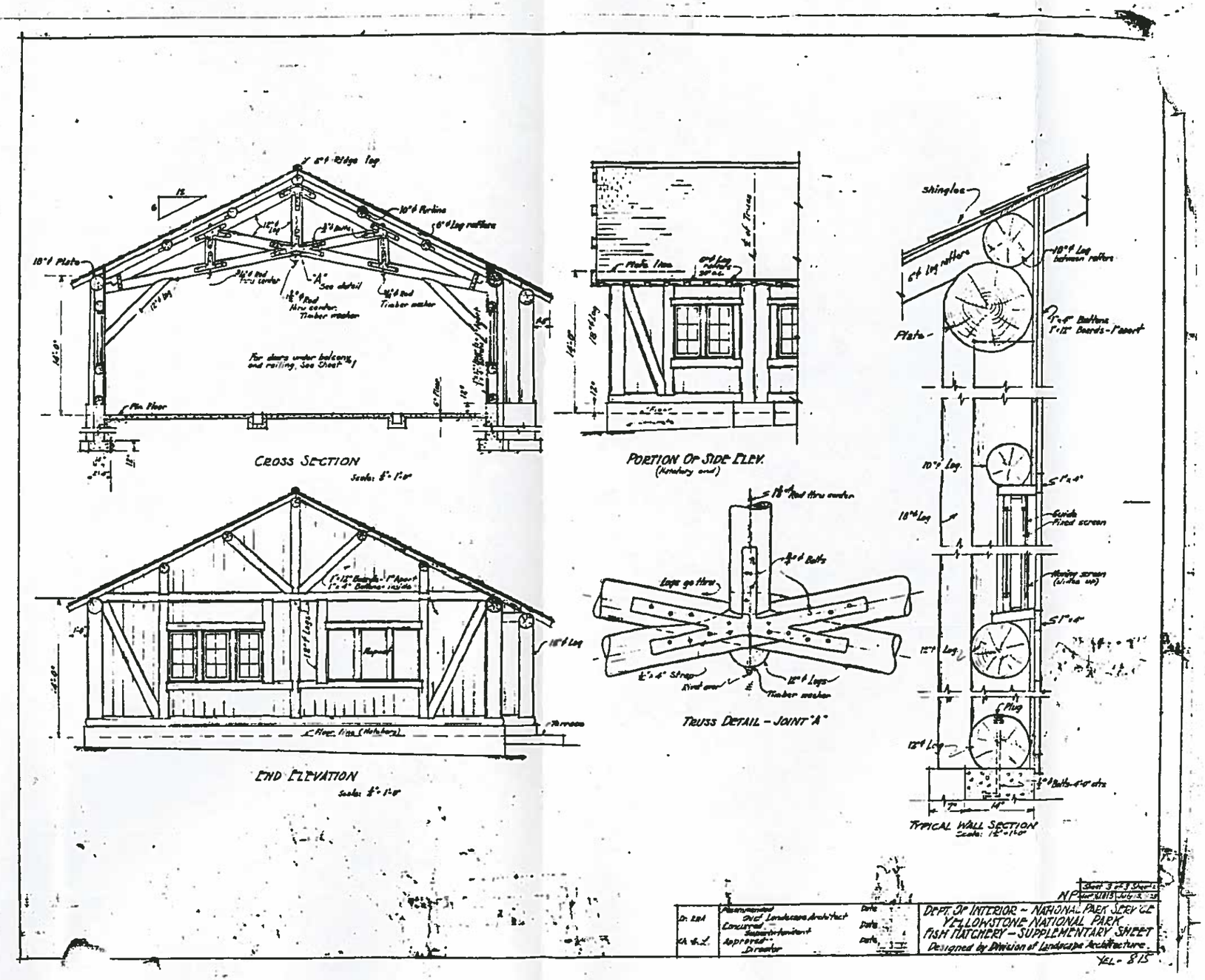
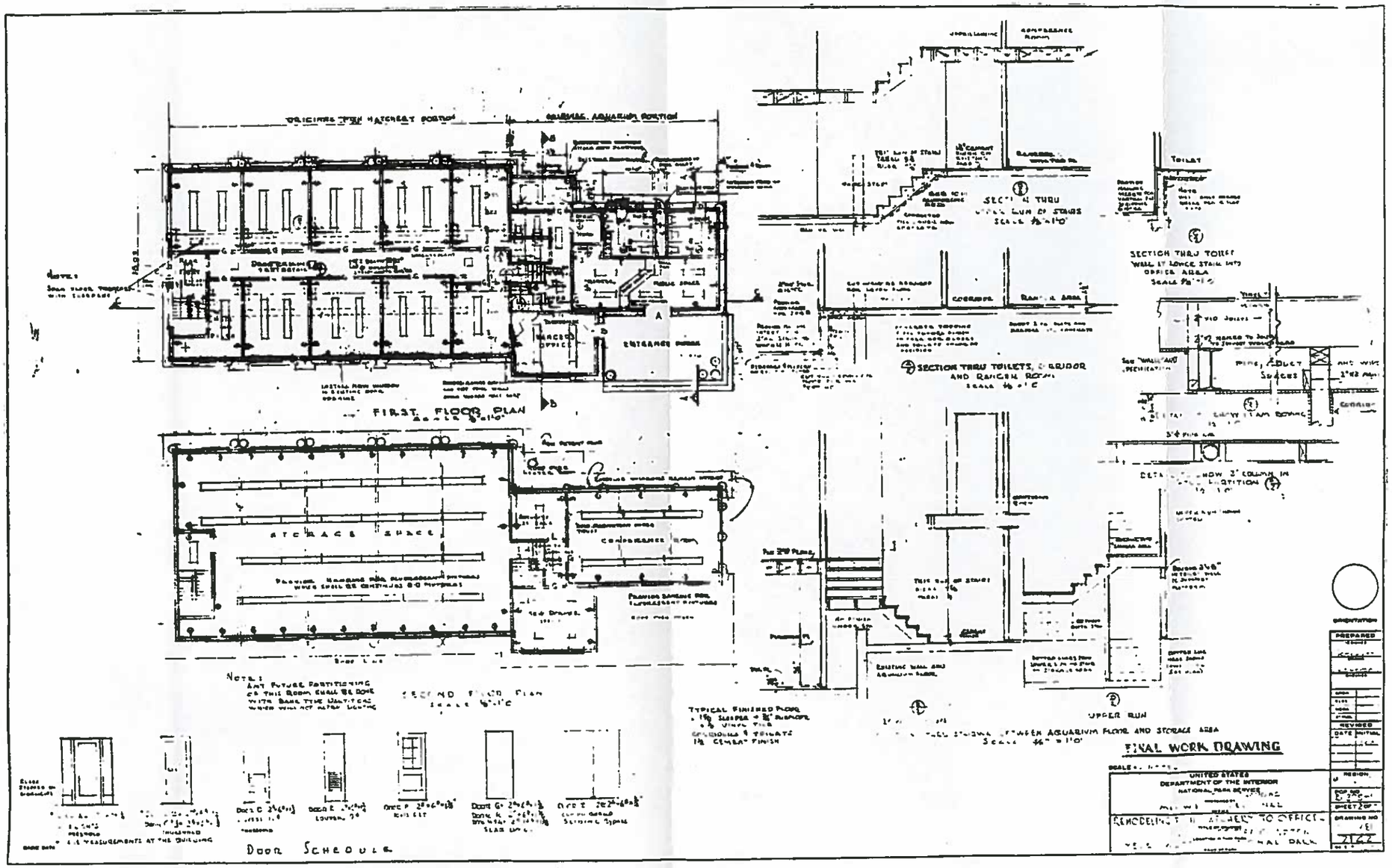
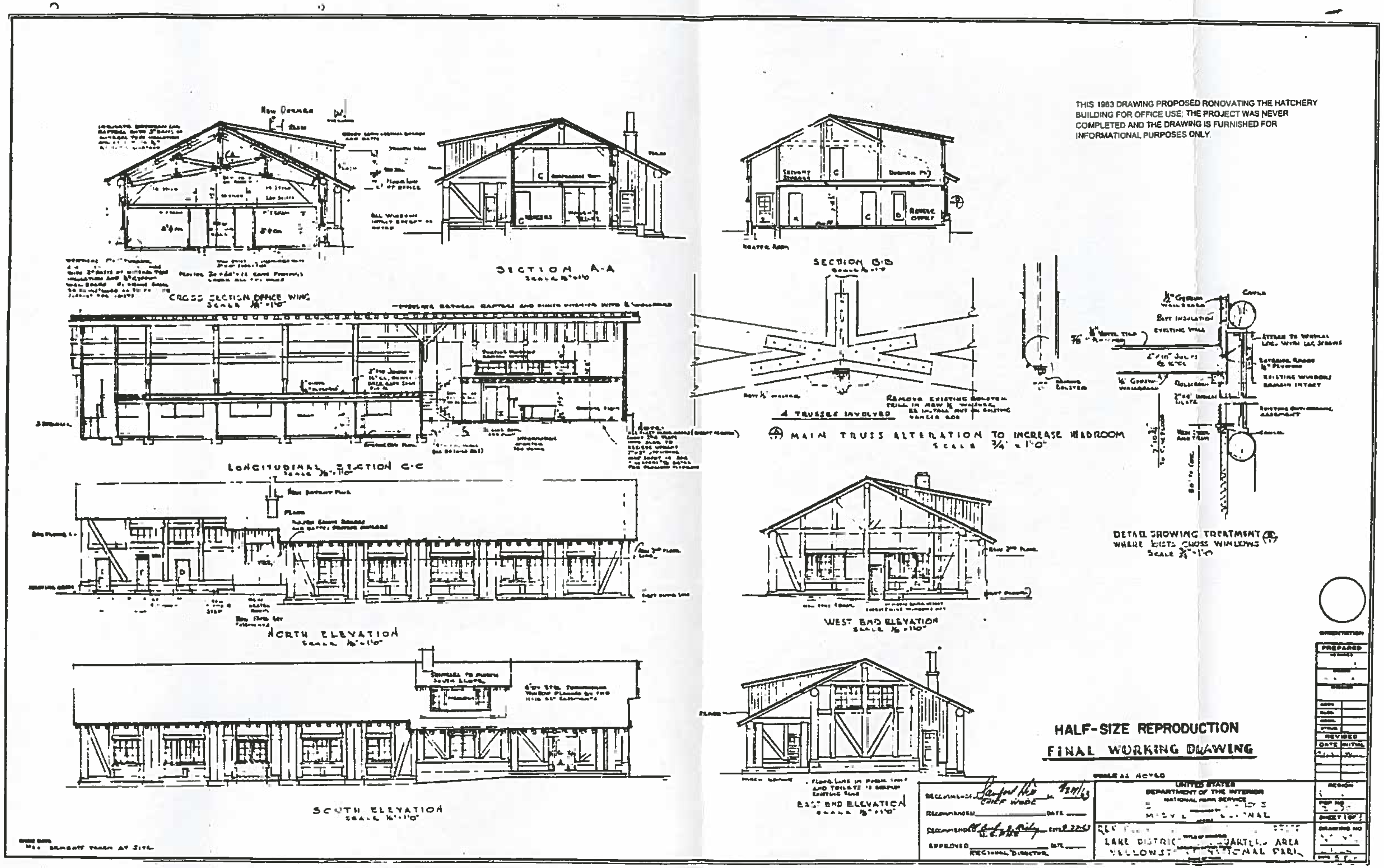

CROSS SECTION
(See Supplementary Sheet)
LONGITUDINAL SECTION
HATCHERY
AQUARIUM
OFFICE
PORCH
BALCONY
PLAN
HALF-SIZE REPRODUCTION
DEPT OF INTERIOR-NATL PARK SERVICE
YELLOWSTONE NATL PARK
MTN HATCHERY
DRAWN BY LANDSCAPE ENG'R


E/17 ELEVATION (See Supplementary Sheet)
E/17 ELEVATION
SIDE ELEVATION
See Sheet #3
ELEVATION
See Sheet #3


CROSS SECTION
Scale: 1/4" = 1'-0"
PORTION OF SIDE ELEV.
(Kitchen end)
TRUSS DETAIL - JOINT "A"
END ELEVATION
Scale: 1/4" = 1'-0"
TYPICAL WALL SECTION
Scale: 1" = 1'-0"
DEPT. OF INTERIOR - NATIONAL PARK SERVICE
YELLOWSTONE NATIONAL PARK
FISH HATCHERY - SUPPLEMENTARY SHEET
Designed by Division of Landscape Architecture
YEL - 815


FIRST FLOOR PLAN
SECOND FLOOR PLAN
STORAGE SPACE
ENTRANCE HALL
SECTION THRU TOILETS, CORRIDOR AND RAISED ROOM
SECTION THRU TOILET
UPPER RUN
Door Schedule
FINAL WORK DRAWING
UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE


THIS 1963 DRAWING PROPOSED RONOVATING THE HATCHERY BUILDING FOR OFFICE USE: THE PROJECT WAS NEVER COMPLETED AND THE DRAWING IS FURNISHED FOR INFORMATIONAL PURPOSES ONLY.
SECTION A-A
SECTION B-B
CROSS SECTION OFFICE WING
LONGITUDINAL SECTION C-C
MAIN TRUSS ALTERATION TO INCREASE HEADROOM
4 TRUSSES INVOLVED
DETAIL SHOWING TREATMENT WHERE JOISTS CROSS WINDOWS
NORTH ELEVATION
WEST END ELEVATION
SOUTH ELEVATION
EAST END ELEVATION
HALF-SIZE REPRODUCTION
FINAL WORKING DRAWING
UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

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MILLS: NEW ORLEANS, LA.

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CELOTEX ROOF INSULATION BOARD.
CELOTEX INDUSTRIAL INSULATION BOARD.
ACOUSTI-CELOTEX.
CELOTEX REFRIGERATING INSULATION BOARD.

Celotex Standard Building Board and Celotex Lath—General Information

Description and Size of Boards

Celotex is manufactured by felting or weaving strong cane fibers into boards 12 ft. wide, $\frac{1}{2}$ in. thick, and over 1000 ft. long. It is cut to standard sizes 4 ft. wide, 7, 8, 8½, 9, 9½, 10 and 12 ft. long weighing approximately 60 lb per hundred sq. ft. and furnished in thicknesses of $\frac{1}{2}$ and $\frac{7}{8}$ in. Celotex has a pleasing gray-brown or tan color and an attractive semismooth fabric-like texture. It combines high thermal insulating value with considerable structural strength, having ample rigidity to fulfill all structural requirements for which it is used. Its strength is derived solely from its structure as it does not contain any adhesive.

Physical Characteristics

Thermal Conductivity—The thermal conductivity of Celotex has been established by many nationally known laboratories (U. S. Bureau of Standards, Armour Institute of Technology, and others). The average conductivity established by test in these laboratories is 0.33 B.t.u. per hour, per sq. ft., per degree F., per in. thickness.

Structural Strength—Tests made by the Armour Institute of Technology, The University of Minnesota, The R. W. Hunt Company, Columbia University, and other laboratories have shown that Celotex used as sheathing in buildings provides greater bracing against distortion of the building than is obtained with horizontal wood sheathing.

Moisture Resistance—In the manufacture of Celotex the fibers are chemically treated and waterproofed so that the entire board throughout its thickness is highly water resisting.

Fire Resistance—Celotex is slow-burning. Due to its high insulating value, light weight, and the absence of open joints it retards the spread of fires.

Vermin Resistance—In the process of manufacturing Celotex, soluble contents of the fibers are completely removed, leaving no food value whatsoever for rodents or other vermin. Celotex is a sterile product.

Permanence—Cane fibers are known to be extremely durable. With the same protection accorded to other building materials, Celotex will retain its physical characteristics for the life of the building in which it is used. It is now in place in more than 250,000 buildings.

Uniformity—The manufacture of Celotex is closely controlled by chemical and physical tests. Hourly tests are made and records kept of its strength, water-resistance, and other physical characteristics. Uniform quality is maintained and improvements made from time to time.

Practicality—Celotex is made in boards that are light in weight and of size convenient to handle on the job. It is sawed and nailed like wood.

Manufacturing Facilities

Celotex is established throughout the world as a standard building material. The Company produced in 1922 some 18 million sq. ft., in 1927 about 257 million sq. ft., and its present capacity is approximately 350 million sq. ft. per year. Production increases have been made necessary by demand and the Company will increase its production to keep abreast of the demand.

Service

THE CELOTEX COMPANY maintains a large and well equipped Research, Development and Control Department. All problems of application, decoration, and new uses are handled by this department which has an experienced personnel of engineers, architects, chemists, and decorators. Details of application are tested out by this department in the laboratories, but in addition, before issuing specifications, they are tested out on a practical scale so that only reliable, well established specifications are introduced into general use.

SWEET'S

Continued on next page

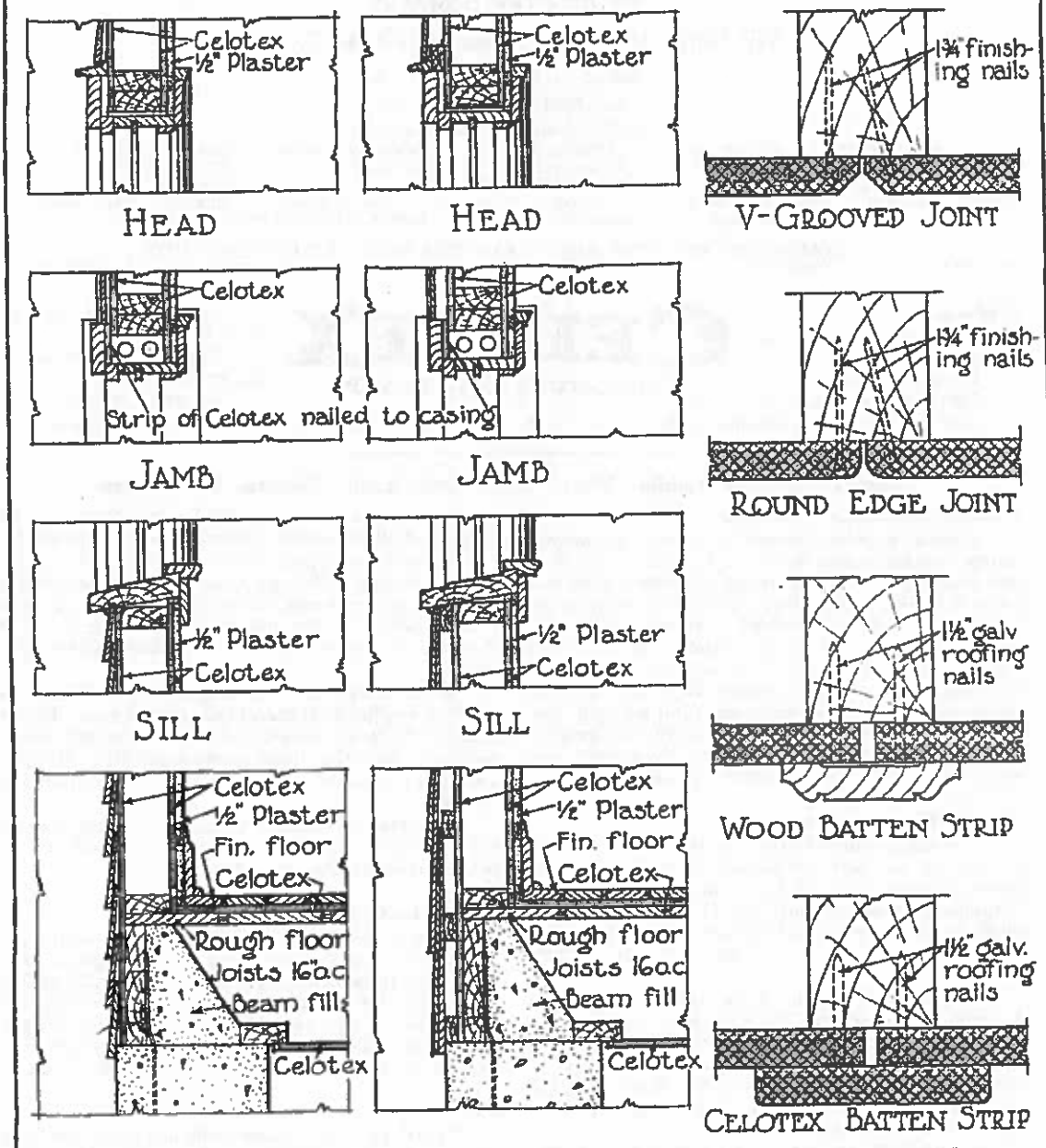

FIGURE 5 FIGURE 6 FIGURE 7

THE CELOTEX COMPANY	DETAILS SHOWING APPLICATION OF CELOTEX TO WOOD SIDING ON WOOD FRAMING, SHINGLES ON WOOD FRAMING AND TYPICAL INTERIOR JOINTS	FIGS. 5, 6 AND 7 NOT TO SCALE

MASONITE CORPORATION

Manufacturers of Masonite Structural Insulation and Presdwood

111 West Washington Street

CHICAGO, ILL.

PRODUCTS

MASONITE STRUCTURAL INSULATION.
MASONITE INSULATING LATH.
MASONITE PRESDWOOD 1/8 INCH THICK.
MASONITE QUARTERBOARD.
MASONITE PRESDWOOD 1/4 INCH THICK.

INDEX

MASONITE

Its Manufacture and Adaptability

Masonite is a manufactured board, made entirely of wood fibre. It retains the natural strength and composition of wood, but is so made that a high degree of insulation value is added.

In the Mason Process of producing this scientific wood product, clean wood chips are exploded under high steam pressure, so that the wood is reduced to fibre. The product thus produced consists entirely of long cellulose fibre, with their strength unimpaired and the lignins, or natural cementing structure of the wood, entirely retained. No chemicals are used; the exploding process is purely a physical one, so that there is no change in the wood except tearing it apart into natural fibres.

Because the Mason Process has succeeded in producing a long fibre of unimpaired strength without the use of chemicals, the MASONITE CORPORATION is able to fabricate a board with the natural strength and composition of wood—an achievement never before attained.

Masonite Structural Insulation, as you buy it, is simply these long fibres thoroughly felted together and pressed into board form. No binder is added to the product. The natural cementing matter of the wood being unharmed, nothing but pressure and heat is needed to form the fibres into structural board. The pressure is applied hydraulically until the required degree of density is obtained. It is possible, therefore, to fabricate Masonite in various degrees of density, suiting the formation to the service the board is to perform.

Masonite Structural Insulation is pressed to a point which gives it the proper amount of structural rigidity, but still maintains great insulating value by leaving a myriad of minute air cells in and between the fibres. As a result, this material combines structure and insulation to a degree that has heretofore been difficult to find.

Its Insulation Value

The thermal conductivity of Masonite Structural Insulation for 1-inch thickness as determined by the G. F. Gebhardt Laboratories, expressed in B.t.u.'s per hour, per square foot of surface, per degree Fahrenheit difference in temperature between the two surfaces of the material is 0.328. Tested by Prof. Frank B. Rowley, testing engineer, University of Minnesota, it was found to have a co-efficient of heat conductivity of 0.321. Both of these tests were made by the flat plate method. According to hot box tests made by Gebhardt Laboratories, the coefficient of conductivity is 0.253.

Where to Use Masonite

The specifications listed in the following pages indicate the great spread of uses of Masonite Structural Insulation. Probably no other building material fits such a great variety of jobs as this one. Its smooth, uniform boards, 1/8 inch thick, 4 feet wide and 8, 9, 10 or 12 feet long, and with a density of about 19 pounds per cubic foot, can be handled, sawed, cut and nailed like wood, because they are wood.

Only the most common uses are discussed in these pages, the more unusual ones being reserved for special bulletins.

Masonite as Sheathing

Probably the most common use of Masonite in building is sheathing. Under frame, brick, stone or stucco exterior walls it replaces other materials without increase in cost, but with a great increase in the value of the building. The added insulation meets every demand of the present day trend toward insulated buildings, and shows amazing results in the reduction of heating costs, additional comfort in winter and summer, and greater rigidity and strength in the structure.

SWEET'S

Continued on next page

MASONITE PRESDWOOD

What Masonite Presdwood Is

It is an all-wood fibre board, made from fibre obtained by exploding fresh, clean chips by high pressure steam. These fibres are then thoroughly felted together and are finished into boards in steam heated, flat-bed hydraulic presses where they are subjected to hundreds of tons of pressure and at the same time to a temperature of nearly 500° F.

In four ways, Masonite Presdwood is a better product than nature's own original material. It is both grainless and knotless, has greater resistance to moisture, is much denser and far tougher. Yet it contains no foreign substance, not even a chemical binder. It is genuine wood—and nothing else—torn apart by steam and put together again by heat and pressure.

Shape, Size and Thickness

Presdwood is made only in board form to a standard width of 4 feet and to a maximum length of 12 feet. These boards are available in two thicknesses only, ⅛ and ¼ inch.

Advantages Presdwood Offers

It will not crack, split or splinter. It is highly resistive to wear and to moisture and shows little contraction or expansion. It contains no grit or foreign substance of any kind and does not, in any way, damage tools. It is easily worked on planers, sanders and shapers, as well as with hand tools.

Uses of Masonite Presdwood

To cover this subject would necessitate the use of much space, for Presdwood is being used extensively in many diversified fields. The uses pointed out herewith are therefore those uses which are of particular interest to the architect, builder, contractor, carpenter and home owner.

For Interior Decoration

Presdwood is used for panels on walls and ceilings, either natural, or as a ground for any desired decorative treatment in private homes, business offices, stores or public buildings. Properly installed, there is no danger of the broad, smooth, handsome boards curling, warping or buckling. It is also used extensively in built-in cabinets and for closet lining.

For Stores and Business Houses

It is used for paneling sidewalls and ceilings, for partitions, for the front and tops of counters, as tops for desks and tables and as drawer bottoms. In some instances it is being used for flooring.

For Lining Concrete Forms

In this field, the use of Presdwood is attracting much attention. Where concrete surfaces are to be left exposed, the use of Presdwood for form lining results in a fine, smooth surface on the concrete wall or column, so that no special surfacing or grinding work is required. In this work the same piece of Presdwood may be used several times. On one big job it was reported that a part of the Presdwood was used eight times.

For Special Uses

Presdwood is also being used to build radiator cabinets, clothes hampers, fire screens, radio tension boards, radio cabinets, card tables, incubators, brooders, shipping cases and children's playhouses.

Method of Applying Presdwood

Cutting and Fitting—Any woodworking tool may be used. Boards should be cut accurately to size. Under no condition should Presdwood be sprung or forced into place.

Nailing—Both size and type of nails to be used are determined by the particular requirements of the case. Where any nailing is required in the center of the board, it should be done first, after which the nailing at the edges would be done. Never "toe nail" Presdwood.

Gluing—Glue Presdwood just as you would any other wood board, using a good grade of waterproof cement or glue and being careful to secure a solid contact.

Note: Where Presdwood is to be exposed to high humidity, it should have water sprinkled or brushed on the screen side and allowed to stand 48 hours or longer before being installed. This insures a permanent smooth, flat surface, as the board will absorb the proper amount of moisture, after which it will show no further contraction or expansion.

Finishes Applied to Presdwood

Among the manufacturers whose products have been applied to Masonite Presdwood with thoroughly satisfactory results are the following:

Adams & Elting, U. S. Gutta Percha Paint Co., Berry Bros., Inc., Cook Paint & Varnish, DeVoe & Raynolds, DuPont, Eagle Picher Lead, Elaterite Paint & Manufacturing, Glidden, Grand Rapids Wood Finishing, Heath & Milligan, Hockaday, Inc., Marietta Paint & Color, Martin-Senour, Benj. Moore & Co., Murphy Varnish, National Lead, Peaslee-Gaulbert, Pittsburgh Plate Glass, Pratt & Lambert, Sherwin-Williams, Truscon Laboratories, and Watson Paint & Varnish.

Note: While the sealers, lacquers, enamels and varnishes of certain well-known manufacturers are mentioned specifically in these specifications, it will be found that similar products of other reputable manufacturers will serve equally as well. Confer with your paint dealer or manufacturer concerning any special finishes or effects you may desire.

Brush Applied

Natural—The rare beauty of rich brown burled Presdwood that always arouses admiration may be preserved by applying first a high grade clear sealer, then two or more coats of clear lacquer or varnish. A beautiful natural finish may be attained by:

First—Applying one coat of Pratt & Lambert's Filtex, reduced 50% with turpentine substitute or one coat of Sherwin-Williams Sanding Sealer No. 04598.

Second—Sanding, when dry, with 000 sandpaper or rub lightly with fine steel wool.

Third—Flow on two or more coats of varnish or two coats of Sherwin-Williams Wood Finishing Lacquer No. 04621. Rub lightly with fine steel wool after each coat dries. For the finest varnish finish rub down the last coat with pumicestone and sweet oil. A number of interesting finishes have been developed which retain the natural burl, but change the color.

Gold Bronze—Secured by applying a mixture of Mongolian Gold Powder No. 10, oil and japan with waste and then wiping. After allowing to dry 12 hours, spray with white lacquer.

Beryl Green—Secured by brushing on one coat of Beryl Green wiping oil stain, wiping, allow to dry 12 hours, then spraying one coat of water white lacquer and one coat of clear flat lacquer.

Gray Marble—Secured by brushing on one coat of Gray Wiping Oil Stain, and finishing as in the Beryl Green.

The following finish is particularly good for outside use:

DuPont Duco—Apply one or more coats of lacquer sealer No. 233-1041. Sand with fine sandpaper or steel wool. Then apply two coats of DuPont No. 259 Finishing Lacquer. Many colors are available and the lacquer number 259 should be given in connection with the color number.

Spray Applied

Note: There are many spraying lacquers suitable for inside use. Among them being:

DuPont Duco—Use one or more coats of sealer No. 233-1041 rubbed when dry with fine sandpaper or steel wool, then two coats of finish lacquer No. 237.

Mill White Enamel—An inexpensive finish for factories and workrooms is one coat of Filtex reduced by adding one-fourth part turpentine substitute. One coat of Lyt-all flat finish and one coat of Lyt-all Gloss Finish.

Satin Finish Enamel—Apply one coat of Benj. Moore & Co. Filcote. One coat of Moore's Sani-Flat White, reduced with 1 pint of raw linseed oil to 1 gallon of paint. One coat of Moore's Dulamel White. Rub lightly with 000 sandpaper or fine steel wool, after the first two coats, if desired.

Outside Paint

Outdoor Paint Finish—Apply one coat lead and oil, using raw linseed oil in large proportions. Second coat with lead and oil, using less oil than in the first coat. The third or finish coat will contain the usual proportion of lead, oil and zinc.

Condition Assessment

Building materials were assessed on site in regard to condition. A rating method and priority system has been used for assessing the condition of materials and is described as follows:

Materials Rating System

1. Historic Material—Preserve (in place)
2. Historic Material—Preserve wherever possible; replace with in-kind
3. Historic Material—Preserve wherever possible; replace with compatible
4. Preserve where there is no reason for removal
5. Remove/alter/replace (sensitively)
6. Specified treatment not required

Priority Rating System

Critical—Requires immediate action to preserve essential historic features and materials experiencing advanced deterioration, or to assure the stability of the building, or to preclude a threat to health or safety.

Serious—Materials or assemblies are approaching an advanced state of degradation, or will soon pose a threat to health or safety.

Minor—Degradation is minimal and preventative maintenance has not been followed; life expectancy of the material is reduced.

Evaluation Methodology

- The building was measured with tape measures and hand held devices; measurements were compared with original drawings on-file with the NPS.
- Materials on site were compared with the historic development of construction methods, materials, and technology as developed by preservation, architectural, and engineering disciplines.
- Historic documentation and significance of the structure was reviewed to provide a basis for evaluation and to understand the importance of on-site materials, assemblies, systems.
- The structure was photographed in its current condition.
- Visual observations of defects were made and incorporated into this report.
- Assemblies that have failed or are approaching failure were recorded photographically.
- Representative structural calculations were done for typical supporting members to confirm their adequacy for continued use. The building was evaluated for resistance to earthquake forces.
- Building codes were reviewed to assess safety for occupancy and the general public; the review includes consideration for potential future uses as well as current uses.
- Other written material and evaluations for the building were reviewed and incorporated as they were discovered during research on the facility.

Historic Building Materials and Assemblies

Site and Site Elements: Although appearing relatively natural it is suspected that the site was impacted by the construction of the Hatchery—it may have been leveled to a degree and it is known from historic drawings that there were planting areas, an exhibit pond, and random sidewalks at the site; particularly near the primary public entrance at the southeast corner of the building. Remnants of sidewalk features (both asphalt and concrete) can still be found at that area of the site and a series of cut stone steps occurs south of the public entrance doors. Currently, all sides of the structure are surrounded by ground surface consisting of on-site gravel and earth intermixed with sparse natural grasses and turf; and mature coniferous trees surround the building. Midway along the south (lakeside) elevation there is an asphalt curved drive that accesses the raceway portion of the hatchery and that is still currently used by park maintenance vehicles. The hatchery is set back from a paved drive that occurs south of the building and is between the structure and the shoreline of Yellowstone Lake.

As noted in the historic text, there were also three rearing ponds located along Hatchery Creek to the west of the building proper, as well as underground drainage features for the raceways between the structure and Hatchery Creek. Underground water and electrical utilities serve the building and a water manhole is located near the Northeast corner of the facility.

Concrete: Concrete was used for all sub-surface supporting elements including footings and stem walls as well as for slabs-on-grade at the front entrance terrace and the floor of the raceways and aquarium exhibit area. Open drainage trenches in the raceway floor are also constructed of concrete. The date of the concrete is attributed to 1928 when the structure was constructed. Concrete for the structure is discussed in detail in Appendix C.

Stone: The fireplace and chimney are stone. The origins of the stone have not been documented but it is very possible that it was collected from the immediate area. Individual stones are of intermediate size (6–10" in diameter) and vary in shape from rounded to angular to irregular. Rhyolite (a form of Granite prevalent in this area of the park) is the most likely type of stone incorporated in the construction. The stone is laid in random pattern with the exception of the shaped mantle and a shallowly depressed shelf in the face of the fireplace that is an obviously later modification to the assembly. Research is continuing to try to find a historic photograph of the fireplace face.

Mortar: The mortar is associated with the stone described above and occurs only in the fireplace and chimney. It is attributed to the 1928 date when the structure was constructed; the mortar is in good condition and, with the exception of the newer inset, is pigmented a charcoal color.

Roofing material: The roof is surfaced with wood shingles that are believed to have been installed as part of the original construction. In keeping with the Parkitecture style of design, the shingles are double coursed and are installed with wide exposure (16"+/-). The existing roofing is severely eroded, particularly at the higher elevations on the roof, and there are numerous locations where sections of shingles are missing on the roof. Sheathing boards along the edge of the roof exhibit some deterioration and will need replacement at the time that the structure is reroofed.

Metal gutters and accessories: None noted.

Structural steel: Limited to truss connections at the interior of the structure. It is believed that the steel is A-7 quality and that the bolts are the equivalent of ASTM A-307 grade.

Cast iron: None noted. There may be internal castings associated with the fireplace damper.

Sheet metal and flashings: Flashing on site is limited to copper step flashing at the base of the chimney. The flashing appears to be in excellent condition and is a classic example of properly done step flashing at a roof penetration. The flashing will have to be loosened and reattached as new roofing materials are applied to the roof; maintaining the level of craftsmanship during this operation will be important functionally as well as visually.

Soffit materials: None.

Roof sheathing: Rough sawn 1x boards (original). Edge replacement as noted under 'Roofing Materials' is warranted.

Fascia: None; rafter tails and purlins are exposed.

Exposed log: Log structural members have been exposed at the exterior of the structure to create a rustic appearance for the building and to relate the building to the natural forested areas that occur in this part of America's premier park; consistent with the tenets of the Parkitecture style of architecture. The exposed log occurs at the sill line (base of wall), along the top of the wall (cap), as vertical columns spaced along the elevations at major structural lines (including corners), as perimeters of all window and door openings, and as brace patterns in the walls. Exposed log work is also visible in the form of rafter tails and purlins around the edge of the roof. Most log work near the base of the building exhibits deterioration from the deep snow that occurs at that location and significant portions of the log work in these areas needs to be replaced. The log work above the snowline appears to be in good condition and should remain. As a matter of site specific behavior, the sill logs on the south elevation are all deteriorated whereas the sill logs on the north elevation are not; and all column bases on the north elevation are deteriorated whereas the column bases on the south elevation are not. Joinery of all log work requires attention in the form of sealants. The species of wood for the logs was not investigated; however, Douglas fir wood have been one of the preferred choices of log builders in the 20s.

Wood siding: The structural system for this building would be classified as a braced wood frame with lumber infill. There are no traditional framing members in the walls and the wall finish is in the form of siding that is nailed directly to the cap and sill logs. The siding is intentionally gapped and the gap is covered by an interior batten. Siding around all sides of the structure is 1x12 flat siding with 1" gap and battens are 1x4 flat siding. It is in fair condition but does require maintenance in the form of some re-nailing and application of new coating. In its existing configuration the wall is suitable for habitable use during the summer and moderate parts of the shoulder seasons; it would not be suitable for use during the winter season because of the lack of insulating materials.

Exterior wood trim and casings: All exterior wood trim and casing is exposed log work with coped joints as can be seen in the photographs; it is in fair condition with some members requiring replacement.

Shutters: All window openings have removable wood shutters (protection from snow) and the shutters are currently in place. The shutters are of various designs and are in very poor condition; it is recommended that they be replaced to be of similar appearance throughout. Connec-

tion hardware for the shutters also requires replacement.

Windows and glazing: The windows (including some panes of glass) are believed to be original to the date of construction (1928). The windows are typically wood hinged (casement) divided lite windows and occur throughout with the exception of side windows in the North wall of the Aquarium area which are awning windows. The hinge mechanism for the casement windows was field applied using conventional surface hinges. The windows are glazed with single pane glazing and, in most cases, the glazing is intact. As can be seen on the current photographs (pages 43–92) there are selected locations where glazing is broken and one of the high wall windows into the aquarium area is damaged with dividing mullions and muntins missing. The majority of the windows are believed to be repairable. With the exception of two main entrance door sidelites and six windows in the West elevation that were not installed, 1928 drawings showing glazing configurations confirm the location and size of these openings.

Exterior doors: Doors into the aquarium exhibit area and the office are vertical grain fir paneled half-lite doors with a 4/4 array of glass over three flat recessed panels. They are painted forest green. Hardware on the doors includes rabbeted hinges, mortise lock with stamped metal knob, and plain beveled escutcheon plate all of which are original.

The pair of service doors into the raceway area are plank doors featuring a bead pattern at the seam of three equally spaced planks. The hardware is remarkable: the three hinges are hand crafted exposed steel and visually extend the full width of each door leaf. The hinges are shaped at the leading and butt edges with gothic or medieval patterns and the bolt pattern attaching the hinges to the planks of the door are highly visible. Latching hardware is original, is of monumental length, and is configured with a thumb latch and pull handle.

The utility door that accesses the North end of the balcony is also a wood board door but it is made of thinner boards than the raceway doors and the joints between the boards are flush tongue and groove (T&G) joints. This door was visually intended to disappear into the board pattern of the wall and is finished identically to the adjacent wall surface.

Wood framing: Wood framing materials occur only around the 1928 storage closets and as supporting members for the recently introduced storage platform at the west end of the raceway area. 1928 framing at or near the storage areas includes partial height stud walls, sill plates, and stair stringers all of which are in good condition. The new storage platform is constructed of 2x10 floor joists, girders fabricated with multiple 2x10s, and log supporting columns—all in good condition.

