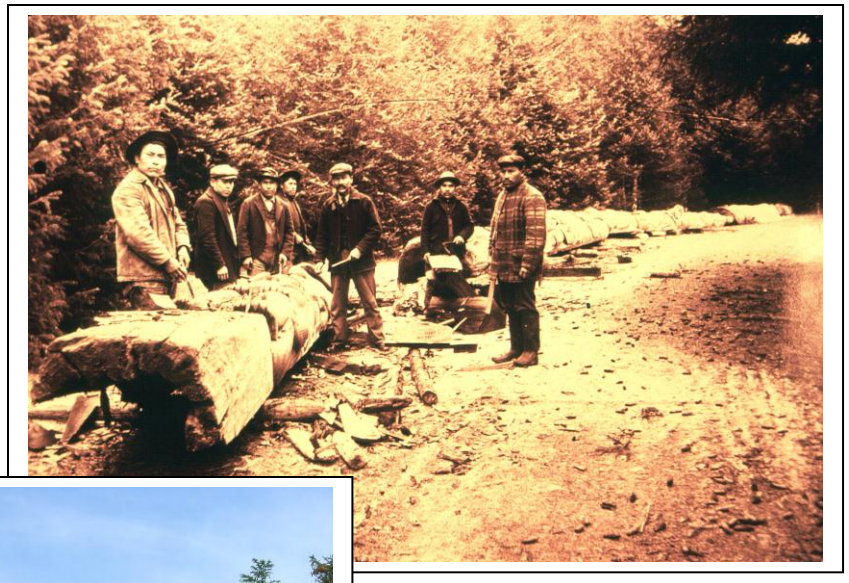
A History of Totem Preservation
Sitka National Historical Park



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Introduction

Sitka National Historic Park is located in the northern portion of the region where totem poles were traditionally erected. The region, roughly 1000 miles long and 100 miles wide, lies along the Northwest coast of North America. The northern portion, located in what is now Southeast Alaska, is the ancestral home to the Haida and Tlingit tribes. Here in the resource rich, temperate rain forest a complex material culture evolved marked by a unique artistic style.

Few objects, whether made from wood, bone, shell or fabric, were left unembellished with carved, woven, or painted design governed by subtle rules of line and form. Totems, monumental wood carvings are among the most impressive objects created by native tribes of the region. Strictly speaking the term refers to carved poles erected outdoors. In this report the term also includes carved columns, commonly referred to as house posts that served to support the main beams in clan houses.

The erection of totems was often associated with potlatches, ceremonial gatherings where material goods are given away to guests, garnering status for the host who commissioned the carving. Traditionally no particular effort was made to preserve or repair the poles once erected. Carvers did, however, employ techniques that tended to extend the life of poles. In most cases they worked with western red cedar, and occasionally with yellow cedar, both decay resistant species.

The golden age of totem carving is short, generally considered to be between 1830 and 1880. By the latter part of the 19th Century, disease had decimated the population of most native communities. This, together with heavy handed governmental and church efforts to westernize the native population, resulted in the loss of many aspects of traditional culture. Somewhat ironically, as the native material culture declined, totems began to capture the imagination of the American public and came to symbolize the romantic idea of the North. Various expeditions were made to the Northwest coast around the turn of the century to collect poles along with other native artifacts for exhibition in museums as well as private venues.

One such expedition was carried out in 1902 under the direction of Alaska territorial governor John G. Brady. Initially arriving in Southeast Alaska as a Presbyterian missionary, Brady developed a real appreciation for Tlingit and Haida culture and established cordial relationships with many in the Native community. Appointed Territorial Governor in 1897, he worked both to improve the conditions in native villages and to attract new settlers to the sparsely populated area. Brady saw an opportunity to publicize the potential of this little known region by creating Alaska exhibits at world's fairs including both the Louisiana Purchase Exposition in Saint Louis in 1904 and the Lewis and Clark Exposition in Portland in 1905.

Although Brady planned to display a diverse array of artifacts and natural wonders from this vast territory, he felt that totem poles, in particular, had the potential to attract a great deal of attention at the fairs. Having a number of friends among the natives of Southeast Alaska, he hoped to be able to elicit donations of poles.

Brady's initial success came in 1901 when Saanaheit, chief of the Haida village of Kasaan, offered a gift consisting of a pole, four house posts and a canoe. Saanaheit donated these items under the condition that "*these are to be transported to the government park at Sitka and to be erected and remain there as memorials to my people*." He noted that the pole had been erected by his uncle in the village of Kasaan seventy years earlier. Brady shipped the donated objects to Sitka, the territorial capital, where they were displayed along the Old Russian Walk on land set aside as a government reserve in 1890. This reserve would eventually become Sitka National Historic Park.

Governor Brady's son Hugh recalled that the pole was in poor condition at the time it was collected and that the lower section had to be sawn off because it was in such deteriorated condition. In a letter dated September 26, 1967 he noted that, "Such preservatives as were then known were applied prior to repairing figures and repainting". The work was done at the saw mill run by the Brady family.

Later in the year, Brady traveled to both Haida and Tlingit villages along the coast of Prince of Wales Island in an attempt to secure promises for additional pole donations. A number of the natives responded positively and in a letter to the Assistant Secretary of the Interior, Brady explained that he had informed the potential donors "*that we would take good care of them and preserve the history of each one"*. (Andrew Patrick #23)

Promises in hand, Brady departed on the revenue cutter *Rush* to gather the poles. He stopped at the Tlingit villages of Shakan, Klawok, and Tuxekan where he collected the Cormorant Memorial pole, Gaanaxadi/Raven Crest pole, the Raven Memorial pole and the Raven Head Down pole. All but the latter were eventually erected at Sitka.

The Raven/Shark pole was collected at a site about six miles from Klawok. The Rush also stopped at Howkan where the Wolf pole was brought aboard. At Klinkwan, the Raven/Frog pole was picked up. Within a few days this load of totems from the Rush was transferred to a larger vessel that transported them to Seattle.

Continuing on to the village of Sukkwan, the Rush took on three more donated poles, the Mosquito Legend, Lakich'inei and Trader Legend. The last stop in the pole collecting odyssey was at Old Kasaan where the Yaadaas Crest and two Yaadaas corner poles were brought on board. The cutter then sailed to

Ketchikan where Brady arranged for another ship to transport the poles to Seattle. Additional artifacts that found their way into the world's fair exhibits were later collected in the village of Tongass.

The Alaska exhibit at the fair was ultimately comprised of fourteen poles along with artifacts collected from other native groups. Brady was determined to use native workers to paint and erect the poles as he thought they would be less expensive than local labor and would take more care in handling the poles. Photographs taken of the poles erected on the fair grounds show them freshly painted. The images indicate that the extent of the painting and the overall use of white paint as a background substantially altered the original appearance of the poles.

Although a few of the more decayed poles were sold in Saint Louis for fear they would not be able to withstand the rigors of return shipment, the majority were transported to Portland for the Lewis and Clark Exposition. After the close of that exposition the poles were returned to Sitka, arriving in January 1906. Brady along with Elbridge Merrill, a local photographer, laid out the plan for the re-erection of the poles along the Russian Walk, attempting to create a scenic landscape that would dramatically display the monumental carvings.

Brady enlisted Merrill's help in repairing the poles prior to their erection; so beginning the century long saga of preservation of the Sitka pole collection. This report will discuss the physical nature of totem poles, the agents that tend to deteriorate them, the changing attitudes towards preservation in the native community, as well as the methods and materials used in the various campaigns to restore and preserve the Sitka poles.

Chapter 1

Northwest Coast Totems:
Nature of Wood and Decorative Paint

Western Red Cedar

Most of the poles collected by Brady and erected along the Russian Walk were carved from Thuja plicata, commonly known as western red cedar. A few poles with relatively slender shafts collected from the Tlingit village of Tuxekan were carved from yellow cedar.

Western red cedar has a number of characteristics that make it a good choice for monumental outdoor sculpture including resistance to weathering and potential to grow to a large size. It is valued as carving wood due to its characteristic straight grain, uniform texture and relative softness. Typically mature trees have few branches in the lower portion of the trunk that might hinder carving.

Cedar's resistance to weathering is due principally to the presence of chemical compounds called extractives in the heartwood that help deter fungal and insect attack. The two components of the red cedar heartwood extractives primarily responsible for its decay resistance are thujaplicans and water soluble phenolics. In log form, after the tree is cut down, this resistance has been shown to lessen over time in an outdoor environment due to the tendency of the phenolics to leach out when in contact with water.

The ability of the living tree to produce extractives increases with age, making the later formed heartwood more resistant than early heartwood located at the center of the log. Partly because of this characteristic, decay of western red cedar often progresses from the inside out, a condition commonly known as heart-rot. Totems with heart rot may have a sound exterior surface but contain large internal decay pockets. In some cases this decay extends for a substantial distance up the log and can so weaken the pole that it becomes vulnerable to collapse.

Old trees grown in virgin forests have a higher concentration of extractives in the heartwood and thus a greater degree of decay resistance than second growth trees that have a lower natural decay resistance. (Gonzalez, 1997) As we will see, this characteristic has affected the longevity of both reproduction and original poles carved from logs taken from second growth trees.

Sapwood, comprised of newly formed tissue along the perimeter of the trunk, does not contain extractives and is therefore much more susceptible to decay. It has higher moisture content than heartwood and, in drying, exhibits considerably more checking. Sapwood is typically about one inch thick in mature western red cedar trees. Its light cream color easily distinguishes it from the red-brown

heartwood. To forestall deterioration, traditional carvers removed all the sapwood from the log before carving the pole features.

Wood expands and contracts in response to changes in atmospheric moisture. This expansion and contraction is anisotropic, meaning it is not uniform in all planes. It moves relatively little along the grain, from one end of the log to the other. There is considerably greater movement across the grain, in the plane that is tangential to the growth rings. Movement is somewhat less in the radial plane that extends from the center of the log out to the bark edge. Due to the anisotropic nature of wood and the resulting stresses, recently cut logs tend to split as they dry and water is lost from the cell walls. These splits can sometimes be quite wide and extend all the way from the center of the log to the outer edge.

Like all wood species, western red cedar is stressed during the drying process and responds dimensionally to changes in moisture content; however it is dimensionally stable in comparison to most other species found in the region. Native carvers, possessing an empirical knowledge of wood, no doubt knew of this and other characteristics of western red cedar. In selecting an appropriate cedar log for totem carving they looked for straight grain, tight growth rings and an absence of defects.

Traditional techniques employed to extend the life of carved poles

In addition to carefully choosing quality logs, native carvers employed techniques that tended to prolong the life of the poles. As mentioned, because sapwood does not have the extractives found in heartwood and is thus subject to rapid decay, it was removed from the log before carving was begun.

Another common but not universal practice that tended to prolong the life of totems is the hollowing out of the rear of the log, leaving it in a shape approximating a U. This practice, used primarily on large diameter poles, tended to limit the extent of radial splitting by lessening drying tensions. It also removed early formed heart wood that possessed a lesser quantity of decay resistant extractives. Additionally hollowing of the rear surface made the poles significantly lighter and thus easier to maneuver and erect.

In most instances deep cuts into the totem log that exposed end-grain surface were angled so as to shed water and lessen the likelihood of decay.

There is some evidence on older poles that surfaces that were to be buried were charred prior to erection to forestall fungal decay.

Traditional Paint Decoration

When the carving of a totem was completed paint was applied to selected areas. The location of the painting and the color pallet used depended on the traditions of the particular tribe. In most instances paint was applied only to highlight select areas. Traditionally it was used for decorative effect rather than preservation. Marius Barbeau, a noted Canadian totem expert wrote, "*The restorers as a rule forget that ……the totems were carvings not paintings. Paint was used on house fronts, and very sparingly on some, not all, totem and house poles*". (Barbeau Marius Totem Poles National Museum of Canada Bulletin 119, Anthro. Series No. 30 p. 853.)

There are varying accounts relating to the sources of binders and pigments traditionally used on totems. The type of pigment and binder varied through time and geographically. Many accounts indicate that western paints were readily adopted due to their relative ease in formulation and application.

Both oral history and modern scientific tests on paint samples from wooden artifacts from the Northwest Coast suggest that salmon eggs were the most commonly used paint binder. (Williams, S.1980) The paints were made by grinding mineral pigments and mixing them with a binder. In some instances organic materials were used as pigments. Paint from outdoor totems erected during the early and mid-19th century is seldom found since the binders do not hold up well to the weather

Some sources indicate that green and red paints were created by grinding small stones of those colors with salmon eggs and cedar bark. Another means of producing a green color was by having copper, which was available to Northwest coast native groups prior to European contact, corrode in urine. Yellow was produced by boiling a particular variety of moss in water and black was produced by boiling hemlock bark in water. Pigments obtained from minerals were for the most part more permanent.

Peter C. Nielson of Sitka (oral interview) provides somewhat different sources for native paints. His information came from Jim Jacobs who provided the information to Nielson in 1926. Jacobs had overseen the carving and painting of the Wolf Totem which is now exhibited in the Sitka NHP visitor center. Pigment sources as recalled by Jacobs were as follows: black from powder scraped from carbon black stone, red from an iron ore, white from gypsum and blue/green from copper sulphate dug from a natural copper mine. To make the adhesive or paint binder dried trout eggs were chewed along with pitchy spruce root. The saliva-trout egg mixture was saved and then blended with the coloring agents to create the paint used to decorate the Wolf Totem.

Chapter 2

Northwest Coast Totems:
The Nature of Totem Pole Deterioration

Poles displayed outdoors in the totem region are subject to a number of agents of deterioration. Foremost among them is fungal decay. Also common are insect infestation, wind damage, and vegetative growth. In some locations, visible and ultra violet light also contributes to deterioration. The following discussion details the mechanisms of these agents of decay.

Fungal Decay

Fungi are simple thread-like plants that deteriorate wood by breaking it down with enzyme action and then consuming some or all the fiber. If left unchecked, fungal decay can result in the loss of substantial structural strength.

Decay fungi require moisture, oxygen, and a suitable temperature range. The optimum temperature for fungal activity is generally thought to be between 75 and 90 degrees; however, growth can take place between 40 and 105 degrees. Fungal decay proceeds most rapidly when the moisture content of wood is at or just above the fiber saturation point; a condition in which the cell walls of the wood are fully saturated but the cell cavities are empty. The abundant rainfall and moderate summer temperature of Southeast Alaska create an environment where fungi thrive.

There are a large number of species of fungi. The species are commonly grouped according to the type of damage they do to the wood constituents. Brown rot fungi, the type that most commonly attacks totem logs, primarily consumes cellulose. This group of fungi gets its name from the fact that it leaves the wood with a brownish appearance. Wood deteriorated by brown rot typically has a shrunken surface area and cross grain checking that is sometime confused with charred surfaces. White rot fungi also occasionally attack cedar totem logs. These fungi consume both cellulose and lignin. The deteriorated wood is characterized by yellowish white color. Wood affected by white rot fungi is very light in weight. Unlike brown rot affected wood, it does not shrink excessively in volume. Total loss of strength does not occur until the wood has been infected for some time.

Decay is typically most extensive at the base of standing poles and on end-grain surfaces. Deterioration at the base is often exacerbated by the presence of vegetation that increases moisture on the surface of the pole. In some instances, plant roots physically and chemically break down the wood fiber and accelerate fungal decay. If the deterioration is allowed to progress at the base, the entire totem becomes unstable with collapse under storm conditions a real possibility.

End grain surfaces, particularly on upper portions of the pole, are vulnerable because water is easily absorbed through the open cell walls and lumens. It is estimated that end grain surfaces absorb water at ten times the rate of tangential or radial surfaces. Deeply carved totems expose additional end grain surfaces making them more susceptible to fungal decay. The heartwood exposed by deep carving is typically closer to the center or pith of the tree and thus has less concentration of the decay resistant extractives.

Another factor that promotes fungal deterioration on horizontal end-grain surfaces is the accumulation of organic debris which tends to hold moisture in contact with the pole surface. Once fungal decay is established on these surfaces, higher plants will often colonize the area, promoting further deterioration.

As mentioned fungal decay can also take place internally, resulting in voids within the pole not visible from the exterior. Often times these areas of rot are wetted by rain water that seeps down from deteriorated end-grain surfaces above. Fungal decay pockets tend to become established in naturally weakened areas of the log such as at wind checks or at the junction of limbs.

Fungal decay of wood will not occur if any of the any of the required environmental conditions including moisture content, temperature, and oxygen level are not present. As an example, the lower portion of the buried end of poles is often found to be in reasonably good condition because the level of oxygen in the immediate environment is below the level required to sustain fungal growth.

