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SUSITNA HYDROELECTRIC PROJECT

ARTIFICIAL NESTS AND NESTING STRUCTURES BUILT FOR BALD EAGLES IN THE TANANA AND SUSITNA RIVER DRAINAGES AUGUST-SEPTEMBER 1985

Report by
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Under Contract to
Harza-Ebasco Susitna Joint Venture

Prepared for
Alaska Power Authority

Final Report
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NOTICE

ANY QUESTIONS OR COMMENTS CONCERNING
THIS REPORT SHOULD BE DIRECTED TO
THE ALASKA POWER AUTHORITY
SUSITNA PROJECT OFFICE

ARTIFICIAL NESTS AND NESTING STRUCTURES BUILT FOR FOR BALD EAGLES (Haliaeetus leucocephalus) IN THE TANANA AND SUSITNA RIVER DRAINAGES, AUGUST-SEPTEMBER 1985.

Introduction

Here we report the preliminary results of an experiment to design and test aesthetic, natural-appearing artificial tree-nests and mobile artificial nesting structures for bald eagles (Haliaeetus leucocephalus). The experiment began in May 1985 and is being conducted for Harza-Ebasco Susitna Joint Venture and the Alaska Power Authority.

Methods

Researching and devising methods for building and installing artificial bald eagle nests and nesting structures were done in Fairbanks, Alaska during 15 May - 15 July 1985. Nests and nesting structures were prefabricated during 15 July - 20 August 1985.

The design for the nesting platform was a modification of an older design developed for bald eagles in Trinity County, California (see Lamb and Barager 1978), and a more recent design used to replace a fallen bald eagle nest along the Pitt River, California (G. Hunt pers. comm. 1984, 1985; R. Jackman pers. comm. 1984). The design for a mobile aluminum tripod nesting structure was derived in part from earlier tripod designs developed for bald eagles and ospreys (Pandion haliaetus) in Michigan (e.g., Pinkowski 1977; Postupalsky 1978; Temple 1978, Plate 1) and a more recent aluminum design used to replace a fallen bald eagle nest near a reservoir in Arizona (see Grubb 1980, 1983).

The tree-nests were installed during 1 August - 10 September 1985 by three men using river boats (Tanana River drainage) and supported by light turbine helicopters (Bell 206B Jet Rangers) (Susitna River drainage). Two team members free-climbed designated white spruce trees (Picea glauca). One team member wearing standard tree climbers fitted with long gaffs climbed the designated balsam poplar trees (Populus balsamifera). Climbing team members also wore helmets, safety goggles and climbing harnesses, and used a variety of nylon webbing slings and carabiners to secure themselves to various points in the trees. One team member remained on the ground and operated a 100-150 foot-long continuous-loop rope and pulley system that was secured between points in the trees above the construction sites and the ground. All three team members wore Maxson 49-HI voice-activated FM transceivers capable of sending and receiving signals over distance of about 0.5 mile.

The mobile aluminum tripod nesting structure was also installed by a three-man field-team. The tripod and artificial nest were assembled on the ground, and raised and carried into place by a light turbine helicopter (Bell 206B Jet Ranger) using the helicopter's standard sling cable rigged with a 150 foot-long length of 4,500 pound-test 5mm Kevlar line. The pilot wore a Maxson voice activated transceiver and was guided in lowering the tripod by the similarly radio-linked field-team on the ground.

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Results and Discussion

Two artificial nests were installed in white spruce trees along the Tanana River near Fairbanks, Alaska. The nests were located at elevations of about 400 feet above sea level in typical interior Alaskan riparian habitats comprised largely of white spruce and balsam poplar stands, tall alder (Alnus spp.) and willow (Salix spp.) shrublands, and black spruce (P. mariana) boglands. Both nests were positioned to represent two entirely new nesting locations (i.e., nesting territories) for bald eagles near the terminus of the current downstream nesting distribution of bald eagles in the Fairbanks sector of the Tanana River basin.

Six more artificial nests were built in white spruce (three nests) and balsam poplar (two nests) trees, and on the mobile aluminum tripod nesting structure (one nest) in the middle basin of the Susitna River in southcentral Alaska. The nests were located at elevations between about 1,000 and 2,400 feet above sea level in typical southcentral Alaskan riparian and upland habitats comprised largely of white spruce and balsam poplar stands, tall alder and willow shrublands, black spruce boglands, short birch (Betula spp.) shrublands, and shrub-tundra communities. The nests were postioned to represent two entirely new nesting locations (one spruce and one poplar tree site) and four alternate nest sites at four existing nesting locations (two spruce and one poplar tree site, and the mobile aluminum tripod site) near the upper elevational limits of nesting for bald eagles in Alaska.

Preliminary designs used for the artificial nests and nesting structure are shown in Appendix 1. Case histories of all eight artificial nests, including the nest mounted on the artificial nesting structure, are provided below.

Tanana River No. 1 (BAEA.AFN.01)

Tanana River No. 1 is an artificial bald eagle stick nest in a tree along the south bank of the Tanana River about 3 air miles south from the Richardson Highway and Fort Wainwright, and about 9 air miles upstream from the mouth of the Chena River south of Meridian Island near the center of the northern boundary of the SW 1/4 of Section 6, T2S R1E, Fairbanks D-2 Quadrangle (Figure 1). The nest was built to represent an entirely new nesting location within the middle basin of the Tanana River drainage (see Plates 1 and 2).

The nearest known naturally-occurring bald eagle nesting locations are located about 7 air miles upstream and 5 air miles downstream from the artificial location, respectively. The upstream nesting location [Nesting Location BE-83 (NWAPCO)] has been present for at least 15 years (L. Peet, pers. comm. to D. G. Roseneau, 1980). It contains one nest in a balsam poplar tree. The nest was surveyed by aircraft and boat and found active in 1979, inactive in 1980 and active again in 1981-1984 (Roseneau and Bente 1981; R. Ambrose and M. Amaral, unpubl. data; D. G. Roseneau, unpubl. data). Bald eagles reoccupied it and reared one chick in it in 1985 (D. G. Roseneau, unpubl. data). The downstream nesting location [Nesting Location BE-83.2 (NWAPCO)] was first discovered in 1981 when a pair of birds began building a nest along an Air Logistics helicopter route (Air Logistics Inc., pers. comm. to D. G. Roseneau). It contains one nest in a spruce tree. It was surveyed by boat and found active in 1983 and 1984 (data are not available for 1982) (D. Norton, pers. comm.). Bald eagles reoccupied it and reared one chick in it in