Flooring: Aquarium exhibit area—Flooring is unpatterned natural colored concrete in serviceable condition.

Aquarium service area—Flooring is dimensioned lumber planking; designed for easy removal to access utilities serving the underside of the aquarium exhibit tanks.

Balcony—Flooring is matched fir flooring in serviceable condition; finished naturally.

Raceway—Flooring is unpatterned natural colored concrete in serviceable condition.

Elevated storage platform—Flooring is unfinished plywood.

Office—Current flooring is indoor-outdoor carpet; it is installed over an original inlaid linoleum surface that is applied to a concrete slab-on-grade substrate below.

Ceilings: The ceiling in the office area is painted celotex with an applied square wood batten pattern; battens are stained dark brown. The office ceiling is original to the era of construction. All other ceilings are exposed structure displaying exposed log rafters, purlins, and the underside of natural wood sheathing.

Interior walls: With the exception of the office area, all walls are exposed board and batten stained wood assemblies as described under the 'wood siding' paragraph above. Unless the walls are rehabilitated for increased thermal performance, they can continue to be used; they need to be cleaned, prepped, and stain/finish touch-up is required.

The office area walls are constructed of wood framing or furring and are covered with painted Masonite. Similar to the ceiling, the walls are appointed with a square wood batten pattern.

Wallpaper: None noted.

Interior doors: Interior doors are five panel vertical grain fir doors with beveled panels. They are finished naturally and are original to the 1928 construction with the exception of the interior office door which is believed to be an original paneled door re-fitted in a new location.

Millwork: As noted for exterior elements, most interior trims are of fitted or coped log construction in keeping with the rustic style of architecture. Casing for doors in walls framed with dimensional lumber is of flat 1x4 stock finished to match the doors and walls and features butted corners. The balcony railing is noteworthy as an example of interior log millwork. Spacing for individual railings within the railing assembly exceeds current code limita-

tions; however, spacing is very close to code mandated requirements and violating the original design would adversely affect this historic feature.

Cabinetry: Original cabinetry in the facility is limited to the aquarium tanks that were used for exhibiting fish. The tanks are constructed of planking that is bolted together and reinforced with dimensional lumber bulkheads and whalers. Each tank was originally lined with copper sheet; a more recent modification inserted thin cementitious liners around the tank (presumably to improve lighting levels in the display). Incorporating (or interpreting) one or more of the original tanks is recommended.

Stairs: There are four sets of steps associated with the Hatchery:

1. Exterior steps along the north wall—even though these are clearly intended as service steps, they are beautifully detailed with half-log treads, half-log stringer, and pole (log) hand-crafted railing. The steps also serve as a second exit from the balcony viewing platform.
2. Utility stair below aquarium tank floor—constructed of dimensional lumber; access from above requires modification to make the steps fully functional.
3. Steps between raceway floor and office (see plan)—constructed of dimensional lumber with planed lumber treads and risers. In good condition; requires re-finishing.
4. Steps from aquarium exhibit area to balcony viewing platform—this feature is constructed with planed lumber treads and risers and pole (log) hand-crafted railing. In good condition; requires re-finishing.

Hardware: The double doors into the aquarium area, exterior office door, and exterior raceway doors require ADA accessible door hardware. (See section on building codes). Other door hardware could remain; however, in the interest of simplifying keying systems or access other replacement may be mandated. Retaining historic visual elements (such as escutcheons) is recommended. If the raceway area of the Hatchery is rehabilitated to an Assembly occupancy, then the raceway doors would require panic hardware. Introducing panic hardware to this pair of doors will require great sensitivity because of the quality and workmanship of the original design.

Exterior painting: Exterior painting or stain has been applied to siding, log work, doors, and windows; it is recommended that those elements be re-coated. Wood shingles were originally stained green; however, it is recommended that pigmentation of replacement shingles be considered in relation to other buildings in the hatchery complex (some of which have new roofs). An alternate approach would consider application of clear retardants/preservatives/repellents.

Mechanical: Existing mechanical systems include fish water supply (disconnected), aquarium and raceway grey water drainage, and a single circa 1940s cabinet heater in the office area. It is not unreasonable to assume that the heating appliance has reached the end of its useful life and that a more energy efficient appliance could be introduced into the facility. Improvements to energy efficiency could also affect how equipment is sized and utilized (see energy section of this report). Revisions to or additions of water and/or waste systems into the facility is dependant upon the uses that the building will be put to.

Electrical: It is assumed that electrical systems would require total renovation if the building is used for any other purpose other than storage; and, conversely, that the existing systems are adequate for the current storage use. It was noted that most conductors were protected by flex conduit and that the exterior panel is of recent manufacture. It is recommended that grounding of the entire system be investigated.

Materials Inventory

Category	Location	Element	Description	Rtg	Cond	Priority	Remarks
Site							
Site		Site landscaping	Gravel w/scattered grass and ground cover, all sides of building	4	Fair	Minor	Maintain; enhance
Site		Trees	Evergreens all sides of structure	1	Good	Minor	Maintain
Site		Site grading	Adequate drainage at south and east; potential for negative drainage around north and west sides	5	Mixed	Serious	Install permanent drainage gutter at north wall
Site		Paths and walks	Cut stone steps and walkway	2	Poor	Minor	Repair/restore (original)
Site		Paths and walks	Fragments of conc. walk-SE corner	6	N/A	Minor	Remove (not historic)
Site		Paths and walks	Fragments of asphalt walk-SE corner	6	N/A	Minor	Remove (not historic)
Site		Manhole	Metal manhole w/cover	4	Poor	Minor	
Site		Service drive	Curved asphalt service drive	3	Fair	Minor	
Sub-Structure							
Structure		Foundation-aquarium/office	Reinforced conc. stem wall	3	Poor	Critical	Repair
Structure		Foundation-S wall raceway area	Reinforced conc. grade beam/footing	5	Very poor	Critical	Replace
Structure		Foundation-N wall raceway area	Reinforced conc. grade beam/footing	3	Poor	Critical	Repair
Structure		Ext. front entrance steps (Terrace)	Reinforced concrete, unpatterned	5	Very poor	Critical	Replace
Structure		Interior concrete floor slabs	Reinforced concrete, unpatterned	1	Good	Minor	Add sealants
Structure		Exterior concrete floor slab-entry	Reinforced concrete, unpatterned	1	Good	Serious	Add sealants
Structure		Raceway drainage trenches	Original concrete drains for fish tanks	1, 2	Good	Minor	Enhance gutters
Roof Assembly							
Roof		Roof ridge	Wood shingles (Boston lap)	5	Very Poor	Critical	Replace
Roof		Roof surfacing	Wood shingles (sawn)-special coursing	5	Very Poor	Critical	Replace
Roof		Air infilt. barrier	New mat'l (did not exist historically)	5	N/A	Critical	Add
Roof		Cedar breather	New mat'l (did not exist historically)	5	N/A	Critical	Add
Roof		Icedam edge protection	New mat'l (did not exist historically)	5	N/A	Critical	Add
Roof		Roof sheathing	Spaced S4S boards	2	Fair	Critical	Replace edge boards
Roof		Insulation	(see Ceiling under Interior category)				
Roof		Flashing	Copper (chimney only)	1	Good	Minor	
Roof	Perimeter	Fascia/Soffit	Underside of roof sheathing is exposed	2	Good		Apply repellent
Roof		Chimney	(see separate category below)				
Roof Structure		Rafters	6" dia. Log @ 2' c/c +/-	2	Varied	Critical	Replace all rafter tails
Roof Structure		Purlins	8–10" dia. Log (5 thus full length)	1	Fair	Minor	Epoxy ends

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Category	Location	Element	Description	Rtg	Cond	Priority	Remarks
Roof Structure		Trusses	10–12" log chords/webs	1	Excellent	Minor	Improve connections
Roof Structure		Braces (internal)	8" dia log (4 total)	1	Good	Critical	Re-do anchorage
Log Structure—Exterior Walls							
Orig. Log	Sill logs	Entire perimeter	18" Log attached to conc. stem wall	5	Poor	Critical	Replace deteriorated
	Log wall cap	Entire perimeter	14–16" Log attached to cols. and roof	1, 2	Varied	Serious	Replace selected
	Log columns	Corners; all structural bays	18" Log (coupled)	1, 2	Varied	Critical	Replace many bases
	Log bracing	Ends; corners	8–10" Log	1, 2	Fair	Serious	
	Intermediates	Window/door perimeters	8–10" Log	1, 2	Fair	Serious	Replace selected
General	Connections	Throughout	Supplement as required (see text)	5	N/A	Critical	Add or modify connections
	Joint sealants	Throughout	Replace w/new throughout	5	Very Poor	Critical	
	Rot prevention	Throughout	Install new borate rods throughout	5	N/A	Critical	New material (preventative)
	Coating	Throughout	Maintain natural; apply clear where required	5	Poor	Serious	
Exterior Walls							
Walls		Siding	1x12s; spaced	1, 2	Fair/Good	Minor	
Walls		Battens	1x4s at all siding seams (12" c/c)	1, 2	Fair/Good	Minor	
Walls		Framing	None at exterior				Unconventional wall construction
Walls		Insulation	New mat'l (did not exist historically)	TBD	N/A	N/A	Not required for seasonal use
Walls		Vapor barrier	New mat'l (did not exist historically)	TBD	N/A	N/A	Not required for seasonal use
Walls		Furring at office	Unknown; presumed to be wd framing	1	Good	Minor	
Walls		Windows: raceways	Hinged casement w/sgl pane glazing	1, 2	Fair/Poor	Serious	Replace where broken
Walls		Windows: aquarium	Hinged csmt/awning w/sgl pane glazing	1, 2	Fair/Poor	Serious	Replace where broken
Walls		Windows: office	Hinged casement w/sgl pane glazing	1, 2	Fair/Poor	Serious	
Walls		Ext casings and trims (thru-out)	Log	1, 2	Fair	Minor	Replace as required
Walls		Int casings and trims (thru-out)	Log or 1x4 jamb; 1x6 head flat wood profiles	1	Good	Minor	
Walls		Main entry door	Pair, wd panel w/divided half-lite	1	Good	Minor	Repaint
Walls		Office door	Wd panel w/divided half-lite	1	Good	Minor	Repaint
Walls		Balcony/utility door	Custom wood board	1	Good	Minor	Repaint
Walls		Raceway/service doors	Pair, custom wood plank	1	Fair/Good	Minor	Repaint
Walls		Removeable shutters	Various wood constructions	5	Very Poor	Serious	Reconstruct all new
Interior—Raceway Area							
Interior	Raceway	Ceiling	Exposed structure	1	Good	Minor	Clean

Materials Rating System: 1. Historic Material—Preserve (in place); 2. Historic Material—Preserve wherever possible; replace with in-kind; 3. Historic Material—Preserve wherever possible; replace with compatible; 4. Preserve where there is no reason for removal; 5. Remove/alter/replace (sensitively); 6. Specified treatment not required.

Category	Location	Element	Description	Rtg	Cond	Priority	Remarks
Interior	Raceway	N wall	Bd and Batten wd siding	1	Fair/Good	Minor	Clean; touch-up
Interior	Raceway	E wall	Open to aquarium/Bd and batten wd siding	1	Fair/Good	Minor	Clean; touch-up
Interior	Raceway	W wall	Bd and batten wd siding	1	Fair/Good	Minor	Clean; touch-up
Interior	Raceway	S wall	Bd and batten wd siding	1	Fair/Good	Minor	Clean; touch-up
Interior	Raceway	Flooring	Exposed concrete	1	Fair/Good	Minor	Sealer
Interior	Raceway	Door(s)	Wd (5) panel VG fir door(s)	1	Fair/Good	Minor	Re-finish
Interior	Raceway	Casing and trims	1x4 jamb; 1x6 head flat wood profiles	1	Fair/Good	Minor	Re-finish
Interior	Raceway	Vapor barrier	New mat'l (did not exist historically)	TBD	N/A	N/A	Not required for seasonal use
Interior	Raceway	Ceiling insulation	New mat'l (did not exist historically)	TBD	N/A	N/A	Not required for seasonal use
Interior—Aquarium Area							
Interior	Aquarium	Ceiling	Exposed structure	1	Good	Minor	Clean
Interior	Aquarium	N wall	Bd and batten wd siding	1	Fair/Good	Minor	Clean; touch-up
Interior	Aquarium	E wall	Bd and batten wd siding	1	Fair/Good	Minor	Clean; touch-up
Interior	Aquarium	W wall	Open to raceways/bd and batten wd siding	1	Fair/Good	Minor	Clean; touch-up
Interior	Aquarium	S wall	Bd and batten wd siding	1	Fair/Good	Minor	Clean; touch-up
Interior	Aquarium	Flooring (basic)	Exposed concrete (See sub-structure)	1	Fair/Good	Minor	Sealer
Interior	Aquarium	Flooring (balcony walkway)	(see Balcony category below)				
Interior	Aquarium	Exterior door	(See exterior walls)				
Interior	Aquarium	Vapor barrier	New mat'l (did not exist historically)	TBD	N/A	N/A	Not required for seasonal use
Interior	Aquarium	Ceiling insulation	New mat'l (did not exist historically)	TBD	N/A	N/A	Not required for seasonal use
Interior—Office Area							
Interior	Office	Ceiling	Painted Celotex w/stained wood battens	3	Poor	Serious	
Interior	Office	N wall	Painted Masonite w/stained wood battens	1, 2	Fair/Good	Minor	Repair/Re-paint
Interior	Office	E wall	Painted Masonite w/stained wood battens	1, 2	Fair/Good	Minor	Repair/Re-paint
Interior	Office	W wall	Painted Masonite w/stained wood battens	1, 2	Fair/Good	Minor	Repair/Re-paint
Interior	Office	S wall	Painted Masonite w/stained wood battens	1, 2	Fair/Good	Minor	Repair/Re-paint
Interior	Office	Base	1x8 flat wood w/quarter round	1, 2	Good	Minor	
Interior	Office	Flooring	Indoor-outdoor carpet	5	Poor	Serious	
Interior	Office	Interior door	Wd (5) panel VG fir door(s)	1	Fair/Good	Minor	Re-finish
Interior	Office	Exterior door	(See exterior walls)				
Interior	Office	Casing and trims	1x4 jamb; 1x6 head flat wood profiles	1	Fair/Good	Minor	Re-finish
Interior	Office	Vapor barrier	New mat'l (did not exist historically)	TBD	N/A	N/A	Not required for seasonal use

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Category	Location	Element	Description	Rtg	Cond	Priority	Remarks
Interior	Office	Ceiling insulation	New mat'l (did not exist historically)	TBD	N/A	N/A.	Not required for seasonal use
Interior—Office Fireplace							
Interior		Basic fireplace	Rhyolite rubble stone w/charcoal mortar	1	Good	Minor	Significant historic value
Interior		Mantle	Coursed stone	1	Good	Minor	Significant historic value
Interior		Hearth	None (integral w/office floor)	N/A			
Interior		Appointments	Obsidian accents; antler accessories	1	Good	Minor	Significant historic value
Interior—Balcony Area							
Interior		Ceiling	Exposed structure	1	Good	Minor	Clean
Interior		N wall	Bd and batten wd siding	1	Fair/Good	Minor	Clean; touch-up
Interior		E wall	Open to aquarium area	N/A			
Interior		W wall	Open to raceway area	N/A			
Interior		S wall	Bd and batten wd siding	1	Fair/Good	Minor	Clean; touch-up
Interior		Flooring	T&G fir flooring (natural)	1, 2	Fair/Good	Minor	
Interior		Door(s)	(See exterior walls)				
Interior		Vapor barrier	New mat'l (did not exist historically)	TBD	N/A	N/A	Not required for seasonal use
Interior		Ceiling insulation	New mat'l (did not exist historically)	TBD	N/A	N/A	Not required for seasonal use
Interior		Handrail and guardrail	Custom pole and log	1	Good	Minor	Clean
Steps/Stairs							
Exterior Steps		Treads	One-half log	1, 2	Fair	Serious	Apply preservative; re-anchor
		Risers	None	N/A			
		Stringer(s)	One-half log	1, 2	Fair	Serious	Apply preservative; re-anchor
		Landing	T&G wd flooring	1, 2	Fair	Serious	Apply preservative
		Railings	Custom pole and log	1	Fair	Minor	Protect
Office steps (interior)		Treads	3/4" Planed lumber	1, 2	Good	Minor	Finish
		Risers	3/4" Planed lumber	1, 2	Good	Minor	Finish
		Stringer(s)	Dimensioned lumber	1	Good	Minor	
		Landing	T&G wd flooring	1, 2	Good	Minor	Finish

Materials Rating System: 1. Historic Material—Preserve (in place); 2. Historic Material—Preserve wherever possible; replace with in-kind; 3. Historic Material—Preserve wherever possible; replace with compatible; 4. Preserve where there is no reason for removal; 5. Remove/alter/replace (sensitively); 6. Specified treatment not required.

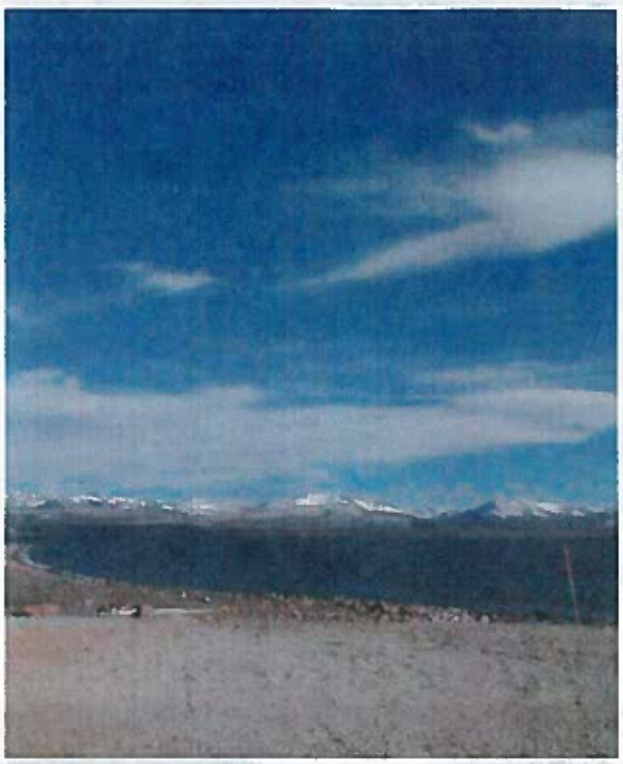
Category	Location	Element	Description	Rtg	Cond	Priority	Remarks
		Railings	None	5	N/A	Critical	Recommend to be added
Balcony steps		Treads	3/4" Planed lumber	1, 2	Good	Minor	Finish
		Risers	3/4" Planed lumber	1, 2	Good	Minor	Finish
		Stringer(s)	Dimensioned lumber	1	Good	Minor	
		Landing	None	1	Good	Minor	
		Railings	Hand crafted pole	1	Fair	Minor	Protect
Service steps to aquarium		Treads	Dimensioned lumber	1, 2	Fair	Minor	Clean
		Risers	None	N/A			
		Stringer(s)	Dimensioned lumber	1, 2	Fair	Minor	Clean
		Railings	None	5	N/A	Critical	Recommend to be added
1st Floor Structure							
Floor	Raceway	(See sub-structure)					
Structure	Office	(See sub-structure)					
	Aquarium, public	(See sub-structure)					
Structure	Below tanks	Joists and girders	2x8 Joists and girders	1	Good	Minor	Clean; repellent
Lateral Force Resisting System							
Structure		(See Structural Commentary)	Log braced frame	1	TBD	Critical	Further calculations required
Hardware							
Hardware	Public Entry Drs	Hinges; latchset; surface lock	Add functional lock and ADA hardware	1. 5	Poor	Minor	ADA access
	Ext. Office door	Hinges; latchset; surface lock	Add functional lock and ADA hardware	1, 5	Poor	Minor	ADA access
	Int. Office door	Hinges; latchset; surface lock	Make lock functional	1, 5	Poor	Minor	
	Raceway door(s)	Hinges; latchset; surface lock	Restore decorative hardware	1	Poor	Minor	
	Utility door (N)	Hinges; latchset; surface lock	Make lock functional	1, 5	Poor	Minor	
	Closet doors (6)	Hinges; latchset; surface lock	Make locks functional	1, 5	Poor	Minor	
	Windows	Hinges; sash lock	More effective latches recommended	1, 5	Fair/Poor	Minor	
	Shutters	Wall attachments	Barrell bolts (replace w/new system)	5	Very Poor	Minor	
Mechanical							
Mech	Water supply	Supply for fish only	Galvanized piping	6	Poor	TBD	Future utility requirements not identified
	Waste	Waste from raceways only	Galvanized piping; open conc. trenches	6	Poor	TBD	Future utility reqmts. not identified

Priority Rating System: Critical—Requires immediate action to preserve essential historic features and materials experiencing advanced deterioration, or to assure the stability of the building, or to preclude a threat to health or safety; **Serious**—Materials or assemblies are approaching an advanced state of degradation, or will soon pose a threat to health or safety; **Minor**—Degradation is minimal and preventative maintenance has not been followed; life expectancy of the material is reduced.

Category	Location	Element	Description	Rtg	Cond	Priority	Remarks
	HVAC	Heater in office only	1940s oil heater	5	Poor	TBD	Future utility reqmts. not identified
Electrical							
Elec	Service	Exposed electrical service-N wall	Relatively new service disconnect	4	Fair	Minor	
	Distribution	Lighting and power	Flex conduit	4	Fair/Poor	TBD	Future utility reqmts not identified
Security							
Security		Security system	None	5	N/A	TBD	Recommend system to be added
Fire Detection/Extinguishing Systems							
Fire		Fire detection	None	5	N/A	TBD	Add system if structure occupied
		Fire alarm	None	5	N/A	TBD	Add system if structure occupied
		Fire extinguishers	Unknown	5	N/A	TBD	Add system if structure occupied
		Emergency lighting	None	5	N/A	TBD	Add system if structure occupied
Fire	General	Add second exit, assembly area	(Future-applicable only if structure used)	TBD			
Erratta							
Chimney		Basic materials	Rhyolite rubble stone w/charcoal mortar	1	Good	Minor	Add spark arrestor
		Flashing	Copper step flashing	1	Good	Minor	Protect
Rearing Ponds		West of building	Would require reconstruction	N/A			Interpretive potential
Access panel		NE corner	PWD panel	4	Fair	Minor	

Materials Rating System: 1. Historic Material—Preserve (in place); 2. Historic Material—Preserve wherever possible; replace with in-kind; 3. Historic Material—Preserve wherever possible; replace with compatible; 4. Preserve where there is no reason for removal; 5. Remove/alter/replace (sensitively); 6. Specified treatment not required.

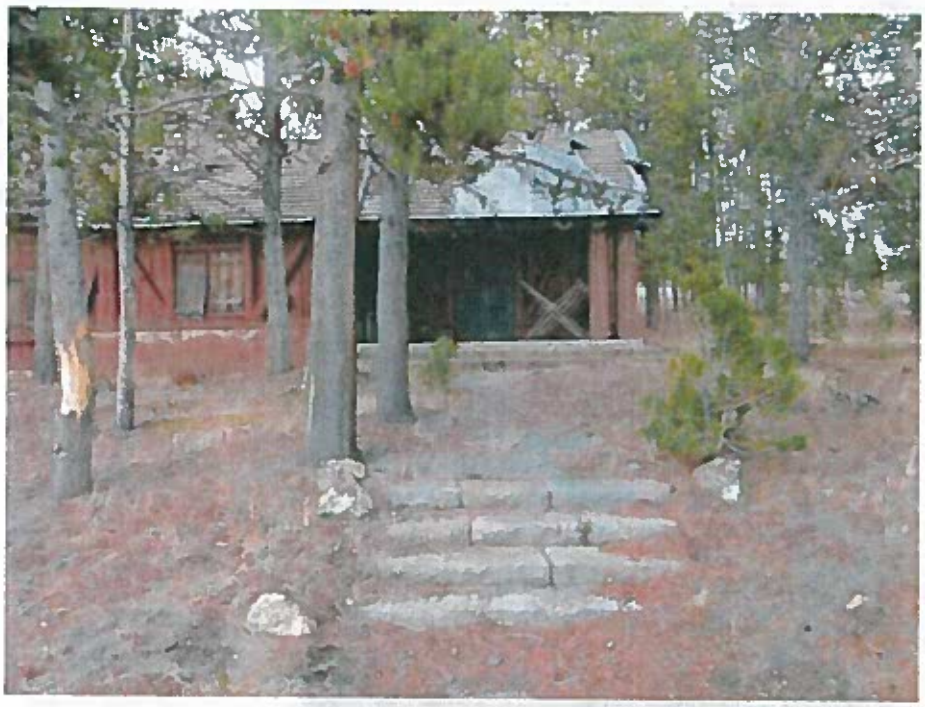
Current Photographs



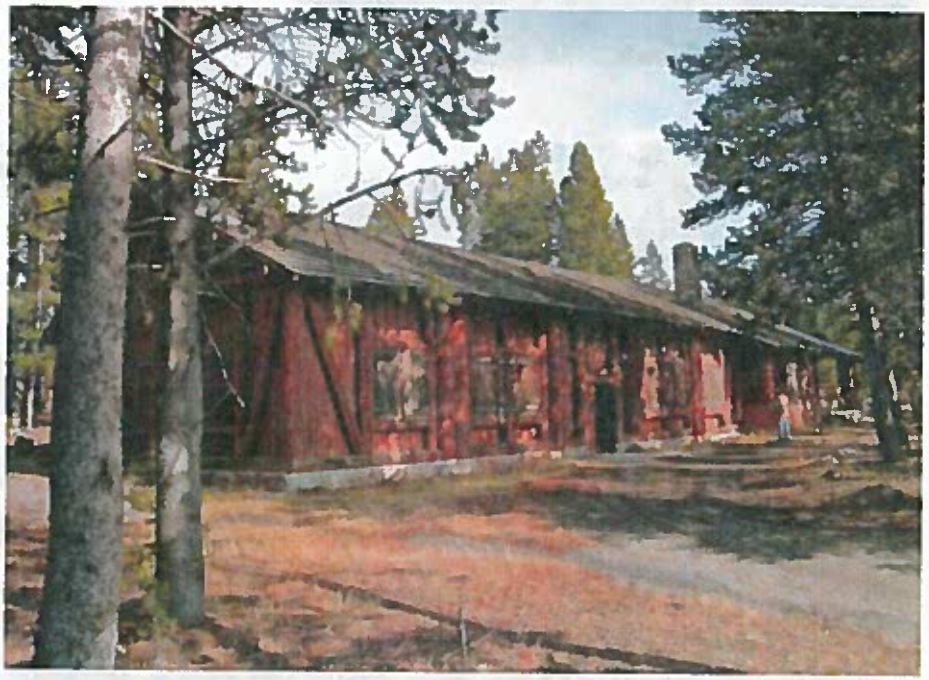
View looking east across Yellowstone Lake from Hatchery site; Hatchery structure is in stand of trees behind and to the left of photographer. Photo by Ken Sievert, November 2007.

Winter environment that Hatchery structure is subjected to; note depth of snowdrift at right in photo and encroachment of snow onto base of log structure. Photo by Herbert Dawson, May 2006.

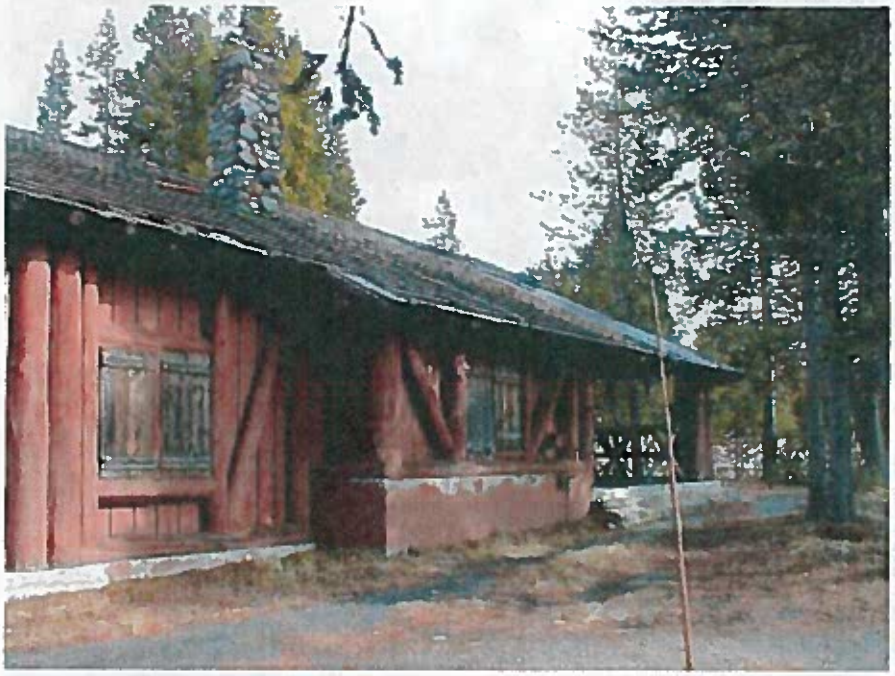
Original cut-stone steps that connected hatchery to parking area across drive on the shore of Yellowstone Lake; note stripped bark on tree from bison rubbing horns on tree. Photo by Herbert Dawson, November 2007.



Asphalt circular drive that accesses hatchery side doors for service and utility purposes. Photo by Herbert Dawson, November 2007.



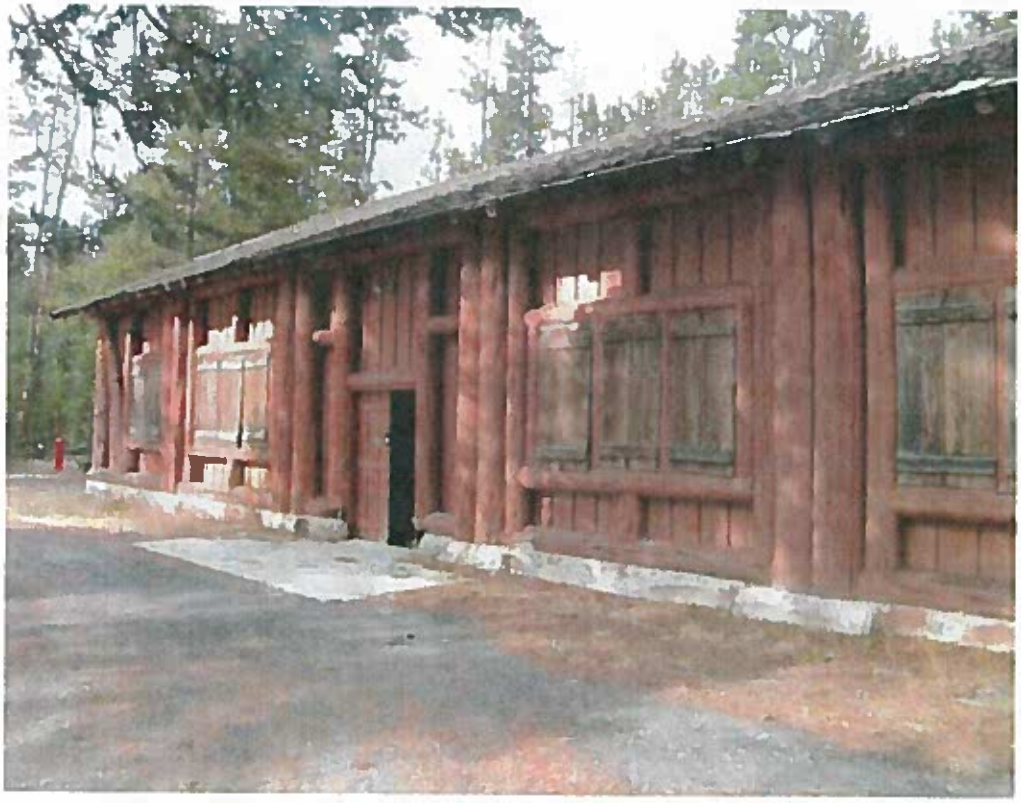
"Majestic Breakproof" manhole cover located north of east end of structure. Photo by Herbert Dawson, November 2007.

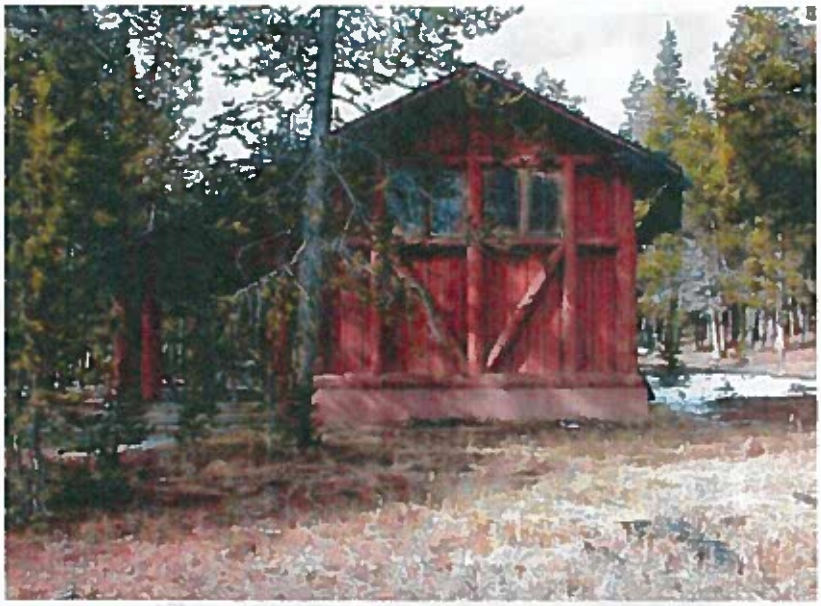


South (primary) elevation; visitor access to hatchery was through covered terrace at extreme right end of structure. Photo by Ken Sievert, November 2007.

South (primary) elevation; visitor access at east end of building. Photo by Ken Sievert, November 2007.

West end of south elevation showing entrance into hatchery raceways. Photo by Herbert Dawson, November 2007.

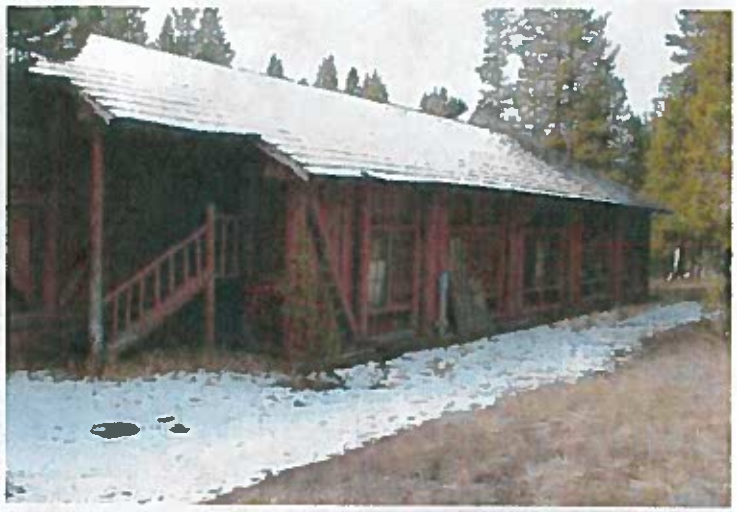




East elevation; aquarium exhibit was located at this end of building. Photo by Ken Sievert, November 2007.

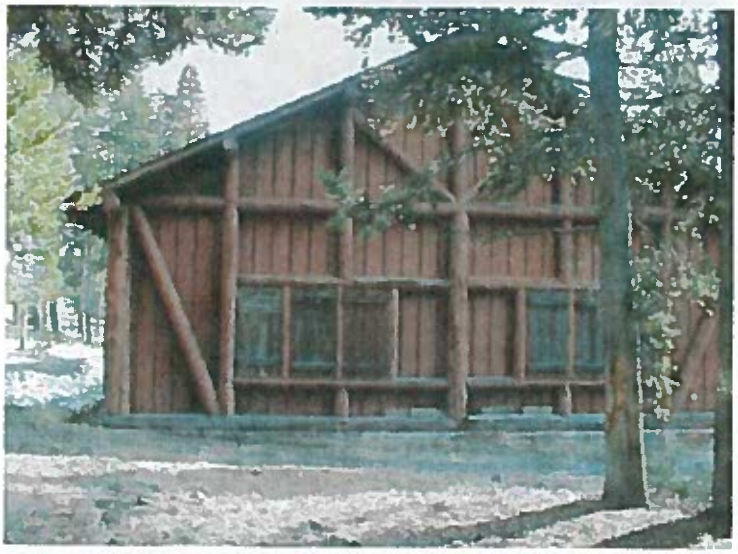
South side of east elevation showing concrete corner terrace at visitors entrance into hatchery. Photo by Ken Sievert, November 2007.

West end of north elevation; note manhole at lower left of photo. Photo by Ken Sievert, November 2007.



East end of north elevation; high windows provided clerestory lighting into aquarium exhibit area. Photo by Ken Sievert, November 2007.

West elevation; the walls are spaced 1x12s with 1x4 battens over the joints on the interior. Total wall thickness is 1½". Photo by Ken Sievert, November 2007.

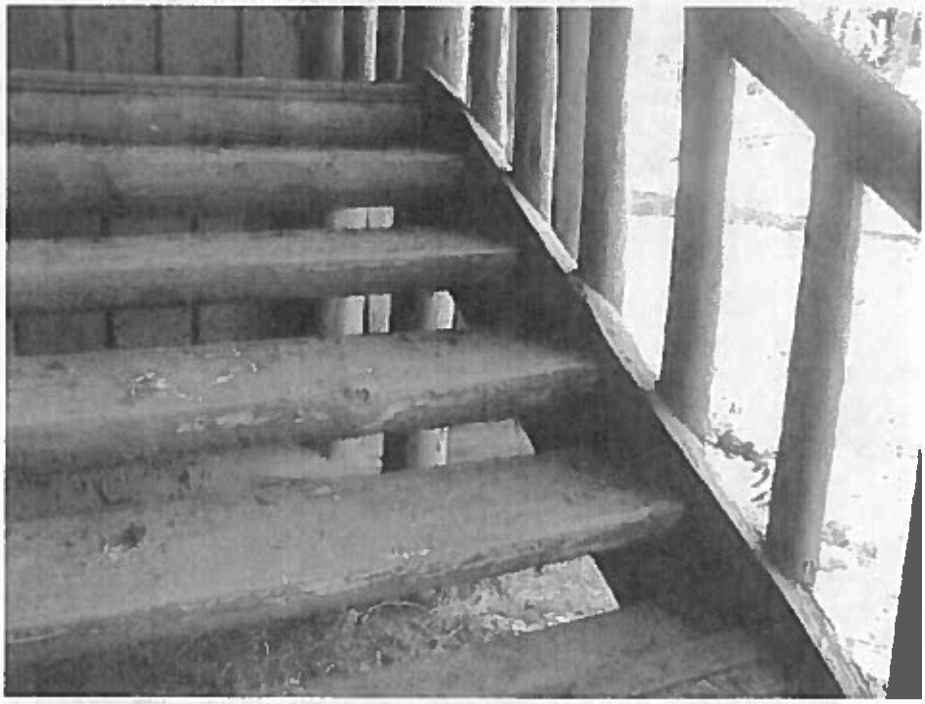


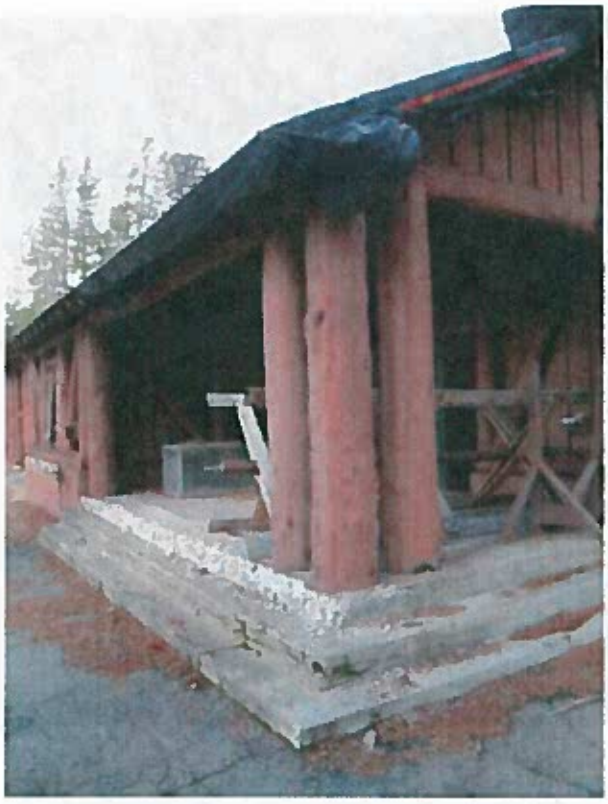
West elevation; note different sizes of log members in wall. Photo by Herbert Dawson, November 2007.