Sunlight

Totems erected in locations exposed directly to the light and heat of the sun will typically tend to check and split more that poles erected in deep shade. This is most likely due to the fact that they undergo more frequent and rapid wetting and drying cycles that result in greater expansion and contraction of the wood fiber. Light, particularly the Ultra Violet component, also tends to deteriorate surface wood tissue. Poles in exposed locations typically have less fungal deterioration due to increased air circulation and lower moisture content.

Vegetative Growth on Poles

Vegetative growth on the surface of poles generally occurs after the wood is deteriorated by fungal decay. Once the growth begins, the decay process accelerates. Plant roots tend to break down wood fiber physically while acids secreted by the vegetation tend to chemically attack the wood tissue. Large roots can physically split otherwise sound wood through wedging action. Lichens, ferns, mosses and sprouts of both deciduous and coniferous trees have all been observed growing on carved cedar poles

Insect Damage
Damage caused by insects is most often found in conjunction with fungal activity on poles. Carpenter ants, a large variety of ant about 3/8”-1/2” long, are the primary insect pest. These ants do not consume wood but rather hollow out galleries in which they lay their eggs. For the eggs and young larva to survive the main nest locations need to be located in permanently moist wood. However older larva can survive in drier wood so galleries are sometimes found in areas of the pole that are relatively sound. Smaller ants that are thought to break down the frass of carpenter ants are also occasionally seen on damp surfaces of deteriorated poles.

Wood boring beetle damage including surface exit holes and subsurface tunnels is also occasionally observed. Some beetle species cause damage when the tree is still standing, while other species attack only downed wood. In the southernmost portion of Southeast Alaska damage typical of termites has been noted on totems. Termite channels are distinguished from wood boring beetle damage in the fact that they extend along the growth rings where the softer spring wood is consumed. The termites responsible for this damage probably belong to the Pacific Dampwood species: a large variety of termite that typically attacks wood already highly deteriorated by fungi.

Other Animal Pests
Occasional damage results from rodents nesting within totem logs. Typically rodents will create nests within existing voids or decay pockets and in so doing will enlarge interior chambers through gnawing. When wetted, their organic nesting material promotes fungal decay in adjacent wood.

Woodpecker damage is sometimes seen on the exterior surface of poles. The deeper holes are generally made by the birds when in search of insects; more shallow holes are made by larger woodpeckers drumming on the surface to announce their territory. Occasionally tapered holes, about 2” in diameter, are seen on the surface of poles. These are probably caused by woodpeckers attempting to make nesting holes.

Deterioration Attributable to Inappropriate Application of Modern Paints
Overall applications of paint have been made to totems in restoration campaigns in the mistaken belief that it will prevent the infiltration of rainwater and forestall deterioration. This practice not only distorts the aesthetics of the pole but, under some circumstances, can accelerate fungal decay.

The bond between newly applied paint and wood on outdoor poles is seldom sound because the damp surfaces usually found on totems in Southeast Alaska

do not accept paint well. While un-weathered, dry Western red cedar does bond well with paint; weathered cedar surfaces provide a poor substrate. Once the interface fails the paint tends to blister, flake, and peel.

Paint applied to even moderately deteriorated end-grain surfaces will not prevent rain water from entering the wood and paint on longitudinal surfaces will slow the exit and evaporation of water that enters through the end-grain. This internal vapor pressure often causes paint to fail in a relatively short period of time. Modern acrylic and latex paints typically perform poorly because they do not penetrate into the wood fiber and instead form a surface film that hinders moisture migration out of the poles. Another consequence of the application of paint to weathered outdoor poles is that can temporarily masks the extent of fungal and insect deterioration occurring beneath.

Chapter 3

An Overview of Pole Preservation Efforts

Evolving Native Attitudes toward Pole Preservation

Traditionally, no particular effort was made to preserve or repair totems once they were erected. While the initial commissioning of the carving of a totem conferred status to the individual or clan, preservation had no such effect.

When a totem collapsed or its features became unrecognizable due to extensive deterioration, the original owner or his descendants could commission a copy. As with the original, the erection of a copied pole was accompanied by ceremonial activities. The copies were not exact duplicates, as each carver interpreted the image or story in his own way, within the bounds of the form-line rules.

There are indications from historic photographs from the late 19th and early 20th century that totems were occasionally preserved, but this practice may have been influenced by contact with European culture. A few images of native villages depict props set up beneath leaning poles to prevent them from collapsing.

Native attitudes toward the preservation of totems began to change in the early part of the 20th Century even as the totem carving tradition along with many other aspects of traditional culture was on the wane. Some in the native communities recognized a need to preserve the old totems as symbols of their culture that was then under considerable stress. Another factor that influenced both the native and white communities to consider totem preservation in a new light was the expectation that totem parks could help draw tourist to the region, thus improving the economy.

As will be discussed in more detail, the desire on the part of the native community for preservation of totems and other expressions of their material culture was given official recognition in the late 1960's with the creation of the Southeastern Alaska Indian Arts Council.

Large Scale Preservation Projects Begin

Skeena River Project

The first large scale totem preservation project took place at village sites along the Skeena River in British Columbia in the 1920's. This project was undertaken by the Canadian Government and the Canadian National Rail Road. Although the primary purpose was to provide a tourist attraction for passengers on the railroad, the project was welcomed by most of the native villagers. The restoration work included re-erecting leaning and fallen polls, re-orienting the poles toward the railroad line rather than toward the river, and painting the poles with commercial paints.

The project began in Kitwanga, the village closest to the rail line in 1925. Here eighteen poles were cut off at their un-carved bases and lowered. Poles carved in the round were channeled out at the rear and re-erected on creosote treated support posts. Bolts 1" in diameter affixed the totems to the support posts. Bolt holes on the carved face were plugged. Poles originally hollowed at the rear were attached to their support posts with horizontal cross braces. The totems were cleaned and then saturated with linseed oil as a preservative measure. They were then re-erected and concrete pads were poured around the bases. A bituminous material was applied to the interface of the support posts and concrete. Finally the poles were painted with commercial oil paints. (Canadian Conservation Institute Newsletter June 1988)

CCC Era Preservation in Southeast Alaska

In the late 1930's, the US Forest Service led an effort to collect and restore totems from various abandoned villages in Southeast Alaska. This program was funded initially through the Works Project Administration and later through the Civilian Conservation Corp. The immediate goal of the program was to provide employment opportunities in the difficult economic conditions brought on by the great depression. The long term goal was to preserve the totems and move them to totem parks located at sites more accessible to the tourist trade. Like the Canadian Railroad project, the CCC restoration work was envisioned as a means of increasing tourism, thereby bolstering the local economy.

The US Forest Service administered the preservation effort because most of the village sites where the totem had been standing were located in the Tongass National Forest, which covers most of Southeast Alaska. Linn Forrest, a Forest Service architect was put in charge of the program. He designed totem parks at Haidaburg, Klawok, Saxman, Mud Bight, and Shakes Island. The Forest Service worked with the National Park Service in restoring and re-carving poles at Sitka National Historic Park. The work undertaken at Sitka is discussed in detail later in this report.

The intent of the project was to preserve poles where possible and to reproduce them in cases where the originals were beyond repair. Older native workmen,

some of whom were experienced carvers, directed the carving and made the determination on how to accurately repair and/or reproduce the poles. The bulk of the work was done by young, native, men who had little or no prior carving experience.

Work was performed primarily with hand tools including adzes and knives that followed the traditional Northwest Coast form. In use these tools were pulled toward the carver's body rather than pushed away, affording more control than western tools. However unlike the traditional native tools, steel blades, often fashioned out of used car springs and old files, were utilized

Restoration work included removal of deteriorated sections of the poles and replacement with newly carved features. Generally, the replacement elements were affixed with large galvanized spikes. Some of the larger elements were affixed with bolts or all-thread rods. Bolt heads and nuts were generally set beneath the surface and covered with round plugs shaped to conform to the adjacent surface. In some instances entire carved figures were removed and replacement figures spliced in and affixed to vertical supports at the rear.

The original weathered pole surface was commonly removed to get to sound, fresh wood. This process, sometimes referred to as "skinning", removed the original scalloped surface texture, much prized by early carvers and tended to flatten and distort surface features.

The crews at most of the totem parks used Permatox D, a commercial variety of pentachlorophenol preservative to eradicate fungi and insects. This was an early use of this chemical which did not come into common usage until the 1940's. Pentachlorophenol is relatively clear and does not discolor wood nor does it tend to leach out of wood. The chemical is manufactured as a clear crystal which is then mixed with solvents, typically mineral spirits prior to application. Pentachlorophenol was usually applied in a 5% solution, the maximum concentration that could be easily dissolved in mineral spirits.

Pentachlorophenol was widely used as an insecticide and pesticide from the 1940's until 1984 at which time its use was restricted to certified applicators for industrial use. The restrictions in use came about due to the increasing evidence of the chemical's deleterious effect on human health including damage to the liver, kidney and immune system as well as probable links to cancer.

Although the use of Pentachlorophenol is not permitted for most applications, it is still used regularly to treat utility poles. The utility industry estimates that the replacement life of poles is increased from 7 years to 35 years with "penta" treatment, an indication of its efficacy.

CCC era preservation work also often included the application of sheet lead to end- grain surfaces to reduce both surface decay and the infiltration of water into the pole. Lead worked well because it is malleable and thus able to conform to the irregular shape of carved surfaces. Additionally, it is corrosion resistant; potentially lasting up to two hundred years in exterior conditions.

Initially Forest Service project managers planned to use traditional, native paints, however as the project progressed, it became apparent that it would be difficult to produce in the quantity needed and that very few natives knew how to make paint in the traditional manner. Eventually the attempt was abandoned and commercial paints were used on the restored poles.

Although this program employed techniques and materials that might not gain approval today due to aesthetic concerns and the toxicity of some of the materials used, it did help extend the life of poles that would otherwise no longer exist in any form. The CCC restoration effort also had the effect in many native communities of rekindling pride in the totem heritage as well as linking the preservation or poles with the preservation of the carving tradition.

The outbreak of World War II in late 1941 resulted in an abrupt shift in government priorities and an end to the Forest Service led totem preservation effort. Although some of the specific objectives of the project were not achieved, it was estimated that forty eight poles were restored and fifty four, thought to be beyond salvage were reproduced. Linn Forrest, the architect of the program, stated that about one third of the poles that were standing in the native villages at the turn of the century were preserved in one form or another.

Post War Preservation Efforts

After the war there was little coordinated effort to maintain the new totem pole parks or to address the preservation needs of the poles left at the traditional village sites. This was due in part to lack of funds as well as to the fact that the totem parks were owned and controlled by different entities. Parks in Klawock, Haidaburg and Saxman were under the jurisdiction of the local village councils; Shakes Island was under the jurisdiction of the Bureau of Indian Affairs and Kasaan and Totem Bight were under the jurisdiction of the Forest Service. Over time this lack of maintenance led to visually obvious deterioration.

Alaska State Museum Survey and Collection Efforts in the 1960's

Although concern was expressed intermittently by natives and non-natives alike about the deteriorating condition of Alaskan totems, it was not until the late 1960's that a serious preservation effort was undertaken under the auspices of the Alaska State Museum.

In June 1969, a team consisting of curators, Wilson Duff and Jane Wallen, along with Joe Clark, a wood preservation specialist from the U.S. Forest Service, conducted a field survey of totem poles remaining at traditional village sites in Southeast Alaska. The purpose of the survey was to determine the number, location, and condition of the poles and provide recommendations for their preservation. The project also included the efforts of the Alaska Native Brotherhood and a number of Tlingit and Haida elders who served as guides and advised the team on clan history, lineage and ownership issues.

The group surveyed poles remaining in abandoned village sites which had been passed over due to the perception that they were beyond salvage in the collections efforts of the CCC some thirty years prior. The survey team found about forty poles that, although in fragile condition, were thought to be salvageable if provided preservation treatment and placed in a protective environment. The primary impediments to moving and treating the poles lay in questions about ownership and the benefit of defying traditional cultural practice and preserving poles that previously were allowed to simply deteriorate and collapse.

The Southeast Alaska Indian Arts Council was established in response to the need to resolve ownership issues so as to allow for the collection and preservation of the poles. The preamble of the council constitution states that "*In order to preserve, in true perspective, an awareness of an old order which we honor, we, the Indian people of Southeastern Alaska do hereby establish a council for the preservation of the historic Indian arts……*"

Native peoples from a number of towns and villages in Southeast Alaska passed a series of Resolutions and Agreements in support of the council gaining custodianship of the poles. The resolutions gave authority to the council

chairman to grant permission for collection and preservation of poles whose ownership could not be determined. The Resolutions and Agreements, written in support of the Arts Council, attempts to resolve ownership of unclaimed poles in the abandoned village sites. It states:

"..recognizing the problems of clan ownership of these historic and valuable items, and further recognizing the difficulties in finding true owners under historic Indian law or under the laws of the State of Alaska, and….being greatly in favor of the newly established Southeastern Alaska Indian Arts Council taking title to all interests in these artifacts in order to be able to act to immediately begin their preservation, …we agree to divest ourselves …..and the interests of all others…in all Totem Poles now belonging to any tribe or clan, where no other ownership is asserted: and that further that this ownership shall pass in trust for the Indian People of Southeastern Alaska to the Southeastern Alaska Indian Arts Council for all time…"

About forty four poles were removed from the remote village sites by Forest Service crews in 1970 and 1971. They were brought to Ketchikan which had been selected as the site for a cultural center that would display the poles in a protected environment and serve as a source of knowledge to foster the art form. Although funding and establishment of the center did not progress rapidly or without complications, the cultural center including display and teaching areas was eventually constructed and the poles did receive conservation treatment.

Preservation Efforts Resulting from Survey

This survey was Joe Clark's first exposure to the problems of totem preservation and marks one of the first instances where a professional wood preservation specialist addressed these issues. He described the survey and provided recommendations for totem preservation in a publication for the International Institute for Conservation of Historic and Artistic Works (June 1970, New York, N.Y.) Clark later worked with the staff at Sitka National Historical Park using the experience he had gained in the survey project.

Clark estimated that many of the poles surveyed at the village sites had been in place for 50 to more than 100 years and cautioned that no poles left outdoors could be preserved indefinitely. To extend the life of outdoor poles he recommended the application of a fungicide and water repellant. He proposed using a gaseous fumigant followed by the application of liquid preservative His expectation was that a fumigant would penetrate more deeply into the wood than a liquid, however he realized that fumigants have little residual properties and that therefore liquid preservative would be needed to prevent future fungal and insect infestation.

Clark recommended the use of pentachlorophenol in a hydrocarbon solvent to slow fungal decay of the poles. This preservative was in wide use by the 1970's and had been used on totems since the CCC preservation efforts. He

understood that although the chemical could effectively kill surface fungal growth it was not likely to penetrate into deep decay infections or have an appreciable affect on well established areas of decay. The usual concentration of penta in solvent was 5%, the highest concentration that could be satisfactorily dissolved in mineral spirits or Stoddard solvent. Clark recommended using a stronger solution, increasing the concentration to 15%, which he suggested could be accomplished by using a higher grade solvent or modifying the solvent with alcohol to increase the solubility.

Clark pointed out typical areas of poles that should receive special attention and repeated application of fungicide. They included exposed end-grain surfaces, surfaces with detailed carving, and joint interfaces. He suggested that such areas receive repeated flooding applications of fungicide for a minimum of five days.

He noted that the absorption of rain water into end grain surfaces contributed to the deterioration of the wood and considered an end-grain seal to limit water penetration into the poles, however, none appears to have been specified or used in his treatment of totems.

In the Appendix to the survey report Clark stressed the need to remove herbaceous vegetation from around the poles so as to reduce the risk of fungal decay at and near the base. He recommended that those poles that had been placed on support posts - a practice implemented in the CCC work- be erected in such a way that the exposed end-grain surface extend at least several inches above grade so as to allow for intermittent drying and for the application of preservative.

For those poles which were to be collected and placed in an indoor environment Clark recommended against the use of toxic wood preservatives. He noted that insect activity was likely to desist as the poles were air dried indoors because both termites and carpenter ants prefer moist wood. Consequently he advised that routine application of insecticide would not be necessary. Instead Clark suggested that insecticide only be applied locally if insect activity was observed as the poles were brought into the drying space.

Clark was concerned about retaining the fragile carved surface of the severely weathered poles as they dried and consulted with Robert Organ a conservator at the Smithsonian Institution about appropriate surface consolidants. Organ apparently sent Clark a number of consolidants to try on an experimental basis but these are not enumerated. Clark realized that removal of the mosses and lichens which covered much of the carved surface of the old poles, particularly the end-grain, could damage the fragile wood tissue if removed while the poles were still damp and therefore recommended that the growth be left in place as the poles dried.