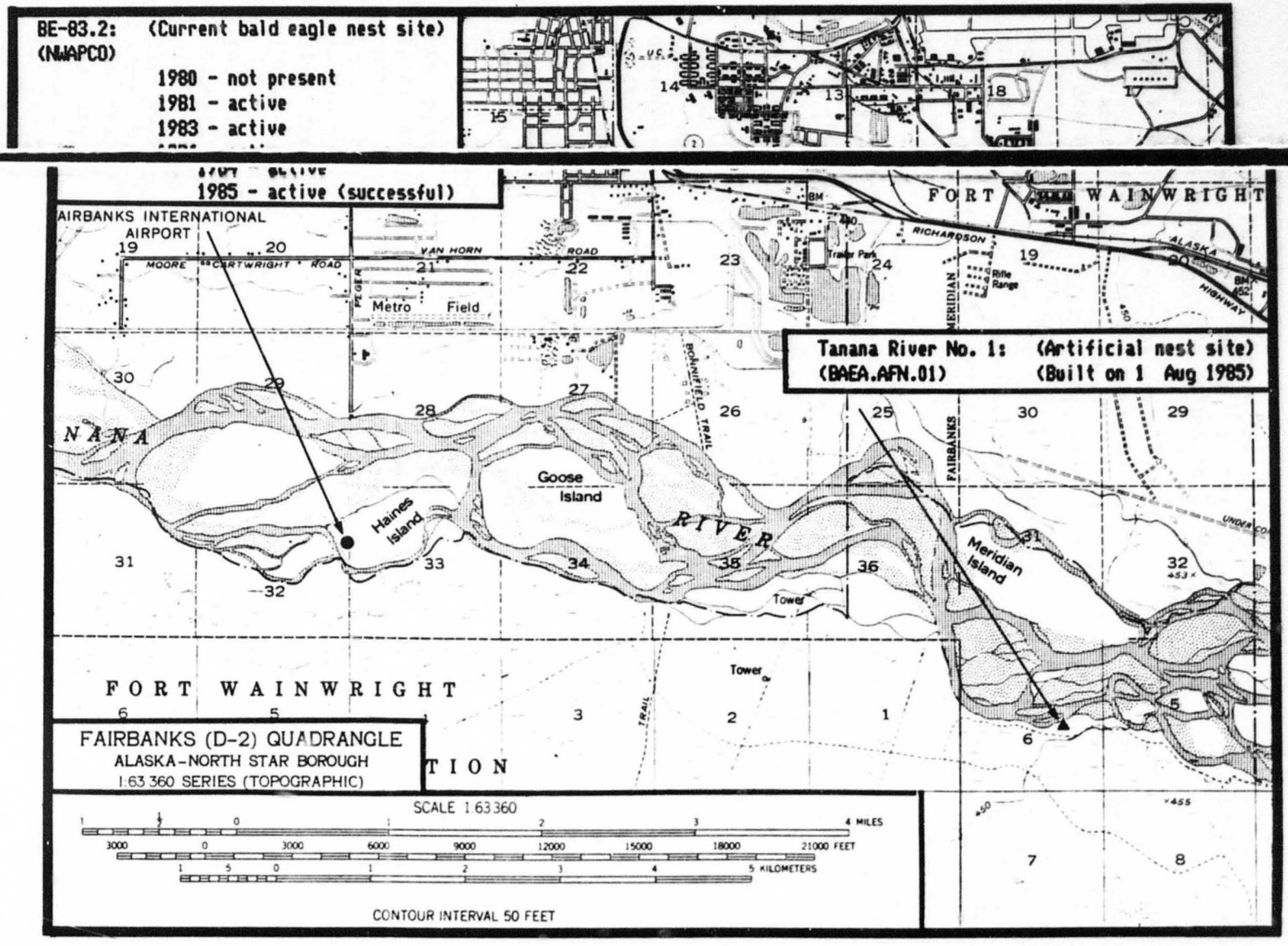

Figure 1. The location of artificial nest site Tanana River No. 1 near Meridian Island, Tanana River, Alaska and the nearest neighboring bald eagle nesting location (BE-83.2, Northwest Alaskan Pipeline Company survey series) in the Tanana River drainage. The artificial nest was built several miles away from BE-83.2 and another artificial nest (Tanana River No. 2) to provide a new, previously unavailable nesting location that might attract another pair of bald eagles to the Fairbanks - Northpole section of the river.

1985 (D. G. Roseneau, P. J. Bente and J. D. Woolington, unpubl. data). The spruce tree nest may have replaced an older nest reported to be located in a poplar tree a few miles upstream from the mouth of the Chena River in the 1970's (J. Binkley, pers. comm. to D. Norton).

The artificial nest was installed about 50 feet above ground on the north side of one of a pair of closely-growing 80-85 foot-tall live white spruce trees on 1 August 1985. The nest tree and partially entwined companion tree were located a few feet apart about 15 feet south of the river in a tall shrub community (predominantly alder) The nest tree's diameter at breast height (DBH) and diameter at nest height (DNH) were about 24 inches and 10 inches, respectively (the companion tree was of similar size). The nest was built in about 9 hours time (as measured from the time personnel first ascended the tree to the time they returned to the ground).

The platform supporting the nest was prefabricated from a 4 x 5 foot piece of 0.75 inch-thick marine plywood cut into an octagonal shape by sawing 10 inches from the corners. Patterns of vertical 1.25 inch-diameter holes, and vertical and angled 0.75 inch-diameter holes were drilled in the platform to allow good drainage and for installing lengths of 0.75 inch-diameter hardwood doweling. Seventeen pieces of 16 inch-long 0.75 inch-diameter doweling were cut for eventual insertion into the outer round of 0.75 inch-diameter holes drilled at about 40 degree outward angles through 0.75 inch thick, 4.0 x 4.0 inch-square plywood blocks fastened around the perimeter of the platform. [Only seventeen pieces of 16.0 inch-long doweling are needed because at least one of the 0.75 inch-diameter holes nearest the tree trunk is typically left empty]. Eighteen pieces of 12 inch-long and four pieces of 5 inch-long 0.75 inch-diameter doweling were also cut for eventual insertion into the inner round of 0.75 inch-diameter holes drilled at about 20 degree outward angles several inches back from the first round of dowel-holes and the 0.75 inch-diameter holes drilled at 90 degree angles near the center of the platform.

The platform and doweling were sealed with two coats of flat gray exterior latex paint (Glidden Exterior Latex in Kiwi tone). The edges and bottom surface of the platform were camouflaged by streaks of quick-drying flat brown, black and dark gray spray paint (Dap Inc. Derusto primer) before the platform was taken into the field. Several streaks of green spray paint were also applied to the bottom of the platform just before it was mounted in the tree.