Elevation of north stair used to access the service side of the aquarium exhibit area; note that other hatchery related structures were uphill from this side of the hatchery building. Photo by Herbert Dawson, November 2007.

Service door accessed by north stair. Photo by Ken Sievert, November 2007.

North stair detailing; note that treads and stringer are both constructed from ½ log segments. Photo by Ken Sievert, November 2007.



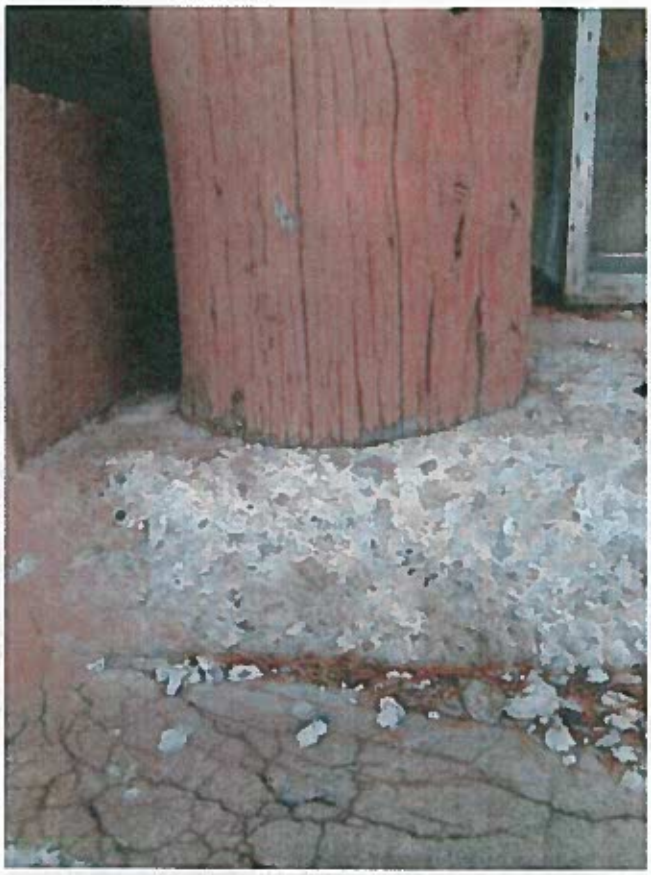


Coupled log columns at SE corner of structure; these columns are approx. 18" diameter members. Photo by Herbert Dawson, November 2007.

Detail of base of columns above; note deterioration at base of right column member. Photo by Herbert Dawson, November 2007.

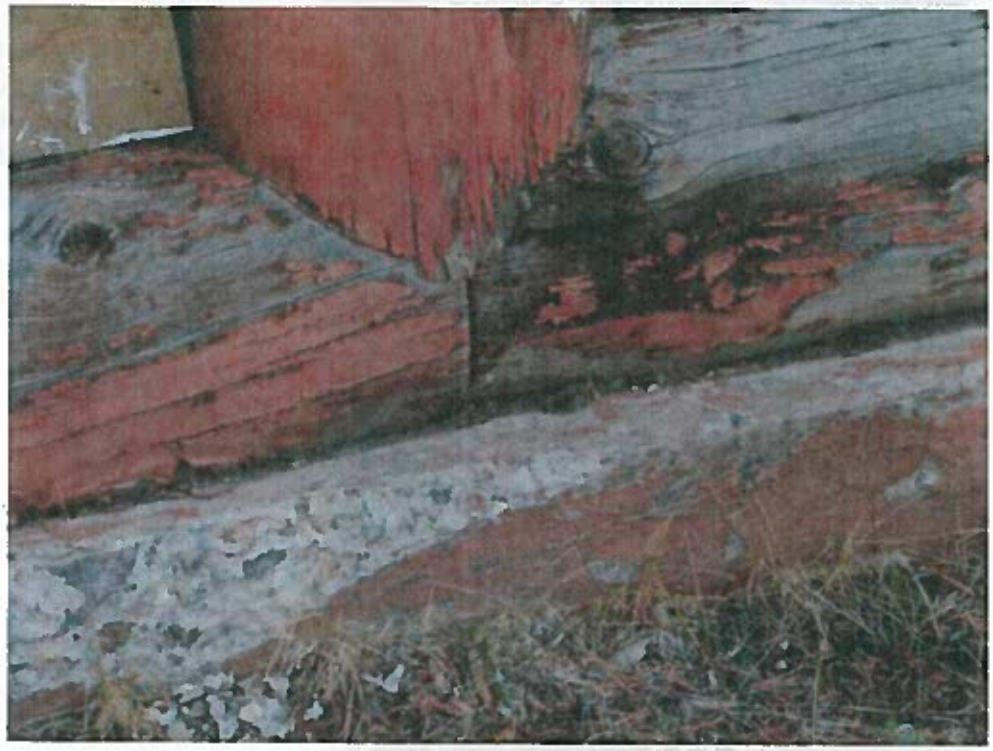
Coupled log columns along north side of structure; note moss at intersection of column bases. Photo by Herbert Dawson, November 2007.

Coupled log columns along south side of structure; columns are in fair condition although sill log and concrete are badly deteriorated. Photo by Herbert Dawson, November 2007.

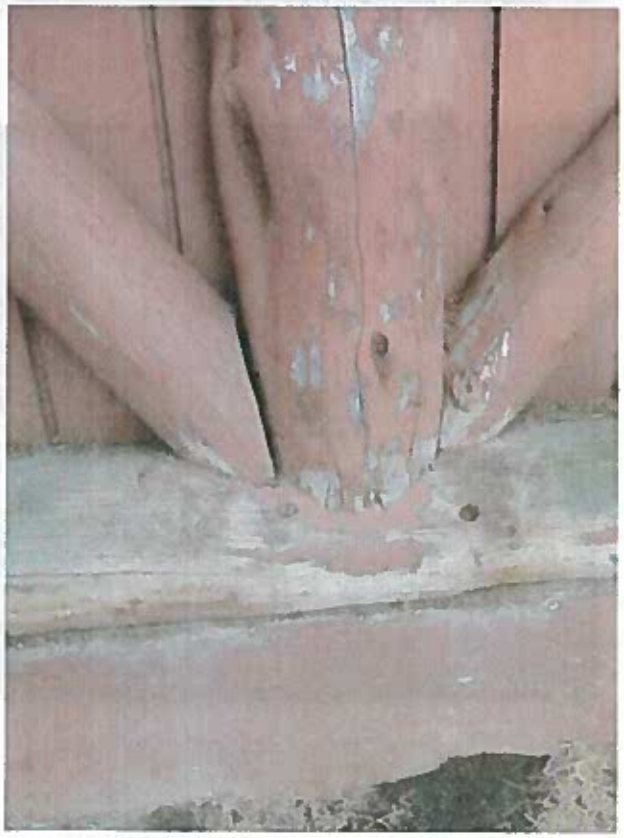


Log column at west end of concrete terrace that serves as main visitors entrance into facility; note that column base appears to be sound at this location although the concrete is severely weathered. Photo by Herbert Dawson, November 2007.

Additional coupled log columns along north side of structure; column bases are badly deteriorated; see text for repair/ replacement alternatives. Photo by Ken Sievert, November 2007.



Sill log detail showing condition where sill log extends beneath secondary log wall column; a high degree of craftsmanship is visible where column logs are coped over sill members. Photo by Herbert Dawson, November 2007.

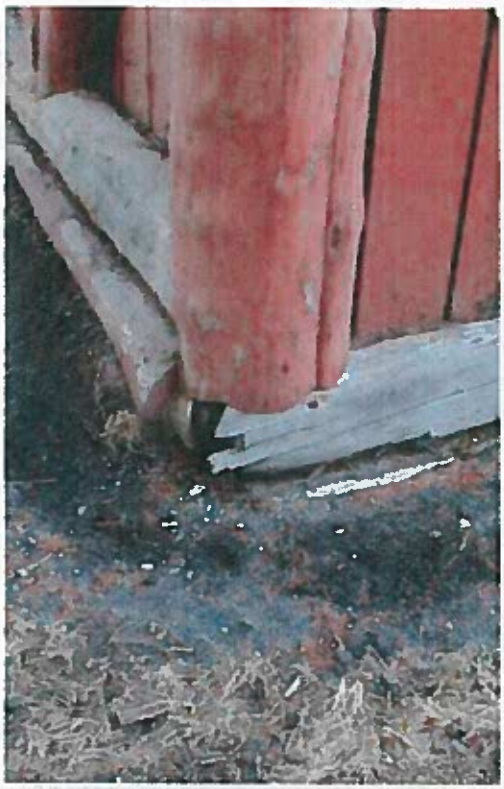


Log joinery where sill, column, and log braces intersect. All members appear to be in fair condition at this joint although unprotected and without sealants at joint locations. As noted in the caption above these members have been carefully fitted. Photo by Herbert Dawson, November 2007.

Sill log detail at southwest corner of structure; note shim stock installed along bottom edge of sill log. Photo by Herbert Dawson, November 2007.

Deteriorated sill log adjacent to corner condition shown in phototgraph above. Exposed concrete is also severely weathered at this location. Photo by Herbert Dawson, November 2007.

Additional examples of deteriorated sill logs around the perimeter of the structure. Although the reasons for the conditions are not readily apparent, the log column bases are the most severely deteriorated along the north (shoreside) wall of the structure and the sill logs are most severely deteriorated along the south (lakeside) of the structure. Photo by Herbert Dawson, November 2007.

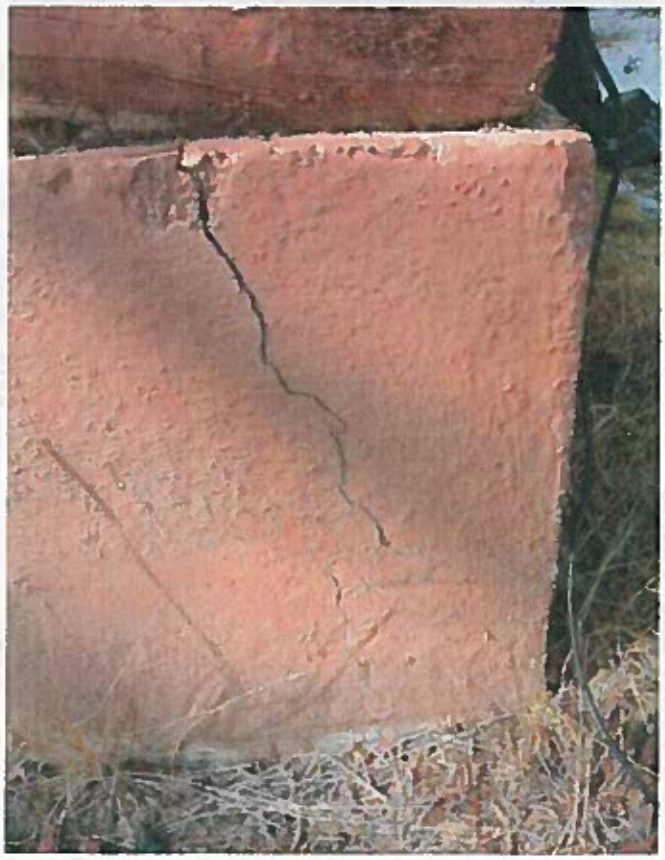


Sill log condition at the northwest corner of the structure. The concrete sub-structure steps up 12" +/- at this location and that the lower sill log turns the corner for the width of the foundation wall. Photo by Ken Sievert, November 2007.

Detail of the photo above showing the Dutchman log return at the corner of the structure. Photo by Herbert Dawson, November 2007.

Condition of concrete support below primary columns at southeast corner of structure. The south side of the building is subjected to extreme weather conditions and repetitive freeze–thaw cycles. Photo by Herbert Dawson, November 2007.

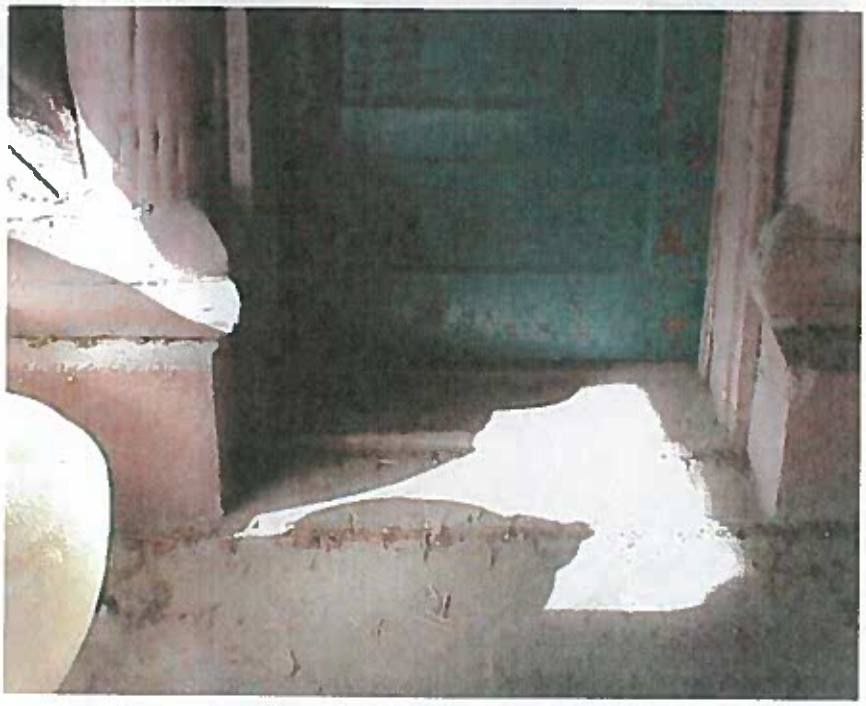
Additional photo at same location; note alligatoring in concrete surfaces on both horizontal and vertical faces. Moss is growing in the cracks further accelerating the deterioration. Photo by Ken Sievert, November 2007.

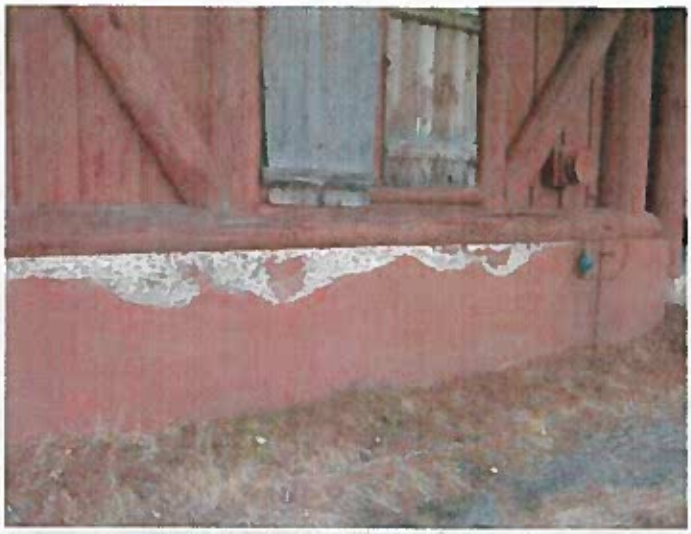


East wall foundation wall. This concrete is in relatively good condition and has not weathered to the same extent as other exposures of the building. A crack was recorded at the northeast corner (right end of the wall above) that is attributed to stress concentrations at the corner location. Photo by Herbert Dawson, November 2007.

Concrete grade beam that surrounds terrace platform and that is protected by roof above is in very good condition and has not weathered. The concrete slab-on-grade floor surface of the terrace area is also in relatively good condition although the exterior steps along the south and east perimeter of the slab are not. Photo by Herbert Dawson, November 2007.

Note the crispness of the concrete forming on the perimeter grade beam. Photo by Ken Sievert, November 2007.





Concrete stem wall along the south side of the office area of the hatchery (located in the center 1/3 of the south elevation). The upper part of the wall is beginning to show significant deterioration from weathering and will require intervention soon if it is to be preserved. Photo by Herbert Dawson, November 2007.

Detailed view of top of wall in photo above. Photo by Herbert Dawson, November 2007.

In this photo of the same wall the paint layer is acting as a mechanism to trap moisture against the face of the concrete and the paint may actually be accelerating the deterioration of the hardened face of the concrete. The concrete used in this structure was not air-entrained and is more vulnerable to freeze-thaw cycles than air entrained concrete. Photo by Ken Sievert, November 2007.

Concrete projection below one of the doubled column locations along the south wall. Once the troweled surface of the concrete has eroded the concrete will deteriorate more quickly as it becomes more porous. Photo by Herbert Dawson, November 2007.

Steps and edge grade beam along the south side of the entrance terrace. Deterioration is advanced in these concrete elements, particularly within the steps. Photo by Ken Sievert, November 2007.

Concrete deterioration adjacent to the side entry doors into the hatchery raceway area. Concrete at this location is in an advanced state of deterioration and is becoming soft and "punky." Photo by Ken Sievert, November 2007.

Detail of location in photograph above. Note that there is some very large aggregate within the concrete mix. Photo by Herbert Dawson, November 2007.

Condition of roof shingles in upper areas of roof; note the advanced weathering (as judged by the thinness near the weather edge) and the high percentage of broken shingles at this thin section Photo by Herbert Dawson, November 2007.

Similar to photo above. Remnants of NPS green shingle stain can be seen on some of the shingles. Photo by Herbert Dawson, November 2007.

Condition of roof shingle ridge; it appears that the lap was intended to be a Boston Lap although the gap at the ridge is inordinantly large. Note the deteriorated shingles midway down the ridge. Tie-offs for ropes can be seen at periodic intervals along the length of the ridge. Photo by Herbert Dawson, November 2007.

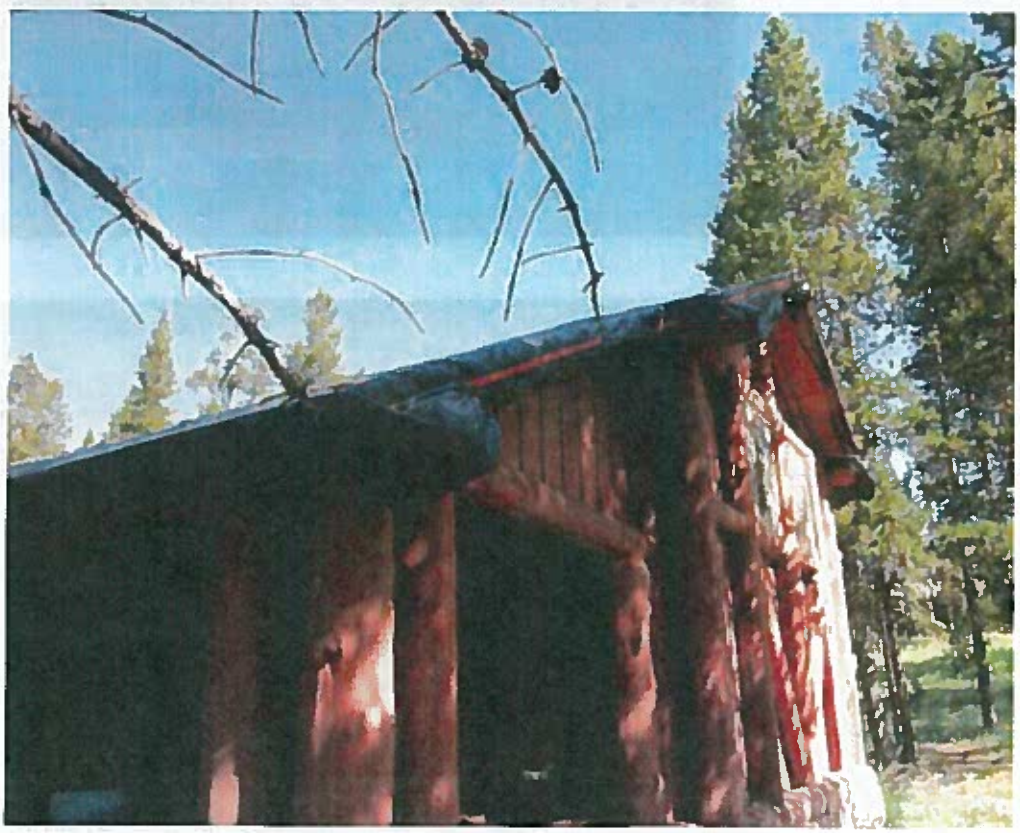
Metal tab from a previous roof repair. Photo by Herbert Dawson, November 2007.

Missing shingles on roof: Shingle nails have rusted through resulting in the loss of shingles at selected areas of the roof. Photo by Ken Sievert, November 2007.

As part of the Parkitecture style of design, the roof shingles have 16" exposure and are double coursed. The result is a unique textural scale that is visually pleasing and very important to the appearance of the building. Photo by Herbert Dawson, November 2007.

The roof construction does not indicate any building paper or "slip sheet" as part of the original roofing. Photo by Herbert Dawson, November 2007.

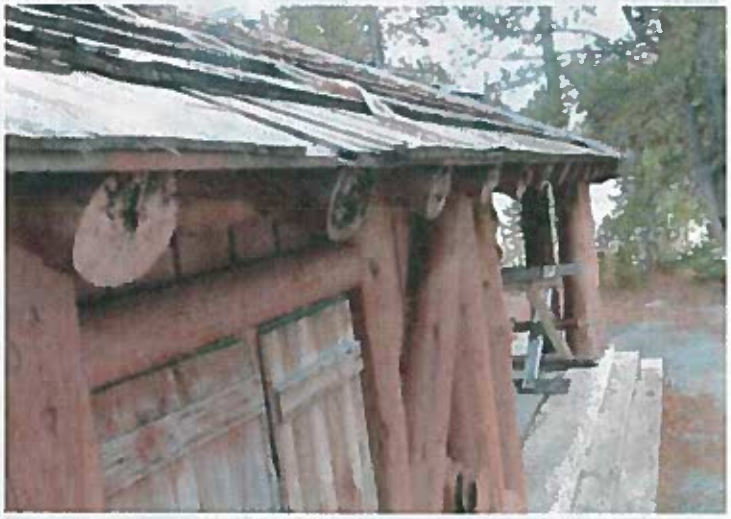
Emergency roof covering that has been applied over the east end of the building (consisting of a heavy gauge of Visqueen). Photo by Herbert Dawson, November 2007.



Similar to above photograph—as a footnote, the temporary roofing has exhibited significant failure in the intervening time between May 2006 and when the facility was reviewed in Nov. 2007. Photo by Herbert Dawson, November 2007.

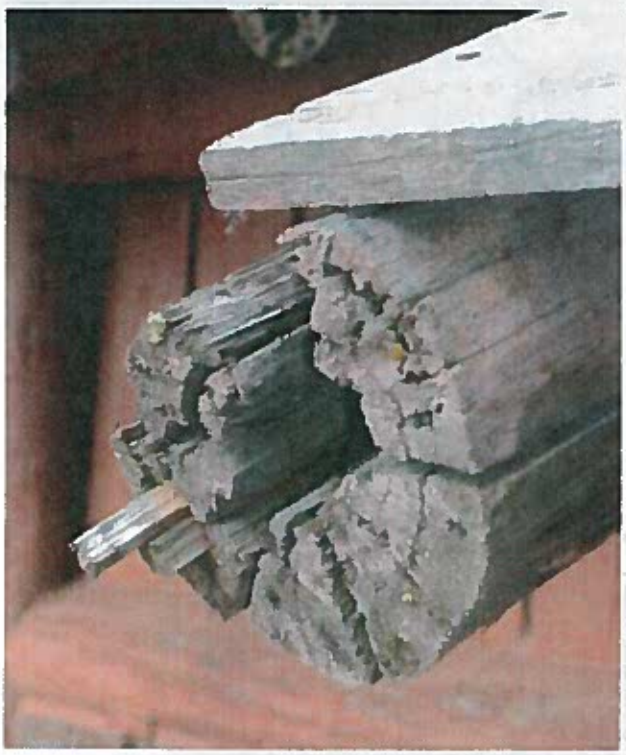
Broken purlin along west edge of roof attributed to a falling tree. Photo by Herbert Dawson, November 2007.

Condition of rafter tails along edge of roof—all rafter tails exhibit deterioration and require repair or replacement (see text). Photo by Herbert Dawson, November 2007.



Soffit areas (underside of edge of roof) exhibit peeled paint, minor weathering, and areas of "spongy" wood. Replacement of some edge sheathing will be required. Photo by Herbert Dawson, November 2007.

Rafter tail along south wall at corner of Office. Photo by Herbert Dawson, November 2007.

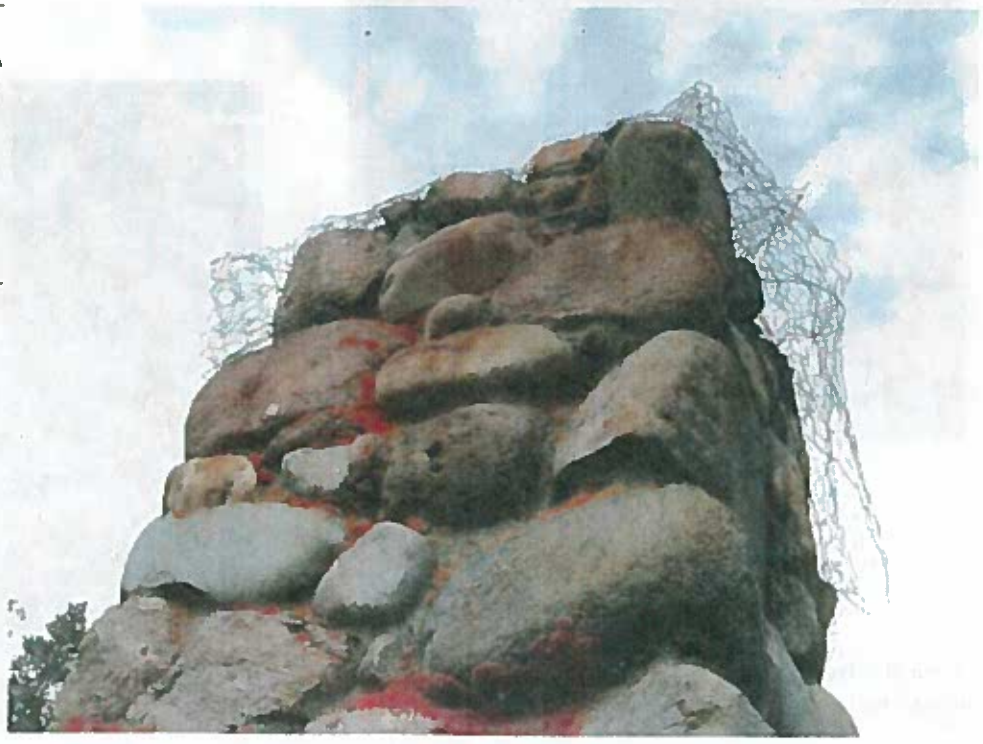


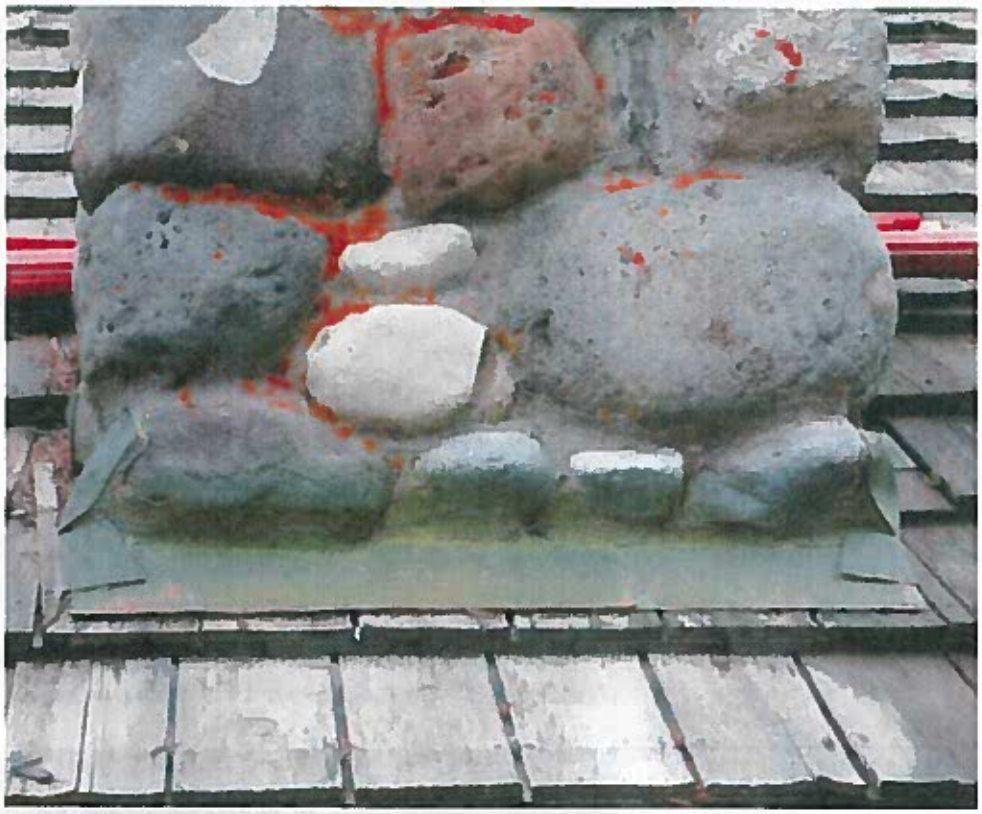
Detail of above rafter. Photo by Herbert Dawson, November 2007.

Typical rafter tail. Note loss of wood around sheathing nail. Photo by Herbert Dawson, November 2007.

Chimney from office fireplace; constructed with rounded (glaciated) stone and Portland Cement mortar. Note the lichen on both the stone and mortar. Photo by Herbert Dawson, November 2007.

Bird/squirrel protection wire at top of chimney. A more permanent protection system is recommended at the time that the roof is replaced. Photo by Herbert Dawson, November 2007.

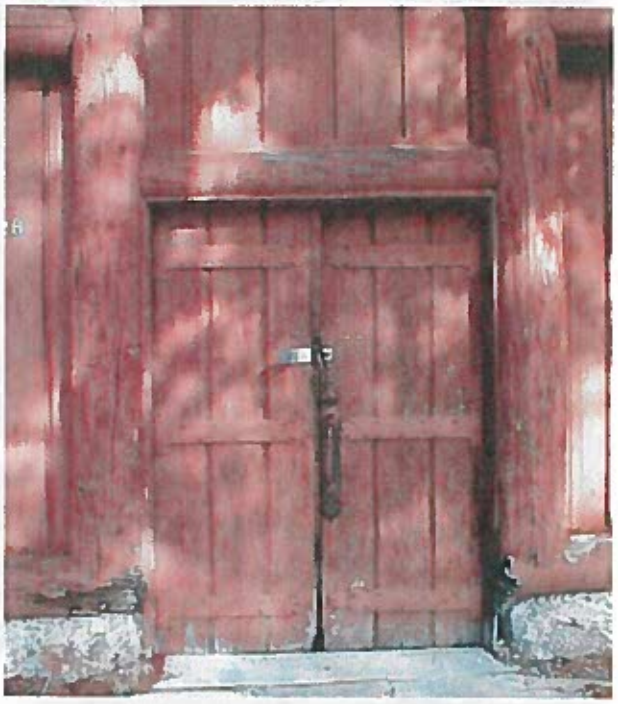




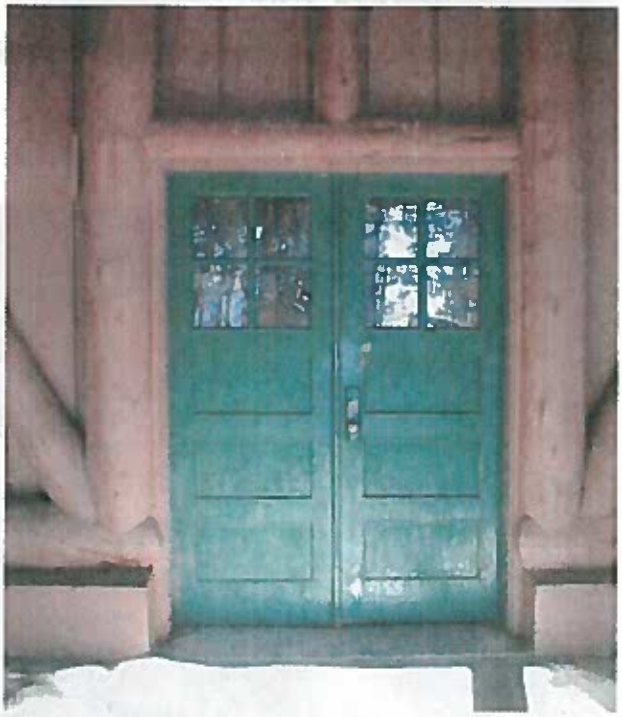
Copper flashing at base of chimney (the flashing has been painted green). The flashing is in very good shape. Photo by Herbert Dawson, November 2007.

The craftsmanship of the step flashing along the sides of the chimney is remarkable and of very high quality. Photo by Herbert Dawson, November 2007.

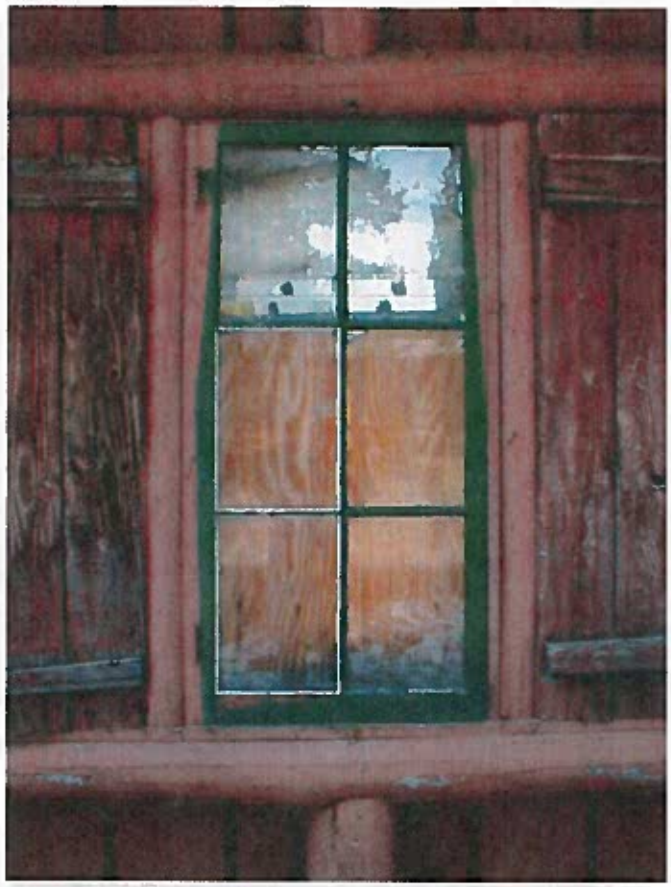
Side entrance into raceway area of hatchery. These openings, including the permanent hardware, are original and exhibit a high degree of integrity. Photo by Ken Sievert, November 2007.



Primary public entrance into aquarium exhibit area. Doors and hardware are original. Photo by Ken Sievert, November 2007.



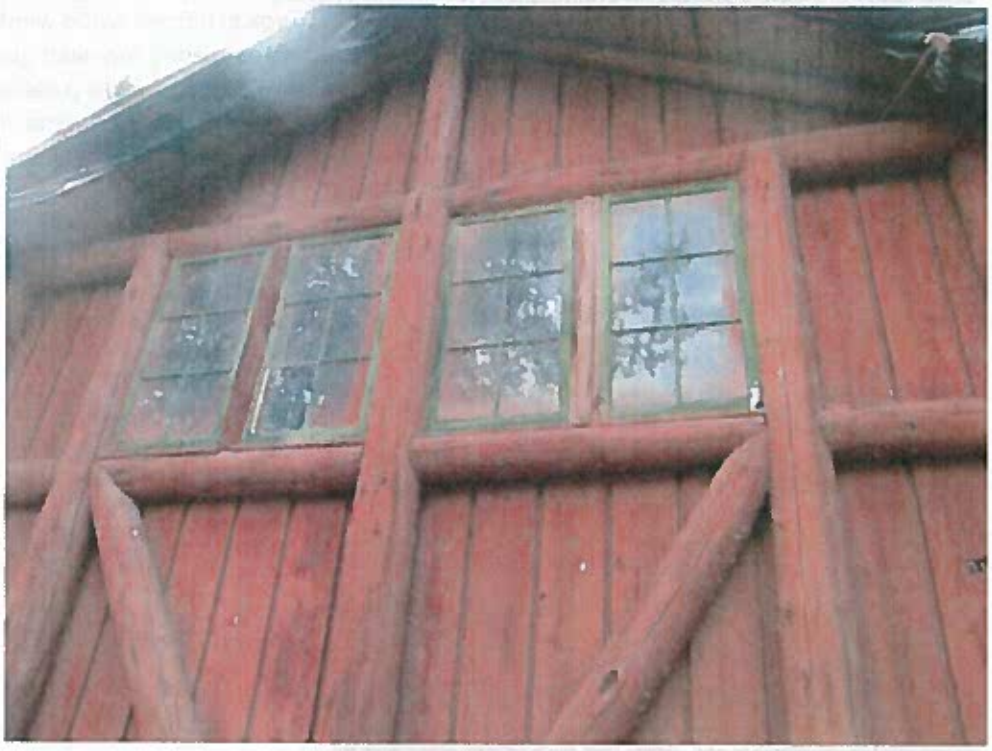
Door into office area from entrance terrace. Door and hardware are original. Photo by Ken Sievert, November 2007.