As large dimensioned wood dries, wide differences in moisture content between interior and surface areas are created, which can lead to excessive cracking and checking. To minimize damage from drying, Clark recommended that the poles be dried very gradually and that the process be further slowed by covering the poles with plastic sheeting if drying damage was noted. He expected that drying damage was more likely in fully round poles than in poles that had been hollowed in the rear and cautioned that wintertime heating could exacerbate the damage by radically reducing ambient relative humidity.

Clark's knowledge of wood technology and his experience with wood preservatives provided a firm foundation for his work on totem preservation. Many of his techniques and treatment recommendations have stood the test of time and are still used by those who work in the field of totem preservation.

Chapter 4

Preservation of Sitka Poles up to WWII

Early Preservation Work
The first instance of preservation of poles in the Sitka collection is the work done on the **Saanaheit** pole and house posts on their arrival in Sitka in 1901. Brady noted at that time that the pole had suffered extensive fungal decay and subsequently had it repaired with cement and red cedar by native craftsmen. Early images of this pole and associated house posts erected along the Russian Walk suggest that they were also painted at this time.

Only the Eagle figure remnant of the original **Saanaheit** pole remains in the Sitka collection. This figure has a thick coat of enamel paint and plaster-like fills in the weathering checks. Although in reasonably good condition when they arrived in Sitka, the house posts have been heavily damaged over the years of outdoor display and have received extensive repairs during a number of restoration campaigns. They are now exhibited in a protected environment. The original carved surface has been "skinned" and a considerable amount of patching has been done.

Preservation of the poles collected by Governor Brady during the voyage of the Rush a couple of years later began soon after their collection and shipment to Sitka. The poles were gathered for the work at a saw mill owned by Brady. Although there are no records of the nature or extent of the work, photographs of the period depict native workmen standing over the poles with elbow adzes in hand suggesting that the weathered surfaces of at least some of the poles were removed.

Images of the poles taken at the Saint Louis Worlds Fair indicate that they were freshly painted and that the paint covered the entire carved surface, a significant change from traditional practice where only selected features were highlighted with paint.

Merrill's Preservation Work
Elbridge Merrill like Brady had an appreciation for the native culture and was convinced that preserving the poles would help preserve the culture. He took on the role, usually in an unpaid capacity, of overseeing the preservation of the poles. Although work done on the poles was not recorded in any detail, early images of the poles suggest that they were painted and some appear to have been "skinned" of their partially deteriorated surface prior to erection.

The area of the Russian Walk and the poles that lined its path became a national monument in 1910 under the Federal Antiquities Act, however in the early years

of the 20th century no mechanism was in place to fund the park. Local press and influential residents complained about the continuing decay of the poles and the lack of funds to arrest it. With the creation of the National Park Service in 1916 the Sitka Park found an administrative home and Merrill was named its first custodian, working for the sum of $12 a year.

Even with this arrangement a regular pole maintenance program was not established and complaints about the condition of the poles and lack of care continued. In March of 1919, A.G. Shoup, Superintendent of the Pioneer Home in Sitka responding to an inquiry about the condition of the poles from Territorial Governor, Thomas Riggs Jr. wrote that he had inspected that poles and "found that no work had been done on any of them." Shoup also noted that one of the poles had blown down the previous fall and that Merrill had made a report of the situation and was awaiting a decision as to whether the pole was worth repairing.

Shoup had previously recommended Merrill's appointment as custodian because of his knowledge and interest in totems but had found that Merrill tended to procrastinate in actually getting the work accomplished. Shoup noted that, Merrill "means alright but he is largely of an"artistic temperament" and has very little regard for business matters."

Apparently Merrill's procrastination remained a problem. In April of 1919 Acting NPS Director Horace Albright wrote to Governor Riggs about the lack of response from Merrill concerning his appointment as custodian of the park and noted "as the warmer season is coming on when work of preserving the totem poles can be taken up, I am anxious to have the work gotten underway." He concluded that "The protection of this monument has been deferred so long by absence of appropriation that it would be regrettable, now that money is available for the work, to have it put off until another year."

By June of 1919 Merrill did commence work on the totems. Shoup reported in a telegram to Governor Riggs that Merrill had erected scaffolding around the poles and had begun painting them. A few days later in a letter to Riggs, Shoup reported that "The work so far consists (of) removing rubbish and down tress in the park, bracing totems, erecting scaffolding around the totems for the painters to work on, and some painting, and removing some dead stumps." Shoup commented on Merrill's hard work and the fact that he has not charged for most of his labor and went on to say, " It is very important that the totems be painted by someone who has made a study of Indian painting, otherwise they would be spoiled, and I know of nobody who understands that as well as Merrill." Shoup noted that some of the totems were still soggy and expressed hope that they would dry somewhat by July, at which time they could be painted.

In 1922 the NPS entered into a cooperative agreement with the Alaska Road Commission to look after the poles. Records suggest that little, other than

painting, was done to preserve the poles from this point until the late 1930's. The poles continued to deteriorate, some to the point where they could no longer stand.

Pole Preservation in the 1920's and 1930's

Sitka National Monument was administered and maintained by the Alaska Road Commission under an agreement that commenced in April, 1922 and extended to the mid 1930's. During those years preservation of the poles received relatively little funding and attention. The 1936 Annual Report to the Director of the NPS authored by Ike Taylor, Chief Engineer mentions that "Necessary repairs were made to totem poles which included backing with cedar and painting where needed." The expenditure on maintenance of the poles as well as the foot paths through the totem park amounted to $700. The memo states that the monument is in good condition but notes that the "totems will require continuous attention in the way of painting and repair". During this period no mention is made of using fungicides or placing poles with deteriorated bases on support posts.

By the late 1930's it was recognized that preservation of the poles required more than intermittent painting and repairs and a number of memo's from NPS and USFS staff addresses this question. A 1939 memo to the Director authored by Joseph S. Dixon, Field Naturalists suggests the use of water soluble salts including; zinc chloride, sodium fluoride, mercuric chloride and copper sulphate in an effort to slow fungal decay.

WPA and CCC Preservation Work at Sitka

Preservation of the Sitka poles in the late 1930's was administered by the Forest Service under agreement with the National Park Service. Work was initially funded under the Federal Works Project Administration allotment. The preservation campaign began in early 1939 after Charles Burdick, Associate Regional Forester made an assessment of the condition of each pole. The carving crew consisted of nine workers with John Maurstad serving as foreman and George Benson as chief carver. When WPA funds ran out at the end of the year, the project was completed with Civilian Conservation Corp funding. Richard Tate served in the role of foreman in this phase of the program.

An undated and unsigned memo in the Sitka NHP archives notes that only six of the older natives in the area had experience in totem carving and that WPA regulations limited employment to only seven and one half days per month per person, slowing progress in the early stages of the project. The memo goes on to say, "Quite a number of the younger Indians have been employed on the restoration project and it has contributed considerably in reviving their interest in this art.

The Forest Products lab advised the Sitka work crew on the use of a Permatox D solution as a preservative. The lab indicated that soaking the poles in the solution would provide the best results, but if that were impracticable the solution could be brushed or spray on the pole surface. Viola Garfield an ethnographer, who worked with Lynn Forrest in overseeing the project described the solution as being 22 parts by volume of Stoddard Solvent, 3 parts pearl oil, and 1 part Permatox D concentrate.

Stoddard solvent, described by Garfield as a penetrant, is an organic solvent, similar to mineral spirits. It has relatively low toxicity. Pearl oil, is described as a spreader. Garfield may have meant pear oil which is the common name sometimes ascribed to an organic compound made from alcohol and acetic acid that was used commercially as a waterproofing agent for aircraft fabric. As previously mentioned Permatox D is a commercial variety of pentachlorophenol and is the active toxic agent in the fungicidal solution.

Park records suggest that the recommended soaking of the poles in the fungicidal solution did not occur. Instead three applications of the Permatox D solution were made to each pole by brush, allowing 24 hours between coats. Recognizing the toxicity of the solution, workers were required to wear rubber gloves during the process.

An article in the Cordova Times in March 1940 described the ongoing preservation work on the eighteen poles at Sitka National Monument. It reported that “This work is being done by natives using hand-wrought chisels and knives” and foreman Tate describes the native workmen as “artists in wood carving.” The article went on to note that “In many instances the totems are beyond saving. In that event, the Forest Service CC duplicates the pole….Consequently, by exact measurements and callipering these native artisans are producing totem poles that will carry on the legend told by the carvers of the original poles”

The article mentions the difficulty in procuring cedar logs of sufficient size to faithfully replicate the original totems. Logs were apparently towed to Sitka from the Ketchikan area.

This article also notes that the repaired and reproduced poles were painted with commercial paints formulated to match the original paint colors. The reason given for use of commercial paint is their durability in comparison to the native mineral and animal oils. However it was pointed out that the, “paints have been mixed that are indistinguishable from native colors”.

Apparently not everybody was happy with the appearance of the poles. After the newly restored poles were erected some questions as to the accuracy of the chosen paints arose. In a memo to Superintendent Beem in March of 1940, Miller states, “There is some controversy as to wheather (sic) the present paints,

especially the green, are of the same shades as those that were originally used by the natives."

A letter from Regional Forester Heintzleman to Carl Russell, an NPS official on December 21, 1939, stated that after the poles were painted a coat of Pentra-Seal was applied to prevent moisture penetration and blistering of the paint. Only a single coat was applied, as additional coats cause the wood surface to appear glossy, resulting "in artificial appearance to the totems." This product was described as being similar to spar varnish. Heintzleman closes his letter with this observation, "Sufficient time has not yet elapsed, of course, to determine the full value of the preservative treatments we are employing, but to date they have proved satisfactory."

Some of the poles that were originally carved in the round or remained rounded at the lower extreme, were hollowed out at the rear and fitted with yellow cedar support posts. The convex surface at the rear was coated with the Permatox D solution as well as coal tar prior to attaching the support post. Regional Forester Heintzleman stated in a letter to Superintendent Frank Been that the bases of all the poles and support posts were coated with Avenarious Carbolineum, penetrating creosote oil that acts as a fungicide and insecticide. The hole into which the base of the support post was lowered was lined with porous material to allow water to drain away from the wood surface.

The Forest Service and Park Service policy was to preserve all the elements of the original poles that were replicated. These elements were to be stored in a shed to be built along the totem trail. In a letter from NPS Superintendent Frank Been to Frank Heintzleman the Regional Forester overseeing the totem work then underway, Been states the need for either a temporary shed to house the original poles and pole fragments and a permanent building that would serve as storage and exhibit structure. He envisioned the permanent structure as being designed in the form of a native lodge with open sides. The decision as to where to place either the temporary shed or permanent structure appears to have put off construction.

In the same memo Superintendent Been, who was stationed at Mount McKinley National Park, mentions that an NPS custodian who would be stationed at Sitka was about to be selected. This marked the beginning of on-site administration of park operations by NPS staff.

In February 1940, Ben Miller, the new NPS Custodian, expressed in a memo to Superintendent Been that he and Lynn Forrest were "in a quandary as to what to do with the old poles." While he recognized their value, he didn't feel that it was worth building a new building for the seven old poles that were then resting outdoors on pallets. He suggests contacting the Smithsonian Institution to determine if they were interested in taking custody of the original poles.

It is not known whether the Smithsonian was in fact contacted. In any event by March of 1940 the two temporary carving and restoration sheds were torn down and six of the original poles were left on skids on the forest floor where they remained until 1947 when they were moved to a Navy airplane hangar on Japlonski Island.

Ultimately all eighteen poles were preserved in some manner. The eight poles in the worst condition were reproduced and ten others were restored with varying amounts of reproduced elements. Close examination indicates that some of the poles considered “original” actually retained very little of the original carved features.

A few years after the work was completed the efficacy of the Permatox D solution as a preservative for the Sitka totems was questioned by NPS Senior Engineer Edd Preece in a memo for the Branch of Historic Sites in March 1942. Preece noted that the topical application of the Permatox D solution has limited penetration and that the most effective preservative treatment for wood is through deep penetration which can only be accomplished by pressure treatment. He noted that Wolman Salts, Velcure and Chromated Zinc Chloride have all been used successfully in commercial pressure treatment applications. He points out that the lack of pressure treatment facilities that could accommodate large poles in Alaska is the principal problem in utilizing that technique on the Sitka poles. To solve this problem, he suggested the alternative of cutting the poles into short sections for pressure treatment at the site and then re-assembling them. Preece concluded, “If this procedure is not permissible then the only possible procedure is surface treatment despite the fact that this sort of preservative is not as competent.” There is no indication that cutting the poles into short sections for purposes of pressure treating was seriously considered or acted upon.

Chapter 5
Preservation of Sitka Poles: Post WWII-1991

The CCC pole preservation program at Sitka, like that at the other totem parks, was quickly terminated after entry of the United States into WWII and the resultant changes in governmental priorities. Relatively little detailed information is available as to what was done to preserve the poles in the years between 1941 and 1970.

The first paragraph of a strongly worded memo from L.J. Mitchell, Superintendent of Sitka and Glacier Bay National Monuments to the Regional Director of Region Four in October of 1959 states, "The last major maintenance work accomplished on the subject structures (totem poles) was during the CCC days. Since that time, maintenance has consisted of painting and accomplishment of minor repairs to figures. The time has arrived when structural rehabilitation is mandatory if these unique items are to be saved from danger of total destruction by falling, or by failure to arrest rot that is found in practically all of them to at least some degree."

The memo goes on to complain that the park request for funds to establish a rehabilitation program for the poles has been denied. Attached to this memo is a Totem Condition and Maintenance Requirement Survey that notes surface and structural condition along with recommendations. Most of the recommendations include treatment with preservative and re-painting. Replacement of rotted sections and support posts is on a few of the poles was proposed. It is not evident what, if any, work was ultimately carried out at this time.

Three Poles Shipped to NY Worlds Fair

In 1963 three poles, the Potlatch Pole (#12), Gonaquadet (#1) and Shark People Pole (#2), were taken down and shipped to New York for the World's Fair in 1964/1965. On their return in 1966 the poles were re-erected close to the new visitor center.

The un-carved deteriorated bases of the Gonaquadet and Shark People Pole were removed. The poles were then re-erected on new yellow cedar support posts. Specifications prepared by Museum Technician Romaine Hardcastle, stipulated that the base of the pole be at least four inches above grade level and that both carved poles and support posts be thoroughly treated with penta prior to erection. The specifications also stated that the poles were to be bolted to the support posts through existing holes where possible and the holes were to be plugged.

These poles along with The Wedding Pole (#4) and Fur Trader Pole (#8) were also painted at this time. Specifications for the work included mechanical scraping and wire brushing to remove loose paint followed by spray application of

three coats of pentachlorophenol. Cracks over ¼" in width were to be filled. The choice of fill material was left up to the contractor. Lead caps were to be installed on surfaces vulnerable to decay and the poles were to be given two coats of oil based paint. The specified colors included flat black, brick red, totem pole blue, and flat white. These colors were to match the paint on the other poles in the collection.

The Saturday Review published an article in October 1966 by Katherine Kuh that lamented the deteriorated state of Alaskan aboriginal art. This article was widely read and helped bring the pole preservation needs in Sitka some additional attention. In response to that article a memo was sent to NPS Chief Archeologist, Charlie Steen noting the preservation needs of the poles. The author of the memo suggested the use of Pencapsula, a synthetic resin initially developed for use by the NPS on the walls of adobe ruins in the Southwest. Luckily this material was not applied to the totems.

An undated chart in the park archives, presumably prepared in the late 1960's, lists the totems by number and indicates the particular year, between 1960 and 1966, that each totem was painted. Another chart that appears to have been prepared at the same time details future preservation work planned for individual poles each identified by number, between fiscal year 1970 and 1983. The document, titled Totem Maintenance Schedule, states that the maintenance includes cleaning, preservative treatment and painting. The nature of the preservative treatment is not detailed. Preservation maintenance for most of the poles was scheduled every five years. It is likely that this maintenance schedule was altered due to the extensive work undertaken on the poles in the early 1970's.

Late in 1969 a brief condition survey of the poles was undertaken by park maintenance staff. The survey focuses on the condition of the painted surface; relatively little attention is directed to structural concerns or the extent of fungal deterioration. Most of the recommendations involve the need to repaint. In a few instances the presence of decay pockets is noted, but for the most part the wood was reported to be in good to excellent condition. In retrospect, this report seems to have been a somewhat optimistic assessment.

Preservation Campaign, 1971-1972

In 1969 Daniel Kuehn, Sitka NM historian, wrote to Joe Clark requesting advice on the best means to maintain and preserve the poles. Kuehn, who was later to become park superintendent, observed that many of the poles were in excellent condition but several required immediate attention and that "In the past, preservative technique has amounted simply to the application of "penta" and repainting." Clark and Kuehn had met earlier in the year when Clark briefly visited the park as a member of the team undertaking the Alaska State Museum sponsored state-wide totem survey.