The platform was mounted in the tree by bolting it down onto two support brackets prefabricated from pieces of Steel City slotted right-angle steel stock (three 1.5 inch-long, 0.38 inch-diameter bolts per side) after bolting the support brackets to opposite sides of the tree trunk (three 3.5-4.5 inch long, 0.38 inch-diameter lagbolts per side). The two horizontal components for the support brackets were made from 5 foot-long pieces of RA-300 stock, and the two vertical and two slanted components were made from 3 foot-long pieces of RA-225 stock. The back-brace was made from one 12 inch-long piece of RA-225 stock cut to length on site. The back-brace was secured to the tree by one 3.5 inch-long, 0.38 inch-diameter lagbolt.

The 3 foot-long and 5 foot-long support bracket components were given one coat of flat gray metal primer and camouflaged by streaks of brown and black metal primer before being taken into the field (Dap Inc. Derusto primers). The fresh-cut back-brace ends were painted on-site.

The nest was made from 8-10 foot lengths of 1 inch-diameter (at-the-butt) aspen saplings cut and dried for one year, and similar-sized fresh-cut green alder saplings cut on-site. The saplings were woven between the 16.0 inch-long and 12.0 inch-long hardwood dowels after the dowel-butts were coated with glue and driven into place on the platform (Weldwood waterproof resorcinol glue). Short 1-2 foot-long lengths of 1 inch-diameter and smaller dried aspen and dead alder found near the construction site were inserted at varying angles between the two rows of saplings to complete the woven rim of the nest.

The nest was filled with about 6-8 inches of tightly packed fresh-cut green spruce boughs. The spruce boughs were covered by 2-3 inches of short, criss-crossed dried alder and spruce sticks followed by 3-4 inches of freshly picked sphagnum moss and grass, several handfuls of small dead twigs and a few freshly cut, leafy poplar twigs.

Fourteen-gauge stove wire was strung from the bases of the 16.0 inch-long dowels mounted around the edges of the platform to slots in the horizontal and slanted components of the support brackets. Stove wire was also strung in an open zig-zag fashion beneath the platform between the two horizontal components of the support brackets. Large, fresh-cut spruce boughs and some alder and willow saplings were inserted into the wire web to cover the bottom of the platform, and smaller spruce boughs were wedged at downward angles between the bottom of the nest and the top of the platform to hide the edges of the platform.

A large perching place was made by selectively pruning one of the nest tree's limbs about 10 feet above the nest. The tops of the nest tree and partially entwined companion tree also provide several potential perching places for resting eagles.

The nest tree and partially entwined companion tree are a prominent feature along the river bank, standing alone among 10-20 foot-tall alder and willow at least 200 yards downstream the nearest stand of sizeable spruce. The completed nest faces north, overlooking an extensive series of shallow river channels and several grassy islands supporting about 50-100 nesting pairs of mew gulls (Larus canus), several nesting pairs of herring gulls (L. argentatus) and several pairs of Canada geese (Branta canadensis).

Tanana River No. 1 was surveyed by light fixed-wing aircraft on several occasions during April and May 1986. The nest was empty on 17 and 24 April. One adult bald eagle was perched on the rim of the nest on 25 April (at the same time pairs were present at Tanana River No. 2 and natural nesting location BE83.2). One adult eagle was perched in the nest tree on the man-made perch and a second adult was standing in the center of the nest on 28 April. Eagles were not present near the nest on 29 and 30 April, nor on 1 and 8 May. One adult eagle was perched in the nest tree and a second adult was perched on the rim of the nest on 11 May. Eagles were not present near the nest on 13, 19 and 20 May.

[The nest tree at the upstream natural nesting location (BE-83) fell down during the winter of 1985-1986. A pair of bald eagles was seen perching in the vicinity of the lost nest site in early April 1986 (L. Peet pers. comm. to D. G. Roseneau 29 April 1986). One adult seen perching near BE-83 on 29 April and 19 May 1986 may have been the mate of the bird incubating eggs at Tanana River No. 2 (see below). A pair of eagles was perched near the downstream

natural nesting location (BE-83.2) on 25 April 1986. One adult was perched near BE-83.2 on 30 April, and one adult was seen in the nest on 8, 11 and 13 May 1986. No adults were seen near BE-83.2 on 19 and 20 May 1986].

Tanana River No. 2 (BAEA.AFN.02)

Tanana River No. 2 is an artificial bald eagle stick nest in a tree on the south bank of an unnamed island in the Tanana River about 1 air mile southwest from the Richardson Highway, about 13 air miles upstream from the mouth of the Chena River and about 4 air miles upstream from Tanana River No. 1 in the southeast 1/4 of Section 2, T2S R1E, Fairbanks D-1 Quadrangle (Figure 2). The nest was built to represent an entirely new nesting location within the middle basin of the Tanana River drainage (see Plates 3, 4 and 5).

The nearest known naturally-occurring bald eagle nesting locations are located about 3 air miles upstream and 9 air miles downstream from the artificial location, respectively. The upstream nesting location [Nesting Location BE-83.2 (NWAPCO)] has been present for at least 15 years (L. Peet, pers. comm. to D. G. Roseneau, 1980). It contains one nest in a balsam poplar tree. The nest was surveyed by aircraft and boat and found active in 1979, inactive in 1980 and active again in 1981-1984 (Roseneau and Bente 1981; R. Ambrose and M. Amaral, unpubl. data; D. G. Roseneau, unpubl. data). Bald eagles reoccupied it and reared one chick in it in 1985 (D. G. Roseneau, unpubl. data). The downstream nesting location [Nesting Location BE-83.2 (NWAPCO)] was first discovered in 1981 when a pair of birds began building a nest along an Air Logistics helicopter route (Air Logistics Inc., pers. comm. to D. G. Roseneau). It contains one nest in a spruce tree. It was surveyed by boat and found active in 1983 and 1984 (data are not available for 1982) (D. Norton, pers. comm.). Bald eagles reoccupied it and reared one chick in it in 1985 (D. G. Roseneau, unpubl. data). The spruce tree nest may have replaced an older nest reported to be located in a poplar tree a few miles upstream from the mouth of the Chena River in the 1970's (J. Binkley, pers. comm. to D. Norton).