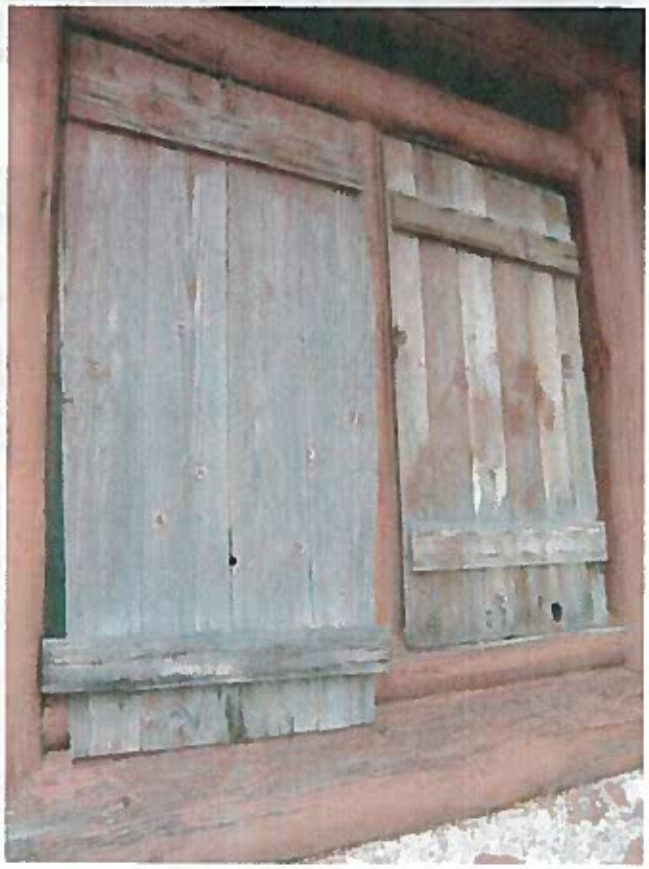
Typical hinged wood window with true divided lites; note recently replaced glass units (unpainted glazing). Glass is single pane and a variety of glass exists on site including original lites as well as newly replaced lites. Photo by Ken Sievert, November 2007.

Hatchery raceway area generally has windows deployed in ranks of three as shown in this photograph; end bays of raceway section feature doubled windows. Photo by Herbert Dawson, November 2007.

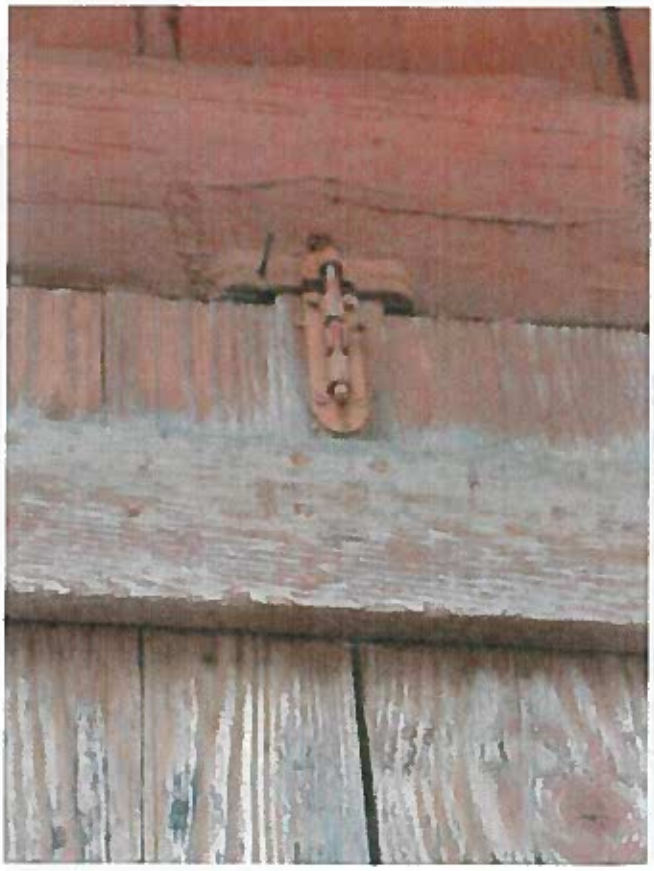
High wall windows to admit overhead light into aquarium exhibit area (east end of structure). Photo by Herbert Dawson, November 2007.



Wood shutters have deteriorated or have been replaced with improvisational coverings. It is recommended that they be replaced including the attachment hardware. Photo by Herbert Dawson, November 2007.



Window sill log that requires replacement. Note that dimensioned lumber sill plate for window is also partially missing. Photo by Herbert Dawson, November 2007.



Detail of barrel bolt that was used to hold winter window shutters in place; many of these are missing at the existing window locations. Photo by Herbert Dawson, November 2007.

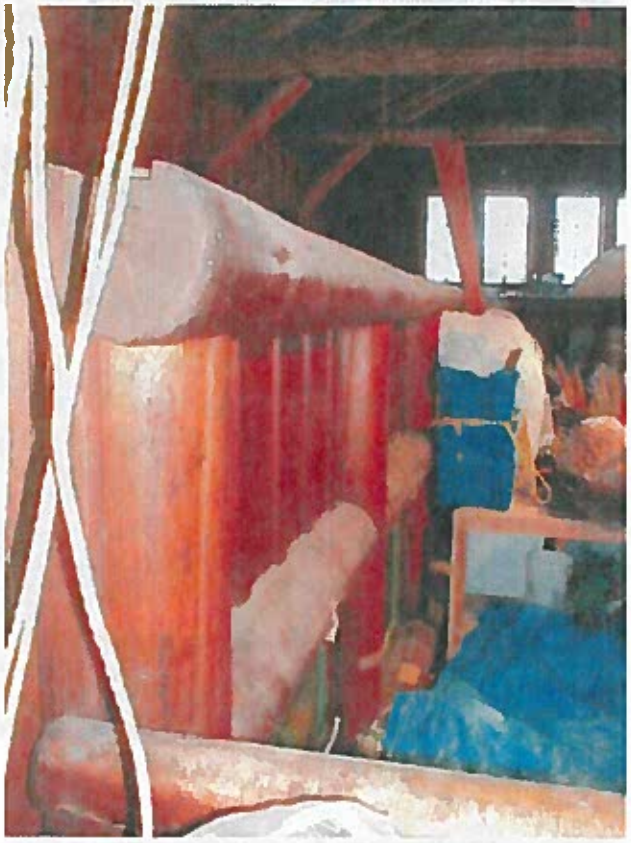
Intersection of structural log window mullion with window sill log. This mullion is missing a trim piece that was originally cut into the log mullion (see below). Photo by Herbert Dawson, November 2007.

Window with trim piece described above in-situ. Due to the small size of the trim piece and difficulty of achieving mechanical connection, this detail may require re-evaluation. Photo by Herbert Dawson, November 2007.

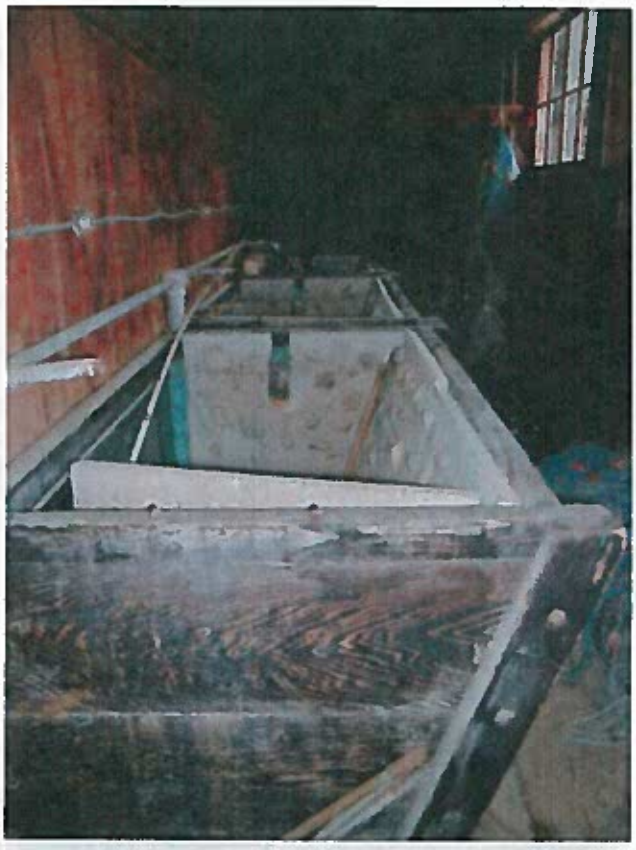
Public queuing area for viewing fish tanks in aquarium exhibit space (to the right). Note that the facility is used for storage during the off-season and, at the time the evaluation was conducted, the building was filled with equipment and furnishings from other YNP services or departments. As a consequence, it is difficult to execute photography that is truly representative of the interior features of the building. A sense of the rustic log architecture, the exposed wood structural elements, and the cavernous open space can be seen in the background. Originally, the fish raceways could be seen from the elevated balcony at the top of the steps. Photo by Ken Sievert, November 2007.

Front view of the fish tank aquarium exhibits (there were 7 aquarium exhibits in total); note the log detailing surrounding the exhibits. Photo by Ken Sievert, November 2007.

View from balcony of face of fish tank exhibits (looking east). Exhibit walls are partial height wood walls and that the service area for the fish tank exhibits is located on the back side of these walls. Photo by Ken Sievert, November 2007.



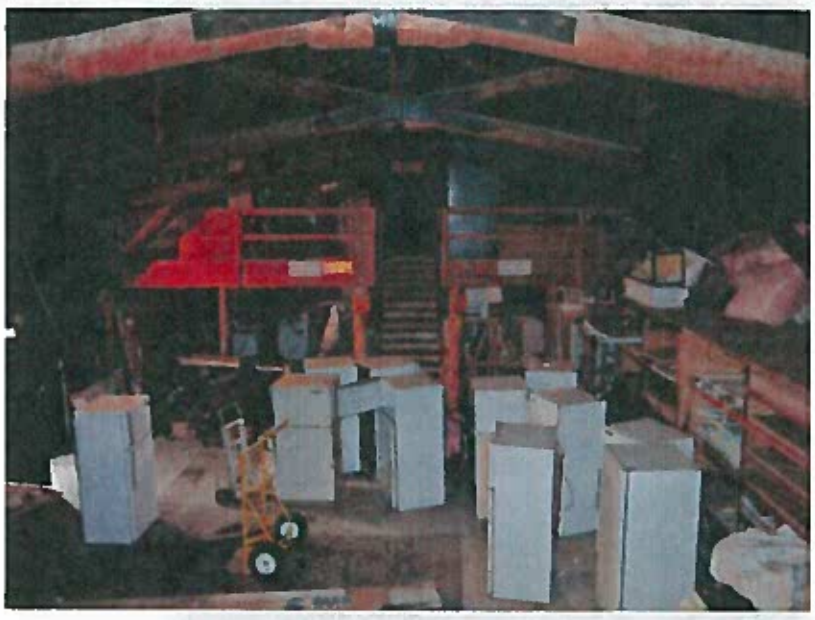
This service stair connected the lower floor of the fish raceways in the hatchery to the higher floor of the aquarium exhibit area. It provided access for workers to service the tank side of the exhibits. Photo by Ken Sievert, November 2007.



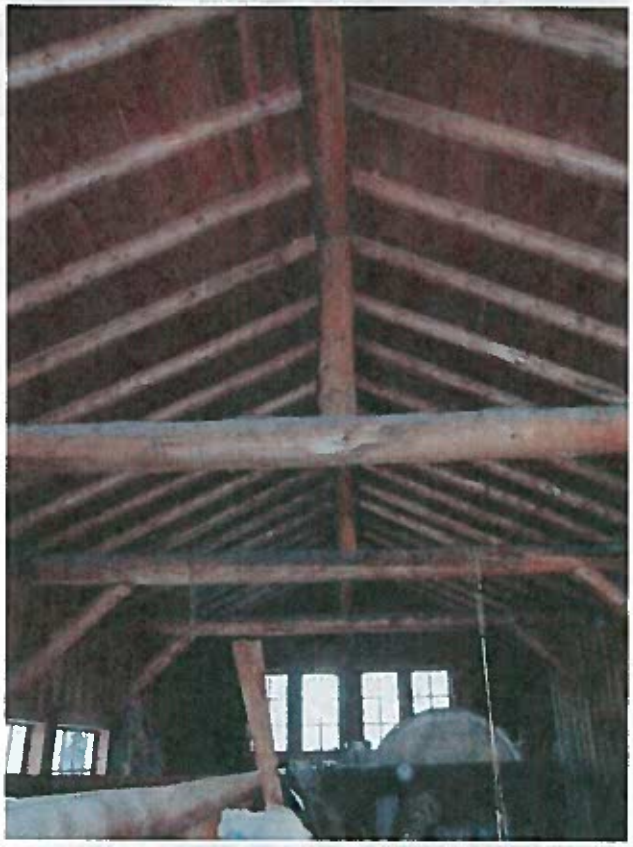
Fish tanks used in the aquarium exhibit area; the public viewing area is on the other side of the wall. Photo by Herbert Dawson, November 2007.

Additional photo of the aquarium fish tanks (looking east); stored equipment visible in the photo is from the fisheries division of YNP. Photo by Ken Sievert, November 2007.

View from balcony of original fish raceway area of hatchery (now used for storage). Note that an elevated storage platform has been constructed in the west end of the building to provide additional storage. Photo by Herbert Dawson, November 2007.



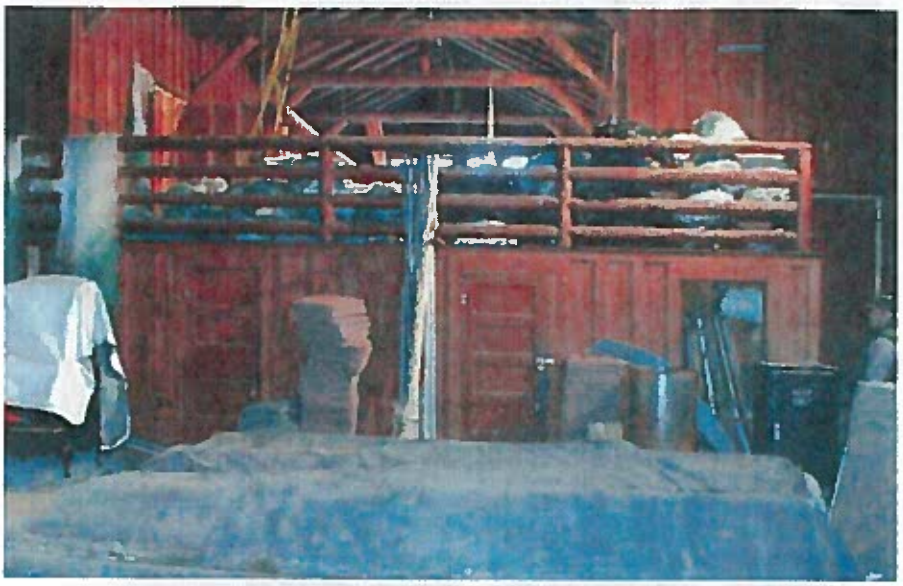
Roof structure over the aquarium/public exhibit end of the building; the roof trusses over this narrower portion of the structure are simple king-post log trusses (with knee braces). Photo by Herbert Dawson, November 2007.



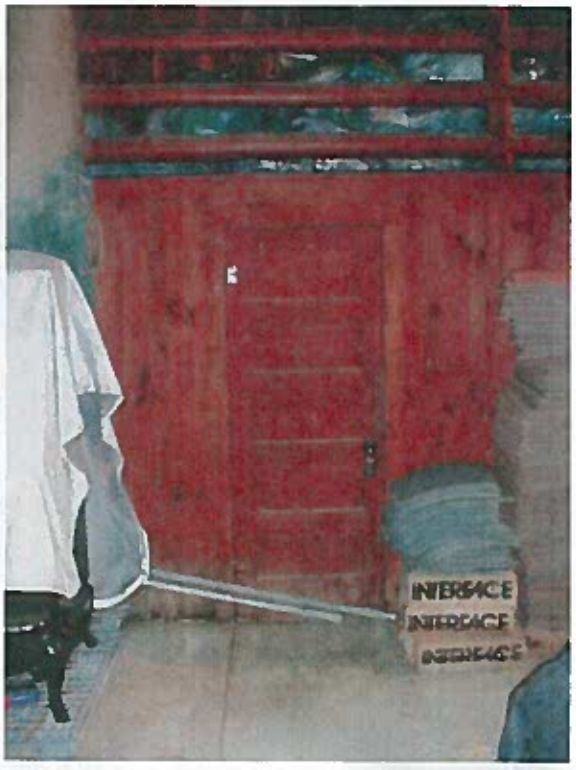
View of exposed wood roof structure and wood truss assembly over the original raceway area from hatchery floor below. The balcony and aquarium exhibit area are visible to the right in the photo. Photo by Ken Sievert, November 2007.

Drainage gutters cast into concrete floor of raceway/ hatchery portion of structure, currently filled with blocking to provide a uniform floor height. These features are important to the interpretation of the facility as a hatchery. Photo by Herbert Dawson, November 2007.

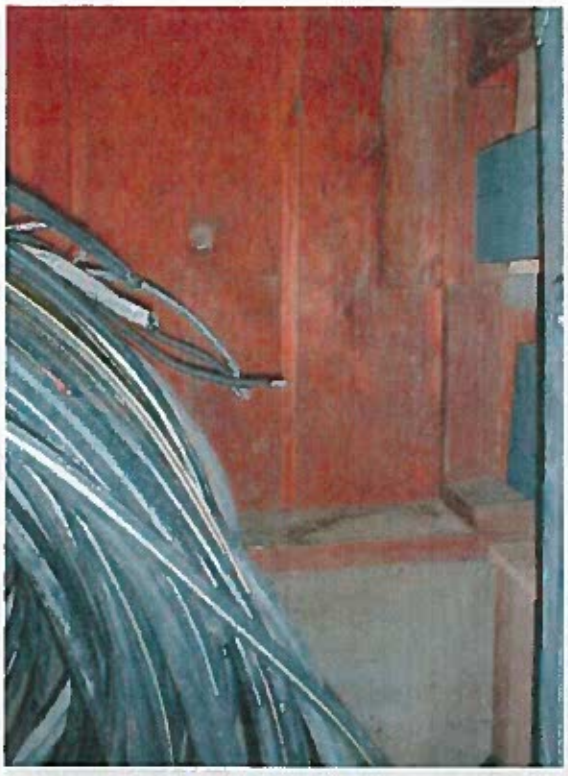
View of balcony with storage wall below. Note door at far right that accesses the office for the facility. The aquarium exhibit area is behind the balcony in this photograph. Photo by Ken Sievert, November 2007.



Detail of storage door. These doors and hardware are original to the building. Photo by Herbert Dawson, November 2007.



Access to the interior service stair (connecting the hatchery floor to the service area of the aquariums) can be seen in the left of the photo, behind stored materials and equipment. Photo by Ken Sievert, November 2007.



Interior of one storage closet within storage wall; these storage units are basically as deep as the balcony above is wide. Note the exceptionally good quality of the exposed concrete in the grade beam at the base of the wall. Photo by Ken Sievert, November 2007.

Personnel door connecting the hatchery floor to the office as viewed from the hatchery side of the wall. Door and hardware are original parts of the building construction. Photo by Herbert Dawson, November 2007.

Interior of the office showing the stone fireplace, painted celotex ceiling, and painted masonite walls. The door to the left accesses the steps leading to the hatchery floor. The tack and riding gear is used by fisheries division to get to the remote lakes in Yellowstone National Park. Photo by Ken Sievert, November 2007.

Details in the face of the fireplace; note the obsidian accent (one of two) and the antler art for holding fireplace matches. With the exception of the inset the fireplace features charcoal colored mortar that is fine grained. Photo by Ken Sievert, November 2007.

Inset in face of fireplace above mantle; the cause of this inset is not known at this time. Photo by Ken Sievert, November 2007.

Drainage trench along north wall, installed by YNP volunteer crews. Photo by Herbert Dawson, November 2007.

Access panel located at northeast corner of hatchery floor (adjacent to exterior stair). Photo by Ken Sievert, November 2007.

Piping for original water supply to aquarium exhibit area; located near the east end of the north wall and in proximity to the manhole shown with the site photos. Photo by Herbert Dawson, November 2007.

Drinking fountain located on south wall of entrance terrace; small in scale. Photo by Herbert Dawson, November 2007.

Electrical service to facility is located midway along the north wall and is served underground. Photo by Ken Sievert, November 2007.

Supply piping and electrical lighting (in flex conduit) adjacent to the aquarium exhibit tanks. Photo by Ken Sievert, November 2007.

King-post truss configuration over aquarium exhibit area. Photo by Herbert Dawson, November 2007.

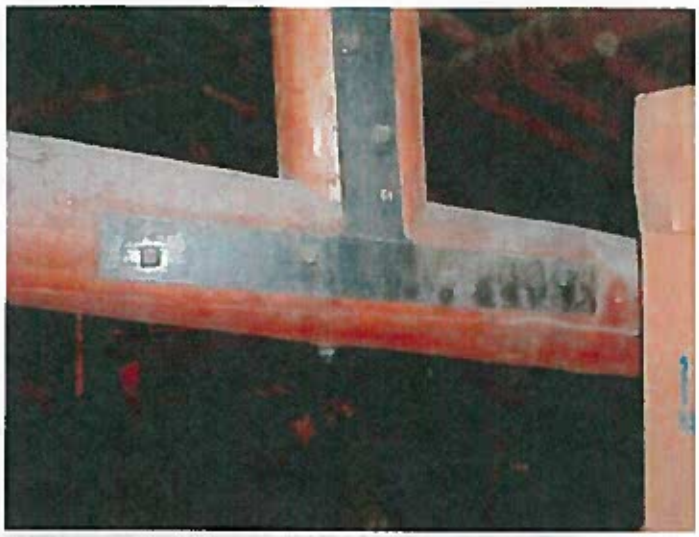
Modified scissors truss configuration over hatchery area. Photo by Herbert Dawson, November 2007.

Top connection detail—modified scissors truss. Photo by Ken Sievert, November 2007.

Bottom connection detail—modified scissors truss. This particular truss is located at the top of the storage platform stair and has wrapped head protection. Photo by Ken Sievert, November 2007.

Vertical web details—modified scissors truss. Top of vertical web. Photo by Ken Sievert, November 2007.

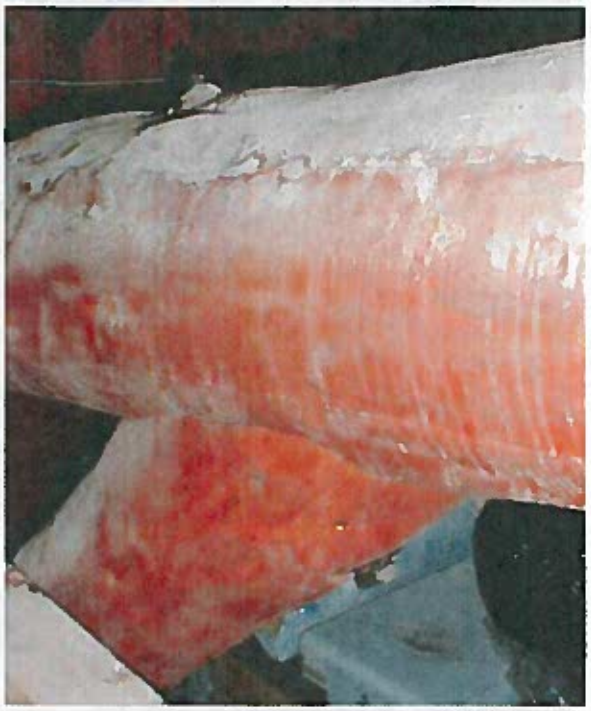
Composite photo of vertical web assembly taken from storage platform build at the west end of the original hatchery raceway area.



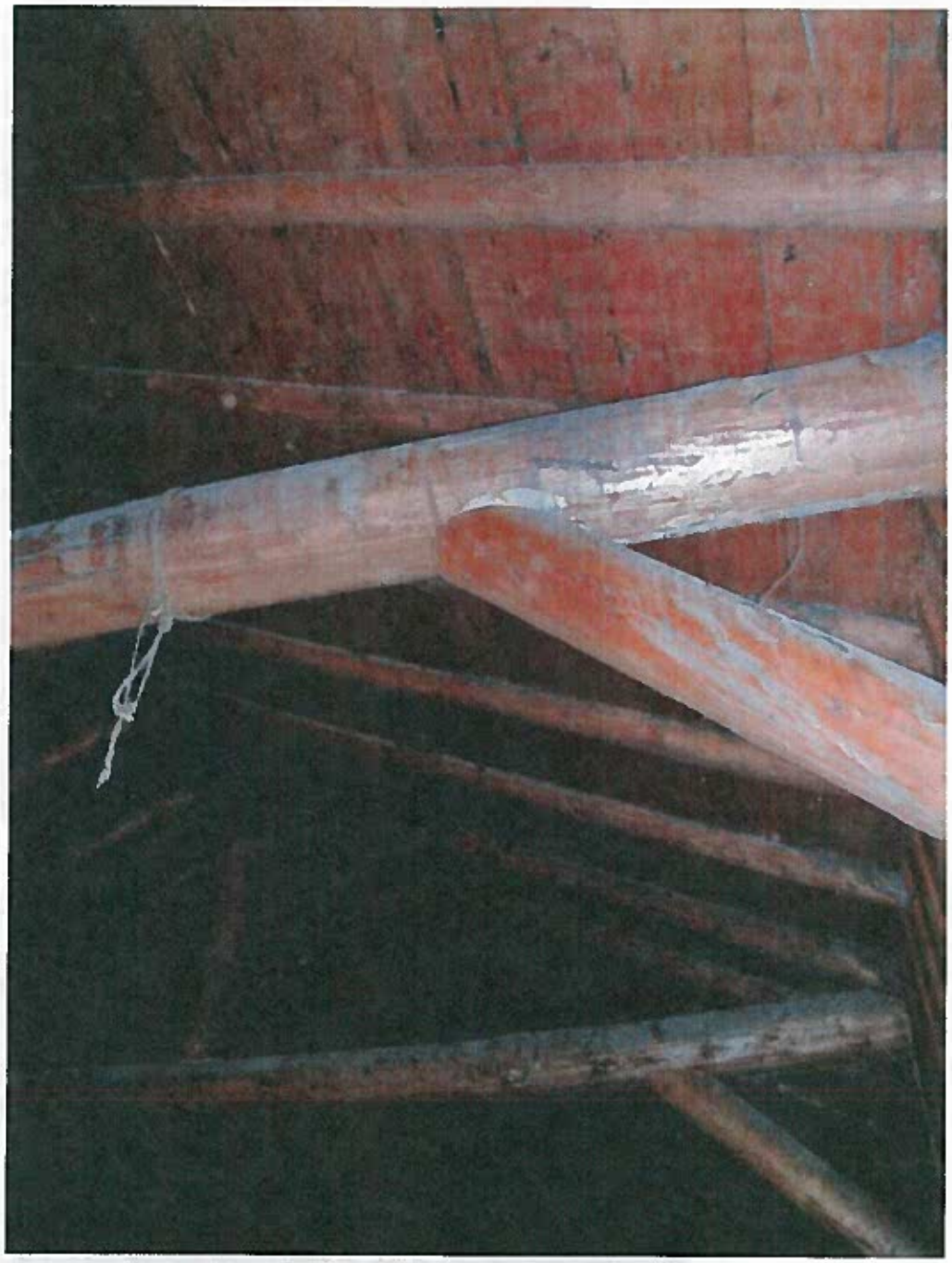
Bottom of vertical web.

Heel joint of modified scissors truss showing connection of top to bottom chord including steel plates and bolt pattern. The combined chord members socket into the coupled log columns at the exterior of the building walls. Photo by Ken Sievert, November 2007.

Knee brace details—modified scissors truss. Note through bolt and careful coping of the log members. Photo by Ken Sievert, November 2007.



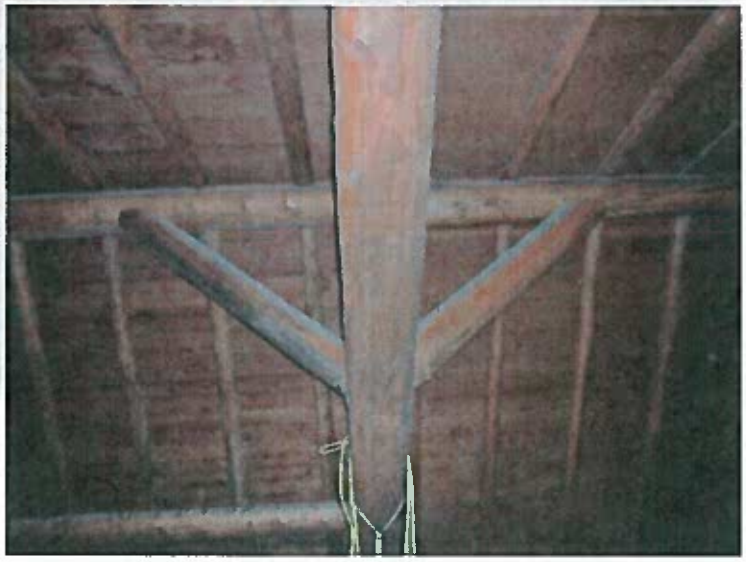
Composite photo showing knee brace from modified scissors truss as it engages the wall (and coupled columns at the exterior) and the heel joint of the truss above. Note the through bolt at the heel joint (similar to the brace bolt in the photo above). Photo by Ken Sievert, November 2007.



Knee brace details at the aquarium King-post truss; note that these braces were nailed only and that this brace has slipped out of position and requires (minor) repair and stabilization to be effective. Photo by Herbert Dawson, November 2007.

Roof stabilization brace at each end of roof ridge line. These braces add stability in the east–west direction for the roof assembly. Photo by Herbert Dawson, November 2007.

Knee brace detail between the roof ridge purlin and one of the King-post trusses. Note that this bracing detail occurs at only one location (near the balcony) and that the brace connection is totally reliant on nailing. Photo by Herbert Dawson, November 2007.



Part 2. Treatment and Use

Ultimate Treatment and Use—Guidelines

Procedural Alternatives:

As a Historic Building in an established Historic District, any work undertaken on the Hatchery must be done in compliance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties* as administered by the United States Department of Interior (DOI). Those standards include guidelines for four treatment approaches for historic properties as outlined below; in order of importance:

- Preservation—retains all historic fabric through conservation, maintenance, and repair. This approach includes preservation of changes and alterations that have been made over time.
- Rehabilitation—retains all preservable fabric through conservation, maintenance, and repair but allows greater latitude for replacement if the property is more deteriorated. Rehabilitation standards focus attention on the elements that give a property its historic character.
- Restoration—Retains only materials from the most significant time in a property's history while permitting removal of materials applied to the property from other periods of time.
- Reconstruction—Re-creation of a non-surviving site, landscape, building, structure, or object utilizing all new materials.

Recommended Preservation Treatment:

The recommended treatment for the Hatchery is the Rehabilitation classification as outlined in the DOI guidelines.

Justification:

It is not anticipated that the Hatchery will be used for its original purpose in the future because of a change in mission regarding fish culture at Yellowstone Lake, as well as the dated condition of the facility and its equipment. A change in use, or occupancy, will necessitate that the historic structure be rehabilitated to accommodate the new use. There are also deteriorated building elements that could more effectively be replaced either in their entirety or partially, as their condition warrants, rather than preserved in a deteriorated condition. Those elements could include, but are not limited to, rafter tails, sill logs, bases of upright log columns, purlin crowns, concrete entrance steps, and selected areas of badly deteriorated concrete foundations.

DOI Guidelines define the "Rehabilitation classification" as follows:

When the physical condition of character-defining materials and features warrants additional work repairing is recommended. Rehabilitation guidance for the repair of historic materials such as masonry, wood, and architectural metals again begins with the least degree of intervention possible such as patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading them according to recognized preservation methods. Repairing also includes the limited replacement in kind—or with compatible substitute material—of extensively deteriorated or missing parts of features when there are surviving prototypes. Although using the same kind of material is always the preferred option, substitute material is acceptable if the form and design as well as the substitute material itself convey the visual appearance of the remaining parts of the feature and finish. When an entire interior or exterior feature is missing, it no longer plays a role in physically defining the historic character unless it can be accurately recovered in form and detailing through the process of carefully documenting the historical appearance. Although accepting the loss is one possibility, where an important architectural feature is missing, its replacement is always recommended in the Rehabilitation guidelines as the first or preferred, course of action. Thus, if adequate historical, pictorial, and physical documentation exists so that the feature may be accurately

reproduced, and if it is desirable to re-establish the feature as part of the building's historical appearance, then designing and constructing a new feature based on such information is appropriate. However, a second acceptable option for the replacement feature is a new design that is compatible with the remaining character-defining features. The new design should always take into account the size, scale, and material of the historic building itself and, most importantly, should be clearly differentiated so that a false historical appearance is not created.

Ultimate Treatment and Use—Compatability Matrix

In the event that a new use for an historic structure has not been determined and has not yet evolved into a specific recommendation, one strategy for adaptively reusing or rehabilitating the building or structure is to study the spaces within the structure and look for a new use that is a good 'fit' (has compatibility) with the size, arrangement, construction, and nature of the existing spaces. Information collected in the preparation of HSRs like this document can greatly assist this approach. As a part of this report the Hatchery has been studied to explore other potential uses for the building, or, to confirm the proposed uses identified during previous planning activities. Regardless of the final selected use for the facility, there are features, spaces, and materials that must be preserved within NPS/DOI guidelines to maintain the historic credibility and integrity of the property.

Within the framework of compatibility, elements of a building or structure to be evaluated for rehabilitated use include, but are not limited to, the following:

1. Size and arrangement of the space(s) contained in the building: are they small cellular spaces or are they large unobstructed spaces, and what is the relationship of spaces to each other (adjacencies)?
2. The fundamental structural system: clear-span structures can accommodate large rooms, rigid frame structures with a grid layout "fit" best with orderly spaces that are repetitive in size, and bearing wall buildings (generally) adapt well to occupancies with smaller rooms.
3. Available structural capacity: can existing members accept changes in loading inherent in the change in occupancy (including capacity of underlying supporting soils)?
4. Ease of modification of the basic structural system: will change or modification represent an easy or difficult construction or design challenge?
5. Building code implications: which use requires the least code compliance?
6. Available fire resistance offered by the existing building: is existing fire resistance suitable for the proposed new use (including exits, fire separation, areas of rescue, etc.)?
7. A new use that can most successfully align with current NPS policies for structures.
8. Degree of difficulty for making the facility accessible to mobility impaired individuals.
9. Adverse effects to the historic structure.
10. Appropriateness of the proposed use to maintaining the integrity criteria of historic structures; location, workmanship, design, feeling, setting, association, and materials.
11. Existing building utility systems: materials, adaptability, capacity, flexibility.
12. Durability of materials can be a consideration; some uses mandate more durable materials than others.
13. Relative cost to accommodate a proposed use.
14. Energy; seasonal uses.
15. "Green" (LEED) building considerations.
16. Parking.
17. Best use of building's cultural and aesthetic attributes.
18. Serves the greatest number of visitors.

The existing building could be characterized as an example of a log quasi-industrial structure that blends elements of Mill building construction with romantic log architectural stylization that permeated the West in the 1920s, and was strongly influenced by the philosophies of Parkitecture. Contextually it is non-obtrusive, organic, and strongly related to many other park log structures that 'grow harmoniously from the natural site' as envisioned by the park's 1928 landscape architecture and engineering divisions.

The structure was designed for fish culture production on most of the ground floor with an elevated public exhibit and interpretive area at the east end of the hatchery space. The fish production took place in a single large clear span room outfitted with tanks and raceways for the brood fish, eggs, and fingerlings and the aquarium/exhibit area projected into the production space from the elevated open balcony that permitted visitors to view hatchery operations, as well as absorb the information presented

by the aquarium/exhibits. The original design would be compatible with a new use that incorporates large open space or open space planning concepts.

Evaluation factors are presented in matrix format below as a comparison of what might be done with the Lake Fish Hatchery. The matrix is site-specific and should not be applied indiscriminately to other structures.

The matrix is intended as an aid to assist in clarifying thinking (only); elements can be added to the left hand side of the matrix when appropriate and weighting is judgmental. Another way to tailor this assessment is to assign numbers and rank each category numerically.

The best 'fit' based on the above evaluation would be to rehabilitate the facility for an interpretive or museum use; this is partially due to the fact that the east end of the building was originally designed for that purpose.

Another use that ranked surprisingly high was the Mercantile category; the ability to have open retail space contributes to the compatibility of that use.

The storage/utility functions that are current uses for the building rate high in ease of adaptation but rank low in cultural, aesthetic, and visitor service categories.

Evaluation for Rehabilitated Use—Lake Fish Hatchery

ELEMENT; ATTRIBUTE	ASSEMBLY; Interpretive, Museum, lecture, meeting	BUSINESS; Offices	EDUCATIONAL Classroom	FACTORY; Maintenance Shop	HAZARDOUS MATERIAL STORAGE	MERCANTILE; Retail, Bookstore, Gifts	RESIDENTIAL; Staff, Visitors	STORAGE	UTILITY
Size & arrangement of spaces suitable for proposed use	+	-	+	+	-	+	-	+	+
Adaptability of basic structural system (clear span)	+	+	+	+	-	+	-	+	+
Available structural capacity	+	+	+	-	-	+	+	+	+
Ease of modification	+	-	+	+	-	+	-	N	N
Compliance with building codes	N	+	-	-	-	+	N	+	+
Available fire resistance	N	+	N	N	-	+	-	N	N
Compliant with NPS policies	N	N	N	N	-	N	-	N	N
Mobility Impaired - ADA	EQ	EQ	EQ	EQ	NA	EQ	EQ	EQ	EQ
Historic adverse effects	+	-	+	-	-	+	-	-	N
Appropriateness & Integrity	++	N	+	-	-	+	-	-	-
Impact to incorporate Utility Systems	EQ	-	EQ	EQ	NA	EQ	EQ	+	+
Durability of materials suitable for use	N	N	N	-	-	+	-	-	-
Relative cost to re-hab to new use	+	-	N	N	-	+	-	+	+
Energy implications	EQ	EQ	EQ	-	EQ.	EQ	EQ	+	+
Green "LEED" considerations	EQ	EQ	EQ	EQ	NA	EQ	EQ	NA	NA
Parking	EQ	EQ	EQ	EQ	NA	EQ	EQ	NA	NA
Best cultural & aesthetic fit	++	N	N	-	-	+	N	-	-
Provides a service to the greatest number of visitors	+	-	N	-	-	+	N	-	-

Note: The occupancies listed are directly related to the occupancy types listed in the 2006 International Building Code.

(+) Indicates a favorable condition or 'fit'
(-) Indicates an unfavorable condition or 'fit'
N Indicates a neutral condition
EQ Indicates category applies equally to all listed occupancy categories
NA Indicates that a category is not applicable to a specific occupancy type

Results from this type of evaluation relate to building attributes only; these results must also fit within regional planning goals of the national park unit as inferred by the opening paragraphs of this section of the report.

Ultimate Treatment and Use

In recent times The Lake Fish Hatchery has not been used for its original purpose as a producer of native cutthroat-trout fish eggs and fingerling fish for stocking and transplanting, and it has been determined that the building will not be used again for those purposes. As noted in the introduction it currently serves as temporary seasonal storage for the Park Fisheries Research branch (part of the Yellowstone Center for Resources) and permanent storage of construction materials, equipment, and furnishings for the Lake Maintenance Subdistrict.