Clark's response in a letter to Kuehn in January 1970 noted that although brush or spray application of "penta" is a "good basic procedure and is effective in protecting the surface parts of the totems" it is not effective in eradicating interior fungal decay pockets. He suggested that fumigation would be necessary to eradicate internal decay, but cautioned that gaseous fumigation would not provide residual protection from future decay. Clark did not recommend a specific fumigant, but indicated that he was hoping to research the topic further and would contact the park when he had more detailed protocol.

His initial research dealt with methyl bromide and sodium methyl dithiocarbamate. Although little data were available that indicated the depth of penetration of these gases in large dimension wood, Clark hoped that the partially deteriorated poles would allow fairly deep penetration.

Methyl bromide is a colorless and odorless material that becomes a gas at room temperatures. It had been used extensively as an agricultural and structural anti-microbial and pesticide. However; since Clark's proposal it has been found to have negative human health effects and to contribute to the depletion of the ozone layer, consequently its use has been phased out for most purposes. Dithiocarbamate is also suspected to cause negative health effects and it is rarely used today.

Clark performed tests using these fumigants on sections of deteriorated poles from Sitka and reluctantly concluded that "with their characteristic pattern of widespread but localized decay (they) cannot likely be effectively fumigated in the field by practical methods." (Preservation of Totem Poles at the Sitka National Monument at Sitka, Alaska) As an alternative he suggested submerging the poles in a trough with two different chemical solutions, sodium fluoride and copper sulfate. The sodium fluoride soak was to precede the copper sulfate soak. The first soak was estimated to require 6-10 days while the second soak was estimated to require 8-12 days, depending on the diameter of the pole.

The excavation of trench tanks were recommended by Clark as the most economical means of submerging the poles. Later on, in consultation with park staff it was decided to dig two trenches on the open fort site, located in close proximity to the totem walk. Trenches were dug approximately 48 feet long, and 40 inches deep with sides that tapered from 96 inches at the top to 48 inches at the bottom. They were lined with plywood that was then covered with a continuous sheet of 6 mil polyethylene. Cushioning material was placed over the polyethylene over which was place a second sheet of polyethylene. The park was naturally concerned about leakage of the toxic chemicals into the soil and ground water and stipulated that a test of the tightness of the tanks be done with fresh water prior to filling the tanks with the fungicidal solutions.

To enable the preservative chemicals to diffuse into the wood it was deemed necessary to remove the paint that had been periodically applied to the totem surfaces since the CCC restoration campaign. Clark initially recommended "wet strip" manufactured by H.F. Staples & Co. This stripper apparently was not effective in removing the layers of paint, precipitating a call to the manufacturer. In a letter to Clark dated June 18, 1971, a representative of the company noted that the remover works best in an environment of 70 degrees or so and the temperature in Sitka was most likely too low. It was suggested that Dry Strip be used instead because it is more effective on the types of paint on the poles. The manufacturer's representative added that this material also works better in temperatures of at least 65 degrees and suggested that small portable enclosures be constructed around the poles and heated to expedite paint removal.

Rather than constructing enclosures to provide the needed heated environment, the totem surface was heated with steam prior to application of the paint remover and subsequently steamed again to remove the residue of paint and the paint remover chemicals. This no doubt had a somewhat deleterious effect on the surface of the totems since steam tends to lift wood fibers and darken the surface.

Although removal of lead caps from the end grain, horizontal surfaces of poles is not specifically mentioned in the documents that address the double dip process, it is likely the caps, installed during the CCC campaign, were removed at that time to facilitate diffusion of preservative into end grain surfaces. Examination of the poles during the 1991 survey indicated that the caps were not put back in place when the poles were re-erected.

Clark recommended that the poles be wrapped in polyethylene sheeting after the paint removal process so that the moisture content would remain high, thus facilitating deeper diffusion of the preservative.

After the poles underwent the double-diffusion preservative treatment they were placed under a shelter to dry somewhat prior to the application of what Clark termed "a final preservative-consolidating resin treatment." This shelter was constructed on the fort grounds and removed once the work was completed. The purpose of the resin treatment was to consolidate deteriorated wood tissue on the surface, provide some measure of water repellency, and provide a good substrate for paint. Clark did not make specific recommendations concerning re-painting, but he did suggest that if re-painting was to be done it should adhere to the colors and patterns originally found on the poles.

The preservative-consolidating solution was formulated by the USDA Forest Products Lab. It consisted primarily of mineral spirits into which was mixed pentachlorophenol concentrate, spar varnish, silicone resin and paraffin wax. Clark recommended that this solution be applied until the point of refusal and that

it not be allowed to dry between applications. The expectation was that the preservative would remain effective in repelling water for a year or so.

The park considered various methods of re-mounting the poles. Some thought was given to mounting the poles on steel support bars secured to a concrete pad at the bottom and extending some distance up on the interior surface of the poles. Park Superintendent Kuehn commented to the General Superintendent, Alaska Group in a memo of 3/10/71 that this method "will eliminate the need for support poles which are subject to decay and expensive to replace, and it will enable the poles to be removed much more easily in the future when they inevitably have to be taken down."

Clark, on the other hand, recommended that those poles with deteriorated bases be re-erected on support posts carved to fit into the hollow at the rear and those poles with sound bases be re-buried as was originally done. The bases of both support posts and poles were to be coated with penta-grease where they were to be on contact with the ground so as to assure a long service life. Clark's recommendations concerning re-erection of the poles were ultimately carried out. Only the Saanaheit pole was re-erected on a steel post.

Park records indicate that preservation work on the poles commenced in the fall of 1971and the poles were re-erected in the fall of 1972. In May of 1973 a memo by Superintendent Kuehn to the Alaska State Director justified the decision not to repaint the poles based on both aesthetic and preservation concerns.

Kuehn noted that in the past the park was criticized because the poles were painted in inappropriate colors and patterns. Specifically mentioned was the over use of white paint and the painting of surfaces that should have been bare. Kuehn also cited the fact that historically natives did not repaint poles once they were erected. He pointed out that the poles retained an appearance of faded paint after the bulk of the paint was removed during the preservation work that was recently concluded. The decision not to re-paint was arrived at after consultation with totem poles experts including Bill Holm, curator of the Burke Museum and George Federoff, an employee of the Indian Arts and Craft Board. Kuehn also noted that paint hinders the penetration of preservatives and its presence would make future preservation treatment more difficult.

The Superintendent also brought up the need to plan for a facility to store and exhibit the poles once they could no longer be exhibited outdoors. He stated, "Our goal should be to preserve them in their location as long as possible and then bring them indoors before they are lost." He estimated that if properly treated the poles could remain outdoors for another 20 to 25 years. To maximize their exhibitable life he suggested that they be treated with Woodlife, a commercial pentachlorophenol solution, every two years.

Pasco Report
In 1978 Duane Pasco, an accomplished totem carver from Washington State who had previously carved the **Bicentennial** pole for the park was contracted to assess both the authenticity of the appearance of the Sitka poles and their condition. His 1978 report addressed the repairs and changes the poles had undergone over the years. It concluded that some of the poles did not accurately represent the original work or conform to traditional form line conventions.

Pasco sketched some of the features of the poles as they looked at the time and then based on his knowledge of form line design sketched how the forms should appear. He made clear what the park staff had suspected; that years of deterioration and subsequent repairs including patching and skinning off the weathered surface had significantly changed the appearance of many of the poles and they no longer accurately represented the artist's intent. Pasco noted that the poles were particularly distorted on end-grain areas, including shoulders, bottom of eyes sockets and the top of heads. He cautioned that in commissioning new reproductions the park should avoid having inaccurate or distorted images repeated and strongly recommended that the carvers chosen for the task should be conversant in form line design and avoid rote copying of the altered poles.

Preservation Efforts 1970's-1988
Concern about the state of the outdoor pole collection continued after the intensive efforts in the early 1970's. A memorandum from the Acting Associate Director for Planning and Resource Preservation in the Northwest Region to the Alaska Area Director in 1976 confirmed that the Forest Products Laboratory still advocated the use of the pentachlorophenol based preservation solution that had been recommended in their report of 1971. This suggests that the park continued to apply this solution cyclically after the work done earlier in the decade.

Early in 1979 the park contacted conservator Mary Pat Wyatt, the Alaska State Museum conservator, seeking advice on preservation of both the outdoor pole collection and the house posts and pole fragments on exhibit in the Visitor Center. Wyatt re-iterated the recommendation for the use of a 5% solution of penta to treat mold, mildew and surface decay as well as lindane to eradicate insect infestations. Lindane has since been found to cause health and environmental damage and its use is currently severely restricted.

Injection of Pole-Fume or WoodFume was also recommended to stop "dry-rot" in the interior of poles. This material is a solution that utilizes metham sodium as the active ingredient. It is applied as a liquid which then volatizes and disperses within the pole as under vapor pressure. Wyatt suggested the park better control

relative humidity within the visitor center to avoid mold growth and minimize movement and splitting of wood.

Later in 1979 park superintendent Susan Edelstein expressed concern about the safety of pentachlorophenol and sought clarification from the Alaska Area Director as to its continued use. Her memo indicates that park staff sprayed a 10% solution of penta on the poles every year with the work generally taking place in September. She wrote, “My concerns are for both the staff members making the applications and for visitors who might brush, touch or lean against the poles at some later time” and asked for alternatives if the use of penta should be discontinued. It is not clear if the Area Director recommended discontinuation of use of penta and a viable alternative at that time.

A few years later Park Ranger Gary Candelaria contacted the new Alaska State Museum conservator, Alice Hoveman with questions about the advisability of filling cracks in totem fragments on display in the visitor center. Hoveman recommended that cracks not be filled as the changes in ambient relative humidity and the resultant expansion and contraction of the wood could cause additional splitting. She instead recommended the park provide as stable an environment as possible, with a target range of 55-60%, and minimize exposure to light. Additionally she suggested that extremely fragile fragments be consolidated with a 15% solution of PVA-AYAF in Xylene.

Looking for alternative materials, park Superintendent Ernest Suazo, contacted the Chief Scientist at the Alaska Regional Office in August 1981 to inform him that the park was proposing to use WoodFume and lindane to treat the poles during the course of the next fiscal year. He inquired as to what if any NPS approvals would be required prior to use.

In October 1981 Park Chief of I&RM again contacted the Regional Chief Scientist with a Departmental Pesticide Use Proposal for WoodFume and a request for use of a pesticide that could substitute for lindane. The accompanying memo states that the park was attempting to eradicate carpenter ants and ambrosia beetles from the poles. Ambrosia beetles have a symbiotic relationship with wood fungi. Rather than ingesting cellulose, as is the case with most other wood pest, these beetles ingest fungi that grow in their galleries. Although a nuisance they do not damage poles to the extent of carpenter ants and other wood boring beetles.

The memo noted that WoodFume had been used successfully at other totem sites in Southeast Alaska including Wrangell and Ketchikan. It is not clear whether the park received information on a viable alternative to lindane or whether the poles were ultimately treated with WoodFume.

In the face of increased evidence of environmental and health problems associated with use of Pentachlorophenol, the NPS discontinued its use in the

early 1984, impacting totem preservation activities at the park. It is quite possible that no preservation measures were undertaken after penta usage was discontinued and the start of the new preservation campaign in the early 1990's.

Steve Hendrickson Memo on Totem Preservation

A re-examination of the park's approach to the preservation of its totem collection was urged by curator Steve Hendrickson in a memorandum to his supervisor Chief Ranger, Gary Candelaria in 1988. Hendrickson's major concern was that park policies and procedures should be in keeping with recent advances in preservation techniques as well as current thinking on ethical treatment of ethnographic objects. He noted that Sitka was not the only institution that has grappled with the preservation challenges of outdoor poles and that it should look to museums in Canada and in the lower forty–eight for help in finding solutions.

Hendrickson made the distinction between major conservation treatment and preventive conservation. He stressed that conservation treatments should be carried out under the direct supervision of a conservator, that all work should be fully documented and the documentation archived by the park for future reference. Preventive conservation on the other hand could be carried out by park staff after receiving appropriate training.

He understood that no magic bullet could preserve the poles for the long term in an outdoor environment and that conservation treatment was in a sense buying time for the poles. Given that reality he, like a number of former park staff members, suggested the park plan for the "retirement" of the CCC era poles as well as the more recently commissioned poles.

Hendrickson listed a number of preservation activities he felt the park should avoid and others that the park should follow along with a suggested maintenance cycle. Although some of the recommended materials and practices are not in keeping with current conservation thinking, on the whole the memo espoused sound preservation principals and helped move the park in the right direction in regard to conservation treatment, preventive maintenance, documentation and long range planning.

This memo articulated many of the concerns of park staff and helped bring about initiatives undertaken by Superintendent Michele Hellickson some three years later including the organization of a totem conference and arranging for a condition survey of the totem collection by NPS wood conservators.

Chapter 6
Preservation of Sitka Poles: 1991- 1996

Totem Conference 1991

By the 1990's all the poles and house-posts in the Sitka collection thought to be original had been taken down and placed in indoor display or storage. However park staff realized that many of the CCC era poles in the collection, then on exterior exhibit for over fifty years, were also actively deteriorating. During the winter of 1991 the park contacted Ron Sheetz and Alan Levitan, wooden artifact conservators at Harpers Ferry Center, a central NPS object conservation facility, for assistance in conducting a condition survey of the poles. In conjunction with that survey the park hosted a conference in the summer of 1991 that brought together subject matter specialists, conservators, carvers, cultural resource managers and members of the local community, both native and non-native.

Initially, one of the more contentious issues brought up by some in the native community was worthwhile to preserve the poles at all. Once again, the argument was made that traditionally native culture placed little value on preserving poles and that therefore the park should simply allow the poles to deteriorate and return to the earth. Others espoused the argument that these poles should be preserved as a reminder of traditional stories and lineages. Complicating this stance was the fact that the poles in question were themselves duplicates. Park staff questioned whether the NPS as a preservation agency had a special responsibility to preserve these artifacts that transcended the desires of the local community.

After considerable discussion, a consensus emerged that it was indeed appropriate to preserve examples of earlier carving, even though it was understood that these examples were themselves duplicates and, as Pasco's report made clear, they had been altered and in some instances, distorted during past restoration campaigns. It was felt by the conference attendees that these poles could still provide inspiration and information to the general public as well as contemporary carvers. It was further decided that the preservation efforts should continue to go hand and hand with the efforts to preserve the skills and cultural traditions associated with totem carving, an activity the park had fostered since the 1960's in association with the cultural center.

Pole Condition Survey 1991

A condition survey carried by Sheetz and Levitan out during the week of June 17th 1991 addressed the condition of the both the standing poles exhibited outdoors, and those that had been placed in storage. One storage area, adjacent to the visitor center, had an overhanging roof but was open to the elements on one side and both ends. This shed housed both original pole fragments and CCC era reproduction poles and house posts. The original Saanaheit house posts along with additional pole fragments were housed in a

Bally Building located behind the visitor center. Although this space was entirely enclosed, it did not have environmental controls.

The conservators utilized an aerial lift that enabled full access to all the standing poles with the exception of the Saanaheit pole, the tallest pole in the collection.

A number of tools and techniques were utilized to assess the condition of the poles. Thin probes were used to help determine the soundness of the wood and the extent of fungal decay pockets. Degree of resistance to a probe is a good indicator of the presence of fungal decay. Use of these probes was limited to un-carved areas as they left small holes in the surface.

A Delmhorst moisture meter was used in conjunction with the probes to determine moisture content at various areas on the poles. Moisture content helps in the identification of fungal decayed areas which may not be visually obvious. This meter has an external probe with pins of various lengths that are inserted into the wood. Direct current supplied by batteries travels out of one pin and is picked up by the other. The meter measures resistance to the flow of electricity- the damper the wood the greater the flow- and correlates it to moisture content. Areas with high MC often indicate the presence of fungal decay.

Pins are generally insulated up to their tips. By using pins of different lengths moisture content can be read at different depths allowing moisture gradient to be determined. In some instances the location of decay pockets not visible on the surface can be identified. MC measurements can be made at greater depth than standard pins allow by inserting nails or similar ferrous elements to a given depth in the wood and attaching alligator clips to the protruding ends. Nails and screws are typically insulated with Teflon tape along their length, leaving the end uncovered, so as to get a true reading at a particular depth.

Because the relationship between electrical conductivity and moisture content varies somewhat from species to species, the meter readings are most useful for comparative purposes and are not necessarily accurate for western red cedar. As previously noted, fungal deterioration proceeds when the MC is at or just above the fiber saturation point, a condition in which the cell walls are fully saturated but cell lumens are empty. Moisture content readings above 30% are indicative of wood at the fiber saturation point. These are areas of active or potential fungal activity.