The artificial nest was installed about 58 feet above ground on the south side of a 68-70 foot-tall live white spruce tree on the south side of the island on 23 August and 10 September 1985 (the platform was mounted in the tree on 23 August and the nest was completed on the platform on 10 September). The nest tree was located about 75 feet north of the island's south bank near a few similar spruce trees in a stand of shorter balsam poplar trees. The nest platform was mounted a few feet above the tops of the surrounding poplar trees. The nest tree's diameter at breast height (DBH) and diameter at nest height were about 18 inches and 6.5 inches, respectively. The nest was built in about 9 hours time (as measured from the time personnel first ascended the tree to the time they returned to the ground).

The platform supporting the nest was prefabricated from a 4 x 5 foot piece of 0.75 inch-thick marine plywood cut into an octagonal shape by sawing 10 inches from the corners. Patterns of vertical 1.25 inch-diameter holes, and vertical and angled 0.75 inch-diameter holes were drilled in the platform to allow good drainage and for installing lengths of 0.75 inch-diameter hardwood doweling. Seventeen pieces of 16 inch-long 0.75 inch-diameter doweling were cut for eventual insertion into the outer round of 0.75 inch-diameter holes drilled at about 40 degree outward angles through 0.75 inch thick, 4.0 x 4.0 inch-square plywood blocks fastened around the perimeter of the platform. [Only seventeen

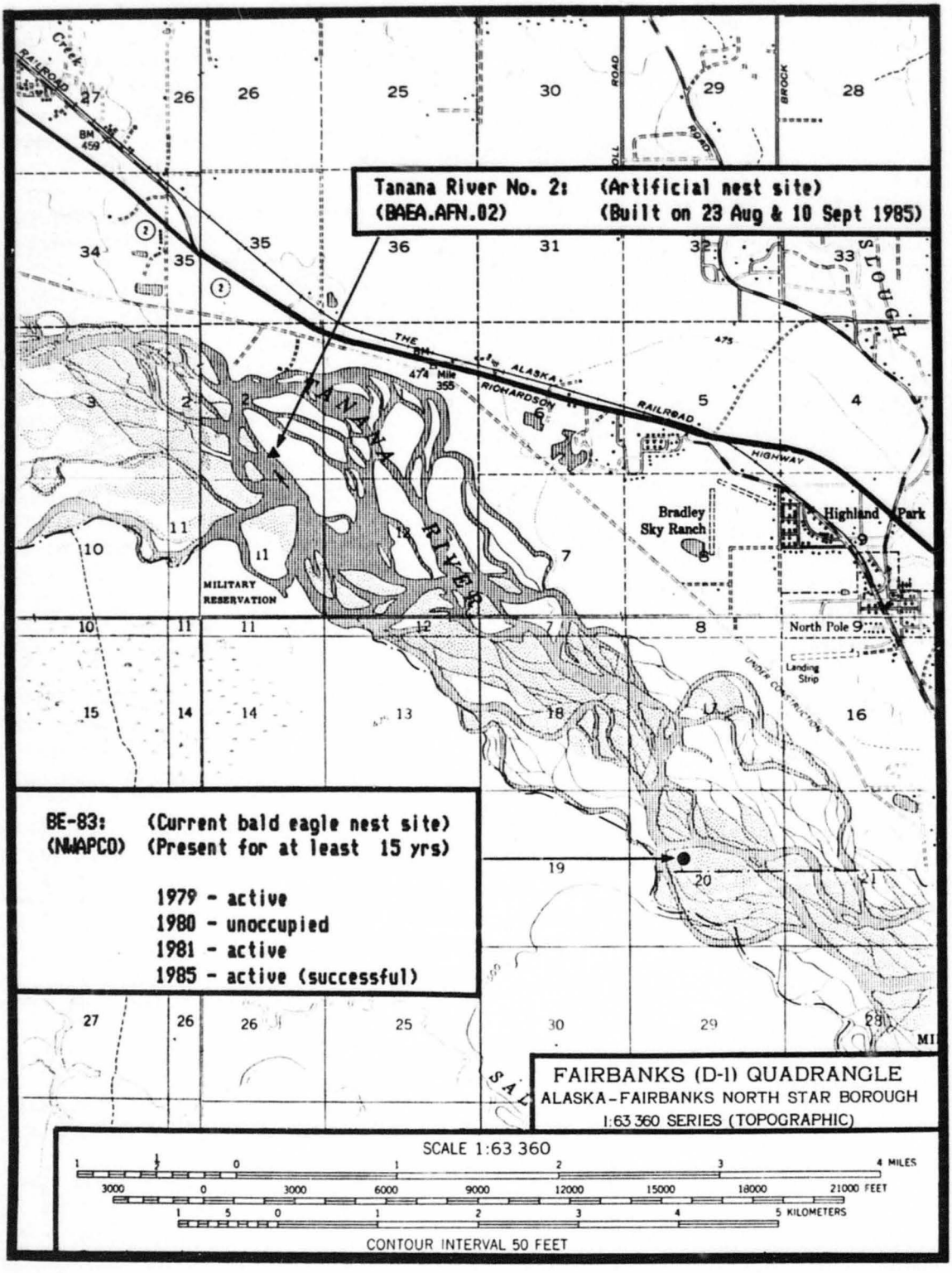

Figure 2. The location of artificial nest site Tanana River No. 2, Tanana River, Alaska and the nearest neighboring bald eagle nesting location (BE-83, Northwest Alaskan Pipeline Company survey series) in the Tanana River drainage. The artificial nest was built several miles away from BE-83 and another artificial nest (Tanana River No. 1) to provide a new, previously unavailable nesting location that might attract another pair of bald eagles to the Fairbanks - Northpole section of the river.

pieces of 16.0 inch-long doweling are needed because at least one of the 0.75 inch-diameter holes nearest the tree trunk is typically left empty]. Eighteen pieces of 12 inch-long and four pieces of 5 inch-long 0.75 inch-diameter doweling were also cut for eventual insertion into the inner round of 0.75 inch-diameter holes drilled at about 20 degree outward angles several inches back from the first round of dowel-holes and the 0.75 inch-diameter holes drilled at 90 degree angles near the center of the platform.

The platform and doweling were sealed with two coats of flat gray exterior latex paint (Glidden Exterior Latex in Kiwi tone). The edges and bottom surface of the platform were camouflaged by streaks of quick-drying flat brown, black and dark gray spray paint (Dap Inc. Derusto primer) before the platform was taken into the field. Several streaks of green spray paint were also applied to the bottom of the platform just before it was mounted in the tree.

The platform was mounted in the tree by bolting it down onto two support brackets prefabricated from pieces of Steel City slotted right-angle steel stock (three 1.5 inch-long, 0.38 inch-diameter bolts per side) after bolting the support brackets onto opposite sides of the tree trunk (three 4.5 inch long, 0.38 inch-diameter lagbolts per side). The two horizontal components for the support brackets were made from 5 foot-long pieces RA-300 stock, and the two vertical and two slanted components were made from 3 foot-long pieces RA-225 stock. The back-brace was made from one 10 inch-long piece of RA-300 stock cut to length on-site. The back-brace was secured to the tree by one 4.5 inch-long, 0.38 inch-diameter lagbolt.