Identified as historic structure HS-0726 within the Lake Fish Hatchery Historic District, and historically significant under Criterion A, for its role in the conservation policies of the NPS and under Criterion C for their Rustic Style architecture. The Lake Fish Hatchery was listed as a primary historic resource when the district was entered into the rolls of the National Register of Historic Places on June 25, 1985 Subsequent to the initial National Register listing, the Lake Fish Hatchery Historic District was elevated to the status of having historic significance at the national level on 1/20/2005. The Wyoming State Historic Preservation Officer, Claudia Nissley, concurred that the significance of the district should be upgraded to national significance from local and state significance under Criterion A for its significant role in the development of national policies regarding parks and conservation, as well as for its role in being the primary source for wild cutthroat trout eggs for over 50 years.

The structure is an excellent example of "Parkitecture," built under the supervision of Thomas Vint, chief of the Landscape Engineering and Architecture division of NPS and one of the pioneers of the Parkitecture style employed throughout the National Parks System. The hatchery is readily accessible to the public along the shore of the Lake, and it has been recognized that it could serve a more permanent and more visible use than its current storage functions.

As a result of that recognition the Hatchery has been part of the on-going planning of the Lake Fish Hatchery Historic District and the overall Lake Historic District within the park. In 1993 a Development Concept Plan/ Environmental Assessment (DCP/EA) was done that included the Lake Fish Hatchery Historic District in its deliberations. Excerpts from that assessment are summarized below for the use of reviewers.

DCP/EA Lake/Bridge Bay YNP

In 1993 the NPS Denver Service Center produced a Development Concept Plan/Environmental Assessment; Lake/Bridge Bay Yellowstone NP that included the Hatchery. This is the most comprehensive planning conducted on the Lake and Fish Hatchery Historic Districts, and specifically addressed the future potential of the Lake Fish Hatchery. In the Fish Hatchery Historic District, a "living history" exhibit could be created to interpret the park's historic role in fisheries management. Exhibits would include the display of live native fish, a discussion of the interrelationships of fish and other park wildlife, the tools of the fisheries profession, and the evolution of the fisheries management philosophy.

2000 Long-Range Interpretive Plan

In May 2000, the YNP Division of Interpretation released a Long-Range Interpretive Plan that evaluated in particular the need for increased visitor services and in-park visitor centers. A need for a visitor contact station at Lake was among the priorities. Options included facilities in the Lake District entrance, near to the Lake Hotel, or as an alternative, suggested "locating the contact station along the lakefront." "This new visitor contact facility could possibly include a sales area." The report went on to recommend that YNP "interpret the park's aquatic resources, underwater geology in Yellowstone Lake, and fisheries history including issues such as fish stocking, hatcheries, and the introduction of exotic species."[56]

Building Code Review

A building code analysis was done for the Hatchery to determine if there were major areas of concern to be addressed as part of the preservation plan. This analysis is general in nature but includes the primary elements that impact current and future use of the facility. Additional detailed building code requirements would be considered during subsequent phases of project development or preparation of construction documents; detailed requirements are defined to include those technical issues that would not adversely impact the concepts or recommendations for this structure.

Building codes reviewed during the preparation of this report included:

- *2006 International Existing Building Code (IEBC).* The provisions of this Code constitute the minimum standards for change of occupancy, alteration, or repair of existing buildings and structures including Historic structures. The purpose of this code is to encourage the continued use or reuse of existing buildings and structures.
- *2006 International Building Code (IBC).* This Code provides minimum standards to safeguard life or limb, health, property and public welfare by regulating and controlling the design, construction, quality of materials, use and occupancy, location and maintenance of all buildings and structures. This code is intended for use with new structures and as a source of criteria for the IEBC by reference.
- *NFPA 101—Life Safety Code.*

Criteria

As applicable to the Hatchery, the IEBC has been determined to be the primary reference for evaluation of the property. If in the process of evaluating the structure an unsafe condition is uncovered, then the appropriate authorities will be duly advised.

The requirements of IBC are generally stricter than those of the IEBC due to the fact that they are applicable to new construction rather than the reuse of existing buildings; however, the two codes are very similar in regard to topics dealing with life-safety issues. Both codes were consulted and are reported on in the following pages in the interest of allowing park administration to evaluate the benefits of attaining a higher standard of safety if cultural values are not compromised and if the cost/benefit ratio is low.

The application of the IBC and its companion code, the IEBC, is a recent development in the western United States. The IEBC, in contrast to its forerunner the Uniform Code for Building Conservation, is more lenient in regard to recognized historic structures that are to remain as-is or are to be repaired; however, alterations or changes in occupancy quickly shift the emphasis toward new construction criteria depending on the level of impact from the proposed changes. The IBC and the IEBC also require automatic fire sprinkler systems to a much greater extent than the previously used codes. Depending on the nature of the historic property these systems can affect cultural values; at the very least they add considerable expense to the maintenance of the property. Those impacts are identified on the following pages.

Reviewers are cautioned that the code information contained in this document is informational only; as projects are developed further research and consultation of the building code is warranted.

The requirements of IEBC differentiate between repair, alteration, change of use, additions, or relocation of existing buildings; generally the more a structure is changed then the more restrictive the application of the building codes. As an example an existing building that is repaired (only) is not required to meet as many provisions of the building code as one that is altered or added to. The IEBC has further established three different levels of alterations to existing buildings for purposes of evaluating code requirements; therefore, doing a code analysis on an existing building is directly tied to knowing how much change is planned for the structure in the future.

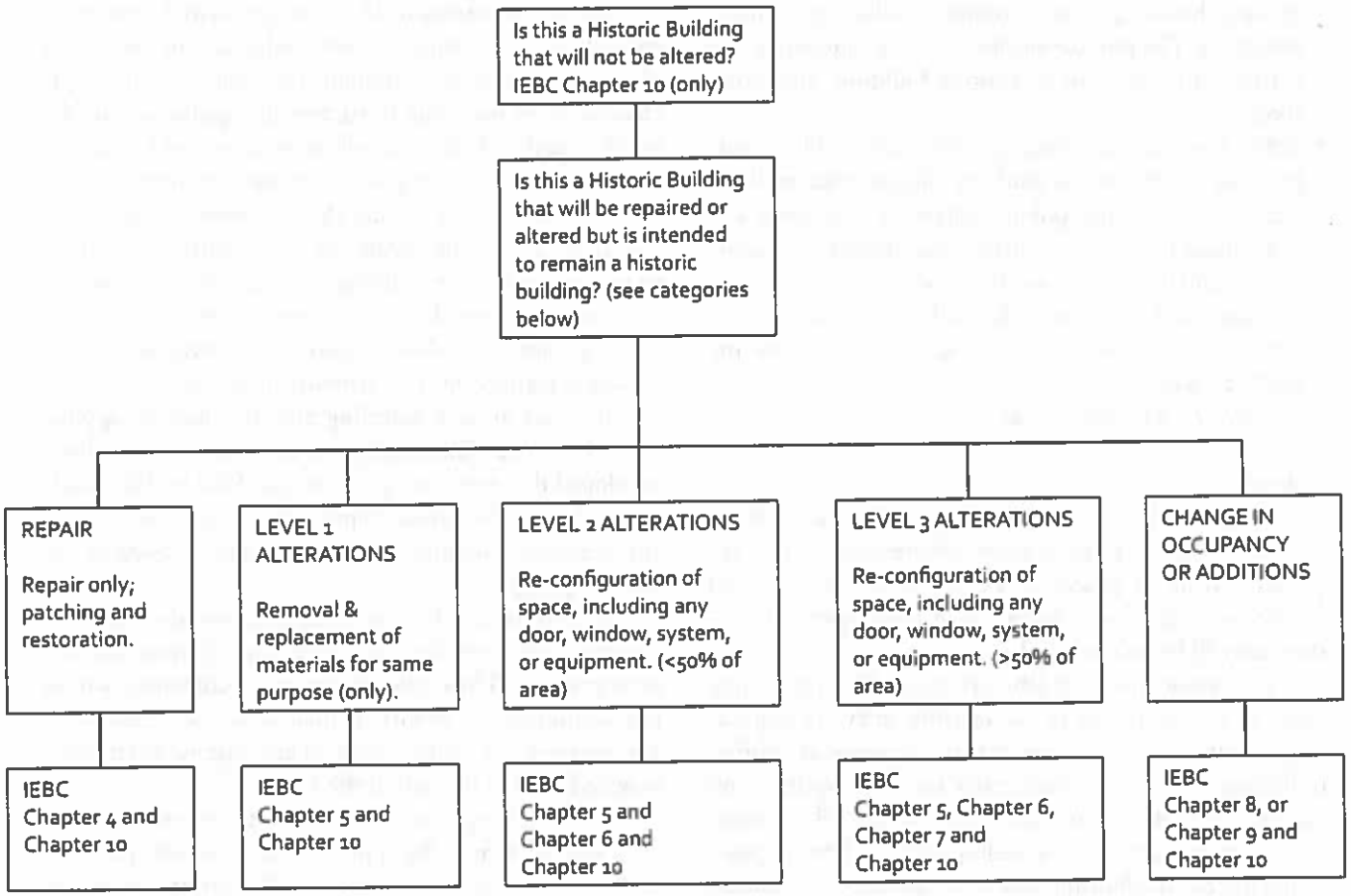
To assist in understanding how this may be applied to the Lake Area Fish Hatchery a code flowchart has been developed that shows which portions of the building code are applied to the various repairs or changes that can occur to existing buildings. The chart is incorporated on the following page.

In the interest of being thorough, several of the code alternatives were looked at as they may apply to this historic property. Those alternatives are documented within this section of the report. Conclusions and recommendations from the comparisons of the various alternatives may be found at the end of the section.

The following flowchart identifies the path of Building Code analysis to be applied to any Historic property as well as a notation of the criteria that determines which classification is appropriate to the project. Each level has different requirements with the least impactive requirements in the left category and the more restrictive and impactive requirements progressively listed toward the right. The applicable chapters of the IEBC that apply to the classification are listed below each category for the convenience of the reviewer.

As noted in the first box the fewest requirements would be for a Historic Property that will not be altered.

International Existing Building Code (IEBC) Flowchart



The Lake Area Fish Hatchery historic property has been evaluated as a repaired building, a Level 1 Alteration building, Level 2 Alteration building, Level 3 Alteration building, and a building that will experience a 'change in occupancy' for comparison on the following pages.

Building Code Evaluation and Comparisons

As noted on the previous page, a detailed evaluation matrix is attached that tabulates IEBC building code requirements as they would apply to code mandated categories of use for the historic hatchery; those categories and their definitions are:

- Repaired Building (only); historic property repaired without consideration to a new use.
- Altered Building; historic property altered without consideration to a new use. Note that although there is more than one level of alteration for non-historic properties described within the code, all levels of alteration are treated generically within the chapter on historic structures.
- Building re-used with a Change in Occupancy; but as an historic property.

The IEBC also has specific requirements for existing buildings that are not certified as historic. Those categories include:

- Repaired Building (only); non-historic property repaired without consideration to a new use.
- Building altered to Level 1 status; replacement materials or assemblies only; non-historic.
- Building altered to Level 2 status; building re-configured but impacted areas less than 50%.

- Building altered to Level 3 status; building re-configured but impacted areas more than 50%.
- Building re-used with a Change in Occupancy; but as a non-historic property.

Since the IEBC lists requirements for both historic and non-historic existing buildings within the same document and there is, by necessity, cross referencing between the requirements, the IEBC can be a difficult code to read, interpret, and apply. The attached matrix attempts to simplify that interpretation to the greatest extent possible.

Although application of the IEBC permits judgment on the part of the building official regarding fire issues it has been assumed that the building official would adopt stricter views regarding fire compliance for this facility because of geographic location, limited year around resources, and the proximity of forest fuel.

Because of the selected method of presentation, this compilation may seem extensive. The reviewer is reminded that there are some very positive aspects to this structure and that some items on the deficiency list are relatively inexpensive to achieve. Limited descriptions of the positive cultural as well as the technical values of the Hatchery are noted in the Ultimate Treatment and Use section of this report.

The categories within the matrix are directly quoted from the IEBC code and the specific line items within the matrix are paraphrased from the code. Some requirements (for example: high rise structures) have been omitted from the matrix as they have no applicability to the Lake Fish Hatchery structure.

International Existing Building Code (IEBC) Analysis

SECTION	DESCRIPTION	REPAIRED HISTORIC BUILDING	LEVEL 1 ALTERATION	LEVEL 2 ALTERATION	LEVEL 3 ALTERATION	NEW OCCUPANCY HISTORIC BUILDING	REMARKS
Historic Building that will be Repaired (only)							
1001.2	Building investigated, evaluated, and written report prepared	X					
1002.0	Repairs may use original or in-kind materials	X					
	If building is determined dangerous, no work is required except to correct identified unsafe conditions	X					
	Historic Buildings undergoing repairs to comply with Chapter 4 of IEBC	X					
	Replacement glazing in hazardous locations must comply with safety glazing requirements in IBC	X					
	Replacement glazing in ordinary locations may use original (or in-kind) materials	X					
Historic Building that will be Altered, Moved, or experience a Change in Occupancy							
1003.2	Historic buildings that do not conform to IBC and that constitute a fire hazard shall be fire sprinklered						SEE TEXT
	Fire sprinklers shall not substitute for the required number of exits						SEE TEXT
1003.3	Door, corridor, & stairway widths not in conformance with IBC may be approved by the Code Official if he deems adequate room for egress		X	X	X	X	
1003.3	Main exit doors need not swing in the direction of travel if other means of egress available for total occupant load		X	X	X	X	
1003.5	Historic finishes can remain		X	X	X	X	
1003.9	Grand stairways are excepted from handrail requirements and guardrail requirements provided that they are not dangerous.		X	X	X	X	
1003.10	Guardrail heights required to be 42"		X	X	X	X	
	Spacing for existing ornamental patterns in historic guardrails shall be accepted		X	X	X	X	
1003.11	Alternative exit signs permitted for historic buildings if character of space adversely affected; subject to approval of official		X	X	X	X	
1003.12	Historical buildings that cannot conform to requirements of IBC and that constitute a distinct fire hazard will be deemed to be code compliant if provided with an approved fire extinguishing system						SEE TEXT

SECTION	DESCRIPTION	REPAIRED HISTORIC BUILDING	LEVEL 1 ALTERATION	LEVEL 2 ALTERATION	LEVEL 3 ALTERATION	NEW OCCUPANCY HISTORIC BUILDING	REMARKS
Historic Building that will be Altered, Moved, or experience a Change in Occupancy (continued)							
1004.1 - 5	Alterations:						
	1. Accessibility: requirements of section 506 applies only to historic buildings that undergo alterations; if altered Section 506 requirements are to be met unless technically infeasible. If historic significance of the property is threatened or destroyed by compliance with 506, then the following alternative requirements may be applied:		X	X	X		
	A. At least one main entrance shall be accessible; if a main entrance cannot be made accessible then an accessible non-public entrance that is unlocked while the building is occupied shall be provided, or, a locked accessible entrance with a notification system or remote monitoring shall be provided.		X	X	X		
	B. Multilevel bldgs: accessible route from accessible entrance to public spaces on the level of the entrance to be provided		X	X	X		
	C. Where toilet rooms are provided at least one accessible toilet shall be provided; may be for each sex or unisex		X	X	X		SEE TEXT
	D. Slope of ramp may be increased to 1 in 8 if run is 24" or less		X	X	X		
1005.0	Change of Occupancy:						
	1. Chapter 8 applies except as noted below					X	
	2. Allowable floor area of historic buildings changing occupancy may be increased by 20%					X	
	3. Historic structures changing to a higher hazard occupancy may use alternative methods to comply with fire resistance and exterior opening protective requirements.					X	
	5. Where fire-retardant roof covering is required roof covering materials not less than class C shall be permitted.					X	NPS POLICY
	6. Door, corridor, & stairway widths not in conformance with IBC shall be approved by the Code Official if he deems adequate room for egress.					X	
	7. Main exit doors need not swing in the direction of travel if other means of egress available for total occupant load.					X	
	9. If finishes are required to be Class III flame spread or better, existing non-conforming materials shall be surfaced with fire-retardant paint or finish.					X	

SECTION	DESCRIPTION	REPAIRED HISTORIC BUILDING	LEVEL 1 ALTERATION	LEVEL 2 ALTERATION	LEVEL 3 ALTERATION	NEW OCCUPANCY HISTORIC BUILDING	REMARKS
1005.0 (cont.)	10. Existing stairways to comply with ch. 8; alternatives for stairways and railings may be accepted by the Code Official if they meet intent of these provisions. *Exception*: Buildings less than 3,000 sq. ft. allow exist conditions to remain at all stairs and railings					X	
	11. Alternative exit signs permitted for historic buildings if character of space damaged; subject to approval of building official					X	
	12. Existing historic stairways in buildings changed to a Group R-1 or R-2 occupancy shall be accepted where it can be shown that the stairway can support 75 per sq. ft.						SEE TEXT
	13. Existing light levels are acceptable if compliance with section 811.1.1 will lead to a loss of historic character or materials					X	
	14. Accessibility (section 812.5) shall apply to historic structures that change occupancy unless technically infeasible. Alternative requirements of 1004 shall be permitted if compliance with these requirements threaten or destroy the historic significance of the building.					X	
1006.0	Structural:						
	1. Historic buildings shall comply with applicable structural provisions for the work as classified in chapter 3 (i.e., repair, level 1, 2, 3 alterations, change in occupancy, relocated buildings, or additions) *Exception*: Code official may accept existing floors and approve operational controls that limit the live load on any such floor					X	
	2. If code official determines that a component or portion of a building is dangerous, only that specific component or portion shall be required to be repaired, strengthened, or replaced					X	

SECTION	DESCRIPTION	REPAIRED HISTORIC BUILDING	LEVEL 1 ALTERATION	LEVEL 2 ALTERATION	LEVEL 3 ALTERATION	NEW OCCUPANCY HISTORIC BUILDING	REMARKS
Chapter 4 - Repairs							
401.2	Use materials permitted by Code or use like materials	X					
401.3	Work shall make building no less conforming to code than it was before the repairs	X					
403.1	Cannot use hazardous materials for repair	X					
403.2	Replacement glazing to comply with safety glazing requirements	X					
404.1	Existing level of fire protection to be maintained	X					
405.1	Existing means of egress maintained	X					
406.1	Existing level of accessibility maintained	X					
407.1.1	Seismic evaluation required (see IEBC for detailed requirements)	X					
407.1.2	Wind design and analysis is required of existing building undergoing repairs	X					
407.2	Repairs shall not reduce strength or stability of existing building	X					
408.0	Electrical repairs may be done with like material except:						
	Receptacles to comply with 406.3(D) of NEC	X					
	Grounding of grounding type receptacles permitted to be grounded to any point	X					
409.0	Mechanical: must comply with 401.1	X					
410.0	Plumbing:						
	Prohibited materials:						
	Copper and brass traps and tailpieces less than .027" wall thickness	X					
	Solder with more than 0.2 percent lead	X					
	Water closets w/a concealed trap or unventilated space or with walls not thoroughly washed at each discharge	X					
	Cement, concrete, mastic, hot-pour, or O-ring joints	X					
	Joining of different types of plastic with solvent	X					
	Saddle type fittings	X					

SECTION	DESCRIPTION	REPAIRED HISTORIC BUILDING	LEVEL 1 ALTERATION	LEVEL 2 ALTERATION	LEVEL 3 ALTERATION	NEW OCCUPANCY HISTORIC BUILDING	REMARKS
410.2	Water closets: replacement water closets must comply with International Plumbing Code; maximum capacity shall be 1.6 gallons per flushing cycle (3.5 gallons for blowout design)	X					
Chapter 5							
506.1	Accessibility requirements apply (see 506.1.1 - 506.1.12 and chapter 11 of IBC), if technically infeasible the alteration shall provide access to maximum extent feasible		X	X	X		
	The altered element or space is not required to be on an accessible route		X	X	X		
	Accessible means of egress are not required		X	X	X		
	Altered entrances are not required to be accessible if the building has an existing accessible entrance on an accessible route.		X	X	X		
	Platform lifts complying with ASME A18.1 & ICC A117.1 are permitted as part of an accessible route.		X	X	X		
	One of each type of performance area to be accessible; all not required to be accessible.		X	X	X		
	Accessible alarms for sleeping units in I-1, I-2, I-3, R-1, R-2, & R-4 occupancies apply only to the quantity of spaces being altered.						SEE TEXT
	Accessible unisex toilet permitted if existing toilet rooms cannot be altered.		X	X	X		
	Maximum threshold height of 3/4" at doors (beveled)		X	X	X		
	Accessibility of existing facilities not required to exceed that of new construction.		X	X	X		
	Alterations shall not reduce existing accessibility.		X	X	X		
	When alterations impact areas of primary function, then an accessible route must be provided including toilet rooms/fountains except as noted:		X	X	X		
	1. Cost of accessible route need not exceed 20% of cost of alteration of space						
	2. Provision does not apply to alterations limited to windows, hdwr, controls, outlets, or signs						
	3. Provision does not apply if alteration limited to mechanical, electrical, fire protection systems or abatement of hazardous materials						
507.1	Structural:						
	Applies to replacement of building supported equipment and to re-roofing		X	X	X		
	Where additional dead load is generated structural components to comply with IBC unless stress is increased less than 5%		X	X	X		
	Roof diaphragms to be evaluated for all re-roof projects that exceed 50% of the roof area if roof diaphragm is part of a lateral force resisting system		X	X	X		

SECTION	DESCRIPTION	REPAIRED HISTORIC BUILDING	LEVEL 1 ALTERATION	LEVEL 2 ALTERATION	LEVEL 3 ALTERATION	NEW OCCUPANCY HISTORIC BUILDING	REMARKS
Chapter 6							
607	Structural:						
	1. New alterations to not reduce strength or stability of building or members			X	X		
	2. New members to comply with IBC			X	X		
	3. Existing members supporting new vertical loads to comply with IBC; 5% increase in stress permitted.			X	X		
	4. Level 2 alterations that increase the seismic base shear by more than 5% must comply with chapter 7 (707)						SEE TEXT
	5. Alterations that cause a change in snow drifts shall comply with IBC (*Exceptions*: where stress is not increased by more than 5% or group R occupancy with fewer than 5 dwelling units that qualifies for light frame construction methods)			X	X		

SECTION	DESCRIPTION	REPAIRED HISTORIC BUILDING	LEVEL 1 ALTERATION	LEVEL 2 ALTERATION	LEVEL 3 ALTERATION	NEW OCCUPANCY HISTORIC BUILDING	REMARKS
Chapter 7 - Level 3 Alterations							
703.3	Interior finish in exits to comply with section 603.4 (IBC rqmt for flame spread and smoke developed)				X		
704.1	Automatic sprinkler systems required for new work areas				X		
704.2	Fire alarm and detection systems required				X		
	1. Manual fire alarms required for group A, B, E, F, H, I, M, R-1, & R-2 occupancies on all floors in work area				X		
705.0	Egress (exits) required in accordance with 605; including lighting and exit signs				X		
706.0	Accessibility to be in compliance with 506				X		
707.0	Structural:						
707.2	Alterations shall not reduce structural strength or stability				X		
707.3	New structural members to comply with IBC				X		
707.4	Design loads on existing members (that are not affected by the alteration) shall be the loads applicable at time the building was constructed				X		
707.5	Buildings/structures where seismic base shear is increased 5% or more due to alteration:						
	1. Engineering evaluation and analysis required				x		
	2. If no more than 30% of floor and roof involved in alteration over 12 mo. period, evaluation and analysis to show that structure complies with the loads applicable at the time the structure was constructed				**		TBD
707.6	If gravity loads increased, then all members shall meet requirements of IBC				**		SEE TEXT
	1. Exceptions (a) if stress increase <5%; (b) Group R occupancy of 5 dwelling units or less						
707.7	Alterations to increase strength or stiffness of existing structure that are not required by IBC or IEBC are not required to be designed for forces conforming to IBC provided that an analysis is submitted to show that:						SEE TEXT
	1. Capacity of existing structural members is not reduced						
	2. Lateral loading is not increased beyond capacity of existing elements						
	3. New structural elements detailed and connected to comply with IBC						
	4. New non-structural elements detailed and connected to comply with IBC						
	5. A dangerous condition is not created						
	Voluntary alterations to lateral force resisting systems in accordance with IEBC-App. A and referenced standards permitted						

SECTION	DESCRIPTION	REPAIRED HISTORIC BUILDING	LEVEL 1 ALTERATION	LEVEL 2 ALTERATION	LEVEL 3 ALTERATION	NEW OCCUPANCY HISTORIC BUILDING	REMARKS
Chapter 8 - Change of Occupancy							
801.1	CHANGE IN OCCUPANCY BUT NO CHANGE IN OCCUPANCY CLASSIFICATION						SEE TEXT
	Must comply with sections 802 through 811 only						
	1. Exceptions: A. If change is to lower hazard in all 3 hazard tables (see manual); provisions of chapter 7 not required.						
	B. As modified in section 1005 for historic buildings						
	C. As permitted by Chapter 12–Compliance Alternatives						
801.2	CHANGE OF OCCUPANCY FOR A PORTION OF A BUILDING: Section 812 shall apply					**	SEE TEXT
801.3	A change of occupancy classification shall require a Certificate of Occupancy					X	
803.1	Building elements and materials in portions of buildings undergoing change in occupancy to comply with 812					X	
804.1	Fire protection requirements of 812 apply to buildings pr portions of buildings undergoing change of occupancy					X	
805.1	Means of egress in portions of buildings undergoing change of occupancy classification to comply with 812					X	
806.0	Accessibility in portions of buildings undergoing change of occupancy classification to comply with 812.5					X	
807.0	Structural:						
807.1	A. Where change of occupancy results in higher loads (based on IBC tables), then building or portion to comply with IBC					X	
	1. *Exception*: where stress levels not increased by more than 5%.						
807.2	A. Where change in occupancy results in higher wind or snow importance factors then applicable provisions of IBC apply						SEE TEXT
	1. *Exception*: where new occupancy is less than or equal to 10% of the building area; cumulative effects to be considered						

SECTION	DESCRIPTION	REPAIRED HISTORIC BUILDING	LEVEL 1 ALTERATION	LEVEL 2 ALTERATION	LEVEL 3 ALTERATION	NEW OCCUPANCY HISTORIC BUILDING	REMARKS
807.3	Seismic: Existing buildings with a change of occupancy shall comply with the following:						
807.3.1	A. Where change results in a higher seismic factor, or change results in reclassification to a higher hazard category in table 812.4.1 (life safety and exits), or where Group M changed to A, E, I-1, R-1, R--2, or R-4 occupancy and more than 2/3 of floors involved in level 3 alteration work, then building shall conform to seismic requirements of IBC for new Seismic Use Group						SEE TEXT
	Exceptions:						
	2. Where acceptable level of performance and safety is obtained using reduced forces specified in 407.1.1.3						
	4. When new occupancy is within only 1 story of building, only lateral resisting elements in that story and stories below need to comply with IBC and exception 2 above (distribution may include floor immediately above)						
808.2	All unsafe electrical conditions to be corrected in buildings undergoing a change without requiring all parts of electrical system to be brought up to the current edition of the ICC Electrical Code					X	
808.3	Electrical service to comply with ICC Electrical Code for new occupancy when building undergoing a change in occupancy					X	
808.4	Electrical outlets to comply with ICC Electrical Code for new occupancy when building undergoing a change in occupancy					X	
809.0	When occupancy change results in different kitchen exhaust requirements or to increased mechanical ventilation requirements then the new occupancy must comply with the intent of respective International Mechanical Code provisions					**	TOILETS
810.1	When occupancy change results in different plumbing fixture requirements or to increased water supply requirements then the new occupancy must comply with the intent of respective International Plumbing Code provisions.					**	TOILETS
811.0	Light and Ventilation shall comply with the requirements of the International Building Code for the new occupancy.					X	
812.1	Occupancy classification may be changed providing that building meets requirements of Chapter 7 applied throughout.					X	
812.0	CHANGE IN OCCUPANCY CLASSIFICATION					X	
812.1.1	A. Where a portion is changed and that portion is not separated from the remainder with fire barriers with a rating as reqd in IBC then the entire building must meet the requirements of **Chapter 7** for the most restrictive occupancy in the building.						SEE TEXT

SECTION	DESCRIPTION	REPAIRED HISTORIC BUILDING	LEVEL 1 ALTERATION	LEVEL 2 ALTERATION	LEVEL 3 ALTERATION	NEW OCCUPANCY HISTORIC BUILDING	REMARKS
	Exception: Compliance with all of Chapter 7 is not required when change of occupancy to equal or lesser hazard. A. Where a portion is changed and that portion is separated from the remainder with fire barriers with a rating as reqd in IBC then that portion of the building must meet the requirements of Chapter 7 for the new occupancy group						SEE TEXT
	Exception: Compliance with all of Chapter 7 is not required when change of occupancy to equal or lesser hazard						
812.2	The relative degree of hazard between different occupancy groups is set forth in tables 812.4.1, 812.4.2, and 812.4.3					X	
812.2.1	Building or portion thereof may change within same occupancy group or to occupancy group with lesser hazard (in all 4 hazard categories) provided that it complies with Chapter 7					X	
	Exception: Compliance with all of chapter 7 is not required when change of occupancy to equal or lesser hazard						
812.2.2	All provisions of this chapter apply when occupancy changes to a higher hazard, or changes to an H occupancy.					X	
812.3	Change of occupancy to equal or lesser hazard in all three hazard classifications (life-safety, height-area, exposure)						
	A. Permitted as long as capacity of means of egress complies with IBC , and					X	
	B. Interior finish of walls and ceilings of means of egress shall comply with IBC for the new occupancy group.					X	
	C. Where the new use is classed as Group I-1, R-1, R-2, or R-4 the following additional requirements are to be met:						
	1. Corridor doors and transoms to comply with 605.5.1 & 605.5.2						
	2. Automatic sprinkler systems to comply with 604.2						
	3. Fire alarm and detection systems to comply with 604.4						
	F. Where the new use is classed as Group R-3, the following additional requirements are to be met:						
	1. Dwelling unit separation shall comply with 703.2.1						
	2. The smoke alarm requirements of section 604.4.3 shall be met						

SECTION	DESCRIPTION	REPAIRED HISTORIC BUILDING	LEVEL 1 ALTERATION	LEVEL 2 ALTERATION	LEVEL 3 ALTERATION	NEW OCCUPANCY HISTORIC BUILDING	REMARKS
812.4.1	Fire and life-safety requirements:						SEE TEXT
	Hazard categories in regard to *life-safety and exits* in accordance with table 812.4.1 (see code)						
	I. Means of egress for change to higher hazard category in table 812.4.1:						
	A. Means of egress to comply with chapter 10 of IBC						
	1. Exceptions: a) Stairways to be enclosed to comply with 703.1						
	b) Existing stairs complying with Chapter 7 permitted for continued use subject to approval of official						
	c) Replacement stairway where slope cannot be reduced shall not be reqd to comply with tread/riser requirements						
	d) Existing corridor walls of lath and plaster in good condition or 1/2" GPDW shall be permitted						
	e) Existing dead end corridors to comply with 605.6						
	f) Existing window of 4 sq. ft. and 22" ht. and 20" width shall be accepted as emergency rescue/escape opening.						
	II. Means of egress for change to equal or lower hazard category in table 812.4.1:						
	A. Existing elements of the means of egress to comply with 705 for the new occupancy group						
	B. New elements of the means of egress to comply with Chapter 10 of the IBC						
	1. *Exceptions*: a) Replacement stairway where slope cannot be reduced shall not be reqd to comply with tread/riser requirements						
	b) Compliance with 705 not reqd where change in occupancy complies with 812.3						
	III. Egress capacity: shall meet or exceed occupant load specified in IBC if change of occupancy to equal or lesser classification					X	
	IV. Handrails in existing stairways to comply with 605.9 in the area of the change of occupancy classification					X	
	V. Guardrails to comply with 605.10 in the area of the change of occupancy classification					X	SEE 1003.10

SECTION	DESCRIPTION	REPAIRED HISTORIC BUILDING	LEVEL 1 ALTERATION	LEVEL 2 ALTERATION	LEVEL 3 ALTERATION	NEW OCCUPANCY HISTORIC BUILDING	REMARKS
812.4.2	Height and area requirements:						SEE TEXT
	Hazard categories in regard to *height and area* in accordance with table 812.4.2 (see code)						
	I. When change of occupancy to a higher hazard category as shown in table 812.4.2: heights and areas to comply with Chapter 5 of IBC.						
	A. *Exceptions*: 1 story building in Group E occupancy not required to meet the area limitations of the IBC						
	II. When change of occupancy to an equal or lesser hazard category as shown in table 812.4.2:						
	A. Height and area of existing building shall be deemed to be acceptable						
	III. Fire barriers: when a change in occupancy is made to a higher hazard category as shown in table 812.4.2						
	A. Fire barriers in separated mixed-use buildings to comply with fire resistance requirements of the IBC						
	1. *Exception*: if fire barrier reqd to be 1-hour, existing lath & plaster in good condition or 1/2" GPDW shall be permitted						
812.4.3	Exterior wall fire resistance requirements:						SEE TEXT
	Hazard categories in regard to *fire resistance ratings for exterior walls* in accordance with table 812.4.2 (see code)						
	I. When change of occupancy to a higher hazard category as shown in table 812.4.3:						
	A. Exterior walls to have fire resistance and protectives as reqd by IBC; does not apply to walls at right angles to property line						
	1. *Exception*: 2 hour rating allowed where building 3 stories or less and is classified as A-2, A-3 w/occ load <300, B, F, M, or S.						
	II. When change of occupancy to an equal or lesser hazard category as shown in table 812.4.3:						
	A. Existing exterior walls, including openings, shall be accepted.						
	III. Opening protectives: openings in exterior walls protected as reqd by IBC; when protection reqd because of distance from property line, the sum of the area of such openings shall not exceed 50% of the total area of the wall in each story.						
	1. *Exceptions*: a) When IBC permits openings in excess of 50%						
	b) Protected openings not reqd in R-3 occupancy 3 stories or less that are 3' min. from property line						

SECTION	DESCRIPTION	REPAIRED HISTORIC BUILDING	LEVEL 1 ALTERATION	LEVEL 2 ALTERATION	LEVEL 3 ALTERATION	NEW OCCUPANCY HISTORIC BUILDING	REMARKS
	c) Automatic sprinkler system may be substituted for opening protection where protection required						
	d) Exterior opening protectives not reqd when change in occupancy is to equal or lesser hazard category						
812.4.4	Enclosure of vertical shafts:						SEE TEXT
	A. To be in compliance with IBC for atriums						
	B. Interior stairs enclosed to comply with IBC when change in occupancy to higher category as shown in table 812.4.1						
	1. *Exceptions*: a) Except for Group I occupancy, not required for stairs serving only one adjacent floor						
	b) Unenclosed existing stairways need not be enclosed in a continuous vertical shaft if each story is separated from other stories by 1-hour fire resistive construction and all exit corridors are sprinklered (sprinklers permitted to be served by domestic water supply)						
	c) Existing penetrations of stair enclosures accepted if they are protected in accordance with IBC						
	C. Other Vertical Shafts: (elevator, service, utility) enclosed as reqd by IBC when change to higher hazard category (812.4.1)						
	1. *Exceptions*: a) Existing 1 hour interior shaft enclosures shall be accepted						
	b) Vertical openings other than stairs in buildings other than I occupancies and connecting less than 6 stories shall not be reqd to be enclosed if building provided with automatic sprinkler system						
	D. Openings: all openings into existing vertical shaft enclosures protected by fire assemblies w/rating of 1-hour and maintained self closing or be automatic closing by actuation of a smoke detector; existing fusible link closers permitted in all shafts except stairways if fusible link rating is 135 degrees or less						
812.5	Accessibility: existing buildings that undergo a change in occupancy classification shall have the following						
	I. At least one accessible entrance					X	
	II. At least one accessible route from an accessible building entrance to primary function areas					X	
	III. Signage complying with section 1110 of the IBC					X	
	IV. Accessible parking where parking is provided					X	

SECTION	DESCRIPTION	REPAIRED HISTORIC BUILDING	LEVEL 1 ALTERATION	LEVEL 2 ALTERATION	LEVEL 3 ALTERATION	NEW OCCUPANCY HISTORIC BUILDING	REMARKS
	V. At least one passenger loading zone where loading zones are provided					X	
	VI. At least one accessible route connecting parking and loading zone and accessible entrance					X	
	Where it is technically infeasible to comply with new construction standards for these requirements, the above items shall comply to the requirements to the maximum extent feasible						
812.6	Seismic loads: Existing buildings with a change of occupancy shall comply with 807.3					X	

Building Code Analysis—Comparison as New Construction

For comparative purposes only, the Lake Fish Hatchery historic property has also been evaluated as a new structure in compliance with the 2006 International Building Code. The purpose in comparing the 'new building' and 'existing building' codes is to evaluate the two approaches, and, if there is no penalty to the building (adverse effect) or if there is no compromise in the logic of the code approach in question, then applying a more restrictive standard of safety may be considered.

The two codes are intended to interface at the threshold where it is anticipated that work planned for an existing building is extensive enough to have the same impact as new construction would have to similar space. Buildings experiencing a change in occupancy are candidates for extensive change and, like the Lake Fish Hatchery, must comply with code requirements that are not greatly different than if they were new construction.

One of the benefits of this comparison is that it shows the type of construction, allowable areas, and occupancy classifications for new construction in succinct terms, and these can easily be compared to the existing building in question. In the case of the Lake Fish Hatchery building the attached table clearly shows that a new Exhibit/Museum building that is larger than the hatchery could be constructed of the same materials as the hatchery and still be code compliant.

Performing the comparative evaluation as an Exhibit/Museum function was selected on the basis of the example shown in the 'Treatment and Use' section of this report; similar comparisons for other uses can be quickly done for other proposed uses at the behest of the National Park Service.

Basic Requirements: Existing Square Footage 3,779 NSF (This analysis is for an Exhibit Building/Museum use)

Subject	IBC Section	Sprinklered building	Un-sprinklered building	Remarks
Building use (occupancy)		Museum	Museum	
Occupancy classification	301	A-3	A-3	
Incidental use(s)	508.2	No requirement for separation	No requirement for separation	Storage closets (only)
Accessory use(s)	508.3.1	Service area for aquarium exhibit	Service area for aquarium exhibit	Less than 10% of area.
Non-separated occupancies	508.3.2			N/A - Single Occupancy
Separated occupancies	508.3.3			N/A - Single Occupancy
Total occupant load	1004.1.1	207	207	
Type of construction	503	V-A	V-B	
Allowable area (basic)	503	11500	6000	Based on occupancy classification of A-3
Area increase (frontage)	506.2	2875	1500	Use 0.25 for increase
Area increase (sprinkler)	506.3	0	0	Unsprinklered
Total allowable area	506.1	14375	7500	
Allowable height (stories)	503	2	1	
Exterior wall fire resistance	602	No Rqmt.	No Rqmt.	Sufficient fire separation distance
Number of exits required	1019.1	2	2	Hatchery area requires 2nd exit if used for exhibitry.
Required egress width—corridors	1005.1	4'–0" lower 3'–0" upper	4'–0" lower 3'–0" upper	
Required egress width—stairs	1005.1 1009	3'–0"	3'–0"	No egress stairs @ lower level
Interior finish—exits	803.5	Class B	Class A	(N/A)
Interior finish—corridors	803.5	Class B	Class A	(N/A)
Interior finish—rooms	803.5	Class C	Class C	

Building Code Summary

From the standpoint of building codes, the recommended treatment for the Hatchery after consideration of the classifications studied is to perform all work on the building to comply with the change in occupancy category of the International Existing Building Code as a Museum/Exhibit/Interpretive center if this use is consistent with regional planning of the National Park Service; this alternative will preserve and protect the greatest amount of historic fabric within the building and at the same time give visibility of the History of Fish Culture in Yellowstone as exhibited in a significant Parkitecture building. As a footnote, it would be very expensive to return the building to hatchery use within the standards of today's fish laboratories, even if there were a stated goal to do so. As a consequence a change from the traditional usage is implied.