Although visual evidence and probing indicated that much of the fungal decay in the poles occurs on end grain surfaces the moisture meter is not useful in quantifying moisture content on these surfaces because it is designed to read electrical resistance across rather than along the grain. The extent of fungal decay on and beneath end grain surfaces could only be gauged by visual examination and probing.

Various measuring devices including flexible tapes, rules and calipers were used in the survey to determine the extent of splits, gaps in joins and areas of loss. Magnets were used to determine whether fastening devices were ferrous or non-ferrous. A plumb bob and line were used to determine if the poles were leaning and the extent of lean.

A 35 millimeter camera was used to visually record the condition of the poles with Ektachrome slides. Some of the detail images were later electronically scanned and printed in the survey report to illustrate particular conditions on each pole. Line drawings of each pole previously created for the Carved History publication were included in the report to identify the location of condition problems.

Survey Findings and Recommendations

In August, conservators Sheetz and Levitan sent a memo to Superintendent Hellickson that outlined the overall condition of the standing poles and proposed a strategy to address their preservation needs. This narrative accompanied the illustrated report that addressed the particular condition of each pole.

- **Recommendations-Standing Poles**

The conservators found that deterioration of the poles was greatest at the base where wood comes in contact with soil and is thus subject to periodic wetting and drying. The end grain surfaces at and near the top were also found to have extensive decay. The tops of many of the poles were described as having wide splits and active fungal decay. Contributing to the deterioration was the accumulation of organic debris-primarily hemlock and spruce needles from nearby trees- which tended to trap rain water. The splits allowed rain water to penetrate into the interior of the pole and promote the development of internal decay pockets.

Examination of the top surfaces revealed that most of the CCC era poles at one point had metal caps tacked over end grain surfaces. It is probable that these caps were removed by park staff in the early ‘70’s so as to facilitate the diffusion of fungicide.

Joins on the pole were another area of concern. Projecting features such as beaks and wings were originally affixed to the pole shaft by means of mortise and tenon joins. The joins were then secured with wood pins or dowels that went through the shaft and into the projecting tenon. As these joins loosened over time they were often repaired with nails, bolts and/or adhesives. The assessment found that many of the joins were partially separated, creating a gap at the top that allowed the penetration of water and organic debris, a condition likely to lead to decay of wood tissue around the join. The memo indicated that if not repaired a number of projecting features were in danger of being lost entirely.

Three poles (Lakich'inei, Waasgo Legend and Mosquito Legend) were found to be out of plumb and to have extensive deterioration around the base and thus in danger of falling. It was recommended that the first phase of treatment include taking these poles down for treatment and then re-erecting them on new support posts.

An overall framework for preservation of the pole collection was discussed. Similar to other previous assessments, this report cautioned that, "*It should be understood from the outset that whatever is done to preserve these poles is, from a broad perspective, simply extending their exhibitable life. Wooden artifacts exposed to a climate like that in Sitka will not last indefinitely. If these artifacts are to be truly preserved, they will ultimately require climate-controlled exhibit or storage space. It is not too early for the Park to plan for this space. We should not repeat the mistakes of the past.*"

The authors also stressed that in an outdoor environment wooden artifacts require continual cyclic care. If the exhibitable life of the poles is to be maximized preservation cannot be looked upon as a one time event. The development of a cyclic maintenance plan for each of the poles was recommended that identified the tasks that required the skill and experience of a trained conservator as well as the tasks could be turned over to the park maintenance staff. In keeping with this plan the preservation recommendations were placed in two categories; conservation treatment and preventive maintenance.

- **Recommended Elements of Conservation Treatment**
  - Control fungal decay and insect infestation

The conservators had researched fungicides over the course of the summer. Pentachlorophenol, which had been utilized during the CCC era and again during the work performed by Joe Clark, was no longer an option. As has been discussed, although Pentachlorophenol is effective as a fungicide and insecticide, it was removed from general usage due to health and environmental concerns.

Borate based fungicides were recommended as an alternative due to their effectiveness and low toxicity levels. Unlike fungicides and insecticides previously used on the totem collection, sodium borates are non toxic to mammals and can be used in environmentally sensitive areas. Borates kill insects and fungi by disrupting their enzyme system; however the exact mechanism involved is unknown.

Once in place, the product does not break down or volatize out of the wood, however, borates are hygroscopic, meaning they are chemically attracted to water. Consequently, borates can leach out of wood in ground contact with soil or wood in an excessively wet environment. Another limitation of borates

is that although effective against decay fungi including brown rot and white rot, it will not kill surface mold

At the time the survey was undertaken there was little precedence for the use of borates as a wood preservative in the NPS.

- Limit water infiltration

The pros and cons of capping end grain surfaces to limit water infiltration were discussed in the report. One potential disadvantage that was noted is that if water should enter between the membrane and the pole, evaporation would be hampered. The report stressed that if caps were put in place their effectiveness would need to be monitored.

Different possible membrane materials were proposed for possible use including; sheet metal, fiber-glass, plastic and rubber. It was suggested that various prototypes could be employed and periodically inspected to determine which performed the best. Prototype testing was ultimately not undertaken.

Benefits of application of a waterproofing solution were also discussed. Again, it was emphasized that periodic re-application would be necessary. The US Forest Service formula that included mineral spirits, paraffin wax, turpentine, and linseed oil was mentioned as a possible waterproofing agent. This suggestion was later dropped as further research indicated that there were problems associated with the long term use of linseed oil and that better alternatives were available.

- Fill splits and checks

The report noted that all the poles exhibited some degree of checking and splitting which is a natural and unavoidable condition. Previous repair campaigns dealt with splits in a number of ways so as to minimize the infiltration of rain water and improve the appearance of the poles. These included the insertion of cedar shims into the splits and filling the splits with a variety of plaster like substances. The fills seldom remained water tight for long due to expansion and contraction of the adjacent wood fiber. Typically narrow gaps opened up on either side of the fill. Furthermore, many of the plaster like fills had deteriorated over time and leached out resulting in staining and discoloration of adjacent surfaces.

It was recommended that future filling of splits be kept to a minimum for both aesthetic and practical purposes, and that splits be filled only if there was danger of loss of material or if they provided an entry path for rain water. Although no particular fill material was specified in that memo, the criteria for selection included weather resistance, flexibility and long life expectancy. It was noted that all fill materials would require periodic repair or replacement.

- Reattach Insecure Joints

The recommendation was made that all loose and separated joins should be re-secured where possible using the original attachment method.

- Compensate for Lost Areas

It was suggested that the decision to replace lost surface areas be made by the park cultural resources staff on a case by case basis. Two methods of compensation were put forward: replacement in kind with carved wood for larger losses and replacement with synthetic resin for small surface losses. The report recommended that experienced native carvers make any replacements that required carving of wood while the conservators would make small replacements with synthetic resin where the original contour of the lost area is obvious.

- Consolidate Areas of Severe Fungal Decay

Two methods of consolidating deteriorated wood were put forward; low viscosity two part epoxy and Polyvinyl Butyral (PVB) in alcohol. The epoxy is more weather resistant but has limited penetration and is not reversible. Consequently the epoxy was considered for the poles that were to remain outdoors while the PVB was recommended for the poles and house-posts that were to remain in protective storage.

- Close Gaps Between Support Posts and Rear of Carved Poles

Inspection found that rain water was entering the space between the front of the support posts and the rear of the carved poles, in many instances resulting in fungal deterioration. The recommendation was made to install a membrane between the poles and support posts to prevent the infiltration of water while allowing for air circulation.

- Reduce Visual Impact of Graffiti

Graffiti was noted on a number of poles along the Russian Walk, generally fairly low on the pole, but occasionally in locations that indicated the pole was climbed. Some of the graffiti appeared to have been done fairly recently. Most was carved into the wood surface. The recommendation was made to reduce the visual impact by toning in fresh carving to match surrounding wood surfaces. Reservations were expressed about a previous suggestion to fill carved graffiti with wax, as this technique could make it more visibly intrusive. Another suggestion put forward was to install a wayside exhibit on the trail to warn against contributing to vandalism of the poles.

- **Elements of Preventive Maintenance of Standing Poles:**

Preventive maintenance was understood to be those activities that need to be done on a regular, ongoing basis and could be accomplished by the park maintenance staff.

- Removing Organic Debris from Base

Organic debris, primarily hemlock and spruce needles as well as leaves had been allowed to accumulate around the base of the poles and support posts. In some instances wood chips had purposely been placed around the base to disguise the base of the carved pole. The organic material tended to trap water and accelerated fungal deterioration. The survey indicated a correlation between the presence of organic material and moisture content above 30%. The survey recommended removal of organic material from around the base of the poles and, if desired for appearance purposes, replacement with rounded cobbles that would promote drainage.

- Trimming Branches and Roots Away from Vicinity of Poles

The presence of overhanging branches increases the amount of needles that tend to drop on horizontal surfaces of the poles. It also presents the potential for physical damage to the poles should the branches drop on the poles or hit them as they sway in a storm. Trimming the branches back also allows for more sunlight penetration, speeding evaporation as well as easing access for treatment and inspection. In some instances it was noted that roots of nearby trees were impinging on the base of poles.

- Cleaning

The poles require periodic cleaning using non aggressive methods such as water and soft bristle brushes. The primary purpose of the cleaning is to remove organic material from the surface as well within the larger splits.

- **Recommendations- Poles and House Posts in Storage**

The memo noted that most of the objects in storage had been taken off outdoor exhibit due to poor condition and so not surprisingly extensive areas of old fungal damage, erosion of carved surfaces, and loose joints were found. There were however exceptions such as the Gaanaxadi Raven pole which had been placed in storage as an example of a pole carved during the CCC era. Many of the poles in storage had been repaired during previous restoration campaigns. The survey noted that some of the poles, considered original, actually retained few original components.

- **Recommendations-Storage**

Both short and long term recommendations were made to improve storage conditions. In the short term, it was suggested that all the poles and pole

fragments should be placed on shelving or blocking above the earthen floor and that wood chips be removed from the floor. It was also suggested that those poles that were subject to wetting by wind-driven rain be covered with Tyvek or similar sheeting material that allows moisture vapor to escape but prevents the penetration of water in liquid form. For the long term, it was recommended that a larger facility should be developed that could protect the poles from the outdoor elements and allow for their exhibit and/or study. It was noted that the facility would not require complete climate control.

Treatment Proposal for First Phase of Treatment 1992
Informal communication regarding the totem preservation project continued during the winter of 1992 among the Levitan and Sheetz, Jean Swearingen, Alaska Regional Curator, Steve Peterson Alaska Regional Architect and the park superintendent. Doug Hicks, Assistant Superintendent Williamsport Preservation Training Center, was also brought into the discussion to utilize his expertise in rigging and moving large objects.

Levitan and Sheetz worked to refine the treatment proposal for the first phase of treatment which was to take place during the summer of '92. The proposal involved the lowering, treatment, and re-erection of four poles, which included the Trader Legend pole as well as those mentioned above. The conservators also did further research on borate based preservatives and on water repellants and came up with two promising commercial products. A suitable group of compatible epoxies formulated expressly for preservation use was also identified.

A draft treatment proposal was sent to the Superintendent in April of '92. In the cover letter, the conservators once again stressed that the proposed treatment will extend the exhibitable life of the poles but not preserve them indefinitely in an exterior environment. They also made clear that since these artifacts were to remain on outdoor exhibit preservation treatment would "*require materials and techniques not normally employed in the treatment of museum objects housed in a protected environment. Every attempt will be made to preserve the integrity of these significant objects but it should be understood from the outset that some materials and techniques proposed are not fully reversible. Some aspects of the treatment we are proposing have not been used before on similar objects exhibited under similar circumstances. We are confident, however, that the proposed treatment will do no harm and will help prolong the life of these artifacts."* The cover letter went on to say that because the treatment is to an extent experimental it is particularly important to monitor the poles so as to determine the effectiveness of the treatment and the optimum maintenance schedule. The proposal refined the more general treatment options that were discussed in the survey narrative and identified particular techniques and materials.

- **Cleaning**

The proposal stipulated that cleaning would be done mechanically and with fiber brushes and clean water. Rust stains would be removed mechanically and where necessary with oxalic acid.

- **Fungicide/Insecticide**

Bora Care, a commercial product, comprised of a 40% solution of disodium octaborate tetrahydrate, a borate salt compound in glycol was proposed for use as a fungicide and insecticide. The product is effective against decay fungi as well as carpenter ants, termites and wood boring beetles. It is used for both control of existing infestation and prevention. The advantage of Bora Care over

other borate based preservatives, which are typically less expensive, is that it diffuses more deeply into dry wood due to the inclusion of glycol penetrants.

Bora Care is relatively easy to handle and apply. It can be brushed or sprayed on with inexpensive garden sprayers. Although application temporarily darkens the wood, once the chemical dries entirely the wood returns to its normal color. When dry, Bora Care treated wood can be painted if desired.

Two to three spray applications of Bora Care were proposed for each pole with additional applications to end grain surfaces to the point of saturation.

A highly concentrated form of sodium borates, in solid rod form, was proposed for placement within large splits and behind plugs; areas with a high susceptibility to fungal decay. Molded from fused water diffusible borates, these rods are used commercially by the utility industry for placement around the base of utility poles. As the rods dissolve borates migrate to areas of high moisture content. If the moisture content falls the diffusion stops and the residual preservative remains. The higher the moisture content of the wood, the quicker the rods dissolve and diffuse, the lower the moisture content, the longer the rods will last. Even in relatively moist conditions research suggests that the rods will last 3 to 10 years. The product, commercially sold as Impel Rods, is available in a number of diameters ranging from ¼" to ¾" and lengths from 1" to 3".

- **PolyVinyl Butyral Consolidant**

PolyVinyl Butyral (PVB) was proposed for use as a consolidant for areas of fungal decay in poles and house-posts that were to be displayed or stored indoors. It is a thermoplastic resin, meaning it dissolves in solvent. When the solvent evaporates the resin becomes solid, acting as an adhesive to bind deteriorated wood fibers together.

PolyVinyl Butyral is a resin characterized by its toughness, flexibility and ability to adhere to a variety of surfaces. It is soluble in both polar solvents, like alcohol and non-polar solvents, like mineral spirits and has a number of industrial applications as a film and as a binding agent. For conservation purposes it has been used primarily as a consolidant for deteriorated wood and less frequently as an adhesive.

Tests have shown that PVB dissolved in alcohol will penetrate more deeply into deteriorated wood than other resins. (Y. Wang, & A.P. Schniewind JAIC 1985, Volume 24, No 2). Repeated applications can be made that drives the resin more deeply into the wood. Consolidation with PVB in alcohol is reversible to a degree; however complete removal of the consolidant from deteriorated wood is not practicable in non laboratory conditions.

Generally deeper penetration into the wood can be achieved with lower concentrations of resin to solvent. However with lower concentrations there is

less residual strength. In practice in the treatment of large timbers the initial applications are often in the range of 5%-10% to achieve optimal penetration and subsequent applications are 10%-15% to improve strength. For large scale wood consolidation purposes PVB can be applied by drip, brush, or spray. Working on a smaller scale it can be applied by means of syringe.

Although by 1992 there had been some testing and use of PVB as a consolidant for wood in protected environments there has been little testing of its effectiveness for strengthening deteriorated wood in an outdoor environment that was subject to repeated wetting and extreme temperature.

- **Epoxy Consolidant**

Low viscosity, flexible, two-part epoxy was proposed to consolidate shallow areas of fungal decay on poles that were to remain outdoors. This material has been thoroughly tested and used as a consolidant in exterior settings. Its use is primarily in an architectural context, often in the consolidation of logs and large timbers.

Epoxies are thermosetting; they cure by means of chemical reaction between the resin and hardener. For all practical purposes, once cured the epoxy consolidation is not reversible. Generally epoxies impart more strength than thermoplastic resins and have greater resistance to weathering.

Epoxy consolidants, like all thermosetting resins, do not penetrate as deeply as do thermoplastic resins and, unlike thermoplastic resins, additional applications will not drive the consolidant further into the wood. Consequently consolidation with epoxies can result in a hard exterior shell of strengthened wood with partially deteriorated wood beneath. In some instances, the hard outer shell can shear off from the substrate. Even given these disadvantages, epoxy consolidation was recommended for those poles that were to remain outdoors because testing had indicated that it was able to hold up in an outdoor environment. It was recommended that where possible the epoxy be injected deep into the decayed areas so as to avoid the problems associated with surface consolidation.

ConServ brand epoxies were chosen for the pole preservation product because they had been formulated specifically for preservation work. This company marketed four types of epoxies that were mutually compatible as well as tools, equipment, and additives that eased application and made the material more versatile. The primary epoxies used in the totem preservation project included a consolidant (ConServ 100), a patching material (ConServ 200) and an adhesive (ConServ 500). Occasionally a structural epoxy (ConServ 600) was used.