The 3 foot-long and 5 foot-long support bracket components were given one coat of flat gray metal primer and camouflaged by streaks of brown and black metal primer before being taken into the field (Dap Inc. Derusto primers). The fresh-cut back-brace ends were painted on-site.

The nest was made from 8-10 foot lengths of 1 inch-diameter (at-the-butt) aspen saplings cut and dried for one year, and similar-sized partially dried willow saplings. The saplings were woven between the 16.0 inch-long and 12.0 inch-long hardwood dowels after the dowel-butts were coated with glue and driven into place on the platform (Weldwood waterproof resorcinol glue). Short 1-2 foot-long lengths of 1 inch-diameter and smaller dried aspen and willow were inserted at varying angles between the two rows of saplings to complete the woven rim of the nest.

The nest was filled with about 6-8 inches of tightly packed fresh-cut green spruce boughs. The spruce boughs were covered by 3-4 inches of short, criss-crossed dried and partially dried aspen and willow sticks followed by 3-4 inches of freshly cut, leafy poplar twigs and freshly picked grass.

Stainless-steel safety wire was strung from the bases of the 16.0 inch-long dowels mounted around the edges of the platform to slots in the horizontal and slanted components of the support brackets. Stainless-steel wire was also strung in an open zig-zag fashion beneath the platform between the two horizontal components of the support brackets. Large, fresh-cut spruce boughs were inserted into the wire web to cover the bottom of the platform, and smaller spruce boughs were wedged at downward angles between the bottom of the nest and the top of the platform to hide the edges of the platform.

A nearby partially dead poplar tree, several bushy-topped live spruce trees and the top of the nest tree provide some potential perching places for resting eagles. [Bald eagles perched in one partially dead poplar tree by the river bank on several occasions during late summer 1985 -- fresh feces and one molted feather were found below the tree on 10 September].

The nest tree is located on the river side of a relatively open stand of 13 spruce trees whose tops rise 15-25 feet above the top of the surrounding poplar canopy. The nest tree is shorter than several of the neighboring spruce trees, and is not a dominant member of the stand. however, it is separated slightly from the other spruce trees, and is located only about 50-75 feet from the water. The completed nest faces south and overlooks several river channels of varying depth separated by several open mud and gravel bars. It is in direct line-of-sight of Nesting Location BE-83.2 (NWAPCO).

Tanana River No. 2 was surveyed by light fixed-wing aircraft on several occasions during April and May 1986. The nest was empty on 17 April. One adult bald eagle was incubating in the nest on 24 April. The incubating adult was also seen in the nest on 25, 28, 29 and 30 April, and on 1, 8, 11, 13, 19 and 20 May. The mate was seen flying near the nest on 25 April, and perched on the rim of the nest and in nearby spruce trees on 28 April and 13 May.

[A pair of eagles was perched near the downstream natural nesting location (BE-83.2) on 25 April 1986. One adult was perched near BE-83.2 on 30 April, and one adult was seen in the nest on 8, 11 and 13 May 1986. No adults were seen near BE-83.2 on 19 and 20 May 1986. The nest tree at the upstream natural nesting location (BE-83) fell down during the winter of 1985-1986. A pair of bald eagles was seen perching in the vicinity of the lost nest site in early April 1986 (L. Peet pers. comm. to D. G. Roseneau 29 April 1986). One adult seen perching near BE-83 on 29 April and 19 May 1986 may have been the mate of the bird incubating eggs at Tanana River No. 2].

Oshetna River No. 1 (BAEA.AFN.03)

Oshetna River No. 1 is an artificial bald eagle stick nest in a tree on the west bank of the lower Oshetna River about 2.5 air miles (3 river miles) upstream from the confluence of the Oshetna and Susitna rivers in Section 16, T29N R11E, Talkeetna Mountains C-1 Quadrangle (Figure 3). The nest was built to represent an alternate nest site at an existing nesting location in the middle basin of the Susitna River drainage (see Plates 6, 7 and 8).

The nearest known naturally-occurring bald eagle nesting location (Nesting Location BE-2) is located about 500 yards downstream from the artificial site. It contains only one known usable nest site. Bald eagles built the nest in a spruce tree in 1985 to replace another nest in a spruce tree that fell down during the winter of 1984-1985 about 0.5 air-mile farther downstream along the west bank of the Oshetna River. The fallen nest was surveyed by aircraft and found active in 1980, 1981 and 1984. The replacement nest still contained one completely feathered, ready-to-fledge nestling on 4 September 1985 (Susitna Hydroelectric Project Memorandum from D. G. Roseneau, P. J. Bente and J. D. Woolington, LGL Alaska to R. B. Sener, LGL Alaska, 6 December 1985).

The artificial nest was installed about 45 feet above ground on the southeast side of a 60 foot-tall live white spruce tree on 27 August 1985. The nest