Evaluation of Lake Area Fish Hatchery for Compliance with the Americans with Disabilities Act (ADA)

The general categories that are analyzed for compliance with ADA guidelines are listed in the table below. Topics that are related to more than one historic property within the hatchery complex are annotated in the 'build-

Category	Does Apply	Does not apply	Applies to Complex; separate study	Comments
Accessible route	X			ADA site circulation is not clearly defined; walkways required.
Parking	X			Parking spaces to be located and assigned.
Passenger loading zone	X			(1) Required - none exists for this facility.
Pathways			X	Separate site study is recommended
Drinking fountains (and telephones)	X			Add public ADA compliant accessories.
Ramps	X			A ramp to the main public entrance is req'd
Stairs	X			See building code section of report.
Lifts	X			Wheelchair lift from aquarium fl. to balcony recommended.
Entrances	X			Entrance doors do not comply w/ ADA hardware rqmts.; office door undersized.
Doors and gates	X			Door hardware does not comply with ADA
Corridors		X		
Elevators		X		No Elevator in facility (single floor)
Area of rescue assistance		X		Single Floor
Rooms and spaces	X			Storage spaces not required to be fully accessible; all others accessible.
Assembly rooms	**	**		Applies to aquarium and raceway area.
Toilet rooms	X			None: restrooms required for public unless adjacent facilities provided.
Bathtubs and showers		X		
Restaurants and cafeterias		X		
Medical care facilities		X		
Business, mercantile, & civic	**	**		
Libraries		X		
Transient lodging		X		
Transportation facilities		X		
Judicial, regulatory, & legislative		X		
Detention and correctional		X		
Dwelling units		X		

This table is limited to accessible routes, general circulation, and the nature of the spaces within the facility that have detailed ADA planning requirements. It has been derived from the publication *ADA Accessibility Guidelines for Buildings and Facilities* that is published as an appendix to part 1191 of the Americans with Disabilities Act (ADA) by the U. S. Architectural and Transportation Barriers Compliance Board. Detailed planning requirements for clearances, fixtures, and assemblies within the building can be found in this ADA publication.

ing complex' column of the table and will not be specifically addressed by this report.

Summary

A final determination has not been made regarding usage of the building (alternate uses are identified with ** in the table above); however, assuming that the building will be used for a public purpose the following broadscope accessibility provisions apply.

Mandatory Accessibility Provisions:

1. Designate and provide ADA parking space(s) for this facility.
2. Provide ADA unloading/loading zone for this facility (may be related to parking space).
3. Provide (or re-activate) ADA telephones and drinking fountain within facility.
4. Make entrances into aquarium and raceway areas ADA compliant.
5. Revise entrance hardware and hardware into accessible spaces to be ADA compliant.
6. Provide a minimum of (1) accessible unisex toilet room within facility (unless adjacent facilities have been provided).
7. Provide ramp to entrance terrace at southeast corner of structure.
8. Provide wheelchair lift from aquarium viewing area to balcony viewing area.
9. Comply with detailed planning for clearances, fixtures, and assemblies related to the selected occupancy for the building.

The provisions identified above have been integrated into the overall Recommended Treatment Plan (Preservation Plan) assuming the building will be assigned new uses—it is understood that not all of the requirements apply if the building continues to be used for off-season storage only. However, storage use (only) would still require that entrances be accessible for staff members who may have mobility impairment.

Structural Considerations

Criteria For Selected Structural Systems:

Location—Yellowstone Lake, Yellowstone National Park, 44 degrees 33' North latitude; 110 degrees 24' West longitude; 7,741' elevation (approx.).

Structural Building Codes

Building codes and requirements applicable to the engineering evaluation of this structure are as follows:

- *2006 International Building Code* (An occupancy classification has been established in the Building Code section of this report)
- *2006 International Existing Building Code*
- Recommended Lateral Force Requirements, Structural Engineers Association of California (reference only)
- MSU CE & EM publication: Snow Loads For Structural Design In Montana (Videon-reference only)
- Iowa State University Publication: Structural Snow Loads (Keller–University Of Colorado)
- ASCE 7-latest edition

Loads

Loading and factors pertinent to the development of this structure include:

Vertical Loads–Snow:

- From MSU CE & EM publication (projected):
  Interpolated Ground Snow Load: (50 yr reoccurence) = (0,025) x (7,741) = 193 per sq. ft. (drifted snow must be accounted for as applicable)
  Roof Snow Load: (193) x (0.6 wind) x (0.8 slope) = 93 per sq. ft.
  Note: Since this reference does not include data from YNP it is not recommended that it be used.
- From Iowa State Univ. publication:
  Ground Snow Load: (7,741) x (0.012) = 92.9 per sq. ft. Roof Snow Load: (0.7)(0.8)(1.2)(1.0)(92.9) = 62.4 per sq. ft. (snow records in this publication show a max. snow depth of 150")
  62.4 / 1.15 DOL FACTOR = 54.3 per sq. ft..

USE 62.5 per sq. ft.

Floor Live Loads (Occupancy Category II)
Corridors and exits: 100 per sq. ft.
Assembly areas: 100 per sq. ft.
Offices: 50 per sq. ft.
Exhibit Areas: 100 per sq. ft. (Note: 1997 UBC would permit 60 per sq. ft. for exhibit areas)
Mechanical & Electrical Equipment loads—Actual Weight

Lateral Loads:

- Wind: 90 MPH basic wind speed; exposure 'D' (general); importance factor of 1.0 (IBC section 1609)
  Basic wind pressure P = 14.13 per sq. ft. (calculation in

appendix)
Uplift on roof P = (-) 11.98 per sq. ft.
Overhangs (worst case) P = (-)19.05 per sq. ft.

- Seismic (earthquake): Static Lateral Force Procedure–section 1615-IBC 2003
  Occupancy Group II (non-essential use and non-hazardous use)
  Importance factor 1.0
  Site Class D (used in lieu of Soils investigation)
  From Building Seismic Safety Council maps (NEHRP):
  Maximum considered earthquake: Short Period Response Coefficient = 1.25g
  Maximum considered earthquake: Long Period Response Coefficient = 0.50g
- Soil/Structure interaction factors:
  Fa = 1.0
  Fv = 1.5
  Design Earthquake Factors (% of gravity; adjusted for site and structural type)
  SDS = .8333 (short period earthquake)
  SD1 = 0.50 (long period earthquake)
  Evaluate structure based on worst load from two factors calculated above.
  Based on the building code and calculation (attached), the Hatchery falls into a Seismic Design category 'D' classification.
  Interior walls and partitions: 5 per sq. ft. lateral load (minimum) – IBC 1607.13
  Concrete/masonry wall base anchorage: 280 PLF – IBC 1604.8.2 (N/A @ Hatchery)
  Distributed loads and total base shear are shown on the diagram in the appendix.

Soils

It has not been determined that a soils investigation has been done at this site.

Other Considerations

Hazardous materials: obvious hazards were not identified at the site during the preparation of this report; however, a hazardous materials survey has not been conducted by a qualified analyst.

Movement of the structure: it is recommended that thermal, shrinkage, and time-dependent factors continue to be monitored at the facility.

Selected Structural "Safety Checks"

Loads and forces applicable to "safety checks" for the building are as listed above.

Building Code requirements as they pertain to structural members were also reviewed as part of this report. Code deficiencies as they are known to exist are listed below, along with a suggested method of mitigation:

Factors:

Live load reduction factors were not applicable to this review because the spans and supported areas in the facility are smaller than the minimums established by the building code.

Duration of Load factors:

1. A duration of load factor of 1.15 has been assigned for Snow Loads.
2. A duration of load factor of 1.33 has been assigned for Seismic and Wind Loads.

Deflection is a measure of rigidity and is significant to safety for structures that are continuous frame systems; it is not generally a safety consideration for structures like the Hatchery but is rather a measure of performance. Performance criteria for new construction can be found in Chapter 16 of the 2006 IBC for comparison. Significant deflections were not noted at the property, based on visual observation.

Findings:

For this report, calculations were done to the extent that weaknesses could be identified and decisions could be made regarding use of the building as well as developing the Treatment and Use Plan; however, additional supplemental calculations will be required to develop connections and details at the time that remedial construction occurs.

- Roof rafters were checked as a part of this report. Based on measured sizes of 6" diameter rafters spaced at 2'–0" o.c., and relying on photographs as well as drawings discovered on the Technical Information Center catalog of the NPS Denver Service Center (E-TIC), the rafters were found to be adequate for the loads identified on the previous page.
- Roof purlins were checked as a part of this report. Based on a measured size of 8" diameter purlins spaced as shown by photographs as well as drawings discovered

on E-TIC, the purlins were found to be marginal for the loads identified on the previous page. Any future loading on these roof members must be evaluated and monitored with care. Although mathematical analysis indicate the members to be marginal, the members have performed during the service life of the structure and evidence of failure was not observed on-site.

- Log scissors trusses were checked as a part of this report; the King-post trusses were not. The scissors trusses were analyzed using three different methods for comparison: 1) they were analyzed as a plane frame by 2007 DCC computer software with the assumption that all joints including the supports were pinned or hinged, 2) they were analyzed as a plane frame by 2007 DCC computer software with the assumption that all joints were pinned but that there was fixity at the supports, and, 3) they were calculated longhand using the traditional mathematical model known as the method of joints. Method 2 is judged as not being representative of conditions observed on site unless there are concealed drift pins or mechanical connectors at the heel joint of the trusses that cannot be seen; however, there was excellent correlation between methods 1 and 3 and it is felt that the conditions modeled by these approaches do represent the truss assemblies at the hatchery. Based on these parameters the trusses were found to be adequate for the loading imposed and individual truss members (chords and webs) were found to be adequate. However, connection plates (particularly at the heel joints) were found to be deficient and will require modification. Some of the interior web/chord joints can be strengthened by increasing bolt sizes within the existing bolt patterns; heel joints will likely require additional steel plating or significant shear keys to strengthen the joints to comply with what is required by current knowledge on snow loading, as well as code requirements as they relate to unbalanced loading.
- Seismic factors were developed as a part of this report (see above and appendix) and a distribution of seismic forces to the structure was tabulated. The distribution of forces utilized the same criteria as for new construction, did not include torsional effects, did not take into account available load reduction factors (1.33 factor), and assumed that the weight of the first floor and foundation was absorbed directly into the soil structure and did not contribute to the overall base shear to be resisted by the structure. The distribution was completed to the extent that shear forces in the exterior walls could be compared with available resistance on-site.
- Earthquake loading as required by building codes is based on statistic probability that is determined from the history of seismic activity in a region, the presence of known faults in the area, and the geology of the underlying soils. The coefficients used in the formulas are then developed by the National Earthquake Center and published in the building codes as maps. Seismic forces are high in Yellowstone National Park due to the volatile nature of the site and the high acceleration factors that the building codes list for that location.
- The lateral resistance of the Hatchery structure can be characterized as being a wood braced frame, with limited resistance from walls due to the nature of their construction; the structure is a simple box assembly conducive to uniform distribution of forces; and the use of wood members make it a fairly ductile (forgiving) structural system. Within the framework of the IBC building code braced wood frames are generally treated as part of a light framing/shear panel system or a combined system and application of seismic design criteria to a pure braced wood frames is not provided for; however, concentric braced frames are still recognized by ASCE thus providing a mechanism for their analysis.
- In terms of past seismic performance, the structure has experienced significant forces from historic seismic events (i.e., Hebgen quake of August 1959) and does not exhibit any significant failures or crack patterns that would be expected from a building that had been overstressed in its past history.
- Other than the wood log corner braces, the available resistance offered by the existing exterior walls at the Hatchery consists of the board and batten siding. The siding is judged as being ineffective in its ability to resist earthquake forces; however, it is believed that the log braces are sufficient in size to resist the lateral loads based on the cursory comparison from the distribution of forces noted above. It is anticipated that the connection of the braces to the remainder of the log framework will require modification, once a more exhaustive structural analysis is performed.
- Door and window headers were not checked during the preparation of this report. By inspection, these members appear to be adequate based on the relatively light loads they are subjected to.
- Soils related movements: none were noted during visits to the site during the preparation of this report.

Concrete Supporting Systems

The American Concrete Institute was founded in

1904; the Portland Cement Foundation was established in 1916; in 1917 the U.S. Bureau of Standards and the American Society for Testing materials established a standard formula for Portland Cement ; pre-stressed concrete using Portland cement was developed in 1927; and by 1914 only (12) plants in the United States reported any production of Natural Cements. Without documentation, but as evidenced by the state of the building industry in 1928, the conclusion is that the concrete utilized in this structure is probably constructed with Portland Cement. Proportioning of mixes was also well established by 1928 as were the procedures for testing both the product and its component parts.

Condition: The concrete used for this structure is very likely similar to what we would cast today although it may have been of a slightly lower strength (on the order of 2500 PSI) and it would not have contained additives to accelerate setting, or have had the plasticizers or pozzolans (fly ash) that are being used with greater frequency in today's construction market. Air-entraining was not perfected until the 1940's so the 1928 concrete did not benefit from the added durability of entrained air.

Significant (sometimes severe) spalling and degradation is visible on the exposed concrete foundation elements; particularly along the south (lakeside) elevation of the structure. This is attributed to water erosion and ice abrasion in the manner typical of bridge piers and abutments. NPS personnel report that winds coming off of the Lake are severe from the south exposure. The wind exposure in combination with the cyclical nature of freezing and thawing at south facing walls is believed to be the root cause of the deterioration of the 79-year-old concrete. There is evidence (as can be seen in current photographs) of water having been trapped beneath a coat of paint on the concrete surfaces; the entrapped water has contributed to the spalling of the concrete surfaces due to freeze/thaw cycles. There are also cracks on the northeast corner of the concrete structure, attributed to the lack of vertical expansion joints.

1927 design drawings do not show any evidence of steel reinforcing within the concrete although steel anchor bolts are indicated at the sill log along the base of the wall. In 1928 minimum reinforcing provisions were not a code requirement so it is possible that little or none was installed; however, many designers and engineers of that era included reinforcing for the recognized benefits of shrinkage compensation and temperature reinforcing. Engineering practices varied widely in 1928 depending on the designing agency and the type of building being designed; COE structures of the time (generally) closely paralleled what we would design today; however, private construction practices would have (generally) not complied with today's requirements. It is not known what the philosophy of the 1928 NPS Engineering department may have been regarding concrete reinforcing. The Hatchery concrete was investigated using metal detection on-site and it has been determined that all concrete elements (stem walls, grade beams, entrance steps, and slabs-on-grade) do contain reinforcing. There were also two locations where erosion of the concrete exposed reinforcing bars (one location is at the west end of the entrance steps; the other is at the west jamb of the raceway doors), the rebar at both locations was square, deformed, and 1/2" (#4) bar. Due to the inexact nature of using metal detection to locate steel in the concrete we cannot, with reliability, determine the exact sizes and spacing of the reinforcing. What we can say is that there is reinforcing and that it is spaced at regular intervals in the members investigated.

As a footnote, there is a distinct discrepancy between the concrete foundation shown on the 1927 plans and what was actually constructed; the north wall of the building was drawn to be considerably higher and appeared to have been designed to be built into the existing hillside behind the hatchery, but either the hillside was shaved back or the hatchery moved closer to the lake shore.

Entrance steps: There also are two sets of steps leading up to the open foyer which are severely cracked (note that the 1927 drawings only show one set of stair steps on the south elevation).

Concrete slab-on-grade: The interior exposed slab-on-grade within the hatchery portion of the structure visually appears to be in good condition where it was able to be viewed. Surface spalling was not noted and crack patterns appeared to be minimal. Significant movement of the slab was not detected.

Other considerations: Wheelchair/ADA access to the Aquarium/Exhibit area for mobility-impaired must be considered. The Entrance Terrace that is the primary access to the facility is currently restricted to ambulatory individuals because of two (2) concrete steps along the perimeter of the Terrace. The steps are in extremely poor condition and replacement is suggested. At the time of replacement a ramped element for ADA access could be designed and constructed.

Concrete Maintenance Strategies Investigated

1. No-Action alternative. The integrity of the surface of the concrete is being compromised at this time and

the deterioration of the foundation structure is accelerating. Deferring work on this feature could result in more advanced deterioration that may be more costly to repair in the future.

2. Repellant alternative. Removal of loose and unsound concrete surface materials and application of a breathable repellant to the remaining concrete could be implemented. This approach would deter deterioration short term but would require re-application of repellant at intervals of 2–3 years to have any effectiveness. Although materials are not inordinately expensive the cyclic application is labor intensive and not likely to be considered a permanent "fix".

3. Rehabilitation (repair) alternative. Rehabilitation will require removal of loose and unsound concrete surface materials down to a sound substrate using the least degree of intervention possible, and then repairing the remaining concrete with limited replacement of in kind materials or with compatible substitute material. The intent is to accurately recover in form and detailing the feature as part of the building's historical appearance.

Comparison of concrete repair methods for rehabilitation: Methods of repairing deteriorated concrete surfaces were researched for this project; as outlined below. Important technical factors to consider when selecting a repair method are:

- The cause of the failure must be understood. The selected repair method is directly related to the cause of failure.
- Properties of the original material must be known (if possible); the success of the repair will be directly related to compatibility between the original materials and the repair materials.
- The service and application conditions at the location where the repair is to be done will affect the success of the repair.

Available treatments: Concrete repair treatments investigated include:

1. Repair with materials identical to the original materials. This would require that the existing structure be cored and the core sent to a specialty laboratory for petrographic analysis.
2. Repair with materials that are similar to the original materials based on the historic record of materials incorporated into the construction of the feature.
3. Repair with plain cementitious mortar that is typical of materials and mixtures readily available in today's construction market.
4. Repair with polymer-modified cementitious mortar.
5. Repair with polymer resinous mortar.

Discussion: Failure mechanisms: Causes of surface failure of the concrete considered include:

A. Faulty construction—Evidence of deficient original construction was not found.
B. Chemical attack—There were no specific areas of the construction identified that exhibited deterioration from chemicals.
C. Movement—Large magnitude movements of the structure were not generally noted during visual inspection of the building.
D. Freeze/thaw damage—There is significant damage from freeze/thaw cycles exhibited throughout all foundation features.
E. Mechanical damage—There is mechanical damage to all lakeside foundation features from the relentless action of the wind in combination with ice against the features.
F. Auxiliary materials (sealants and membranes)—Not all joints were fully sealed at the time of examination.

Conclusion: The failure mechanisms attributed to these foundation features are primarily from freeze/thaw cycles with some effect from mechanical action at selected portions of the structure.

As noted above and based on knowledge of construction practices at the time that the structures were built (as well as judgment), the existing concrete is believed to have had the following properties at the time of construction:

- Compressive strength—2,500 psi +/-
- Tensile strength—350 psi +/-
- Modulus of elasticity—2.87 x 10^6 psi +/-
- Coefficient of thermal expansion—.00055 per degree Fahrenheit

The effects of time generally result in concrete that gains strength for material that is not subjected to the agents of deterioration. Short of testing, the actual strength of the on-site concrete cannot be known with certainty; for purposes of evaluation it is reasonable to assume that the cured strength at the time of placement would be reasonable to use for on-site concrete that is still sound.

Service conditions: Service conditions for the con-

crete is rated as severe, due to exposure. The exposure will make repair of the features more complex and will add to the cost of the repair of the features. An additional complication for repair is created since the surface failure of the existing concrete occurs in both horizontal and vertical surfaces. Repair will have to utilize methods and means to assure adhesion to a full range of sloped surfaces. If low slump hand-troweled repair materials are suitable they could serve to minimize forming.

Comparison of treatment alternatives: Petrographic analysis of the existing concrete could tell us the ratio of the concrete mix used in the original construction (not including water); laboratory compressive testing could tell us the strength of the existing concrete in place. Even though we could determine existing chemistry, it is unlikely that the exact grind of the cement or clinker composition could be matched by today's cement plants unless the raw ingredients came from the same quarry. Further, because what we know of construction practices from the historic record is fairly extensive, and since there are inherent (albeit minor) field variables in concrete mixes, extensive laboratory testing may not provide enough benefit to justify the added expense of the procedures. It is recommended that knowledge of 1920—30 construction practices be used as a basis of selecting a preferred repair method and that more exhaustive laboratory analysis be held in abeyance for unforeseen conditions.

Treatment alternatives are summarized in the table on page 123. As can be seen from the table, plain cementitious repair materials most closely matches the attributed mechanical properties of the original concrete; however, properties for the polymer modified cementitious repair are reasonably close to the original concrete and receive a higher rating regarding ease of installation and degree of success. Polymer resin repair materials appear to be too strong, too stiff, more reactive to expansion and contraction, and are marginal for maximum service temperature for this outdoor application. It is recommended that the Polymer Modified Cementitious Repair method be used for this application if the Rehabilitation alternative is followed.

Additional considerations:

1. If the repair alternative is pursued, it is recommended that NPS engage manufacturers of polymer modified cementitious materials in dialogue to fully explore the limitations of their materials; and to possibly train NPS staff in application techniques for the materials.
2. Coating of the existing and repaired concrete after repairs are made could extend the life of the concrete site features by sealing small crack patterns in the existing concrete surfaces. It could also be a method of making the colors of the existing and repaired areas more uniform. Colors are available for this purpose which are the color of the original concrete in the interest of maintaining the historic appearance. It is important that coating materials allow "breathing" from the concrete below, compatibly bond to the original surfaces, and have similar expansion/contraction properties as the original surfaces. Removal of some previous paint applications may be required.

4. Replacement Alternative. The final alternative would entail complete replacement of concrete sub-structure elements (foundations and footings). The structure (or portions thereof) would have to be hydraulically lifted, shored, and existing concrete elements would be removed and replaced with new materials. This alternative could be applied most readily throughout the raceway portion (west end) of the building; it would be more difficult to implement in the elevated aquarium portion of the building due to the split-level nature of that end of the building as well as the comparatively larger sizes of concrete foundations at that location.

It is recommended that the Polymer Modified Cementitious Repair procedures be applied to the Aquarium (east end) of the structure, and that footings and grade beams be replaced around the raceway (west end) of the building. Entrance steps require total replacement; however, concrete slabs-on-grade are suitable for continued use. A sealant program is recommended for the entire structure.

Energy Considerations

Observations regarding thermal resistance at the existing Hatchery were made during the course of evaluating materials and preparing measured drawings for the facility.

In general, there were no insulating materials found within the Raceway or Aquarium areas of the building. Although wood materials exhibit some thermal resistance in and of themselves, the thickness and application of wood at the hatchery is limited. The roof structure is comprised of a single layer of 1x wood sheathing with cedar shingles applied directly above, and the walls are constructed of a single spaced layer of wood siding with interior wood

Repair system property	Plain cementitious repair	Polymer modified cementitious repair	Polymer resin repair
Compressive strength (psi)	2,900–7,250	4,350–8,700	7,250–14,500
Tensile strength (psi)	435–1,088	1,088–2,175	2,175–3,263
Modulus of elasticity (psi x 10^6)	2.9–4.35	2.175 – 3.625	1.45–2.9
Coefficient of thermal expansion (F°)	.00055	.00055–.00068	.00077 - .00086
Maximum service temperature (F°)	>572	212–572	104–176
Ease of installation	Most difficult	Moderate	Moderate
Likelihood of success (historic performance)	Poor	Fair	Fair
Color compatibility	Equal	Equal	Poor

** Portions of the table above are from *Repairs to Restore Serviceability in Concrete Structures; Mailvaganam & Mitchell; National Research Council of Canada; Construction Technology Update, October 2003.*

battens applied over the seams. Concrete floors and stem walls pre-date the practice of using rigid insulating materials below (or along their perimeters) to prevent thermal transmission. In 1928 rigid insulating materials as we know them today did not exist.

The office area does contain insulating materials representative of the time of the 1928 construction of the Hatchery in the form of the Celotex ceiling and the furred Masonite walls. A copy of a technical page from 'The Celotex Company' is included in the report under historic materials (from a 1930 Sweet's Architectural File catalog) illustrating the thermal resistance of that material. An additional technical page is attached showing the manufacturer's recommended details for applying batten strips to Celotex joints. Although no destructive testing was done to this building during the field work, it is possible that Celotex exists within the walls beneath the Masonite finish materials as part of the wall furring system although, as evidenced by the technical page from Masonite Corporation, Masonite was promoting its own thermal resistance. It is clear from the presence of these materials on-site (as well as the existence of the wall heater) that the fisheries manager worked at the facility into the shoulder seasons of the year.

Infiltration: Windows/doors are in fair condition; however, both types of assemblies would be subject to significant amounts of air infiltration around their perimeters. None of the openings have any weather stripping or thermal joints along their perimeters. Glazing within both windows and doors is single pane glazing.

This facility would be difficult to insulate without adversely affecting the visual qualities of the exposed wood walls and ceilings. Finish surfaces could probably be recreated inside of an insulated cavity wall; however, underdeck insulation of the ceiling would affect truss and purlin profiles as well as hide the exposed natural wood of the roof sheathing. Should roof insulation become a requirement, it is recommended that it be accomplished above the plane of the roof sheathing in the manner of a "cold" roof.

Preservation Plan

Basis for the Preservation Plan

The Preservation Plan is derived from review of the historic documentation of the Lake Fish Hatchery, the rating/priority matrix of the condition assessment, and the technical evaluations of fire, code compliance, and structural safety.

The extent of work to be accomplished at the property must be consistent with a high standard of preservation ethics and integrity as mandated by *The Secretary of the Interior's Standards for the Treatment of Historic Properties.* The recommendations contained within this Preservation Plan are based on the following rationale:

The proposed treatment of the building is preservation of existing fabric and replacement with in-kind materials to the maximum extent feasible, with consideration to protection of persons and property from life-safety

issues. The intent is to sensitively integrate life-safety elements and new uses into the structure (recognizing that they ensure the long-term life of the building) without compromising the historic character.

Continued use of the Hatchery will follow the criteria and principles of Rehabilitation of an Historic Property as defined within the standards identified above.

1. Exterior elements will be preserved and enhanced.
2. All interior spaces will be preserved; modifications for changes in use as well as life-safety improvements will be treated as rehabilitations within a historic structure.

The final appearance of the Hatchery is intended to be essentially the same as what we see today; with emphasis on having the building appear well-maintained and related to its surroundings. The building has conveyed that appearance throughout much of its history, has had little (if any) change to its appearance, and continues to convey a sense of time and tradition as an excellent example of rustic "Parkitecture" as it was developed during the evolution of our care of Yellowstone National Park.

The following paragraphs summarize the priority of work to be implemented at the Hatchery as recommended by this Historic Structure Report. Building elements identified as "critical" or "serious" in the condition assessment portion of this report are reflected in this listing of priorities.

Priority #1

Fundamental protection of at-risk elements has been identified as the first priority of preservation to be addressed. Re-roofing, concrete repair/replacement, and repair/replacement of deteriorated wood structural members including re-connecting of the trusses supporting the roof as well as completion of a seismic evaluation are identified under this priority.

Priority #2

Fire safety has been assigned as Priority #2. Adding alarm, detection, and suppression systems are the primary fire concerns.

Priority #3

Rehabilitation and sealing of the exterior building envelope and up-grading of the utility systems serving the facility have been assigned as Priority #3. Restoration of windows, doors, exterior steps, and replacement of shutters is identified as have improvements to mechanical and electrical utility systems.

Priority #4

Interior restoration and providing for ADA accessibility issues are Priority #4. Minor repair and repainting of the interior, site access, site enhancements are listed within this priority.

Priority #5

Providing for changed use is assigned as Priority #5. Depending on proposed uses, primary impacts to the floor plan may involve exhibitry, lighting, and sensitive changes to surface materials as opposed to heavier constructions such as walls and structure.

Other Priorities:

A listing of other related work to be done to the Lake Fish Hatchery and a prioritization of that work is shown on the accompanying table. The prioritization sequence is based on the condition assessment developed in an earlier section of this report, numerous site visits, and in-office evaluation of the current conditions at the facility.

It is realized that budgetary restraints as well as the logistics of construction sequencing will have an effect on the implementation of this plan; however, the table does reflect the order of importance of preservation activities as determined by this report.

Recommended Priorities for the Preservation Plan

Specific recommendations have been developed below for the first three priorities listed in the Preservation Plan for the building; the remaining priorities are contingent on the final determination of use for the facility.

Priority #1A—Roofing:

Re-roof entire structure with fire treated wood shingles applied over cedar breather and air infiltration barrier. Install shingles with double-coursed exposure to match existing profile; stain shingles to match historic colors. Reuse copper flashing at base of chimney, exercising caution to protect the material. Provide and install new unobtrusive spark arrestor/bird–squirrel barrier.

Priority #1B—Concrete repair/replacement:

Three levels of treatment are recommended for the on-site concrete materials.

1. Interior slabs-on-grade, terrace slab-on-grade (except

perimeter)—clean, apply surface sealer, provide and install traffic sealants at joints.
2. Tall stem walls around east end of building—remove unsound materials including previous layers of paint (controlled water jet), prep remaining surface, apply new cementitious repair to original profile. Cementitious repair material to be polymer modified material of strength and consistency to be compatible with on-site materials as discussed in the Concrete section of this report. Apply topcoat (such as Sikadur) to visually blend new and existing colors and textures into a homogenous material.
3. Replace concrete grade beams around the west end of the building; replace steps at front entrance terrace. Extend depth of replacement grade beams to a depth to be below frost. Note that superstructure will have to be shored at concrete replacement locations.

Priority #1C—Repair/replace deteriorated wood structural members:

As noted for the concrete there are multiple levels of wood treatment that are recommended to be applied at the hatchery.

1. Epoxy consolidation is the recommended treatment for exposed logs in the walls that are located above the height of the sill logs. Epoxy consolidation is also recommended at the ends of the log roof purlins.
2. Cutting in of wood Dutchmen is the recommended treatment at the base of deteriorated log columns. An alternate solution to the wood Dutchmen would be use of a substitute base.
3. Partial replacement is recommended for all rafter tails, including log crowns at those locations.
4. Total replacement is the recommended approach for numerous sill logs that exhibit advanced deterioration.

Priority #1D—Upgrade truss connections to comply with current loading/stress requirements:

Add shear transfer elements between top and bottom chords at heel joints; increase bolt sizes at selected web/chord joints to increase shear transfer at those locations (all based on truss analysis as described in the text of this report).

Priority #1E—Complete seismic analysis for this facility (in total):

Preliminary seismic analysis indicates that the existing log diagonal braces are adequate for seismic forces mandated by current building codes; however, connection of the braces to the cap and base of the wall requires further investigation, and superficially appear to need improvement. Additional engineering analysis is needed and brace-to-wall connections must be further developed.

Priority #2—Provide/improve fire protection measures for the facility:

Provide for fire systems and incorporate consideration of fire resistance and safety in the architectural planning of the facility.

1. Provide an integrated fire alarm system throughout.
2. Provide smoke detection throughout, as mandated by code.
3. Depending upon occupancy of the building, consider fire suppression in the form of extinguishers and/or automatic sprinkler systems.
4. Depending upon occupant load, add second exit from raceway portion of the building.
5. Add exit signage (use code accepted historic appearing signs) and replace exit door hardware suitable for fire exits.

Priority #3—Rehabilitate and seal exterior building envelope; upgrade utility systems:

1. Restore windows. Consider interior storm windows if facility is used during the shoulder seasons.
2. Restore exterior doors, including hardware. Coordinate hardware with ADA assessment.
3. Restore exterior log steps (NE corner).
4. Provide and install new off-season shutters for all exterior openings.
5. Paint/stain all exterior building elements.
6. Caulk/seal all exterior joinery.
7. Replace/rehabilitate primary electrical service to the building.

The ultimate use of the facility would have to be determined to complete additional priorities #4–6, and recommendations for the hatchery. This report can be amended at the time a final decision regarding use is made.

Priority #4—Provide better public accessibility to the building and enhance public visibility of the historic structure.

This priority would also be applicable if the building is thought of as an outdoor exhibit prior to complete

rehabilitation).

Priority #5—Rehabilitation of existing interior assemblies, materials, and features.

Priority #6—DOI compliant modifications for public use of the interior of the facility (implied by a change in use).

1. Consideration of fire exiting.
2. Electrical power, lighting, and distribution commensurate with a different occupancy.
3. In the event that the facility is used for public purposes and if toilet facilities are provided for the public, then it will be necessary to provide both water and waste systems to the facility.
4. Any use that is not seasonal would require consideration to energy, insulation, and related materials.
5. Consideration of interpretation.

Prioritized Work Plan (Preservation Plan)

Category	Location	Element	Description	Rtg	Cond	Priority	Remarks	No.
Priority #1—Fundamental Stabilization and Address Existing Deterioration								
Roof		Roof surfacing	Wood Shingles (sawn)-special coursing	5	Very Poor	Critical	Replace	1.01
Roof		Roof ridge	Wood shingles (Boston lap)	5	Very Poor	Critical	Replace	1.02
Roof		Air infilt. barrier	New material (did not exist historically)	5	N/A	Critical	Add	1.03
Roof		Cedar Breather	New material (did not exist historically)	5	N/A	Critical	Add	1.04
Roof		Icedam Edge protection	New material (did not exist historically)	5	N/A	Critical	Add	1.05
Roof		Roof sheathing	Spaced S4S boards	2	Fair	Critical	Replace edge boards	1.06
Roof		Flashing	Copper (Chimney only)	1	Good	Minor	Carefully re-use	1.07
Roof		Chimney	Rhyolite rubble stone; charcoal mortar	1	Good	Minor	Add spark arrestor	1.08
Roof Str		Rafters	6" dia. Log @ 2' c/c +/-	2	Varied	Critical	Replace all rafter tails	1.10
Roof Str		Purlins	8"–10" dia. Log (5 thus full length)	1	Fair	Critical	Epoxy ends	1.11
Roof Str		Trusses	10"–12" log chords/webs	1	Excellent	Critical	Improve connections	1.12
Roof Str		Braces (internal)	8" dia. log (4 total)	1	Good	Critical	Re-do anchorage	1.13
Sub-structure		Foundation-S. wall raceway area	Reinf Conc grade beam/footing	5	Very poor	Critical	Replace	1.21
Sub-structure		Foundation-N. wall raceway area	Reinf Conc grade beam/footing	3	Poor	Critical	Replace	1.22
Sub-structure		Foundation-aquarium/office	Reinf Conc stem wall	3	Poor	Critical	Repair	1.23
Ext conc steps	Terrace	Front entrance steps (SE)	Reinforced concrete, unpatterned	5	Very poor	Critical	Replace	1.24
Ext conc slab	Terrace	Exterior concrete floor slab-entry	Reinforced concrete, unpatterned	1	Good	Serious	Add sealants	1.27
Orig Log	Log Columns	Corners; all structural bays	18" Log (coupled)	1, 2	Varied	Critical	Replace many bases	1.31
Orig Log	Sill Logs	Entire Perimeter	18" Log attached to conc. stem wall	5	Poor	Critical	Replace deteriorated	1.32
Orig Log	Log Bracing	Ends; corners	8"–10" Log	1, 2	Fair	Serious	Replace selected	1.33
Orig Log	Log Wall Cap	Entire Perimeter	14"–16" Log attached to cols and roof	1, 2	Varied	Serious	Replace selected	1.34
Orig Log	Intermediates	Window/door perimeters	8"–10" Log	1, 2	Fair	Serious	Replace selected	1.35
General	Connections	Throughout	Supplement as required (see text)	5	N/A	Critical	Seismic conn @ braces	1.36
Log	Rot prevention	Throughout	Install new borate rods throughout	5	N/A	Critical		1.37
Log	Sealant	Throughout	Apply new throughout	5	Very poor	Critical		1.38
General		Complete Seismic Analysis		N/A	N/A	Critical	Calculations required	1.50

Category	Location	Element	Description	Rtg	Cond	Priority	Remarks	No.
Priority #2—Fire Protection								
Fire	General	Fire Detection	None	5	N/A	TBD	Add system if structure occupied	2.01
Fire	General	Fire Alarm	None	5	N/A	TBD	Add system if structure occupied	2.02
Fire	General	Fire Extinguishers	Unknown	5	N/A	TBD	Add system if structure occupied	2.03
Fire	General	Emergency lighting	None	5	N/A	TBD	Add system if structure occupied	2.04
Priority #3—Rehabilitate Exterior Building Envelope								
Walls	Exterior	Windows - Raceway area	Hinged Casement w/sgl pane glazing	1, 2	Fair/Poor	Serious	Replace where broken	3.01
Walls	Exterior	Windows - Aquarium area	Hinged Csmt/Awning w/sgl pane glazing	1, 2	Fair/Poor	Serious	Replace where broken	3.02
Walls	Exterior	Windows - Office	Hinged Casement w/sgl pane glazing	1, 2	Fair/Poor	Serious		3.03
Walls	Exterior	Main Entry Door	Pair, wd panel w/divided half-lite	1	Good	Minor	Repaint	3.05
Walls	Exterior	Office Door	Wd panel w/divided half-lite	1	Good	Minor	Repaint	3.06
Walls	Exterior	Balcony/Utility door	Custom wood board	1	Good	Minor	Repaint	3.07
Walls	Exterior	Raceway/Service doors	Pair, custom wood plank	1	Fair/Good	Minor	Repaint	3.08
	Exterior Steps	Stringer(s)	One-half log	1, 2	Fair	Serious	Preservative; anchor	3.11
	Exterior Steps	Treads	One-half log	1, 2	Fair	Serious	Preservative; anchor	3.12
	Exterior Steps	Landing	T&G wd flooring	1, 2	Fair	Serious	Preservative	3.13
	Exterior Steps	Railings	Custom pole and log	1	Fair	Minor	Protect	3.14
Walls	Access panel	NE Corner; PWD panel	Investigate; purpose is unknown	3	Poor	Minor		3.15
Walls	Exterior	Removeable Shutters	Various wood constructions	5	Very Poor	Serious	Reconstruct all new	3.40
Log/siding	Coating	Throughout	Maintain natural; apply clear where required	5	Very Poor	Serious	Apply paint/coating	3.50
Walls	Exterior	Siding	1x12s; spaced	1, 2	Fair/Good	Minor	Apply paint/coating	3.51
Walls	Exterior	Battens	1x4s @ all siding seams (12" c/c)	1, 2	Fair/Good	Minor	Apply paint/coating	3.52
Walls	Exterior	Ext Csgs and Trims (thru-out)	Log	1, 2	Fair	Minor	Apply paint/coating	3.53
Roof	Perimeter	Fascia/Soffit	Underside of roof sheathing is exposed	2	Fair	Minor	Apply paint/coating	3.54
Elec	Service	Exposed elec service-N wall	Relatively new service disconnect	5	Unknown	Minor		3.70