The consolidant is formulated to have low viscosity, so as to penetrate as deeply as possible, saturating and encapsulating decayed wood fibers so as to stabilize weakened areas. It also acts as a primer for the patching epoxy.

When the resin and hardener are mixed together, the chemical reaction begins, causing the mixture to cure and move from a liquid to a solid state. Cure time has three phases which are dependent on temperature, amount of material mixed, and shape of the mixing container. The initial stage is pot life, the period when the mixture is workable and can be applied to the object. The second stage is gel time, the time required for the material to go from a liquid to a solid state, and the last phase is final cure when the mixture becomes hard and dry and reaches 90% of its final strength.

In practice, due to the cool temperatures encountered in Sitka, curing of the epoxy consolidant was often slower than anticipated. Covering the poles with a tarp and heating the enclosed space with a kerosene fueled torpedo heater proved necessary on some occasions to accelerate curing.

Epoxies are "exothermic," meaning that they give off heat as they cure. This heat can shorten the period of time during which the batch is workable. Larger mixes create more heat than smaller batches and as result, have a shorter pot life. The shape of the mixing container and its composition will also affect the amount of heat given off and the pot life. In practice mixing of epoxies in pole preservation work required limiting the size of the batch so as to maximize pot life.

- **Epoxy Patching Material**

The patching epoxy (ConServ 200) recommended for use in the project is relatively soft and flexible and is typically used to fill surface losses. It adheres most readily to wood that has already been consolidated. A good bond also requires a moisture content level below 20% at the time of application. Modifiers are added after the hardener and resin are mixed to make a material with appropriate working characteristics. The modifiers used most commonly in totem preservation work are phenolic micro-balloons and fumed silica.

Phenolic micro-balloons are small (typically about 50 microns in diameter), hollow spheres of phenolic resin; usually rust red in color. They are added to the epoxy as a bulking agent and tend to make the cured material more easily tooled when cured. Epoxy mixed with micro-balloons can be cut, drilled, filed and sanded. Because the tooling cuts through the spheres, the surface of the patch will more readily accept stains and paint. The amount of micro-balloons added to the mix can be adjusted to achieve the desired density, flexibility and workability. High concentrations of micro-balloons in the mix will however weaken the bond to the wood.

Fumed silica is thixatropic. Adding it will thicken the mix and increase its viscosity. It is used is to reduce flow, if for example one is patching an area on the side or overhead. A large amount of this material in the mix will make the cured epoxy more difficult to file and sand.

As the project progressed, it was determined that this epoxy formulation was strong enough to use as an adhesive for most purposes so long as lesser amounts of the modifiers were added. Its relatively low viscosity allowed it to penetrate irregular surfaces.

- **Epoxy Adhesive**

ConServe 500 adhesive is utilized in instances where structural strength is required.. This material has a paste-like consistency and is used to join wood to wood and wood to reinforcing bars. It is not effective as an adhesive for deteriorated wood and thus had limited application in the preservation project.

- **Extent of Treatment**

It was proposed that deteriorated and friable fills were to be removed but that sound fills and patches were to be left in place. Loose and separated elements were to be re-secured using original methods where possible. All new fastening devices were to be non-corroding, either copper alloy or stainless steel.

Also proposed was that the decision to replace missing areas be made on a case by case basis and that patches be made only to those areas which, if left untreated, would lead to further decay. The decisions on extent of treatment were to be made by appropriate park or regional personnel.

Patches would be made with both red cedar and epoxy. The epoxy patches were to be used for surface fills over consolidated wood and they were to be tooled and textured to replicate the appearance of the adjoining weather wood. Cedar patches were to be used in situations where a minimal amount of original fabric would need to be removed in order to make a good gluing surface. The decision was later jointly made by the conservators and park staff that all carved wooden patches would be made by native carvers experienced in the medium.

- **Application of Protective Caps**

Caps were to be placed on the tops and upper horizontal surfaces of the poles where necessary to reduced water infiltration and fungal decay. They were to be removable, visually unobtrusive from the ground, and conform to the carved shape. Lead coated copper and fiber-glass were considered for use.

- **Water repellant/UV inhibitor**

X-100 Waterseal, paraffin based water repellant with soy oil, was recommended as a final treatment step. This product, formulated for use on vertical surface, has a higher concentration of solids in relation to solvent than most water repellants, contributing to longer term effectiveness. The paraffinic oils also help filter Ultra Violet rays. The product is formulated so that the paraffin oils penetrate the wood fiber to form a good water seal while the soy oil reacts with oxygen to bond the wood fibers on and near the surface. (Personal

communication Sheetz with John Tadych, president of American Restoration Products, memo Sheetz to Hellickson May 28, 1992)

As previously noted surface mold and mildew was found on many of the poles. Typically it was observed on surfaces that do not receive much sunlight. Although mold and mildew do not consume wood, their presence does impact the appearance of the poles. Bora Care, although effective in combating wood deteriorating fungi, is not effective against mold and mildew. Consequently the conservators suggested including Busan, a mildewcide with the water repellant.

Like Bora Care, X100 Waterseal can be brushed or sprayed onto the poles. Although it initially darkens the wood surface, with time as the oils penetrate below the surface, the appearance lightens.

- **Documentation**

The proposal stipulated that all treatments would be fully documented and that the documentation would be made available to the park and regional office. Documentation would include all procedures and materials used on the poles, illustrated with diagrams and photographs as necessary to indicate specific areas of treatment. Cyclic maintenance recommendations were to be made as the required frequency for specific tasks became apparent. Initially photographic documentation was made with Ektachrome slides. Later on in the project, photographic documentation was done digitally.

Park staff concurred with the treatment proposal put forth by the HFC conservators and funding was subsequently found to initiate treatment during the following summer.

The Treatment Phase Begins

Lowering of Poles June '92

A crew consisting of three staff members of the Williamsport Preservation Training Center and HFC conservator Ron Sheetz along with Sitka NHP maintenance staff lowered the four poles identified in the treatment proposal as being unstable.

They were taken down in the following manner. With the pole supported at the top by nylon straps affixed to a crane and stabilized at the base with guy ropes, a 2" deep pit was dug. A ¼" deep cut was then made with a chain saw around the base, about 3" above where the pole was to be cut off. This was done so that if a split were to form during the process, it would run only up to the incised ring. The chain saw bar was then inserted toward the center of the pole from front and rear and a 4" cut was made toward the perimeter on each side. Wood shims the thickness of the saw cut were then inserted into the center of the pole from front and rear. The cut was then further widened and additional shims were driven in. Using this method the pole could be cut almost all the way through without it moving. The final cuts were made from the perimeter inward. After cutting through the pole was lowered by crane onto padded 6" x 6" supports.

With the poles resting on 6" x 6" cribbing, the remainder of the previously buried un-carved bases was cut off to facilitate handling and moving. The depth to which the poles were buried proved to be shallower than anticipated. As an example, the **Wassgo Legend** was set only 5' in the ground.

The poles were moved by trailer into the breezeway between the visitor center and the curatorial storage area. Deteriorated support posts were removed from the **Waasgo Legend** and the **Lakich'inei poles**. Many of the ferrous bolts affixing the poles to support posts were found to be severely corroded. As an example, corrosion had reduced a ½" diameter bolt to 3/16" diameter in the open area between the support post and the pole, severely weakening the bolt and creating the potential for collapse.

All the poles were cleaned initially with water and soft bristle brushes and organic debris was removed from the deep splits mechanically. Subsequently the poles were cleaned with a 1:1 mixture of denatured alcohol and water in an attempt to remove green mold stains.

Moisture content readings were taken at the base and upper surfaces of each pole. They ranged from 21% to 47% indicating that in at least some locations fungal decay was advanced.

In addition to lowering the four poles during this campaign, a reproduction **Saanaheit** house post that had been on exhibit in front of the visitor center was

taken down and re-erected on two 10” x 10” treated posts and the loose beak of the Raven Memorial pole was re-adhered with epoxy.

- **Use of Totem Cradle**

To facilitate treatment of the lowered poles HFC shipped a totem cradle to Sitka for use in carving and fitting the support posts and subsequent conservation treatment of additional poles. The cradle, originally fabricated by HFC mount-makers for treatment of a totem belonging to the Department of Interior, consisted of adjustable steel tube framework from which was suspended three 5” wide nylon belts. The belts, sewn in a continuous loop, were strung between steel rollers. Adjusting the belts allowed the totems to be gently and safely turned. The straps could also be raised and lowered by means of a ratchet permitting the totems to be moved to an easy working height.

Phase I, Treatment of Structurally Unstable Poles July-August ‘92

HFC conservators Sheetz and Levitan along with Gene Hirayama, a preservation specialist on staff at the Historic Preservation Training Center worked at the Park from July 20th –August 14 1992. Extensive treatment was performed on the four poles lowered the previous month and preliminary treatment was done on the standing poles.

- **Lakich’inei**

The **Lakich’inei** pole required the most extensive work. Once the support post was removed, it became evident that there was extensive splitting and fungal decay on the rear surface extending up approximately 12’ from the base. Many of the decay pockets were found beneath thin walls of relatively sound wood. This phenomenon, also seen to a lesser extent in other poles, is probably the result of the previous applications of pentachlorophenol which protected the surface from fungal decay but did not penetrate deeply into the wood.

One decay pocket was found to extend up approximately 6’ above the base. About 1” in width and 5” in depth, it appeared to be the result of a natural defect in the log. It was noted that large fungal fruiting bodies were found on the inner wall of the crevice and on the base where the pole joined the support pole.

It was also found that a split extending completely through the center of the pole from the base up to approximately 8’ rendered the pole unstable. The split, 1” wide at the base tapers to approximately ½” at the eight foot level. A ferrous rod, approximately ½” in diameter bridges the split at the eight foot level. It is not clear when this rod was installed. The conservators along with park staff made the determination that installation of an internal supporting structure would be necessary if the pole was to be re-erected outdoors.

Deteriorated wood shims as well as plaster and wood putty fills were removed from the splits and checks. Once removed it became apparent that the wood

under these old fills was, on the whole, more deteriorated than the exposed surfaces. This was most likely due to rain water trapped behind the fills, unable to readily flow to the surface and evaporate.

Considerable effort was made removing organic debris from the deep splits. Long thin probes were initially used for this task, but eventually a more efficient method was developed; a thin, flexible copper tube was affixed to an air compressor and the organic material was removed with air pressure after inserting the tube deeply into the split.

Two coats of Bora Care were applied to all pole surfaces and all splits, checks, and end grain surfaces were repeatedly saturated in an attempt to get the fungicide to penetrate deeply into the wood. In all, four gallons of the solution were used on this pole. In some areas, boron salts remained on the surface after the glycol solution evaporated. This fluorescence was removed by wiping the surface down with hot water on cloths.

One coat of X 100 Waterseal was applied to all surfaces. Multiple applications were made to decayed areas and end-grain surfaces to the point of refusal.

Unstable splits were adhered with epoxy adhesive and some surface losses not requiring structural stability were filled with a flexible epoxy resin that was bulked with phenolic micro balloons.

The split at the left center base of the pole was filled with the epoxy/micro balloon mix so as to stabilize the area and reduce the possibility of loss. This fill was then toned in with oil color stain.

Prior to its mounting on a new support post and re-erection, a stainless steel internal support was affixed to the hollowed interior surface of the Lakich'inei pole to stabilize a long, through split along the grain that emanated from the base and extended for about eight feet. The support consisted of a convex matrix of welded bands running along the length of the pole and across the internal curve. The rigidity of the support was increased with narrow gussets at the apex of the curve. The support was affixed 8" above the base.

Holes were pre-drilled in the support for stainless lag screws. Shims made from neoprene and re-enforced rubber conveyor belt material was placed between the support and the interior of the pole where lags were inserted. Some difficulty in affixing the support was encountered due to presence of a number of decay pockets beneath the predrilled holes in the support. In six locations these decay pockets required stabilization prior to installation of the support.

The following procedure was used to stabilize those locations. Half inch holes were drilled into the decayed wood beneath the predrilled holes in the support. The decayed areas were consolidated with Conserve 100 applied with a siphon

spray gun through the holes. The epoxy was left to cure for two days during which time a tarp was spread over the totem and the space within the enclosure heated with a kerosene heater. Patching epoxy, to which was added phenolic micro-balloons and fumed silica to achieve a caulk-like consistency, was then inserted into the decay pockets. The epoxy was put in an empty caulking tube to which was attached flexible plastic tubing. It was then forced into the decay pockets by a caulking gun. After setting for 24 hours, lead holes for the lags were drilled into the epoxy consolidated areas and the stainless support was firmly affixed to the pole.

- **Trader Legend, Waasgo Legend, Mosquito Legend**

These poles were lowered due to extensive deterioration in the vicinity of their bases and the resultant need to place them on a support posts. They were cleaned, old fills were removed, and deteriorated surfaces were consolidated with low viscosity epoxy. Bora Care and X-100 Waterseal were then applied by brush and spray. The deteriorated un-carved bases were cut off and the rear surfaces were fared so as to enable installation of new support posts.

- **Preliminary Treatment of Standing Poles**

Utilizing a high lift and scaffolding all the standing poles were cleaned, deteriorated plaster and wood shims were removed and one coat of Bora Care was applied. The conservators recommended that an additional coat of Bora Care and water repellant be applied and that the **Yaadaas Crest**, **Frog Raven** and **Shark/Raven** be lowered during the next preservation campaign).

- **Fabrication of Support Posts**

Park and regional staff and the HFC conservators agreed that wooden support posts would be more visually compatible with the environment of the totem park than steel or aluminum posts. The park arranged to have Dave Evans, a restoration specialist with the NPS Alaska Regional office make new support posts during the winter of 1993 for the four totems that had been lowered the previous year. Sheetz suggested to Evans that in shaping he leave approximately 2” of space between the poles and support posts so as to allow air circulation and reduce the chances of fungal growth. (Memorandum to Dave Evans, From Ron Sheetz, Subject Totem Pole support post, August 28 1992).

Using plywood templates of the contour of the rear of each pole, Evans, who had a great deal of experience in working logs, carved the posts to closely fit into the U shaped opening with power and hand tools. The support posts were made from yellow cedar (*Chamaecyparis nootkatensis),* a hard, dense wood that is extremely resistant to fungal and insect attack. This tree grows in the Sitka area and was used for a variety of purposes by natives in Southeast Alaska.

- **Mounting the lowered poles on support posts**

Since neither the **Trader Legend** nor **Mosquito Legend** had previously been erected on support posts, new holes had to be drilled through these poles. The number and location of the poles was determined by Bill Heubner, structural engineer in the Alaska Regional Office. Initially, holes 2" holes in diameter and 3" deep were drilled into the front of the poles to accommodate the washers and nuts. The holes were drilled deep enough to allow for the insertion of wood plugs once the attachment to the support posts was complete. Heubner allowed the conservator some latitude to place the holes in surfaces that were not intricately carved. The next step was to drill 9/16" holes entirely through the pole for the passage of the ½" fiberglass all thread rod specified by Heubner.

The poles were not mounted onto their support posts until they were in position on the trail so as to avoid the difficulty of maneuvering the extra length along the narrow twisting trail. A crane was used to place the pole over the support posts at which time a 4' long 9/16" drill bit was used to drill through the posts using the pre-drilled holes in the poles as guides. The all-thread was then placed in the hole and secured with fiberglass nuts. The treatment report authored by Sheetz noted; "*The extent to which the nuts could be tightened on the rods is limited. Tightening too much caused both a nut and the thread on a bolt to strip. The nuts could only be snugged to the point where the rods started to twist.*" Sheetz also observed that the totems sagged approximately 1" in relation to the support posts once they were erected. Additional problems with the fiberglass all-thread rods and nuts would become evident in the future.

- **Installing Cu-rap 20 at grade**

A means of limiting fungal decay at and immediately below the grade line on support posts was sought because of the concern that Bora Care would leach out in contact with soil. Cu-rap 20, a material used to protect utility poles was selected. It consists of a polyethylene backed wrap to which is applied a paste consisting of borax and copper naphthenate. The bandage is wrapped around the post just at and immediately below the ground line and typically stapled in place. Tests by Mississippi State University have demonstrated the effectiveness of this treatment on southern pine after 15 years of exposure. (Ambrugy, T.L., Freeman M.H.) The researchers concluded that effectiveness is due to the copper being transported into the wood fiber by the diffusible borates.

Prior to re-erection, Cu-Rap 20 was applied to all the totem support posts from ground line down to about 24" below ground line. A minor disadvantage of this treatment that later became apparent is that after a period of exposure some green staining typically appears on the posts just above the ground line.