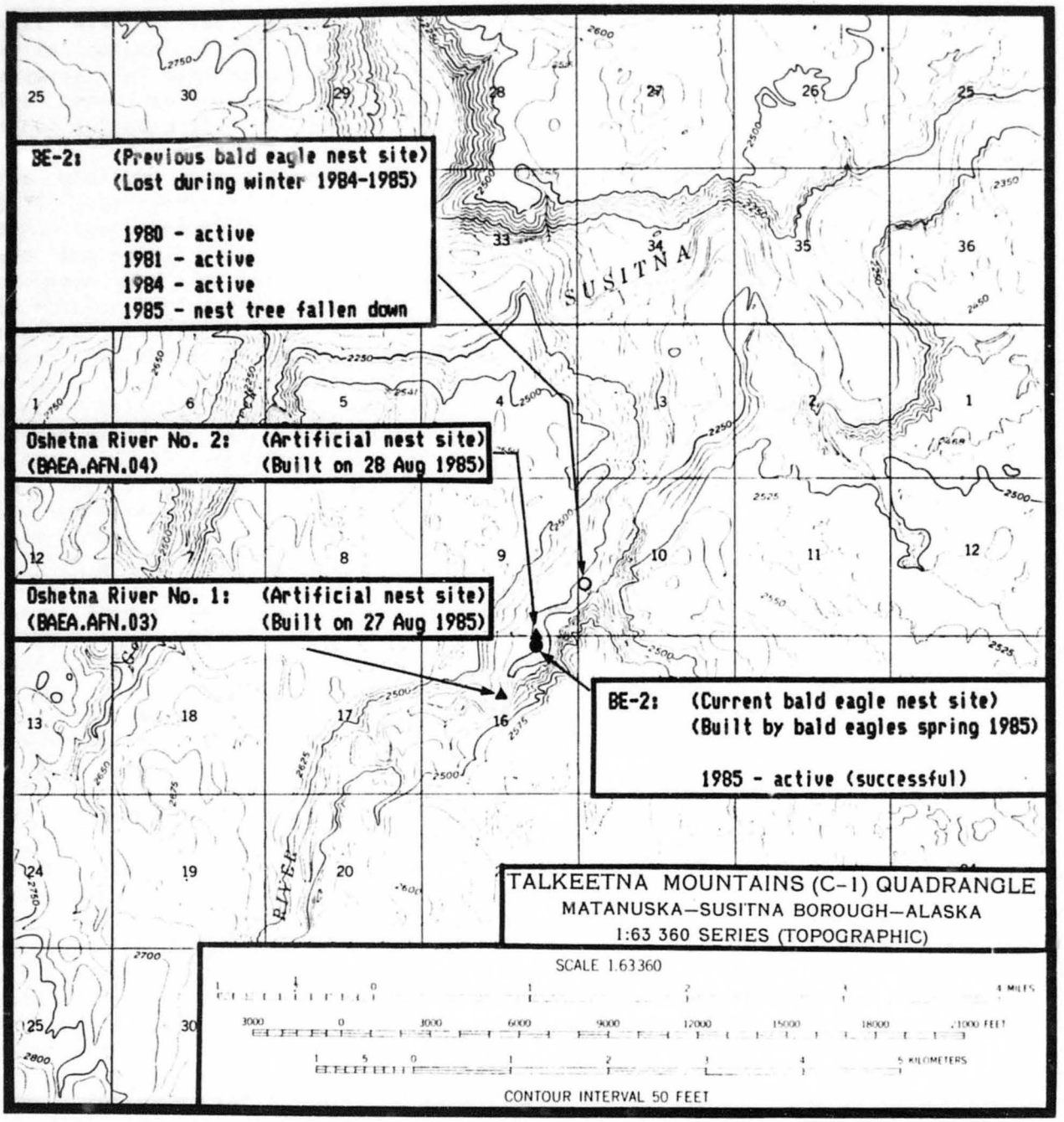

Figure 3. The location of artificial nest sites Oshetna River No. 1 and Oshetna River No. 2, Oshetna River, Alaska and the nearest neighboring bald eagle nesting location (BE-2) in the middle basin of the Susitna River drainage. The artificial nests were built in the immediate vicinity of the single nest site at bald eagle nesting location BE-2 to provide new, previously unavailable alternate nest sites at BE-2.

tree was located about 15 feet west of the river at the edge of a stand of white spruce trees. The nest tree's diameter at breast height (DBH) and diameter at nest height (DNH) were about 15 inches and 6 inches, respectively. The nest was built in about 7 hours time (as measured from the time personnel first ascended the tree to the time they returned to the ground).

The platform supporting the nest was prefabricated from a 4 x 5 foot piece of 0.75 inch-thick marine plywood cut into an octagonal shape by sawing 10 inches from the corners. Patterns of vertical 1.25 inch-diameter holes, and vertical and angled 0.75 inch-diameter holes were drilled in the platform to allow good drainage and for installing lengths of 0.75 inch-diameter hardwood doweling. Seventeen pieces of 16 inch-long 0.75 inch-diameter doweling were cut for eventual insertion into the outer round of 0.75 inch-diameter holes drilled at about 40 degree outward angles through 0.75 inch thick, 4.0 x 4.0 inch-square plywood blocks fastened around the perimeter of the platform. [Only seventeen pieces of 16.0 inch-long doweling are needed because at least one of the 0.75 inch-diameter holes nearest the tree trunk is typically left empty]. Eighteen pieces of 12 inch-long and four pieces of 5 inch-long 0.75 inch-diameter doweling were also cut for eventual insertion into the inner round of 0.75 inch-diameter holes drilled at about 20 degree outward angles several inches back from the first round of dowel-holes and the 0.75 inch-diameter holes drilled at 90 degree angles near the center of the platform.

The platform and doweling were sealed with two coats of flat gray exterior latex paint (Glidden Exterior Latex in Kiwi tone). The edges and bottom surface of the platform were camouflaged by streaks of quick-drying flat brown, black and dark gray spray paint (Dap Inc. Derusto primer) before the platform was taken into the field. Several streaks of green spray paint were also applied to the bottom of the platform just before it was mounted in the tree.

The platform was mounted in the tree by bolting it down onto two support brackets prefabricated from pieces of Steel City slotted right-angle steel stock (three 1.5 inch-long, 0.38 inch-diameter bolts per side) after bolting the support brackets onto opposite sides of the tree trunk (two 3.5 inch-long and one 4.5 inch long, 0.38 inch-diameter lagbolts per side). The two horizontal components for the support brackets were made from 5 foot-long pieces RA-300 stock, and the two vertical and two slanted components were made from 3 foot-long pieces of RA-225 stock. The back-brace was made from one 8 inch-long piece of RA-300 stock cut to length on-site. The back-brace was secured to the tree by one 3.5 inch-long, 0.38 inch-diameter lagbolt.

The 3 foot-long and 5 foot-long support bracket components were given one coat of flat gray metal primer and camouflaged by streaks of brown and black metal primer before being taken into the field (Dap Inc. Derusto primers). The fresh-cut back-brace ends were painted on-site.

The nest was made from 8-10 foot lengths of 1 inch-diameter (at-the-butt) aspen saplings cut and dried for one year, and similar-sized partially dried willow saplings. The saplings were woven between the 16.0 inch-long and 12.0 inch-long hardwood dowels after the dowel-butts were coated with glue and driven into place on the platform (Weldwood waterproof resorcinol glue). Short 1-2 foot-long lengths of 1 inch-diameter and smaller dried aspen and willow were inserted at varying angles between the two rows of saplings to complete the woven rim of the nest.

The nest was filled with about 6-8 inches of tightly packed fresh-cut green spruce boughs. The spruce boughs were covered by 3-4 inches of short, criss-crossed dried and partially dried aspen and willow sticks followed by 3-4 inches of freshly picked sphagnum moss and freshly cut, chopped up leafy poplar twigs.