Category	Location	Element	Description	Rtg	Cond	Priority	Remarks	No.
Priority #4—Public Accessibility and Improved Public Visibility								
Site		Paths and walks	Cut stone steps and walkway	2	Poor	Serious	Repair/restore	4.00
ADA	Walkway	Accessible route		5	N/A	Serious	Construct; add	4.01
ADA	Ramp	Access to entrance, Terrace		5	N/A	Serious	Construct; add	4.02
ADA	Parking	Designate within existing lot		5	N/A	Minor	Designate, mark spaces	4.03
ADA	Loading zone	Integrate with Service Drive		5	N/A	Minor	Designate, mark spaces	4.04
Hardware	Public Entry Drs	Hinges; latchset; surface lock	Add functional lock & ADA hardware	1, 5	Poor	Minor	ADA access	4.05
Hardware	Raceway doors	Hinges; latchset; surface lock	Restore decorative hardware	1	Poor	Minor	ADA access	4.06
Hardware	Ext. Office door	Hinges; latchset; surface lock	Add functional lock & ADA hardware	1, 5	Poor	Minor		4.07
Hardware	Utility door (N)	Hinges; latchset; surface lock	Make lock functional	1, 5	Poor	Minor		4.08
Site		Paths and walks	Fragments of Conc walk-SE corner	6	N/A	Minor	Remove; non-historic	4.09
Site		Paths and walks	Fragments of Asphalt walk-SE corner	6	N/A	Minor	Remove; non-historic	4.10
Site		Manhole	Mtl manhole w/cover	4	Poor	Minor		4.11
Site		Site Grading	Adequate drainage at South & East; potential for negative drainage around N and W sides	5	Mixed	Serious	Install permanent drainage gutter at N wall	4.12
Site		Trees	Evergreens @ all sides of structure.	1	Good	Minor	Maintain	4.15
Site		Site Landscaping	Gravel w/scattered grass and ground cover	4	Fair	Minor	Maintain; enhance	4.16
Priorty #5—Interior Rehabilitation								
Conc. floors		Interior concrete floor slabs	Reinforced concrete, unpatterned	1	Good	Minor	Add sealants	5.00
Conc. drains	Raceway	Original drains for fish tanks	Reinforced concrete	1, 2	Good	Minor	Enhance gutters	5.01
Interior	Raceway	Ceiling	Exposed Structure	1	Good	Minor	Apply paint/coating	5.02
Interior	Aquarium	Ceiling	Exposed Structure	1	Good	Minor	Apply paint/coating	5.03
Interior	Balcony	Ceiling	Exposed structure	1	Good	Minor	Apply paint/coating	5.04
Interior	Raceway	N, S, E, and W walls	Bd & Batten wd siding	1	Fair/Good	Minor	Clean; touch-up	5.05
Interior	Aquarium	N, S, E, and W walls	Bd & Batten wd siding	1	Fair/Good	Minor	Apply paint/coating	5.06
Interior	Balcony	N, S, E, and W walls	Bd & Batten wd siding	1	Fair/Good	Minor	Apply paint/coating	5.07
Interior	Balcony	Handrail & guardrail	Custom pole and log	1	Good	Minor	Apply paint/coating	5.10

Category	Location	Element	Description	Rtg	Cond	Priority	Remarks	No.
Walls	Interior	Int Csgs and Trims (thru-out)	Log or 1x4 jamb; 1x6 head flat wd profiles	1	Good	Minor	Apply paint/coating	5.11
Interior	Raceway	Flooring	Exposed concrete	1	Fair/Good	Minor	Clean, seal	5.12
Interior	Aquarium	Flooring	Exposed concrete (See sub-structure)	1	Fair/Good	Minor	Clean, seal	5.13
Interior	Balcony	Flooring	T&G Fir flooring (natural)	1, 2	Fair/Good	Minor	Clean, stain, seal	5.14
Balcony steps	Interior	Railings	Hand crafted pole	1	Fair	Minor	Protect	5.15
Balcony steps	Interior	Stringer(s)	Dimensioned lumber	1	Good	Minor		5.16
Balcony steps	Interior	Treads	3/4" Planed Lumber	1, 2	Good	Minor	Finish	5.17
Balcony steps	Interior	Risers	3/4" Planed Lumber	1, 2	Good	Minor	Finish	5.18
Office steps	Interior	Stringer(s)	Dimensioned lumber	1	Good	Minor		5.19
Office steps	Interior	Landing	T&G wd flooring	1, 2	Good	Minor	Finish	5.20
Office steps	Interior	Treads	3/4" Planed Lumber	1, 2	Good	Minor	Finish	5.21
Office steps	Interior	Risers	3/4" Planed Lumber	1, 2	Good	Minor	Finish	5.22
Office steps	Interior	Railings	None	5	N/A	Minor		5.23
Structure	Below tanks	Joists & Girders	2x8 Joists and Girders	1	Good	Minor	Clean; repellent	5.26
Service steps	to aquarium	Treads	Dimensioned lumber	1, 2	Fair	Minor	Clean	5.27
Service steps	to aquarium	Risers	None	N/A			Service; add rail for staff	5.28
Service steps	to aquarium	Stringer(s)	Dimensioned lumber	1, 2	Fair	Minor	Clean	5.29
Service steps	to aquarium	Railings	None	5	N/A			5.30
Hardware	Closet doors (6)	Hinges; latchset; surface lock	Make locks functional	1, 5	Poor	Minor		5.31
Hardware	Int. Office door	Hinges; latchset; surface lock	Make lock functional	1, 5	Poor	Minor		5.32
Interior	Office	Ceiling	Painted Celotex w/stained wood battens	3	Poor	Serious	Apply paint/coating	5.33
Interior	Office	N, S, E, and W Walls	Painted Masonite w/stained wood battens	1, 2	Fair/Good	Minor	Repair/Re-paint	5.34
Interior	Office	Casing & Trims	1x4 jamb; 1x6 head flat wood profiles	1	Fair/Good	Minor	Re-finish	5.35
Interior	Office	Basic Fireplace	Rhyolite rubble stone w/charcoal mortar	1	Good	Minor		5.36
Interior	Office	Mantle	Coursed stone	1	Good	Minor		5.37
Interior	Office	Hearth	None, integral w/office floor	N/A	N/A	Minor		5.38
Interior	Office	Appointments	Obsidian accents; antler accessories	1	Good	Minor		5.39
Interior	Office	Base	1x8 flat wood w/ quarter round	1, 2	Good	Minor	Restore	5.40
Interior	Office	Flooring	Indoor-Outdoor carpet	5	Poor	Serious	TBD	5.41

Category	Location	Element	Description	Rtg	Cond	Priority	Remarks	No.
	Office	Furring at Office	Unknown; presumed to be wd framing	1	Good	Minor		5.50
		Misc. hardware		2, 5	Poor	Minor		5.60
Priority #6—DOI compliant modifications for change of Interior Use								
Changed use	Exiting	2nd exit from assembly area	See code analysis section of report	5	N/A	TBD		6.00
Changed use	Stg platform	Strengthen/remove platform	Platform is contemporary construction	TBD	Fair	TBD	Provide access if retain	6.01
Elec	Distribution	Lighting and power	Electrical system for new use	5	Poor	TBD		6.02
Mech	Water supply	Supply for fish only	Galvanized piping	5	Poor	TBD	Modify for public use	6.03
Mech	Waste	Waste from raceways only	Galvanized piping; open conc trenches	5	Poor	TBD	Provide system for public use	6.04
General	Public toilets		New mat'l (did not exist historically)	5	N/A	TBD	TBD	6.05
Security	General	Security system	New mat'l (did not exist historically)	5	N/A	TBD	Add	6.06
Site	General	Service drive	Curved asphalt service drive	3	Fair	TBD		6.10
Roof	Exterior	Insulation	New material (did not exist historically)	TBD	N/A	TBD	Seasonal vs. non-seasonal use	6.20
Walls	Exterior	Insulation	New material (did not exist historically)	TBD	N/A	TBD	Seasonal vs. non-seasonal use	6.21
Roof/wall	Exterior	Vapor barrier	New material (did not exist historically)	TBD	N/A	TBD	Seasonal vs. non-seasonal use	6.50
Mech	HVAC	Heater in office only	1940s oil heater	5	Poor	TBD	Seasonal vs. non-seasonal use	6.60
Rearing ponds	Site	West of building	Would require reconstruction	TBD	N/A	TBD	Interpretive potential	7.00
Exhibit ponds	Site	East of building	Would require reconstruction	TBD	N/A	TBD	Interpretive potential	7.01

Part 3. Record of Treatment

This section intentionally left blank; to be completed when work is implemented at the hatchery.

Preservation Treatment and Recommendations

I. Completion Report

II. Technical Data

Appendices

Appendix A. Supplemental Historical Information

The following excerpt has been taken from the nomination to the National Register of Historic Places as published at <http://www.nps.gov/yell/historyculture/fish-hatchery.htm>.

Lake Fish Hatchery. *The Lake Fish Hatchery Historic District had a prominent role in Yellowstone National Park's fishery management program. The historic district is on the north shore of Yellowstone Lake, the largest mountain, high altitude lake in the United States at 7,733 feet above sea level. The lake is approximately 20 miles long and 14 miles wide. The lake harbors six fish species: cutthroat trout, long-nose dace, redside shiners, lake chub, long nose suckers, and lake trout. The former two are native; the latter four were introduced in the mid-1900s.*

To the east of the Lake Fish Hatchery Historic District is the Lake Historic District. It includes the main concession area for the Lake area (Lake Hotel, Hamilton general store, Lake Lodge and NPS Lake Ranger Station). This section (Lake Historic District) will be developed at a future time.

The Lake Fish Hatchery Historic District consists of nine buildings, constructed for the Fish and Wildlife Service. The fish hatchery activities function was halted in the 1958. Shortly thereafter (during the Mission 66 project [a 10 year effort to upgrade facilities in the parks]), the Lake Hatchery site was adapted to use as headquarters for the southern Lake Maintenance district for Yellowstone National Park.

Description. *The Lake Fish Hatchery Historic District buildings are significant for their architecture and for their role in the conservation policies of the National Park Service under Criteria A and C. The buildings which remain, built between 1930 and 1932, were constructed by the Fish and Wildlife Service, they follow in whole or part the Rustic Architecture of the National Park Service and its policy of nonobtrusive design which flourished during the 1920s, 1930s, and early 1940s. The buildings are of wood with log framing and cedar shingle roofs. Most are painted a nonintrusive brown with dark green trim. Even though their use varies, the buildings blend with each other as well as with the natural surroundings.*

The fish hatchery (Building 726) is a fine example of the log exterior framing found in the area. It is currently used by Fish and Wildlife Service and the National Park Service to support of fisheries research on Yellowstone Lake. This structure was constructed in approximately 1927. The building faces south towards Yellowstone Lake. It is constructed in a modified rectangular form, having one story open to the roof. Square footage of the large structure is 3,464. It rests upon a concrete foundation with a cement plaster finish. The walls have exterior log framing with notable use of massive corner logs with doubled logs equal in size spaced along the wall surfaces while medium-sized logs frame the window openings. Reverse board and batten sheeting is used inside the framing. The gabled roof is covered with wood shingles doubled every course. Structural details include extended log wall plates, purlins, rafters, and ridgepoles. The structure has six light hopper type windows and is painted brown with green window and roof trim. There is an attractive arched log truss on the sidewall and a large rubble stone chimney which extends through the roof.

Facilities were primitive in those days. The fish hatching ponds were wooden troughs outside. These were consistently damaged by bears and the eggs destroyed. A permanent two story log hatchery building and another log building were constructed on Hatchery Creek near the Lake Hotel in 1912, along with a collecting station at Clear Creek in 1913. Condition of the structure is poor. The paint has worn away and rafters show areas of decay. The roof needs to be replaced. The concrete steps to the entry are deteriorated as is the plaster finish of the cement foundation.

In 1872, Congress established Yellowstone National Park "... for the benefit and enjoyment of the people and for the preservation, from injury and spoilation of all timber, mineral deposits, natural curiosities or wonders..., and their

retention in their natural condition." This mandate caused Federal policies to evolve concerning hunting and fishing in the National Parks.

When Yellowstone National Park was created about 40% of its waters were barren of fish. Park administrators early expressed an interest in developing these areas for additional sport. Until 1883, both hunting and fishing were allowed in Yellowstone as the only practical way to feed visitors evolving from a frontier subsistence policy. By the early 1880s there were enough hotels and restaurants to allow a ban on hunting. At the same time, fishing was restricted to sportsmen and a few commercial enterprises who supplied the hotels. This continued until 1917.

In 1889, the United States Fish Commission began fieldwork in Yellowstone. A fish cultural station was in operation on Yellowstone Lake ten years later. "It was the beginning of a gigantic hatchery operation that in the next fifty seven years would yield 818 million trout eggs for use in other waters (mostly outside Yellowstone.)" In 1911, the Yellowstone Park Lake Station was made a substation of the Federal hatchery at Bozeman, Montana.

The Columbine Creek collecting station was built in 1914 and a cottage for the superintendent a few years later. These buildings no longer exist.

In 1917 the Bureau of Sport Fisheries and Wildlife "was authorized by law...to act as advisors to the states regarding fisheries legislation" and a tie between the Federal and State levels was established. In the meantime, the Federal hatcheries program expanded and by 1937 the Bureau operated 88 major fish hatcheries throughout the U.S. The administration of Lake hatchery was handled after 1951 through Spearfish, South Dakota. This jurisdiction was later changed to Bozeman, Montana, and eventually to Saratoga, Wyoming. The hatchery also had aquaria and exhibits. These were heavily visited by the public, providing a method by which the public was informed of the conservation philosophies of the times.

As early as 1920, the Annual Report of the Director of the National Parks indicated the Lake Hatchery was replenishing the depleted fish supply in the National Park Service. In 1922, the scale of the operations was increased with a new hatchery being established at Fish Lake. The annual report for that year proposed "...that a Federal hatchery be established in other national parks whenever that is feasible." This philosophy of using artificial means to replenish the fish of the National Park System waters was soon to be abandoned. The old U.S. Fish Commission had been combined with the Bureau of Sport Fisheries and Wildlife to form the U.S. Fish and Wildlife Service. "While on the one hand the National Park Service was suppose to be preserving native fish populations, on the other hand the U.S. Fish and Wildlife Service was supposed to mass produce trout." The tension grew between the Fish and Wildlife Service and park managers. In 1957, the hatcheries were shut down.

The U.S. Fish and Wildlife Service personnel shifted their attention to research. In 1958, the artificial propagation of fish at Lake was halted and the catch limited to a figure within the natural regenerative powers of the species.

In 1996 the National Park Service assumed responsibility for managing the park's fishery program.

Parkitecture

"Parkitecture" is a blending of the words 'Park' and 'Architecture' and is a recent formulation that in application is defined as that style of Architecture that blends natural elements with construction for use in the Park systems of America, and whose goal is to build something with the least amount of visual intrusion in the natural landscape.

The following excerpt has been taken from *ParkNet (an internet site of the National Park Service)*. This specific website was designed to make available an interactive internet site entitled "PARKitecture in Western National Parks".

The idea of designing with nature flourished in the National Park Service during the early decades of the twentieth century. Architects, landscape architects and engineers combined native wood and stone with convincingly 'native' styles to create visually appealing structures that seemed to fit naturally within the majestic landscapes. Influential professionals like Mary Jane Colter, Daniel Hull, Herbert Maier, Robert Reamer, Merel Sager, Gilbert Stanley Underwood, and Thomas C. Vint applied these principles to their structures, landscapes and road systems throughout the national parks.

The whimsical term "Parkitecture" is a more recent expression. It specifically has been applied to the popular rustic designs of Park Service structures.

Appendix B. Accessibility Guidelines

Background (Excerpted from UFAS Unit 2–Regulatory Issues):

The four federal standard setting agencies, the General Services Administration, the Department of Defense, the Postal Service, and the Department of Housing and Urban Development developed the Uniform Federal Accessibility Standards (UFAS) to be consistent with the Minimum Guidelines and Requirements for Accessible Design (MGRAD). As such, when introduced in 1984, UFAS was the most comprehensive standard to date and is still the mandatory standard for all buildings designed, constructed, altered, or leased with federal funds.

Cities, counties, or states develop their own building construction regulations, and most have added accessibility provisions by adopting in whole or in part the technical specifications of ANSI 117.1 (1980), (1986), UFAS, MGRAD, or those in one of the model codes. All states have some form of access standards.

If no federal money is used in the design, construction, or renovation of the facility, then the Architectural Barriers Act (1968) does not apply. However, if no federal money is used in the renovation of the facility then the provisions of the local building code must be complied with. In recent times most states have adopted the latest edition of the International Building Code. The 2003 edition of IBC contains provisions for accessibility that are referenced from CABO/ANSI 117.1. In summary, the ADA requirements are very similar regardless of the source of funding.

Historic Structures

In regard to historic structures, UFAS provides the following guidance in Unit 2–Regulatory Issues:

The general approach to application of [A.D.A.] standards is to require a cooperative analysis of each renovation/alteration to a "qualified structure" (i.e. a property already listed or declared eligible for listing on the National Register of Historic Places) by interested parties, state and local advisory councils on historic preservation, and others to determine the extent and methods for compliance. The procedures for completing this analysis are described in Section 106 of the National Historic Preservation Act of 1966, as amended...

...The agency can use alternate means to create program access...

... Nevertheless (considering the procedure described above) those historic buildings covered by the Architectural Barriers Act must adhere to the provisions of UFAS when renovations are undertaken.

Under Minimum Requirements For Project Type the UFAS standard continues:

*In the special case of historic buildings the requirements for providing access are detailed in Subsection 4.1.7 of UFAS, pages 13-14.** The general approach to application of standards at historic sites is to require a cooperative analysis of each renovation/alteration to a "qualified structure" to determine the extent and methods for compliance. The procedures for completing this analysis are described in Section 106 of the National Historic Preservation Act of 1966, as amended, 16 United States Code 470 (including Executive Order 11593, Protection and Enhancement of the Cultural Environment); and "Protection of Historic and Cultural Properties", 36 CFR Part 800.*

Each federal agency is responsible for taking into account the effect of an undertaking on any property included (or eligible for inclusion) in the National Register of Historic Places. As a general rule, an official from the federal agency will work with the State Historic Preservation Officer and other interested parties to identify potential conflicts and propose methods for resolving the conflicts during the early planning stages of the project. The goal of this initial planning is to determine what effects (either None, Not Adverse, or Adverse), the proposed undertaking will have on the property.

If it is determined that there will be some effect on the property, the Advisory Council on Historic Preservation reviews and comments on the proposed plans and either amends or accepts the plan. If it is determined that some adverse effect will occur, it is necessary to draw up a Memorandum of Agreement outlining how the effects will be taken into account. An understanding is considered to have an adverse effect when the effect on a historic property may diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Only after the Council has determined that accessibility requirements for accessible routes, ramps, entrances, toilets, parking, displays, and signage have an adverse effect can the special application provisions of Subsection 4.1.7(2), page 14, be utilized. And even then, all requirements which do not have an adverse effect must be met.

*(** Applicable portions of pages 13 & 14 of Subsection 4.1.7 have been attached below for reference.)*

Note that the preceding paragraphs apply only to

federally funded projects; projects funded through State, local, or Private sources must comply with CABO/ANSI 117.1.

The Federal Standards (as well as CABO/ANSI 117.1) both have provisions for implementing Alternative Measures to compliance requirements.

Alternative measures: The wording in ANSI regarding alternative measures is identical to the federal standard (UFAS); the only difference being that a state or local preservation officer can apply the criteria and the involvement of the presidents Advisory Council is not required. A condensation of the Alternative Measures is listed below:

- Accessible routes: Can be limited to (1) for historic properties if multiple routes create adverse impacts.
- Accessible entrance: Only (1) accessible entrance is required to be provided and it does not have to be the primary public entrance.
- Accessible toilets: Only (1) accessible toilet is required within a facility if adverse effects are caused by providing multiple toilets; it can also be of uni-sex design.
- All publicly used spaces on the accessible floor of the facility must be accessible; not all floors within the facility have to be accessible if vertical access causes adverse effects although it is strongly encouraged.

Appendix C. Structural Support Documentation

Unit Weight of Materials

Material Weights Description	Unit	WT	Source
Wood shingles	SF	2.0	TJI Manual
Wood sheathing (1x) 32 PCF)	SF	2.66	Douglas Fir Use Book
Wall sill log (16")	LF	44.5	
Rafters (6")	LF	6.3	
Purlins (8")	LF	11.2	
Trusses and braces (10")	LF	17.4	
18" log columns	LF	56.3	
12" log columns	LF	25.1	
Misc. 4" log	LF	2.78	
10" half log	LF	8.7	
Board and batten siding	SF	3.27	
Wood floor	SF	7.32	
Interior frame wall (storage)	SF	4.66	
Interior frame wall (office)	SF	6.30	
Office wall furring	SF	1.65	
Office ceiling	SF	3.2	
6" concrete slab-on-grade	SF	75.0	
14" x 4.5' stem wall w/28 x 12 FTG	LF	1,139	
14" x 24" GR beam w/28 x 12 FTG	LF	701	
(2) 6" x 16" curbs w/4" FL	LF	266	
(2) 12" x 8" steps w/12" x 12" GR beam	LF	450	

Weight of Structure

Quantities/Weights Description	Unit	Amount	Weights	
Roof area	SF	4,869	40,900	
Wall cap log	LF	342	8,584	
Wall sill log	LF	342	15,219	
Rafters	LF	2,456	15,473	
Purlins	LF	648	7,258	
Scossors trusses—LF of members (109.5 LF/truss)	LF	547.5	9,527	
King-post trusses—LF of members (48.5 LF/truss)	LF	146	2,540	
Roof braces (allowance)	LF	160	2,784	
Wall columns (structural—18")	LF	434	24,434	
Wall columns (structural—12")	LF	140	3,514	
Wall columns (window–door—8")	LF	448	5,018	
Wall columns (braces—8")	LF	174	1,949	
Misc. log trim; windows and doors (8")	LF	326	3,651	
Misc. log railings, etc. (4")	LF	266	740	
Log exhibits (aquarium) (6")	LF	132	832	
Exterior stairs (10" half log)	LF	46	400	
Exterior wall siding	SFCA	4,902	16,030	
Casement windows	EA	35	INC	
Awning windows	EA	3	INC	
Exterior doors	EA	5	INC	
Balcony floor	SF	201	1,471	
Interior public stair	SF	20	146	
Office stair	SF	24	176	
Utility stair	SF	65	476	
Utility floor	SF	333	2,438	
Interior storage walls	SFCA	680	3,169	
Interior office walls	SFCA	212	1,336	
Furred exterior office walls	SFCA	256	422	
Office ceiling	SF	196	627	
			(subtotal=169,114)	
Concrete slab-on-grade (lower)	SF	2,623	196,725	
Concrete slab-on-grade (upper)	SF	628	47,100	
Concrete slab-on-grade (Terrace)	SF	286	21,450	
Concrete stem walls/footings	LF	151	171,989	
Concrete grade beams/footings	LF	179.5	125,830	
Concrete raceway gutters	LF	121	32,186	
Concrete entrance steps (dbl. step)	LF	39	17,550	
			total=781,944	

Simple Beam Analysis—Uniform Load

Project: Lake Fish Hatchery, Yellowstone Lake
Date: 3-Dec-07
Beam description: Typical roof rafter

Comments/notes:

Span (in feet)	7.23			
Tributary width (ft.)	2			
Dead load (psf)	9.4			
Live load (psf)	62.5			
Dead load on beam (plf)	18.8			
Live load on beam (plf)	125			
Total load on beam (plf)	143.8			
Material	DF/larch			
Grade	#2			
Allowable bending stress (psi)	1200			
Allowable shear stress (psi)	95			
Modulus of elasticity (psi)	1400000			
Analysis results				
Maximum moment (ft-lb)	939.6053775			
Dl moment (ft-lb)	122.841315			
Ll moment (ft-lb)	816.7640625			
Maximum shear force (lb)	519.837			
Vdl (lb)	67.962			
Vll (lb)	451.875			
Deflection criteria				
Ex. 1/360 - Enter 360	360			
Deflection based on criteria (in)	0.241			
Enter deflection selected (in)	0.46			
Beam selection				
Required area (in-2)	5.471968421			
Required section modulus (in-3)	9.396053775			
Required moment of inertia (in-4)				
Formual numerator		3394890865		
Formula Denominator		247296000		
Reqd I =	13.72804601			

Options:	6" Dia. Log	Width (in)	Depth (in)	
A=	0			28.27
S=	0			21.21
I=	0			63.62

Simple Beam Analysis—Uniform Load

Project: Lake Fish Hatchery, Yellowstone Lake
Date: 3-Dec-07
Beam Description: Roof Purlins

Comments/notes:

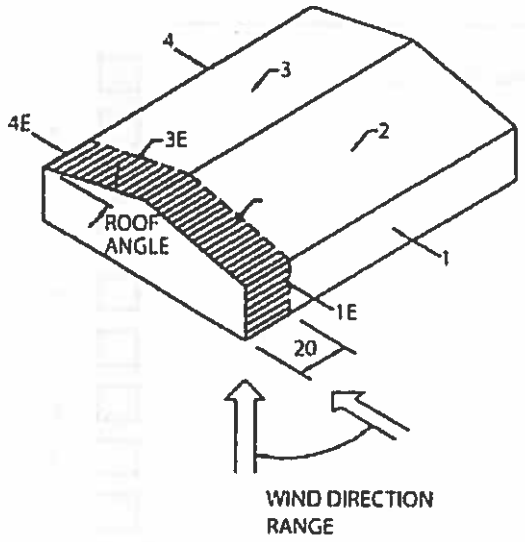
Span (in feet)	13.08	
Tributary width (ft.)	1	
Dead load (psf)	62.6	
Live load (psf)	415.6	
Dead load on beam (plf)	62.6	
Live load on beam (plf)	415.6	
Total load on beam (plf)	478.2	
Material	DF/larch	
Grade	#2	
Allowable bending stress (psi)	1200	
Allowable shear stress (psi)	95	
Modulus of elasticity (psi)	1400000	
Analysis results		
Maximum moment (ft-lb)	10226.68956	
Dl moment (ft-lb)	1338.75108	
Ll moment (ft-lb)	8887.93848	
Maximum shear force (lb)	3127.428	
Vdl (lb)	409.404	
Vll (lb)	2718.024	
Deflection criteria		
Ex. 1/360 - Enter 360	280	
Deflection based on criteria (in)	0.560571429	
Enter deflection selected (in)	0.58	
Beam selection		
Required area (in-2)	32.92029474	
Required section modulus (in-3)	102.2668956	
Required moment of inertia (in-4)		
Formual numerator		1.20936E+11
Formula denominator		311808000
Reqd I =	387.8528943	

Options:	8" Dia. Log	Width (in)	Depth (in)	10" Log	
A=		0		50.26	78.54
S=		0		50.26	98.2
I=		0		201.1	490.9

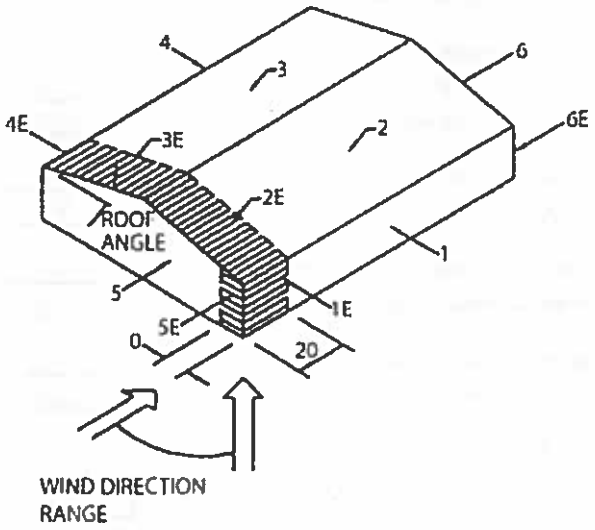
Note: no reduction for duration of load

Applicable Wind Load Cases

CASE A



CASE B



Note to reviewer: these load cases are correlated to formulas and factors found in the ASCE manual on 'Design Loads for Buildings and Other Structures' and referenced by the pertinent building codes that would be applied to the Fish Hatchery structure. The load cases represent the wind direction from sidewalls and endwalls respectively.

Seismic Factors—IBC 2006 (ASCE 7-05)

Project: Lake Fish Hatchery, Yellowstone Lake

Date: December 18, 2007

Occupancy Category/Importance Factor	[X]	I	Ie =	1.00
[ASCE table 1-1 & 11.5.1]	[ ]	II	Ie =	1.25
	[ ]	II	Ie =	1.50
Site Class:	[ ]	A		
	[ ]	B		
	[ ]	C		
	[ ]	D		
	[ ]	E		
	[ ]	F		
Assumed Class (ASCE 11.4.2) Soil properties unknown	[X]	D		

Spectral Response (from NEHRP)–MCE			
Ss (0.2 sec-site B–5%)	= 1.25 g	Short Period Acceleration	
S1 (1.0 sec-site B–5%)	= 0.5 g	(1) Second Acceleration	
Site Coeffecient Fa (ASCE table 11.4-1)	= 1		
Site Coeffecient Fv (ASCE table 11.4-2)	= 1.5		
Maximum Considered Earthquake (adjusted) Sms	= 1.25	Fa(Ss)	(ASCE 11.4.3)
Maximum Considered Earthquake (adjusted) Sm1	= 0.75	Fv(S1)	
Design Earthquake (short period) SDs=2/3 Sms	= 0.833		(ASCE 11.4.4)
Design Earthquake (short period) SD1=2/3 Sm1	= 0.5		

SEISMIC DESIGN CATEGORY

For Short Period Response Structures	[ ]	A	minimal risk
(ASCE table 11.6-1)	[ ]	B	low-to-moderate risk
	[ ]	C	moderate risk
	[X]	D	high risk
	[ ]	E	high risk-near source
	[ ]	F	high risk-near source

For 1-sec. Period Response Structures	☐	A	minimal risk
(ASCE table 11.6-2)	☐	B	low-to-moderate risk
do	☐	C	moderate risk
do	☒	D	high risk
Occ I, II, III w/ S1 > 0.75	☐	E	high risk-near source
Occ IV, w/ S1 > 0.75	☐	F	high risk-near source

Design Response Spectrum–MCE

Period Of Vibration

Fundamental Period T:

(ASCE 12.8.2.1) Ta = Ct x hnx

Height of structure	30.00		
Ct from table 12.8-2	0.02	(hn)3/2 =	164.3167673
x from table 12.8-2	0.75	(hn)3/4 =	12.81861019
Calculated–Ta = T =	0.26		
To = 0.2 x SD1/SDS	0.12		
Ts = SD1 / SDS	0.60		
TL = (see figures in chapter 22)	6.00		

Design Response Spectrum

Acceleration Sa; T < To

Sa = SDS(0.4 + 0.6 T/To)	☐	1.681861
Acceleration Sa; To < T < Ts		
Sa = SDS	☒	0.833
Acceleration Sa; Ts < T < TL		
Sa = SD1/T	☐	1.950299
Acceleration Sa; TL < T		
Sa = SD1 x TL / T x T	☐	45.64377

Seismic Analysis Part II: Seismic Procedure—Asce 7-05

Project: Lake Area Fish Hatchery

Date: April 11, 2008

The following table is reproduced from ASCE 7-05; ASCE 7-05 is the reference standard for IBC 2006.

TABLE 12.6-1 PERMITTED ANALYTICAL PROCEDURES

Seismic Design Category	Structural Characteristics	Equivalent Lateral Force Analysis Section 12.8	Modal Response Spectrum Analysis Section 12.9	Seismic Response History Procedures Chapter 16
B, C	Occupancy Category I or II buildings of light-framed construction not exceeding 3 stories in height	P	P	P
	Other Occupancy Category I or II buildings not exceeding 2 stories in height	P	P	P
	All other structures	P	P	P
D, E, F	Occupancy Category I or II buildings of light-framed construction not exceeding 3 stories in height	P	P	P
	Other Occupancy Category I or II buildings not exceeding 2 stories in height	P	P	P
	Regular structures with $T < 3.5T_s$ and all structures of light frame construction	P	P	P
	Irregular structures with $T < 3.5T_s$ and having only horizontal irregularities Type 2, 3, 4, or 5 of Table 12.2-1 or vertical irregularities Type 4, 5a, or 5b of Table 12.3-1	P	P	P
	All other structures	NP	P	P

NOTE: P: Permitted; NP: Not Permitted

As shown on the table, the Lake Fish Hatchery structure can be analyzed by using the Equivalent Lateral Force Analysis procedure since it is a category I building of light framed construction I = story in height.

Appendix D. Research

Epoxies and Consolidants

The following two paragraphs were extracted from files published on the internet by the Nautical Archaeology Program, Conservation Research Laboratory, Texas A & M University, D. L. Hamilton. The paragraphs are intended as a general introduction to the topic and were selected because of their concise descriptions.

General

Synthetic resins are widely used by (builders, manufacturers, and) conservators. These resins are polymers constructed of single units called monomers that combine with themselves or with other similar units to form polymers. There are two types of polymers: thermoplastic resins and thermosetting resins.

Thermoplastic resins are polymers in which the single units are linked together to form two-dimensional linear chains that are soluble in selected solvents; however, some thermoplastic resins may form insoluble, infusible resins after long exposure to light or heat.

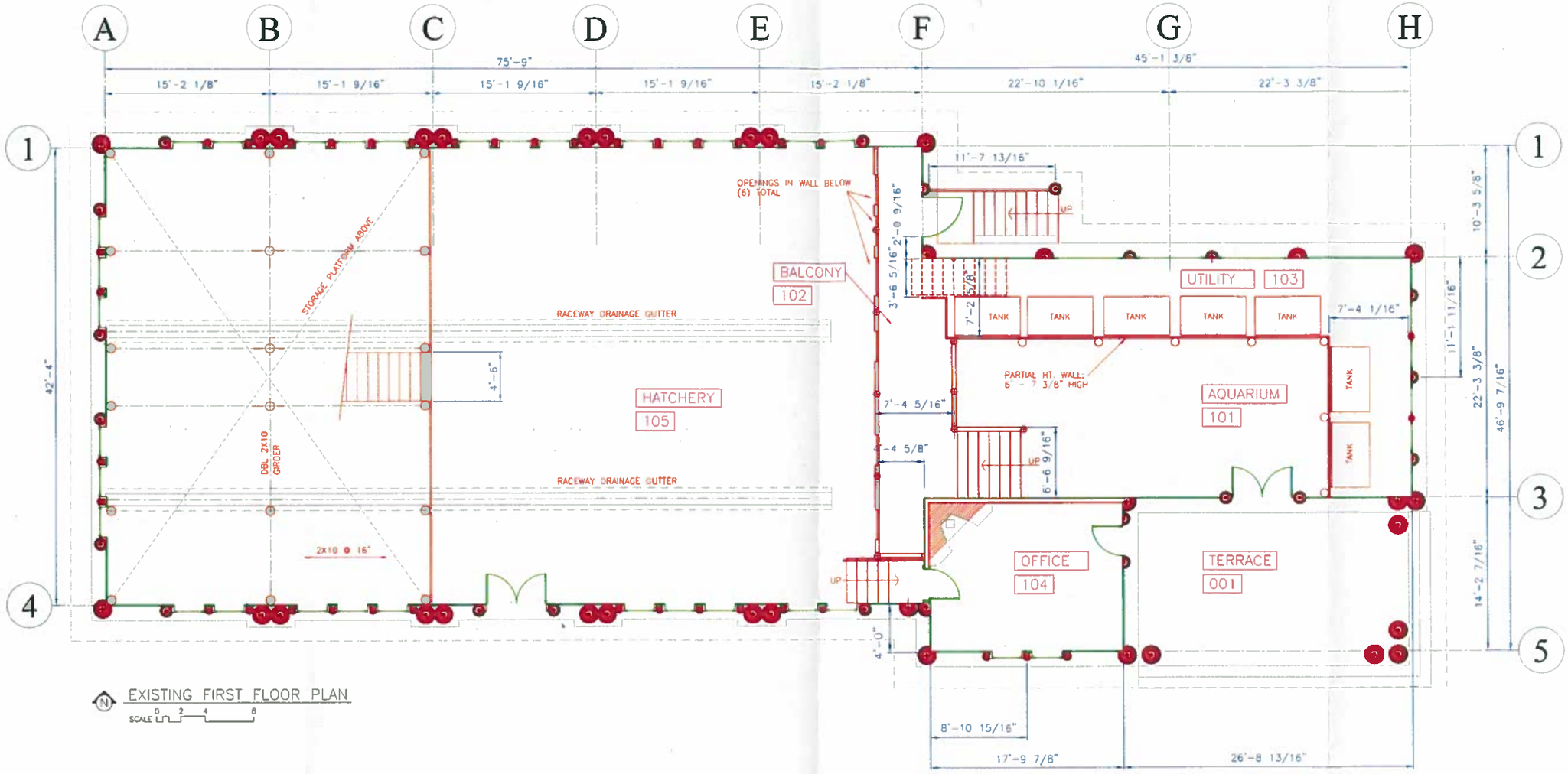
Thermosetting resins are polymers in which the single units are linked together to form three-dimensional networks that are infusible and insoluble in all solvents. Originally, thermosetting resins were hardened by the application of heat, thus the name 'thermosetting.' At present, there are many cold-setting resins, e.g., epoxy, polyurethane, and styrene that congeal at room temperature when a catalyst is added.

Epoxy Resins

There are innumerable thermosetting epoxy resins on the market with many varied properties and special characteristics. Epoxy resins make excellent adhesives, consolidants, and gap-fillers. There are cold-setting thermosetting resins that set up with the addition of a catalyst. The most desirable characteristic, aside from their strength, is that there is no shrinkage as they set. This is in contrast to all the thermoplastic resins that set through the evaporation of a solvent, thereby undergoing some degree of shrinkage. The main disadvantages of epoxies are that they are essentially irreversible and often discolor with age. They are excellent when a very strong, permanent bond is required.