Phase II, Treatment of Standing Poles and 3 lowered poles, 1993

- **3 more poles lowered**

Three additional poles were lowered for treatment and placement on new support posts during this preservation campaign; **the Frog/Raven**, the **Raven/Shark** and the **Yaadaas Crest**. The poles were lowered by means of a crane from which a spreader bar was suspended. Nylon straps ran from the spreader bar to the pole. The spreader bar eased the hoisting, positioning and lowering of the poles. Based on the knowledge garnered the previous year about the shallow depth to which the poles were buried, the bases were dug out with a backhoe while the poles were supported by the crane. This procedure saved time and avoided the potential safety hazard associated with cutting the bases with a chain saw. Once lowered the three poles were placed on a trailer and transported to the breezeway for treatment.

Conservation work during the summer of 1993 consisted primarily of treatment of the three poles lowered the previous spring, and further work on the remaining standing totems. In addition treatment was performed on one of the reproduction Saanaheit house posts and a preliminary evaluation was made of the work done in 1992.

- **Yaadass Crest - An Original Brady Pole?**

Although the park had been operating under the assumption that the Yaadass Crest pole was carved during the CCC era, the condition survey raised the possibility that this pole was carved prior to that period. Sheetz and Levitan noted that the extent of weathering and checking indicated considerable age and that the quality of the carving was, on the whole, better than most of the other CCC era poles. The body of the lower figure and upper two figures were of lesser quality and thought to be CCC work.

The upper figures were joined to the main shaft with a ship-lap joint secured with carriage bolts. This is the only example of such a joint found in the Sitka pole collection. As a preservative measure, the surfaces of the join and the rear of the upper figures were coated with coal tar, a coating used during the CCC preservation campaign. The base of the pole was re-faced with five timbers spiked to the deteriorated shaft and carved in the shape of a bear. The quality of the carving of this figure does not match that on the rest of the pole. Once the pole was lowered, it became evident that a portion of the totem base approximately 10” wide x 36” high was highly deteriorated. Another factor that suggested this pole is an original was the presence of wood shims in the weathering checks of the middle figures, a repair technique used by the CCC workers but seldom used after that period.

The physical evidence suggesting that the **Yaadass Crest** was an original pole, collected by Brady, rather than a reproduction carved under the CCC program led to a re-examination of relevant archival material in the park collection. (Memorandum to park files, Gene Griffin, June 23, 1993) A Forest Service report from March, 1939 indicated that five Sitka poles were restored rather than reproduced and that pole # 390 (the number used at the time to designate the Yaadass Crest) was in the best condition of all the original poles. The age of this pole was further confirmed in an interview conducted by Duane Pasco with George Benson, chief carver, on September 17, 1967 in which Benson states that the CCC crew replaced the top two figures on the number 3 pole. Photographs from that era indicate that the number three pole is the Yaadaas Crest.

The likelihood that the **Yaadaas Crest** was an original pole collected by Brady raised the question as to whether it should be re-erected on the totem trail or placed in storage until suitable exhibit space could be constructed. This decision had the potential of impacting the nature of preservation treatment of the pole. The consensus reached with park and regional staff was that methods and materials should be able to withstand outdoor conditions based on the assumption that the pole may be returned to outdoor display at least until indoor exhibit space was constructed.

The pole was cleaned and deteriorated areas were consolidated with ConServe 100 epoxy. Three partially separated areas were adhered with ConServe 200 epoxy bulked with phenolic micro-balloons and fumed silica. An assortment of band clamps and wood wedges were employed to re-adhere loose and separated areas. Mylar sheeting was used to prevent adhesion of the nylon bands and wood blocks to the poles. A second application of Bora Care was made to exterior and interior surfaces and all surfaces were coated with X-100 water repellant.

- **Frog/Raven**

The Frog/Raven pole, a CCC era reproduction, was given additional coats of Bora Care and water repellant. The raven beak, originally affixed to the main shaft by means of a mortise and tenon join, had been removed the previous preservation campaign due to concern that as a result of its deteriorated condition it might fall off the pole. In a prior repair, probably done in the 1970's, approximately 3" of the front of the beak was cut off and a hole drilled through its length, transecting the tenon, and extending to the rear of the shaft. The join was then re-enforced with a long bolt. As a result of fungal decay and wear of the bolt hole, the beak sagged downward opening a gap on the upper side that admitted rain water and promoted decay.

Treatment to rectify this condition included affixing yellow cedar shims to the tenon to make it fit more snuggly in the shaft mortise, inserting a new ¾" zinc coated all-thread rod, and tightening the rod so as to eliminate the gap at the top.

All surfaces were thoroughly flooded with Bora Care before re-assembly. A red cedar plug was fabricated to fill the bolt hole at the end of the beak so as to prevent water entry and improve the appearance.

The split area at the base was cleaned and all organic debris was removed. Due to damp conditions, it proved difficult to get the sides of the split to dry enough to accept the epoxy adhesive. The area was; therefore, force dried by applying Xylene, a highly volatile solvent, after which the split was adhered with epoxy.

- **Raven/Shark Pole**

The pinned and glued join between the main shaft and shark fin had separated due to deterioration of the pins and failure of the adhesive. The old resorcinol adhesive was removed from mating surfaces and new pins were fashioned from yellow cedar. The fin was re-adhered with Conserve epoxy 200 and the new pins inserted into the original holes. Oil stains in mineral spirits were used to tone in losses and abrasions along the glue line.

A second coat of Bora Care was applied to all surfaces as was an initial coat of water repellant.

A dramatic example of how the exposure to sun and prevailing wind affects condition is provided by the two sides of the shark fin. The side facing the sun and prevailing wind off the water had lost almost all its paint and had an irregular weathered grey appearance. The side in shadow and protected from the wind retained much of its original painted surface.

- **Additional Treatment in 1993 Session**

The bolt holes of the three poles re-erected in the spring of 1993 were filled with friction fit red cedar plugs. In instances where the old holes had worn too large for the plugs to fit tightly they were adhered with a small amount of epoxy. Plugs for the irregular holes in the **Lakich'inei** pole were individually cut to conform to the shape of the holes. After insertion the plugs were fared into the surrounding surfaces and then stained to match with oil colors in Stoddard solvent. Impel rods 1" long x ½" diameter were placed behind the plugs to deter fungal activity in the cavity.

The beak of the lowermost figure of the **Gaanaxadi/Raven Crest** pole was removed in 1992 because the end had been broken off and was lost. Tlingit carver Nathan Jackson who carved the reproduction pole in 1983 agreed to repair the beak. When repaired and repainted, the damaged element was returned to the park. Jackson requested that the beak be rejoined to the shaft with resorcinol adhesive and secured with the yellow cedar dowels. The conservators applied Bora Care to the unpainted surfaces of the beak. Due to shrinkage the beak tenon no longer fit tightly in the shaft mortise. To achieve a snug fit shims were adhered to the top and bottom surfaces of the tenon and the beak was subsequently adhered and pinned to the mortise.

Examination of the upper section of the **Cormorant Memorial/Mortuary Column** indicated that the beak of the bird figure was partially separated from the main shaft. Removal revealed extreme fungal deterioration of the tenon as well as the cheeks and bottom surface of the mortise. These areas were saturated with Bora Care and after drying were consolidated with Conserve 100 epoxy. The beak was then re-adhered in place with bulked Conserve 200 epoxy. Once the beak was secured, the splits in the end grain of the head were consolidated with Conserve 100. The treatment report noted that due to the extreme deterioration of these areas the pole should be closely monitored and the integrity of the join periodically checked.

A second application of Bora Care was made to all the standing poles and those few which had not yet received an application of the water repellant.

- **Evaluation of 1992 Treatment**

A preliminary assessment of treatment performed the previous year was made during the 1993 field session. Epoxy glue joins, fills, and consolidated areas were found to be sound. A single exception noted was the adhesion of the wide split in the **Lakich'inei Pole**. The epoxy had separated from the wood on one side of the join. This appears to have occurred as a result of the physical stresses imposed on the pole as it was re-erected.

A comparison was made of the images documenting the extent of fungal growth on the surface of poles in '91 and '93. For the most part, Bora Care appeared to be effective in preventing the recurrence of fungal growth one year after application. One exception was the top end-grain surface of the **Yaadass Crest Corner Pole** where fungal decay was advanced, resulting in decay pockets that tended to accumulate rain water and organic debris. It was noted that areas such as this would benefit from the installation of a sheet metal or resin cap.

Preliminary Planning for Exhibit of Original Totem Fragments/ House Posts

In the early 1990's Sitka NHP and the Alaska Regional Office commenced planning for the rehabilitation of the park visitor center. Improvements were to include the upgrade of the collections storage space and expansion of exhibit space to allow for display of the original house posts and totem fragments. One of the options under consideration was converting the breezeway to interior display space. Steve Peterson, historical architect, Alaska Regional Office asked Levitan and Sheetz to comment on environmental conditions in the proposed space and the ramifications for the condition of the poles.

The conservators stressed that the most critical factor (memo from Levitan and Sheetz to Peterson August 19, 1993) affecting the preservation of the artifacts was protection from the fungal decay caused by exposure to precipitation. This could be accomplished most simply by placing the artifacts under roof or if

desired totally enclosing the display space. It was also suggested that the artifacts should be elevated above the concrete floor of the breezeway so as to prevent water wicking up through the masonry into exposed end-grain.

The memo cautioned that if the display area was to be heated during cold weather to human comfort levels the resulting drop in relative humidity could adversely affect the wooden artifacts by lowering the moisture content significantly, thereby causing shrinkage. Suggested strategies for mitigating this potential damage included limiting heating in the space and/or providing humidification during the winter heating season. It was noted that the artifacts are now equilibrated to an RH of 70-75% and if moved to a heated space the RH should be allowed to fall gradually over a period of months to about 60% and then maintained in the range of 50%-60%.

Light levels were not considered to be a major problem due to the absence of sensitive painted surfaces. The memo did caution that "*if artificial lighting is used in the display space to augment natural lighting care it should be ensured that the fixtures are placed a sufficient distance away from the artifacts so as to avoid localized heating which could cause desiccation and splitting of the wood*."

Phase III, Treatment of Original House Posts &Totem Fragments 1994, 1995
Conservation treatment during the summer sessions of '94 and '95 focused on original poles and house posts that had been taken off of exterior exhibit and placed in storage under less than ideal conditions. The intent of the work was to clean and stabilize the poles so they could be placed on upright display in a protective exhibit environment.

The poles treated during these field sessions included the set of four original house posts from Old Kasaan given to Governor Brady in 1901 by Chief Saanaheit, as well as the **Memorial/Mortuary Column** and the remaining sections of the **Mosquito Legend** Pole, both of which were collected by the Brady expedition in 1903. The following discussion will outline the unusual condition problems of these poles and the treatment solutions utilized.

In original use, the house posts were under roof however; once acquired by Brady, they were displayed outdoors near the Kiksadi fort site along the totem trail. Eventually their deteriorated condition dictated that they be taken down and placed in storage. At that time, reproduction posts were carved and placed adjacent to the reproduction Saanaheit Pole in front of the visitor center.

Historical photographs and the existing fragmentary park records indicate that while on outdoor exhibit the original posts were periodically repainted and repaired. The earliest photographs taken at the fort site show them fully painted and buried directly in the ground; more recent images show them mounted on rear support posts. The posts were repaired during the CCC restoration

campaign at which time it was noted that they were in “good condition”. Their condition at that time, relative to the other poles at Sitka, is understandable given the fact that they were protected in their original location and exposed to outdoor elements for only forty or so years.

The **Memorial/Mortuary Column** and the **Mosquito Legend Pole** were first erected along the totem trail in 1905 after being shipped back from the expositions in Saint Louis and Portland. Physical evidence and records in the collection suggest that repair and restoration work was undertaken before being sent to the expositions and then sporadically after they were erected on the totem trail.

The **Mosquito Legend Pole** was reproduced by the CCC carvers after which the remaining portion of the original pole was exhibited in the Sheldon Jackson Museum and the reproduction was erected on the totem trail. Extensively restored under the CCC program, The **Memorial/Mortuary Column** remained on outdoor display until the late 1970’s. At that time, it was reproduced and the original was placed in storage.

In 1991, two original house posts were stored in the shed next to the visitor center and two were stored in the lower shed. All were still attached to 6” x 6” support timbers by means of bolts and spikes. The **Memorial/Mortuary Post** was stored in the lower shed, and the remaining portion of the **Mosquito Legend Pole** was stored in the shed adjacent to the visitor center. Although conditions in the storage spaces were better than complete exposure to the outdoor elements, they were far from ideal. Protected by roof from direct rain and sunlight, they were still subject to wetting from wind-blown rain and to damage from insect pests and rodents. Under these conditions the artifacts continued to deteriorate, although at a slower rate than in outdoor display.

The conservation treatment of the house posts and original poles was carried out with the assumption that they would eventually be displayed upright in a partially climate controlled indoor space. The materials and techniques used in the course of the treatment; therefore, differed from those used to treat the outdoor poles. The intent of the treatment was to structurally stabilize the artifacts to allow for display, while preserving as much of the original material as possible. No repainting or replacement of missing elements was undertaken.

- **Saanaheit House Post 5224**

This house post was extremely unstable and in danger of breaking longitudinally into two sections. This condition presented a variety of conservation challenges.

The rear and lower sections had suffered extensive fungal decay. In some locations there remained only a ¾” thick shell of sound wood on the front surface. The decay pocket, extending most of the length of the post, was approximately 12” wide and 6” deep. Some facial features at the top, front and an area at the

bottom front were lost to fungal decay. The past application of wood preservatives to the front surface and the presence of paint coatings that likely contained lead had probably prevented the fungal decay from destroying it entirely. The thickness of the non-decayed "shell" is most likely an indication of the depth of the penetration of the pentachlorophenol preservative that had been applied in previous restoration campaigns.

This house post had many splits and cracks at the top rear. One split extended entirely through the thickness of the post and along its entire length, essentially separating the artifact into two pieces. Intact wood fibers extended across the split in a few locations near the top. Four ferrous rods, ½" in diameter, inserted from side to side at uniform intervals held the two sides of the post together. It is not clear when this repair was made but it is typical of the work done during the CCC era. In the years since this repair was made the holes drilled for the rods had become enlarged and significant fungal decay had occurred at the center rear. The rods passed through sound wood for only a couple of inches at either end. The front surfaces of the two sides of the house post were out of alignment by about ¾".

The few non-decayed areas on the rear surface retained fine scallop marks from an elbow adze; usually indicative of high quality carving. Unfortunately the front surface had been skinned, most probably during the CCC restoration effort. Saw marks on the bottom surfaces show that part of the lower portion of the post had been removed in the past, probably due to extensive fungal decay that occurred when the base of the post was buried.

A carved inscription was found on the lower left rear that read "HC VALLREM US RUSH". The year in which the inscription was made is not known.

The treatment goals were to stabilize the house post by securely re-joining the two sides, re-establishing the overall appearance and to provide for safe future display.

The house post was initially placed on its front surface and the two support timbers at the rear were removed. Severely decayed wood with little residual strength was removed from the large decay pocket on the rear surface to allow for better penetration of the consolidant. Over the period of two days 16 liters of Polyvinyl Butyral (PVB) in a 10% solution was brushed and sprayed to the point of refusal on the decayed surfaces on the rear of the post. This was followed by the application of six liters of PVB to the more heavily deteriorated areas and to end grain surfaces.

Jacks and wedges were used to align the two sides and re-established proper curvature of the front surface. To maintain this alignment four ribs, 3 ½" wide,

were fabricated from epoxy. The ribs extended across the void on the rear surface, aligning and holding the two side of the pole together securely. To create the ribs, temporary dams were fashioned out of ½" thick acrylic sheet. The edges of the acrylic were cut to conform to the irregular shape of the decay pocket. Fiber glass rods, ½" in diameter were placed in the form and wired together at right angles to provide reinforcement. Fumed silica and phenolic micro-balloons were added to Conserve Epoxy 200 so as to make a paste-like consistency. The micro-balloons were added to the epoxy to decrease the weight of the ribs and to increase flexibility. The fumed silica was added to thicken the mix and reduce flow. Each form was filled in three separate pours so as to avoid the exothermic reaction that occurs when a large volume of epoxy cures. Cedar blocks, approximately 2" x 12" were set flush with the rear surface in the final pour to receive lag screws.

An aluminum frame was designed and fabricated to provide lateral support and a means of hanging the post vertically for exhibit. It was essential that the post be hung from a supporting framework because its base was too deteriorated to bear weight. The frame design allowed for distribution of the weight to the relatively sound areas at the edges of the rear and to the wood blocks set within the epoxy ribs. It was fabricated from 2" x 3" rectangular aluminum tubing with 1/8" thick walls and consisted of four cross members, spaced to align with each rib, and two longitudinal members that ran parallel to the long axis of the post. The rear surface of the cross members were kerfed and then bent to conform to the curve at the rear of the post. The cross members were then tack welded to shape. With the frame removed from the post, the welds of the kerfs were completed and ground flush. The cradle was then affixed to the rear of the post with ¼" x 5" stainless steel lag screws.