Fourteen-gauge stove wire was strung from the bases of the 16.0 inch-long dowels mounted around the edges of the platform to slots in the horizontal and slanted components of the support brackets. Stove wire was also strung in an open zig-zag fashion beneath the platform between the two horizontal components of the support brackets. Dried aspen and fresh-cut willow saplings were wedged into the wire web to cover the bottom of the platform, and smaller twigs of aspen and willow were wedged into the nest at downward angles just above the platform to hide the edges of the platform.

A nearby dead spruce tree, several other bushy-topped live spruce trees and the top of the nest tree provide some potential perching places for resting eagles.

The nest tree is located on the river side of a large, relatively open stand of spruce trees growing along the west bank of the river. The nest tree directly overlooks the river's clear waters. The river contains Arctic grayling (Thymallus arcticus). The nest tree is shorter than some of the neighboring trees, but is a relatively prominent (but not dominant) member of the stand because it occurs at the downstream end of the stand. The completed nest faces southeast. It is probably visable from the natural nest at Nesting Location BE-2.

Oshetna River No. 1 was surveyed by light fixed-wing aircraft on 28 May 1986. The nest was empty and in good condition. [The nearby natural nest (BE-2) was also empty. However, one adult bald eagle was incubating in a second nearby artificial nest (Oshetna River No. 2) -- see below].

Oshetna River No. 2 (BAEA.AFN.04)

Oshetna River No. 2 is an artificial bald eagle stick nest in a tree on the west bank of the lower Oshetna River about 2.2 air miles (2.3 river miles) upstream from the confluence of the Oshetna and Susitna rivers, and about 0.3 mile downstream from Oshetna River No. 1 on the boundary of Sections 9 and 16, T29N R11E, Talkeetna Mountains C-1 Quadrangle (Figure 4). The nest was built to represent an alternate nest site at an existing nesting location in the middle basin of the Susitna River drainage (see Plates 9, 10 11 and 12).

The nearest known naturally-occurring bald eagle nesting location (Nesting Location BE-2) is located about 200 yards upstream from the artificial site. It contains only one known usable nest site. Bald eagles built the nest in a spruce tree in 1985 to replace another nest in a spruce tree that fell down during the winter of 1984-1985 about 0.5 air-mile farther downstream along the west bank of the Oshetna River. The fallen nest was surveyed by aircraft and found active in 1980, 1981 and 1984. The replacement nest still contained one completely feathered, ready-to-fledge nestling on 4 September 1985 (Susitna Hydroelectric Project Memorandum from D. G. Roseneau, P. J. Bente and J. D. Woolington, LGL Alaska to R. B. Sener, LGL Alaska, 6 December 1985).

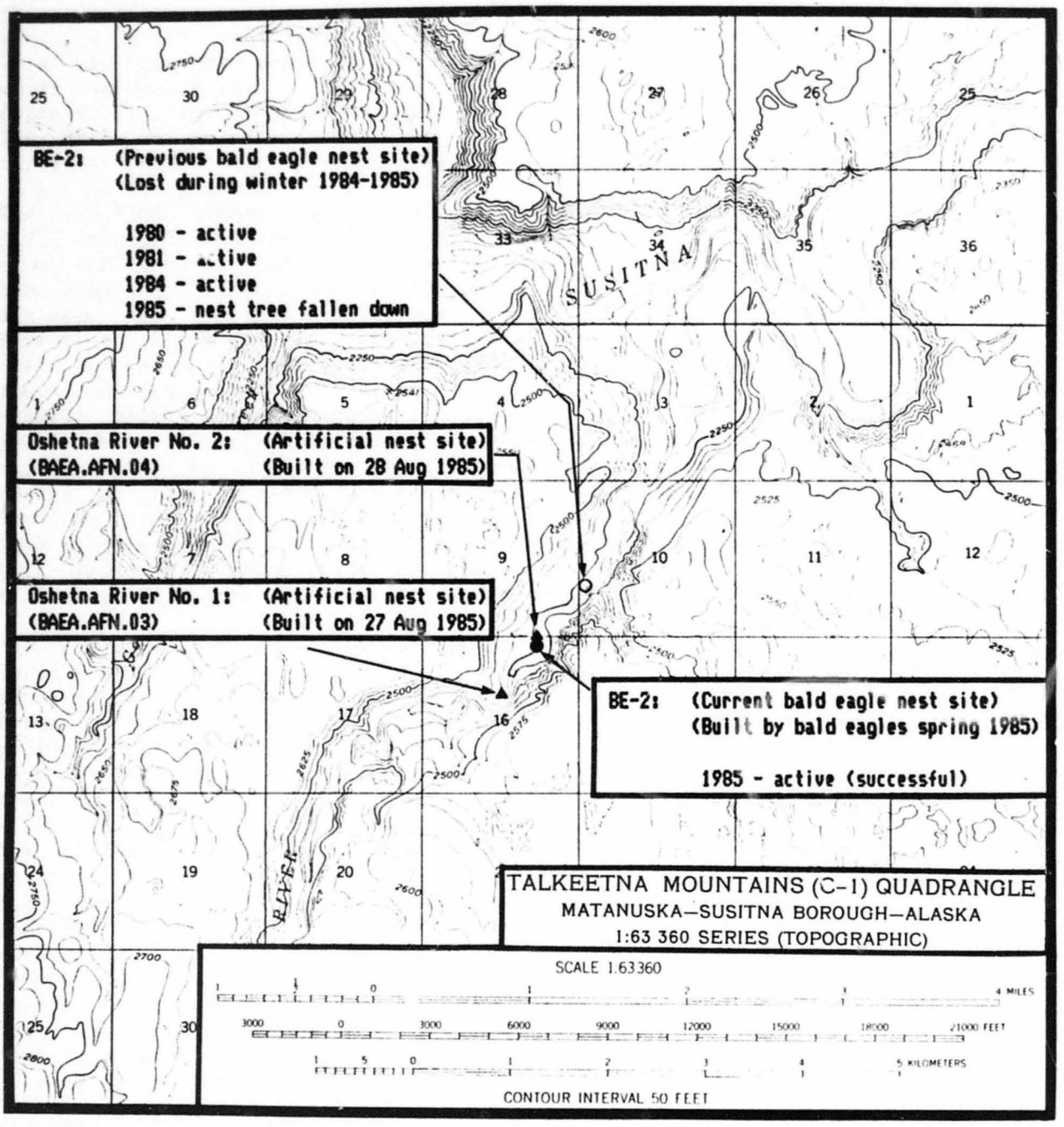

Figure 4. The location of artificial nest sites Oshetna River No. 2 and Oshetna River No. 1, Oshetna River, Alaska and the nearest neighboring bald eagle nesting location (BE-2) in the middle basin of the Susitna River drainage. The artificial nests were built in the immediate vicinity of the single nest site at bald eagle nesting location BE-2 to provide new, previously unavailable alternate nest sites at BE-2.