Appendix E. Measured Drawings

(See pages 149-157)



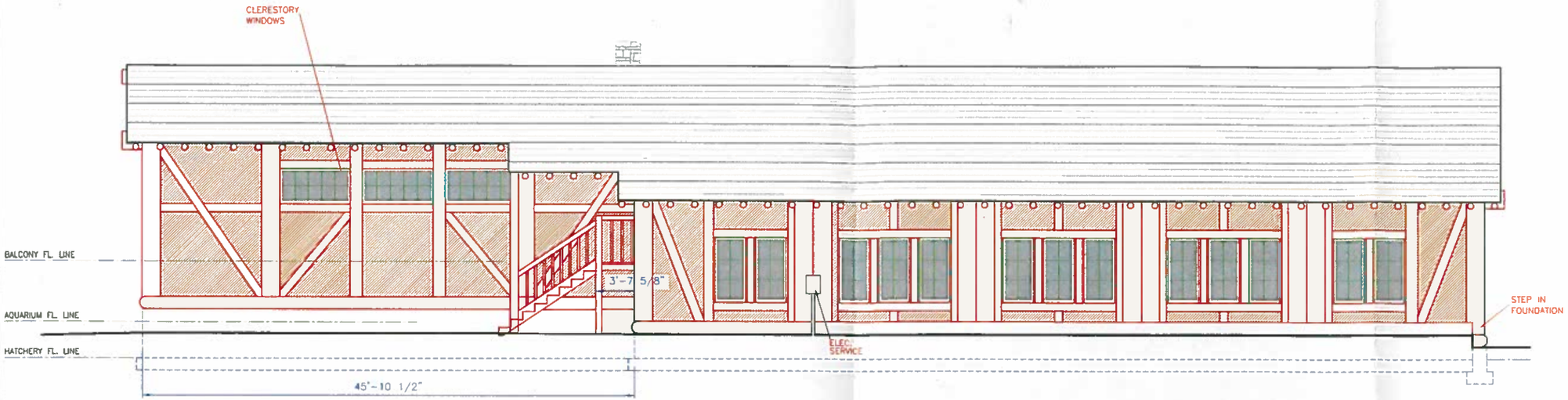
EXISTING FIRST FLOOR PLAN

SCALE 0 2 4 8

APRIL 12, 2008

FISH HATCHERY; YELLOWSTONE LAKE YELLOWSTONE NATIONAL PARK YELLOWSTONE CENTER FOR RESOURCES	Department of the Interior National Park Service Yellowstone National Park	KENNETH R. SIEVERT HISTORICAL ARCHITECT OF RECORD 1602 3RD WESTHILL DRIVE GREAT FALLS, MONTANA 59404	PROJECT NO. 1-2007-YNP XX	STATE OF MONTANA 645 Kenneth R. Sievert GREAT FALLS, MONTANA LICENSED ARCHITECT

FISH HATCHERY YELLOWSTONE LAKE



EXISTING NORTH ELEVATION

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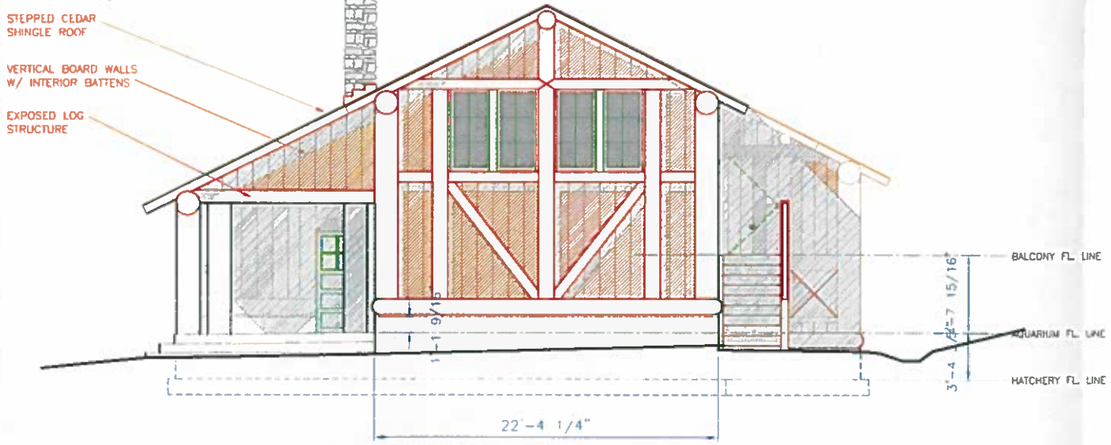


EXISTING EAST ELEVATION

SCALE 0 2 4 8

FISH HATCHERY; YELLOWSTONE LAKE

YELLOWSTONE NATIONAL PARK

YELLOWSTONE CENTER FOR RESOURCES

Department of the Interior
National Park Service
Yellowstone National Park

KENNETH R. SIEVERT
HISTORICAL ARCHITECT OF RECORD
1602 3RD WESTHILL DRIVE
GREAT FALLS, MONTANA 59404

PROJECT NO.
1-2007-YNP

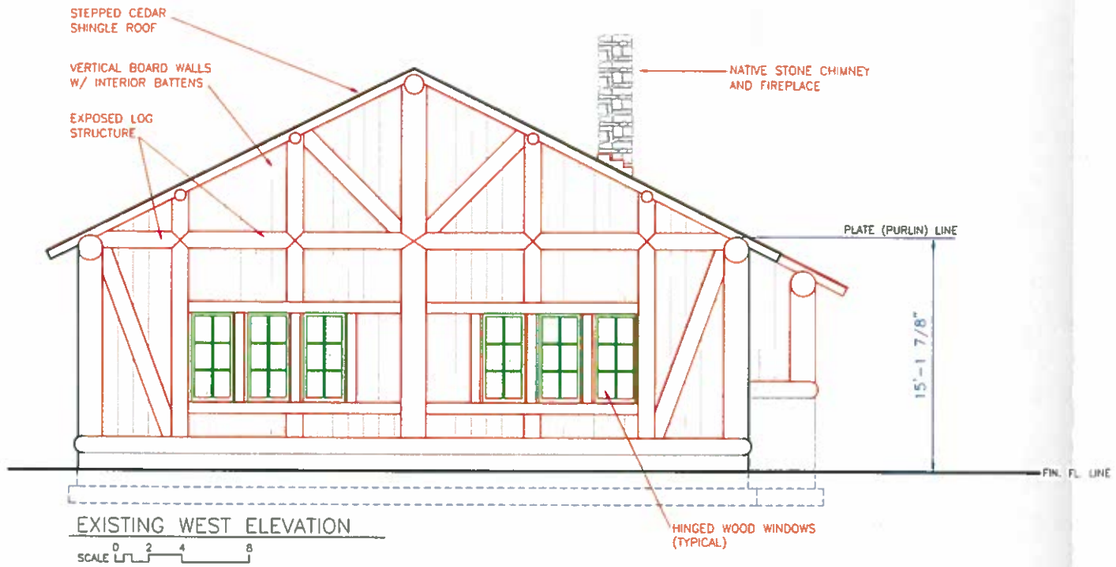
XX

APRIL 11, 2008

STATE OF MONTANA 645 Kenneth R. Sievert LICENSED ARCHITECT

ALL DIMENSIONS SHOWN ON THIS DRAWING ARE BASED ON MEASUREMENTS TRANSCRIBED FROM DRAWINGS OR TAKEN BY THE ARCHITECT. SITE MEASUREMENTS WERE LIMITED TO HAND HELD TAPES AND OTHER DEVICES. IT WAS ASSUMED THAT WALL THICKNESSES ARE CONSISTENT AND IT IS NOT KNOWN IF THE BUILDING IS SQUARE. IT IS THE RESPONSIBILITY OF ANYONE WORKING ON THE BUILDING TO VERIFY ALL OF THE DIMENSIONS SHOWN AT THE TIME MODIFICATIONS ARE MADE TO THE STRUCTURE.

FISH HATCHERY YELLOWSTONE LAKE



EXISTING WEST ELEVATION

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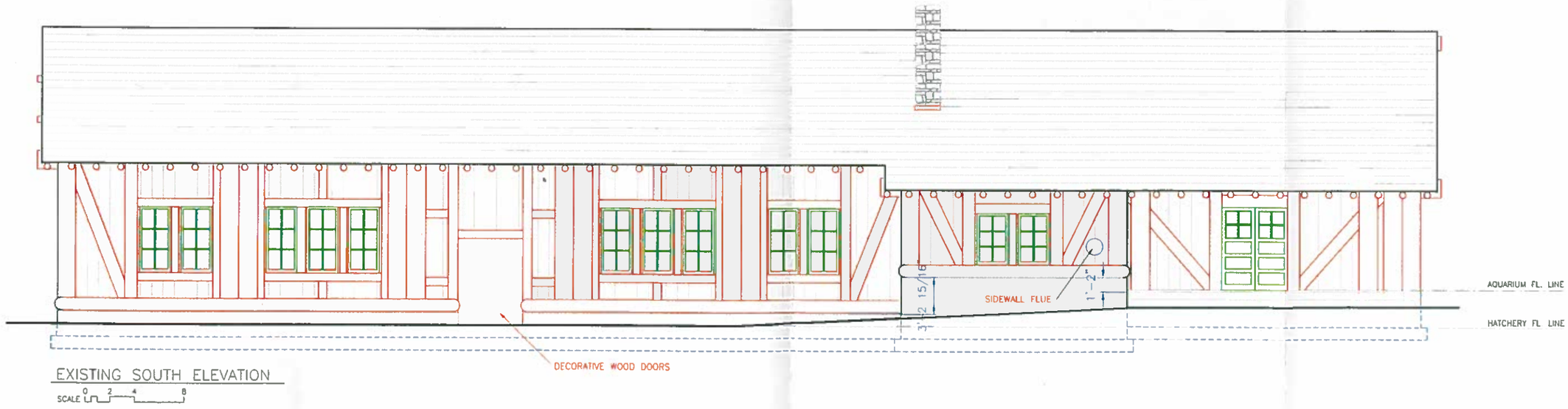


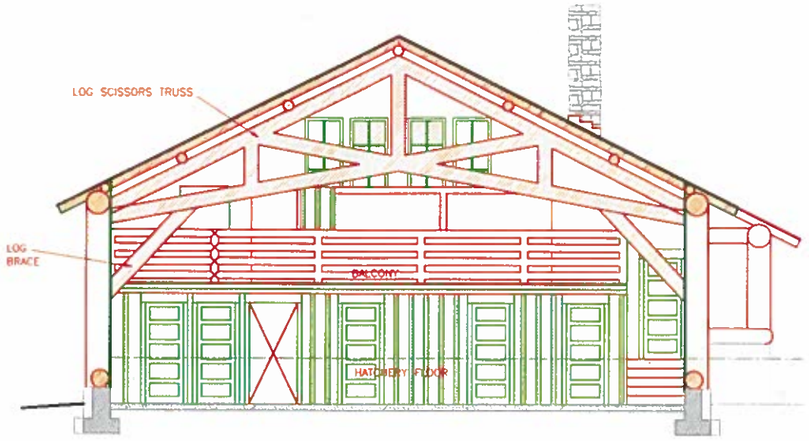
EXISTING SOUTH ELEVATION

SCALE 0 2 4 8

FISH HATCHERY; YELLOWSTONE LAKE YELLOWSTONE NATIONAL PARK YELLOWSTONE CENTER FOR RESOURCES	Department of the Interior National Park Service Yellowstone National Park	KENNETH R. SIEVERT HISTORICAL ARCHITECT OF RECORD 1602 3RD WESTHILL DRIVE GREAT FALLS, MONTANA 59404	PROJECT NO. 1-2007-YNP XX	STATE OF MONTANA 645 Kenneth R. Sievert LICENSED ARCHITECT

OCTOBER XX, 2007

FISH HATCHERY YELLOWSTONE LAKE



SECTION LOOKING EAST FROM HATCHERY FLOOR

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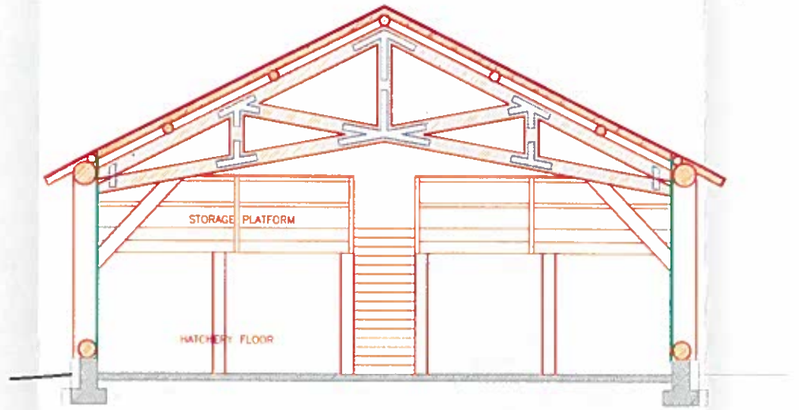
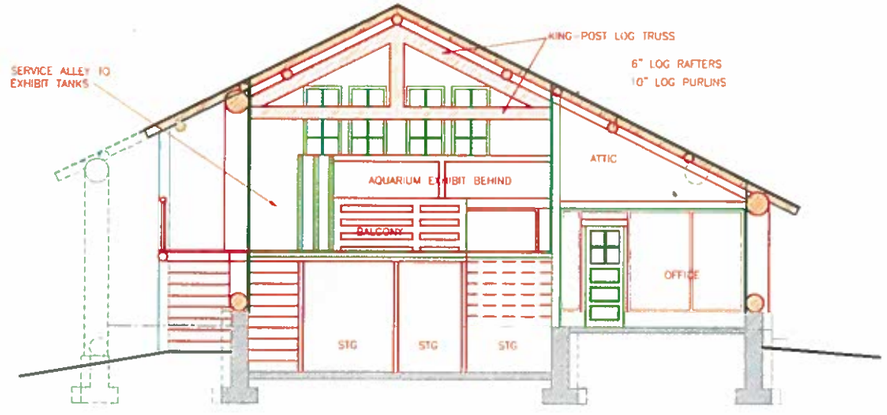


SECTION LOOKING WEST

SCALE 0 2 4 8

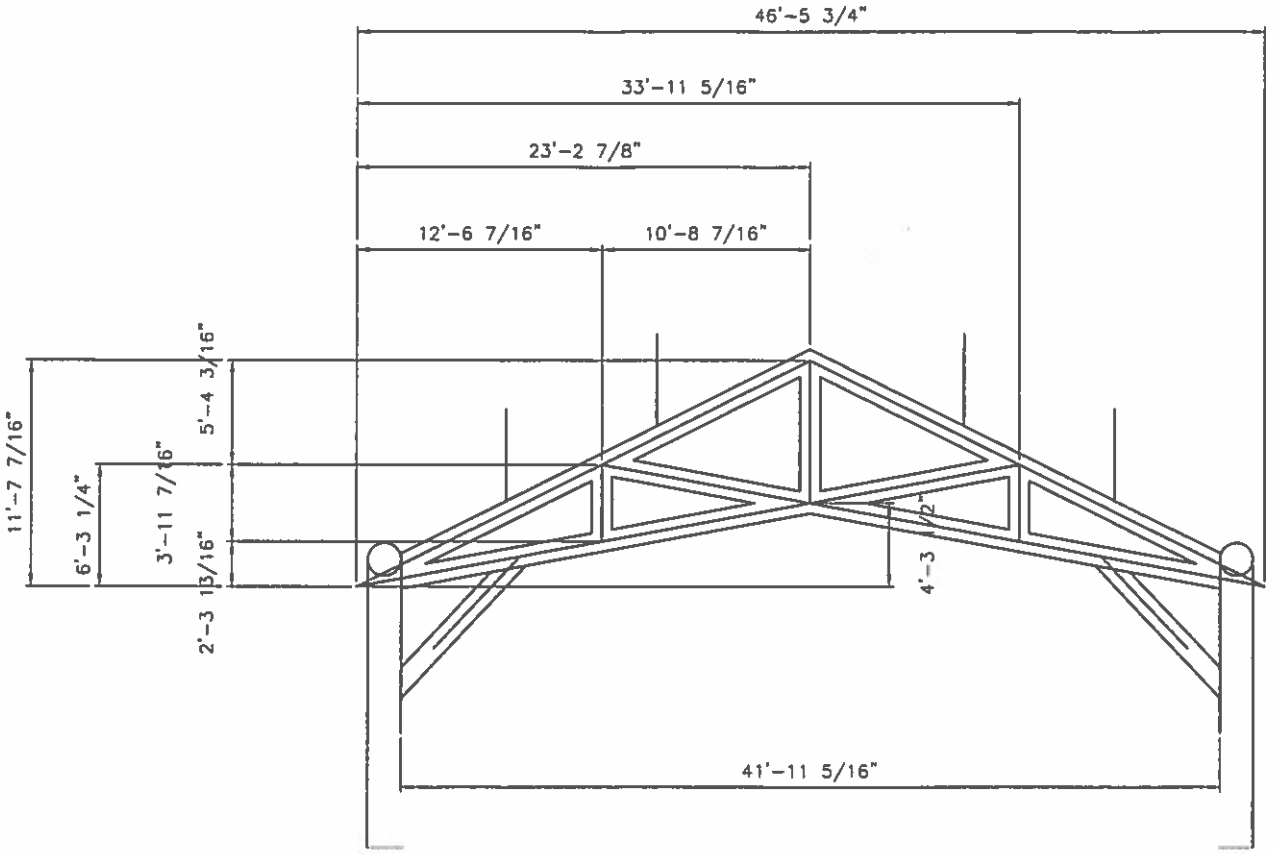


SECTION THROUGH BALCONY

SCALE 0 2 4 8

FISH HATCHERY; YELLOWSTONE LAKE YELLOWSTONE NATIONAL PARK YELLOWSTONE CENTER FOR RESOURCES	Department of the Interior National Park Service Yellowstone National Park	KENNETH R. SIEVERT HISTORICAL ARCHITECT OF RECORD 1602 3RD WESTHILL DRIVE GREAT FALLS, MONTANA 59404	PROJECT NO 1-2007-YNP XX	APRIL 11, 2008 STATE OF MONTANA 845 Kenneth R. Sievert LICENSED ARCHITECT

FISH HATCHERY YELLOWSTONE LAKE



SPACING: AS NOTED ON PLAN

FISH HATCHERY; YELLOWSTONE LAKE YELLOWSTONE NATIONAL PARK YELLOWSTONE CENTER FOR RESOURCES	Department of the Interior National Park Service Yellowstone National Park	KENNETH R. MEYER HISTORICAL ARCHITECT OF RECORD 1462 3RD WESTBELT DRIVE GREAT FALLS, MONTANA 59404	PROJECT NO. 1-2007-YNP XX	APRIL 11, 2008

Appendix F. Participants in the Preparation of This Report

This report has been prepared as part of Cooperative Agreement H1233E007 between the Montana Preservation Alliance and its related contractors; and the National Park Service, Yellowstone National Park.

The purpose of the agreement referenced above is to create Historic Structure Reports for selected historic properties as a first phase to address treatment of Historic Structures in Yellowstone National Park. The Lake Hatchery has been identified as one of those historic properties.

The primary partners in the co-operative agreement are:

National Park Service, Yellowstone National Park
Montana Preservation Alliance
Sievert & Sievert CRC—Professional consultants in the fields of Historic Architecture, Architecture, and Structural Design.

Participants in the preparation of this report, including their areas of expertise, were:

Kenneth R. Sievert, A.I.A.; A.S.C.E. (aff). Principal author; principal investigator of materials, structural assemblies, materials conservation, and building codes; project manager for S&S.
Herbert E. Dawson, YNP Historic Architect; YNP project manager—contributions throughout.
Lee H. Whittlesey, M.A., J.D., Ph.D. (hon), YNP Historian—history, chronology, and historic significance of the Hatchery.
Chere Juisto, MPA; Director and Historian—review; contributions.
NPS Maintenance Division—contributions to Ultimate Treatment of materials and assemblies.

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Keller, Guy Bruce. *Structural Snow Loads.* Colorado: Graduate School of the University of Colorado, 1985

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U.S. Architectural and Transportation Barriers Compliance Board. *Accessibility Guidelines for Buildings and Facilities; Appendix IV.* Latest Edition

Videon, F. F. & Schilke, J.P. *Snow Loads for Structural Design in Montana.* Bozeman, Montana: Department of Civil and Agricultural Engineering, 1989

Notes

Executive Summary

[1] Suzanne Lewis, Superintendent YNP, *Determination of Eligibility*, Correspondence with Claudia Nissley, Wyoming State Historic Preservation Officer. Mammoth, WY: January 18, 2005.

[2] NPS Denver Service Center, Development Concept Plan, Lake/Bridge Bay, Yellowstone National Park (Denver: U.S. Department of Interior, National Park Service, Denver Service Center), 1993, pp. 20–21.

[3] Yellowstone National Park, The State of the Park, (Mammoth Hot Springs: National Park Service) 1999, pp. 4–13.

[4] *Ibid.*, 3–32.

[5] Yellowstone National Park, Division of Interpretation, Executive Summary: Long-Range Interpretive Plan Yellowstone National Park, (Mammoth Hot Springs: National Park Service, May 2000) pp. 13, 17.

Part 1. Developmental History

[6] Suzanne Lewis, DoE correspondence to Claudia Nissley, Wyoming SHPO, YNP, Mammoth, Wyoming, January 20, 2005.

[7] Paul Schullery to Lee Whittlesey, e-mail, February 15, 2006.

[8] Edwin P. Pister, "Wilderness Fish Stocking: History and Perspective," Ecosystems (U.S. Dept. of the Interior, 2001) 4:280.

[9] "The Fish Car Era of the National Fish Hatchery System" (Washington, DC: U.S. Government Printing Office, 1979)

[10] Hugh Zackheim, History of Montana Fisheries Division (Helena, MT: Fish, Wildlife and Parks Division); William Alvord, A History of Montana's Fisheries Division from 1890–1958 (Helena, MT: Fish Wildlife & Parks Division, 1991) p. 2.

[11] www.fws.gov/dcbooth/history.htm. History of D.C. Booth National Fish Hatchery.

[12] *Ibid.*

[13] Context drawn from Lee H. Whittlesey, "Of Fairies' Wings and Fish: Fishery Operations and the Lake Fish Hatchery in Yellowstone," *Yellowstone Science* 14:2(13–19).

[14] Paul Schullery, "Their Numbers Are Perfectly Fabulous: Sport, Science, and Subsistence in Yellowstone Fishing, 1870," *Annals of Wyoming* 76:6–18. Schullery is today considered by many to be the foremost expert on the history of fishing in America.

[15] The 1871 Hayden survey is well treated and cited in Marlene Deahl Merrill, *Yellowstone and the Great West* (Lincoln: University of Nebraska Press, 1999), who also cites Hayden's 1872 and 1878 reports. Dunraven's fishing is in Windham T. Windham-Quinn, Fourth Earl of Dunraven, *The Great Divide: Travels in the Upper Yellowstone in the Summer of 1874* (London: Chatto and Windus, 1876) while Strong's is in William A. Strong *in* Richard A. Bartlett, ed., *A Trip to the Yellowstone National Park in July, August, and September, 1875* (Norman: University of Oklahoma Press, 1968). Sarah Broadbent's index to *Forest and Stream* magazine is housed at the Yellowstone National Park Research Library and her master's thesis on the subject is at both Montana State University and Yellowstone. See also John D. Varley and Paul Schullery, *Freshwater Wilderness: Yellowstone Fishes and Their World* (Yellowstone National Park: Yellowstone Library and Museum Association, 1983); Schullery, "Edward in Wonderland: Yellowstone Recollections of an Angling Great," *American Fly Fisher* 29 (Winter, 2003):2–12; Varley, "A History of Fish Stocking Activities in Yellowstone National Park Between 1881 and 1980," U.S. Fish and Wildlife Service, Information Paper No. 35, January 1, 1981, YNP Library; John Byorth, "Trout Shangri-La: Remaking the Fishing in Yellowstone National Park," *Montana The Magazine of Western History* 52 (summer, 2002):38–47; and Mary Ann Franke, "A Grand Experiment: One Hundred Years of Fisheries Management in Yellowstone," two parts, *Yellowstone Science* 4:4(2–7); 5:1(8–13).

[16] Norris's mention of his trout stocking activities as well

as his interest in stocking carp in some park waters are in P.W. Norris, *Fifth Annual Report...*, 1881, pp. 30–32.

[17] The Evermann and Jordan studies are cited in John D. Varley and Paul Schullery, *Yellowstone Fishes: Ecology, History, and Angling in the Park* (Mechanicsburg, Pa.: Stackpole Books, 1998), while the Forbes study is S.A. Forbes, "A Preliminary Report on the Acquatic Invertebrate Fauna of the Yellowstone National Park, Wyoming...," *U.S. Fish Commission, Bulletin* 11 (1893):207–258 (1891).

[18] B.B. Arnold, "A Ninety-Seven Year History of Fishery Activities in Yellowstone National Park, Wyoming," p. 10, unpublished manuscript, U.S. Department of Interior, Bureau of Sport Fisheries and Wildlife, Division of Fishery Services, March 19, 1967, YNP Library. James R. Simon stated in 1939 that from Yellowstone Lake and Yellowstone River "more clean [cutthroat trout] eggs are now taken than from all other waters in the United States combined." Simon, *Yellowstone Fishes* (Yellowstone Park: YLMA), 1939, p. 8. Currently missing from the park library and archives—and thus from this paper—are the Fishery Annual Reports, 1901–1953, which, if they could be found, would explain much history to us.

[19] The stocking of park lakes and streams with exotic fish—brown, brook, lake, and rainbow trout—had huge effects on the ecosystem, as these fish suddenly inhabited many miles of formerly fishless streams competing with the natives for food and spawning space and in some cases interbreeding with natives to dilute or destroy the native genotypes.

[20] Frank H. Tainter and Bill Tanner, "Fish Culture in Yellowstone National Park The Early Years: 1901–1930," p. 4, unpublished manuscript, 1987, YNP Library. Erwin's original suggestion for a hatchery is in James B. Erwin, *Report of the Acting Superintendent of the Yellowstone National Park to the Secretary of the Interior. 1898.* (Washington: GPO, 1898), p. 12.

[21] Varley and Schullery, *Yellowstone Fishes*, p. 94.

[22] F. Phillip Sharpe, *Yellowstone Fish and Fishing* (Yellowstone National Park: Yellowstone Library and Museum Association), 1970, p. 10.

[23] Hugh Zackheim, History of Fisheries Division, Montana Fish, Wildlife and Parks (Helena), p.1.

[24] Hugh M. Smith and William C. Kendall, *Fishes of the Yellowstone National Park*, Bureau of Fisheries Document No. 904 and Appendix III to the Report of the U.S. Commissioner of Fisheries for 1921 (Washington: GPO), 1921, p. 6. There is also a 1915 edition of this book that was less complete.

[25] Smith and Kendall gave the reasoning behind this theory in 1921, in the following paragraph: "The questions naturally arise, why not let the trout run up the creeks and spawn naturally? Why not permit the eggs to hatch in the manner intended by nature and let the young remain for awhile in the water where they were born and then run back to the lake at the proper time? These questions, which will, no doubt, be asked by many thoughtful park visitors, afford an opportunity to indicate one way in which it is possible to *improve on nature* and to point out why in the Yellowstone National Park, as elsewhere, *it is desirable or necessary for the fish-culturist to go to nature's assistance*" (p. 6, italics added).

[26] Arnold, "Ninety-Seven Year History," p. 10 refers to this site as "West Thumb Creek," possibly present-day Big Thumb Creek, but it is more likely that the stream was present Little Thumb Creek where officials built the hatchery a few years later.

[27] Back, *The Waters of Yellowstone With Rod and Fly* (New York: Lyons Press, 2000), p. 24.

[28] Arnold, "Ninety-Seven Year History," p. 10. The operation is mentioned in John Pitcher, *Report of the Acting Superintendent of the Yellowstone National Park to the Secretary of the Interior. 1901* (Washington: GPO, 1901), p. 5. See also R.J. Fromm, "An Open History of Fish and Fish Planting in Yellowstone National Park," unpublished report, 1940, YNP Research Library vertical files.

[29] Archive Document 6887, 1906, YNP Archives, says the fish hatchery building erected at West Thumb in 1903 by the Department of Commerce was a frame structure with a main portion of 20 by 28 feet and rear (hatchery) portion of 22 by 36 feet, located one and one-half miles north of the West Thumb soldier station. A map drawn by hand onto the text of this document shows the new hatchery on "Fisheries Creek," apparently present Little Thumb Creek. Also built was a barn 22 by 28 feet and an office/storage building 20 by 30 feet. Permission to construct these buildings is in documents 6888, 6889, 6890, and 7323, all 1906. Thus it appears that the hatchery was built in 1903 and additional buildings were constructed in 1906. Document 6886 is a 1906 map that shows the site, which appears to be a bit farther north than the one and one-half miles figure given in document 6887. The 1906 map shows the buildings on what appears

the hatchery proper on the north side of the building, and a staircase built under the overhang adjacent to the interpretative aquariums on the other side of the wall. Herb Dawson to Lee Whittlesey, November 1, 2007.

[41] Tainter and Tanner, "Fish Culture," p. 34, gives these sizes as 48 by 108 feet and 48 by 68 feet respectively.

[42] "Final Construction Report on Account 777...," pp. [1]-2. Inconsistently, the 1929 annual report of the Bureau of Fisheries gave the inside measurement of the building as 38 feet by 108 feet, six inches. C.F. Culler, "Annual Report Fiscal Year 1929 and Season of 1929 Yellowstone Park Station," p. 20, unpublished Bureau of Fisheries report in Box N-41, YNP Archives.

[43] *Ibid.* Similar rearing ponds were built at Mammoth Hot Springs near the present old powerhouse, but their existence was short lived. These ponds were abandoned in 1934 when they proved unsatisfactory in function. Chester Lindsley, *The Chronology of Yellowstone* (unpublished bound manuscript, YNP Library, no date), p. 306. About these rearing ponds at Lake on Hatchery Creek today, Tom Gibney of the contract company Shapins, Belt, and Collins, reported the following in 2007: "In the bed of Hatchery Creek we did indeed find remnants of the long, linear pools listed as "fish rearing ponds" on historic maps/plans. You may remember the historic photograph of one of these ponds. The three ponds were packed closely together, one following the next, beginning just upstream of the Rustic stone culvert. Today vegetation has reclaimed the site, and the stream has scoured out a lot of the structures—perhaps they were even partially demolished/filled in at some time?—but it is quite easy to tell where each pond ended and the next began. The easternmost edge/wall of each pond is evident. I'm not looking at the photo now, but I believe that a simple path/deck for tending the young fish (fry?) rested on this side of the ponds.

Nothing remains of the 'exhibit pool,' which was also long and linear, and was located near the main entrance to the fish hatchery building. The former location of this pool/pond is between the hatchery building and the modern parking lot—i.e., the lot did not extend into this area. This pond must have been filled in/demolished. Some water lines supplied water to this pond, and we did find some evidence of this old system (pipes and valves, I think). But on the surface, there is no sign of the pool itself: no depression or structures." Tom Gibney to Zehra Osman, November 8, 2007, e-mail communication.

[44] *Ibid.*

[45] This woodshed shows up in the 1941 General Development Plan for the hatchery, and shows a fairly good sized woodshed directly north of the mess hall. There was a second smaller woodshed behind the manager's residence which also shows up on the plan. A fenced compound behind the garage is also shown in this drawing. None of these secondary features survived. Herb Dawson to Lee Whittlesey, November 1, 2007.

[46] *Ibid.* Inconsistently, the 1929 annual report of the Bureau of Fisheries gave the measurement of the mess hall as 21 by 58 feet with dining room 20 by 21 feet, kitchen 12 by 21 feet, two bedrooms each 10 feet by 11 feet, one storeroom 10 by 11 feet, and bathroom 5 by 6 feet. Inconsistently, this same report gave the measurement of the "dormitory" as 24 by 83 feet, containing a recreation room 15 by 24 feet, sixteen individual rooms of 8 by 10 feet, with a four-foot hall running through the center of the building. C.F. Culler, "Annual Report Fiscal Year 1929 and Season of 1929 Yellowstone Park Station," p. 20, unpublished Bureau of Fisheries report in Box N-41, YNP Archives.

[47] Daum, "Report on the Construction," [1929], p. 3; "Final Construction Report on Account 777...," p. 4.

[48] Paul Brown to Fred Foster, January 17, 1940, in box D-157, file "620-30 Fish Hatchery Part 2, January 1, 1940 to December 31, 1943," YNP Archives. As for the color, there is a reference in the LCS data sheets about NPS officials "suggesting" that buildings be painted gray-green, and there are still isolated NPS buildings in Yellowstone that remain that color, the majority existing in middle Mammoth (hotel) cottages built in the same (late 1930s) time period. The only other green color discovered so far is a dark green that was used on the doors, windows and roof of some park buildings. Paint samples so far show no trace of this color ever being applied to any of the hatchery buildings. It is possible that the Bureau of Fisheries ignored the order. This may have been part of the beginning of a rift between the two agencies. Herb Dawson to Lee Whittlesey, November 1, 2007.

[49] Daum, "Report on the Construction," [1929], p. 3. For mention of the 1912 "U.S. Boat House," see hand drawn map, August 17, 1912, in Item 45, file 50, YNP Archives. According to YNP Historic Architect Herb Dawson, the "E-TIC plans for the new boathouse, Building No. HS-0730, indicate that it was designed by NPS for the Bureau of Fisheries and probably constructed with Public Works Administration financing,

to be present Little Thumb Creek. Document 5924 describes work done on the West Thumb hatchery in 1906.

[30] As quoted in Fromm, "An Open History," 1940, p. 14.

[31] Arnold, "Ninety-Seven Year History," p. 11.

[32] Smith and Kendall stated that "in 1921, a permanent hatchery was erected on Soda Butte Creek, which had been the site of a field hatchery for a number of years." That same year, officials established a "small hatchery" at Fish [Trout] Lake. Smith and Kendall, *Fishes*, 1921, pp. 5–6, 10. As for Grebe Lake, Lisa Ainley-Conley, of the Intermountain Region LCS Team, has located a "Form 10-768, Individual Building Report," dated November 20, 1959, that inventories the Grebe Lake Hatchery, Building #952, with a description saying that it was built in 1941, owned by NPS, constructed by FWS, for $3,000 square footage of 400 sq.ft. with board-sided, wood-framed walls and wood shingle roof. Remarks on the inventory report show that the structure was transferred from FWS to NPS on May 22, 1959. A second "Individual Building Data" report dated June 31, 1963, and approved by C.K. Townsend shows the building as being unused at that time, but structurally in good condition. An oral history provided by Mary Meagher, former park biologist, on a trip to Grebe Lake in the 1970s found no trace of the building, only wood-slatted water pipes. Herb Dawson to Lee Whittlesey, November 1, 2007.

[33] W.T. Thompson to Commissioner of Fisheries, June 25, 1912, in Item 45, file 50 (letterbox 23), YNP Archives.

[34] Benjamin S. Cable to Secretary of Interior, July 10, 1912, in Item 45, file 50 (letterbox 23), YNP Archives. See also C.A. Thompson to Lloyd Brett, July 12, 1912, in same file.

[35] He refers to the U.S. Bureau of Fisheries boathouse, a log building visible in the 1928 photo.

[36] W.T. Thompson to Lloyd Brett, August 5, 1912, and hand drawn map, both in Item 45, file 50 (letterbox 23), YNP Archives. See also Arnold, "Ninety-Seven Year History," p. 11, and YNP museum collection photos 6858 and 6859.

[37] Tainter and Tanner, "Fish Culture," pp. 21, 30–31; Arnold, "Completion dates and improvement of buildings used for fish culture and management during 1901–1951," in "Ninety-Seven Year History," p. 22. The superintendent's annual report for 1913 elaborated as follows: "A hatchery building 34 by 60 feet was constructed of hewed logs, shingled over to present an attractive appearance, on the site near the outlet of Yellowstone Lake selected and approved by the department [of Interior and Commerce] last year. This building is furnished with modern equipment. The loft was finished and used during the past season as quarters for the employees and will be available for storage use after other contemplated buildings are constructed. This building furnishes room for apparatus with a capacity for eyeing 30,000,000 [fish] eggs. A small dam was built across the [Hatchery] creek about 400 feet upstream from it; and water supply for the work is drawn from this pond through a 12-inch wooden stave pipe." Lloyd Brett, *Report of the Acting Superintendent of the Yellowstone National Park to the Secretary of the Interior. 1913* (Washington: GPO, 1913), p. 9.

[38] *Ibid.*, 31.

[39] Lloyd Brett, *Report of the Acting Superintendent of the Yellowstone National Park to the Secretary of the Interior. 1914* (Washington: GPO, 1914), p. 13.

[40] National Park Service, "Final Construction Report on Account 777, Donation in the Amount of $15,000 for Construction in Connection with Furthering Fish Propagation at Lake Yellowstone in Yellowstone National Park. Appropriation 4 X 470 National Park Service, Donations," p. [1], unpublished manuscript with photographs, 1928–1930, Box N-40, in file of same name as this document, YNP Archives. See also M.F. Daum, "Report on the Construction of the Lake and Mammoth Fish Hatchery Season of 1929," file number 164, [1929], YNP Library vertical files. The original hatchery drawings were designed by the National Park Service Landscape Engineering Department/ Dept. of Landscape Architecture, and recommended by Thomas C. Vint, then Landscape Engineer on August 10, 1927, concurred with by Horace Albright, then Superintendent of Yellowstone National Park, August 15, 1927, and approved by Stephen T. Mather, first Director of the NPS on August 20, 1927. This information comes from three sheets of drawings showing the original proposed hatchery design, from YEL 815 found on the NPS Electronic Technical Information Center site. The drawings closely resemble the building that was built, although there are two sets of stairs coming into the corner entry foyer, instead of one, and the foundation height indicates a design for a building built either deeper into the slope of the hillside behind the hatchery or farther up the hillside. The hillside may have been realigned to reduce the amount of concrete rear wall needed. What also does not show up on these plans is the rear entrance door into

which was being used during the 1930s to construct operational structures, residential structures, and utility systems in an attempt to modernize and provide more sanitary conditions to the park (i.e,. to remedy the dumping of raw sewage into Hotel Creek from Lake Hotel). This structure was misidentified as a contributing property to the Lake Historic District in NPS Determinations of Eligibility dated 1984 and 1994. The other boathouse, HS-4314, was correctly identified as the Yellowstone Park Company (concessioner) boathouse and was marked on the site plans as the "YPB Co. Boathouse." Interestingly, the 1941 development plan shows a planned addition to the west end of the Bureau of Fisheries Boathouse, which was never constructed but which would have almost doubled the size of the boathouse. The plan does not show any boat launching ramps directly in front of the building, but does show docks and a ramp directly across from the hatchery, traces of the ramp, and the drive down to it, all of which still exist. Plans for the Fisheries boathouse include files 101-5564, 101-2080, and 101-2080A, all located on the NPS Electronic Technology Information Center, Denver Service Center, website. Herb Dawson to Lee Whittlesey, November 1, 2007.

[50] History Card File, "Lake—Boathouse," YNP Library. These white, typed cards with orange separators are marked "History Cards" and are located in the wooden file cabinet next to the librarians' "Workroom," Yellowstone Heritage and Research Center, Gardiner, Montana.

[51] Tainter and Tanner, "Fish Culture," p. 40. Historical Architect Herb Dawson believes that this is the still-existing Yellowstone Park Boat Company boathouse, HS 4314, because the date sounds right as does the description of the building: a quasi-rustic architecture that included fake rafter tails and flying purlins added to what was essentially a pole barn. Dawson to Lee Whittlesey, November 1, 2007.

[52] Back, *Waters of Yellowstone*, 2000, pp. 24–25.

[53] Fromm, "An Open History," 1940, p. 28.

[54] Sharpe, *Yellowstone Fish and Fishing*, 1970, pp. 11–12; Mary Ann Franke, "A Grand Experiment: the Tide Turns in the 1950s: Part II," *Yellowstone Science* 5#1 (Winter, 1997): 8. Adds Franke, "Although some fry were returned to the lake, the eggs were scrambled, mixing together distinctive genotypes. In addition, the reduced escape of spawners had combined with fishing pressure to cause the virtual collapse of spawning migrations in some [tributary] streams." See also O.B. Cope, "The Yellowstone Fishery Investigations from Their Inception to the Present," unpublished paper, U.S. Fish and Wildlife Service, no date (1952), YNP Archives.

[55] Franke, "A Grand Experiment," pt. II, pp. 1,8. The Annual Project Technical Reports, produced by the U.S. Fish and Wildlife Bureau of Sport Fisheries from 1962 through at least 1992, have added thousands of pages to our knowledge of Yellowstone National Park streams, lakes, and rivers. Apparently never occurring was a remodeling of the Hatchery into office space. A set of drawings of proposed remodeling of the Lake Fish Hatchery, YELL 101-2142, into office space was found on E-TIC. Completed in 1963, these plans were recommended by Sandford Heis, Chief of the (NPS) Western Office of Design and Construction on September 27, 1963 and by Curtis E. Richey, USPHS, on the same date. Presumably this remodeling would have served as office space for the forerunner of the modern U.S. Fish and Wildlife Service. Herb Dawson to Lee Whittlesey, November 1, 2007.

Part 2. Treatment and Use

[56] Yellowstone National Park, Division of Interpretation, Executive Summary: Long-Range Interpretive Plan Yellowstone National Park, (Mammoth Hot Springs: National Park Service, May 2000) pp. 13, 17.