With the post stabilized and the frame securely attached, the assembly could be turned onto its rear surface for treatment of the carved front. The central portion of the face of the upper figure had been replaced during the CCC restoration work. This patch, which was affixed with large copper spikes, had worked loose and on removal it was apparent that there was extensive fungal decay beneath. This area was consolidated with 10% PVB in alcohol. The patch was then re-affixed to the substrate with hide glue bulked with fumed silica.

Hide glue is a traditional protein based adhesive. It was used in this and similar instances where the object was to be exhibited indoors. Hide glue has several advantages in conservation treatment, the foremost being that it is easily reversible with water. It also has a relatively long working time, excess glue is easy to clean up and the viscosity can be manipulated. Because it does not hold up well to exterior conditions it was not used as an adhesive on poles that were to be returned to outdoor display.

Deteriorated areas along the bottom edge were consolidated with a 20% solution of PVB. The post was then cleaned with a 1:1 mixture of warm water and alcohol on cotton cloths and returned to storage.

The other Saanaheit house posts posed similar, though less extreme problems, typically including soiled surfaces, fungal deteriorated wood, unstable splits, and loose and missing elements. As with the treatment detailed above, Polyvinyl Butyral was used to consolidate decayed areas and hide glue was used to re-adhere loose and separated elements.

- **Memorial/Mortuary Column (5204)**

This pole, carved between 1888 and 1903, was collected by Brady from the Tlingit village of Tuxekan. The shaft, typical of poles from that village, is relatively small in section and appears to have been carved from yellow cedar. The pole has been extensively altered during the course of a number of restoration campaigns. Physical evidence indicates that the base of the shaft has been cut down, quite possibly soon after it was collected by Brady. The bottom end exhibits little fungal decay; unusual for a pole buried in the earth for an extended period of time. Another factor that points to the shaft having been shortened is that soil lines indicate that the lowermost niche at the rear had been partially buried when the pole was last erected.

This might be explained by a notation in Brady's report in 1904 indicating that one of the totems collected at Tuxekan, "had the remains of a child in the butt end of a pole which was in the ground—four feet of it was sawed off and put back in the hole."

The fine scalloped pattern visible on the shaft suggests that the original surface remains and that, unlike many of the other original poles, it escaped the "skinning" process. Undercut tool marks and the lack of adz marks suggests that original surfaces of the cormorant figure probably were removed during the CCC restoration process. A patch approximately 3" wide x 11" long has been inserted into the front of the shaft, 4" below the feet of the bird. Since this is an unusual location for extensive fungal or insect attack the patch may have be in a location where there had been a defect in the log or it may have been inserted for a purpose other than repair.

The series of small niches in the rear of the shaft are approximately 3" deep and roughly rectangular. The width varies from 5" to 7" and the height from 4" to 7". The bottom surface of each niche slopes downward. They are somewhat irregular in shape and out of square, suggesting that they were carved into the shaft after the pole was erected. Clearly niches of this sort could not have been used to hold ashes or other bodily remains. One possible purpose is to provide foot holds. A historical photograph in the park's collection shows a pole very similar to this one with a small pouch placed between the feet of the bird figure.

Footholds would enable an individual to climb the pole and place such an offering at the top. A single larger niche, approximately 44" tall x 9" wide and varying between 3 ½" and 4" is located on the rear of the shaft immediately below the bird figure.

The inner, shoulder portion of both wings is carved out of the central shaft while the outer portion is carved from separate elements that are affixed to the shaft with various types of fasteners. Although the attached elements are well carved, the outline of the feathers does not line up with the feathers on the body suggesting that these elements may be early replacements, possibly made before shipment of the poles to the Saint Louis Exposition. Elements of this sort, which project out from the shaft and are carved from relatively thin timbers, are subject to relatively rapid deterioration.

The original wings may have been affixed to the body with glue. The existing wings were initially secured to the bird figure with wrought iron nails angled through the wings into the body. In later repair attempts both cut nails and wire nails were used to re-secure the wing elements. Presumably the repairs utilizing cut nails predated those utilizing wire nails. At the time the pole was examined all the nails were heavily corroded and most of their mechanical strength was lost. The diameter of the cut nails in particular had increased due to corrosion. This phenomenon, known as corrosion jacking, resulted in splitting of the adjacent wood fiber.

The wings have been repaired on at least three separate occasions as evidenced by the use of different techniques and materials. In early repairs replacement carved elements were affixed to original carved surfaces with copper rivets, the edges meeting in half lap joints. Later repairs were made with wrought and cut nails, while the most recent repairs were made with wire nails. Two curved iron straps, screwed to the rear of the body, serve to reinforce the attachment between the wings and body. The upper strap is convex in section and appeared to be made from wrought iron. The lower strap is flat. It is not clear whether these straps were applied at the same time or if the lower strap was added at a later date. Both straps and the screws holding them in place were heavily corroded. Contact with corroded nails accelerated the decay of the surrounding wood on both the body and wings. The mating edges of the body and wings were decayed, as were the upper edges where end-grain is exposed. Small splits emanated from the upper edges.

Additional damage to the wings included multiple oval holes, typical of that made by lead shot, as well as gouges and abrasion of the type left by woodpecker activity. Splits that ran the entire length of the wings had been repaired in the past by driving nails on an angle from both the interior and exterior surface. This "toe-nailed" repair attempt further split the wood fiber adjacent to the nails.

The tail as well as the head and beak are replacement elements. The condition of those elements and the method of securing them to the main shaft suggest the repairs were made during the CCC period. The replacement head was in fair condition, with one large split on the proper left side that extended approximately two-thirds of the length of the beak. Extensive surface checking and incipient decay on the end-grain surfaces was also evident.

Original portions of the body and neck were extremely decayed, particularly at the juncture between the body and wing. Splits in the neck and breast area rendered the figure unstable and susceptible to further damage. A series of concentric splits that extended along the line of annual rings had formed on the breast area. Attempts to repair these splits were made in the past by driving common wire nails through the split areas into the body. Unfortunately, but not surprisingly, these repairs resulted in further splitting.

A decayed area on the exterior of the proper left leg appears to have been patched during the CCC period. The patch is now lost. The legs have deep splits that were repaired with copper rivets. Repairs of this sort were not typical of the CCC restoration campaign, suggesting that it may have been done soon after arrival at Sitka or while in its original location. The proper left leg was unstable despite the old repair to the split.

Park staff made the determination that this pole was to eventually be displayed in an upright position in the totem exhibit hall. With this in mind, no application of fungicide or water-repellant was made. The pole was thoroughly cleaned with neutral ph soap and water. Organic debris was removed with compressed air connected to a flexible tube inserted deep into the splits. Surface mold was removed with a 1:1 solution of alcohol and water.

Corroded ferrous screws and nails were removed as were the two iron straps that supported the wing extensions. Decayed areas were consolidated with PVB over a period of three days. Initially, two liters of a 10% solution in alcohol and Xylene were applied followed by the application of ten liters of a 20% solution to the more severely decayed areas. Because there were wide gaps in many of the mating edges due to weathering and fungal deterioration, bulked epoxy was used to re- adhere separated elements. To strengthen the join between the base of the wings and the wing extensions, 1/4” dowels were placed in the eroded nail holes on either side of the join.

The CCC era reproduction bird head was reattached to the body by means of a large stainless steel lag screw that was inserted into the existing hole at the top of the head. Due to erosion and splitting adjacent to the hole drilled to receive the original lag screw, it was filled with bulked epoxy so as to better grip the threads of the lag screw. Three stainless steel lag screws were inserted in the existing holes at the front of the neck.

After treatment the pole was returned to storage to await display in the new totem hall.

- **Original Mosquito Legend Pole (Fragment 5218)**

Since its acquisition by Governor Brady, the original Mosquito Legend Pole, probably carved prior to 1888, has undergone many repair and restoration attempts. The remaining fragment, comprising the upper two thirds of the pole, exhibits a variety of repair materials and techniques. The lowermost figure, a devil fish or octopus, and the uppermost watchman figure, have been removed and are now lost. These figures were probably removed during the CCC restoration campaign due to extensive decay. A reproduction pole was carved at that time.

All exterior surfaces have been skinned, and cedar shims approximately ¾" long and averaging 3" wide were inserted in to the weathering checks. Although no paint exists on the surface of the pole itself, remnants of paint are visible in the end-grain of many of the shims, indicating that the pole was painted after these repairs were made. There are several wood patches to horizontal surfaces. The grain of these patches is perpendicular to that of the pole shaft. It is probable that these repairs were made in the period immediately after the pole was collected and prior to its shipment to the St Louis Exposition.

In a number of locations, horizontal end-grain surfaces are covered with coated canvas applied on top of the patches and many of the cedar shims. The canvas was originally tacked and glued in place and later stapled around the perimeter. The appearance and solubility of the old glue suggests that it is hide or fish glue. The coating on the canvas is partially alcohol soluble and appears to be a mixture of shellac and linseed oil, possibly applied at different times. Much of the canvas is now torn and separated from the wood substrate.

Some deteriorated end-grain surfaces are covered with sheet metal. These coverings vary in thickness and composition; some are lead coated copper while others are galvanized steel.

The pole has a structural split that runs almost the entire length. Two bolts extending from side to side partially stabilize the split. Holes through the pole, bored from front to back, indicate that it was at one time erected on a support post.

Many paint spatters and drips were noted on the front surface of the pole. The location and form of the drips indicate that they occurred when the pole was in the horizontal position. Two teeth on the bear figure have been painted white. It is not clear when this was done or why.

The surface of the pole was extremely soiled with areas of mold, mildew and accretions of debris. Extensive fungal decay was present on the end grain surfaces at both the lower and upper ends as well as a few isolated areas on the front surface. The proper right leg and knee of the watchman figure, which was left in place when the rest of the figure was sawn off, has more recently become separated. The shoulder and arm of the child figure has also separated and was found with the pole.

The pole has a dark brown appearance, typical of wood surfaces that have had repeated applications of linseed oil. This material was widely used in the early twentieth century as a wood preservative and documentation indicates it was used in the Canadian National Railroad totem project. In the mid 20th century, a solution including linseed oil, varnish, paraffin wax, and pentachlorophenol was recommended by the U.S. Forest Products Lab as a wood preservative.

Linseed oil, extracted from the flax seed, is often a constituent in commercial oil based paints. In its raw state it is a very slow drying. The traditional method to decrease drying time is to heat the oil, altering it chemically. This product was referred to as boiled linseed oil. Today drying time is decreased by the addition of metallic dryers and solvents rather than the application of heat, but the final product is still referred to as boiled linseed oil.

When applied to wood, linseed oil, whether raw or boiled, penetrates into the tissue. It provides moderately good resistance to water and some resistance to mechanical abrasion. There are however several drawbacks to the use of linseed oil as a wood preservative and consequently it is seldom used today. The oil acts as a source of food for surface mold and for some insects such as cockroaches. It provides little protection from ultraviolet light and, because it remains sticky for an extended period of time it tends to attract dust and dirt further darkening the surface. Under some light and heat conditions the oil can migrate to the surface of the wood eventually creating dark pustules on the surface. Once dry, linseed oil is very difficult to remove; requiring harsh solvents or mechanical action.

The intent of the conservation treatment of the Mosquito Legend pole was to stabilize the pole and to preserve and document the many previous restoration campaigns. The pole was initially cleaned with pH neutral soap and water. Paint drips and spatters were removed with methylene chloride. Separated elements were re-adhered with bulked hide glue and Conserve 200 epoxy. Deteriorated areas were consolidated with 10% solution of PVB. With the exception of the galvanized sheet metal at the upper rear of the pole, all the previous repairs including cedar shims, cedar patches, canvas coverings and lead caps were left in place. Torn and lifting canvas coverings were re-adhered to the substrate with

liquid hide glue. No fungicides or water repellants were to the pole because it was to be displayed in an indoor environment.

Phase IV Field Session 1996

During the two week field session in the summer of 1996, the HFC conservators applied lead caps to horizontal end grain surfaces of the standing poles and applied an additional coat of Bora Care. Much of the work was done in conjunction with the Sitka maintenance staff members so as to familiarize them with the materials and processes.

Discussions about the wisdom of applying some kind of barrier to the end grain surfaces, particularly the top which typically exposes most of the end grain, had been ongoing since the treatment proposal was developed in 1991. There was some concern that a barrier would prevent water from escaping and or evaporating from the end-grain and could possibly lead to further decay. There was also discussion about the best type of material to use for a barrier. Both sheet metal and resin caps were considered.

The advantages of a sheet metal cap were thought to be durability and imperviousness to rain water. However there was concern that sheet metal would be difficult to shape to the contours of the underlying carved wood and that a poor fitting cap would allow water to enter along the edges. Of particular concern was shaping the barrier to conform to a weakened, deteriorated substrate where the application of force to the sheet metal could potentially damage the wood.

Fiberglass and epoxy resins were considered for use as caps because of the relative ease with which they could be shaped. How well these materials would weather over time was, however, a concern.

Early in this field session the conservators were able to examine the top of the Saanaheit pole, the tallest pole in the Sitka collection, from a cage suspended from a crane. This pole had not been examined because the high-lift previously used in the survey work was not able to extend to the uppermost reaches. At the top of the pole are twin watchmen figures. The end-grain surface of the hats of had been covered with lead caps when the pole was erected in the late 1930's. In the intervening years, one of the caps had partially loosened, exposing about one half of the surface to the elements, while the other portion remained firmly affixed.

On examination and removal of a portion of the cap that had been tightly affixed, it became apparent that while the exposed portion of the end grain was extensively deteriorated, that portion that retained its cap was in good condition. Where exposed, the end grain exhibited fungal deterioration and weathering checks; where covered the end grain remained sound. This demonstrated empirically that the sheet lead could provide good protection to the red cedar end

grain over a number of decades. In addition, we found that the sheet lead could undergo fairly extensive plastic deformation while being shaped over irregular surfaces without fracturing. The sheet lead on the Saanaheit pole could still be relatively easily shaped after several decades of exposure. Lead is also corrosion resistant under a wide variety of environmental conditions.

In conjunction with park staff, the conservators made the decision to use sheet lead to cap the tops of all the standing poles where the end grain surface exhibited fungal decay. Lead caps were also used in other areas where fungal decay was advanced, such as open joints and horizontal surfaces that tended to trap rain water and organic debris. In most instances the lead was cut and shaped while on the lift. Tack holes were pre-punched in the sheet lead with an awl. Copper tacks typically ¾" long were used to affix the lead sheet to the poles. Occasionally longer tacks were used when the wood fiber on the surface was too deteriorated to hold tacks or when surface weathering checks were too numerous.

Assessment of Prior Treatment

In 1996 four years had passed since the initial application of Bora Care was made to many of the standing poles therefore a second application was made during that campaign. As with the first application, the fungicide was applied by manual pump sprayer as well as brush. Penetration of the solution proved to be uneven. On some surfaces, particularly those that were relatively free of fungal decay and not exposed to direct sun, the Bora Care tended to bead up on the surface, indicating that the water repellant was still effective. End grain and horizontal surfaces as well as areas where fungal decay was advanced, such as above ground level tended to readily absorb the solution. In those areas it was applied until the wood was fully saturated.

The standing poles were for the time being stabilized and as hoped the conservation treatment of the past five years was buying time, allowing them to remain on outdoor exhibit. Park maintenance staff, having been trained in monitoring and preventive maintenance techniques, undertook those responsibilities after the 1996 field session.

Memo to Regional Historical Architect, Steve Peterson from Levitan, Sheetz discussing environmental considerations for new storage/display area for original totems and fragments (August 19th 1993)

Memo to Superintendent Gary Gauthier (Sheetz, Levitan April 4, 96) discussed storage issues for totems, need for cyclic maintenance and upcoming work for the ’96 season including Mosquito Legend, Yaadaas Crest Corner Pole and Gaanaxadi Raven.

Memo to Superintendent Gary Gauthier from Levitan discussing upcoming work at Sitka for summer ’97 , particularly training Sitka maintenance staff on cyclic maintenance, repair of Wasko Legend Pole and past and potential totem condition surveys and informs superintendent of grant for totem preservation training. (May 6 1997)

Construction of Totem Exhibit-move of totems to protected environment

Ongoing cyclic maintenance

Publication of “most striking objects”

Surveys and Treatment of non-nps pole collections
Workshops on Carved Pole Preservation
Wrangell Totem Survey 1996 (Sheetz, Levitan)
Klawock Totem Park Preservation Treatment 2001

Carved Pole Preservation Workshop Final Report (Levitan)

Future Preservation Needs
Changing approaches to the conservation of poles (Charles Rhyne paper Recent approaches to the Conservation of Northwest Coast Totem Poles)
Storage/ Exhibition indoors