The artificial nest was installed about 57 feet above ground on the southeast side of a 75 foot-tall live white spruce tree on 28 August 1985. The nest tree was located about 75 feet west of the river near the edge of a stand of white spruce trees. The nest tree's diameter at breast height (DBH) and diameter at nest height (DNH) were about 15 inches and 7 inches, respectively. The nest was built in about 7 hours time (as measured from the time personnel first ascended the tree to the time they returned to the ground).

The platform supporting the nest was prefabricated from a 4 x 5 foot piece of 0.75 inch-thick marine plywood cut into an octagonal shape by sawing 10 inches from the corners. Patterns of vertical 1.25 inch-diameter holes, and vertical and angled 0.75 inch-diameter holes were drilled in the platform to allow good drainage and for installing lengths of 0.75 inch-diameter hardwood doweling. Seventeen pieces of 16 inch-long 0.75 inch-diameter doweling were cut for eventual insertion into the outer round of 0.75 inch-diameter holes drilled at about 40 degree outward angles through 0.75 inch thick, 4.0 x 4.0 inch-square plywood blocks fastened around the perimeter of the platform. [Only seventeen pieces of 16.0 inch-long doweling are needed because at least one of the 0.75 inch-diameter holes nearest the tree trunk is typically left empty]. Eighteen pieces of 12 inch-long and four pieces of 5 inch-long 0.75 inch-diameter doweling were also cut for eventual insertion into the inner round of 0.75 inch-diameter holes drilled at about 20 degree outward angles several inches back from the first round of dowel-holes and the 0.75 inch-diameter holes drilled at 90 degree angles near the center of the platform.

The platform and doweling were sealed with two coats of flat gray exterior latex paint (Glidden Exterior Latex in Kiwi tone). The edges and bottom surface of the platform were camouflaged by streaks of quick-drying flat brown, black and dark gray spray paint (Dap Inc. Derusto primer) before the platform was taken into the field. Several streaks of green spray paint were also applied to the bottom of the platform just before it was mounted in the tree.

The platform was mounted in the tree by bolting it down onto two support brackets prefabricated from Steel City slotted right-angle steel stock (three 1.5 inch-long, 0.38 inch-diameter bolts per side) after bolting the support brackets onto opposite sides of the tree trunk (one 3.5 inch-long and two 4.5 inch long, 0.38 inch-diameter lagbolts per side). The two horizontal components for the support brackets were made from 5 foot-long pieces of RA-300 stock, and the two vertical and two slanted components were made from 3 foot-long pieces of RA-225 stock. The back-brace was made from one 8 inch-long piece of RA-225 stock cut to length on-site. The back-brace was secured to the tree by one 3.5 inch-long, 0.38 inch-diameter lagbolt.

The 3 foot-long and 5 foot-long support bracket components were given one coat of flat gray metal primer and camouflaged by streaks of brown and black metal primer before being taken into the field (Dap Inc. Derusto primers). The fresh-cut back-brace ends were painted on-site.

The nest was made from 8-10 foot lengths of 1 inch-diameter (at-the-butt) aspen saplings cut and dried for one year, and similar-sized partially dried willow saplings. The saplings were woven between the 16.0 inch-long and 12.0 inch-long hardwood dowels after the dowel-butts were coated with glue and driven into place on the platform (Weldwood waterproof resorcinol glue). Short 1-2 foot-long lengths of 1 inch-diameter and smaller dried aspen and willow were inserted at varying angels between the two rows of saplings to complete the woven rim of the nest.

The nest was filled with about 6-8 inches of tightly packed fresh-cut green spruce boughs. The spruce boughs were covered by 3-4 inches of short, criss-crossed dried and partially dried aspen and willow saplings followed by 3-4 inches of freshly picked sphagnum moss, freshly cut leafy poplar twigs and freshly picked grass.

Fourteen-gauge stove wire was strung from the bases of the 16.0 inch-long dowels mounted around the edges of the platform to slots in the horizontal and slanted components of the support brackets. Stove wire was also strung in an open zig-zag fashion across the bottom of the platform between the two horizontal components of the support brackets. Large, fresh-cut spruce boughs were inserted into the wire web to cover the bottom of the platform, and smaller spruce boughs were wedged at downward angles between the bottom of the nest and the top of the platform to hide the edges of the platform.

Several nearby bushy-topped live spruce trees and the top of the nest tree provide some potential perching places for resting eagles.

The nest tree is located within a semi-open stand of spruce trees growing along the west side of the river. The nest tree does not directly overlook the river, but the river's clear waters can be seen from the nest. The river contains Arctic grayling. The nest tree is not an especially dominant or prominent member of the stand. Indeed, it is a relatively average member of the stand. The completed nest faces southeast. It is not visable from the natural nest at Nesting Location BE-2.

Oshetna River No. 2 was surveyed by light fixed-wing aircraft on 28 May 1986. One adult bald eagle was incubating in the nest. [The nearby natural nest (BE-2) and the second artificial nest (Oshetna River No. 1) were empty and in good condition -- see above].

Kosina River No. 1 (BAEA.AFN.05)

Kosina River No. 1 is an artificial bald eagle stick nest in a tree at the confluence of Kosina and Gilbert creeks about 5.5 miles upstream from the confluence of Kosina Creek and the Susitna River in Section 9, T30N R8E, Talkeetna Mountains C-2 Quadrangle (Figure 5). The nest was built to represent an entirely new nesting location within the middle basin of the Susitna River drainage (see Plates 13, 14 and 15).

The nearest known naturally-occurring bald eagle nesting location (Nesting Location BE-4) is located along the north bank of the Susitna River about 6 air miles from the artificial location. It contains two known nest sites. One of the nests is located on a cliff and may have been originally built by golden eagles (Aquila chrysaetos). The cliff-nest was surveyed by aircraft and bald eagles were found nesting in it in 1974, 1981 and 1984. It was empty and partially fallen from the cliff in 1985. Bald eagles built the second nest in a live balsam poplar tree about 300-400 yards upstream from the cliff-nest during spring 1985. The tree-nest was probably built as an alternate to the cliff-nest because snow apparently remained in the cliff-nest until well after bald eagles normally lay eggs. Two nestlings fledged from the tree-nest during late August 1985 (Susitna Hydroelectric Project Memorandum from D. G. Roseneau, P. J. Bente and J. D. Woolington, LGL Alaska to R. B. Sener, LGL Alaska, 6 December 1985).

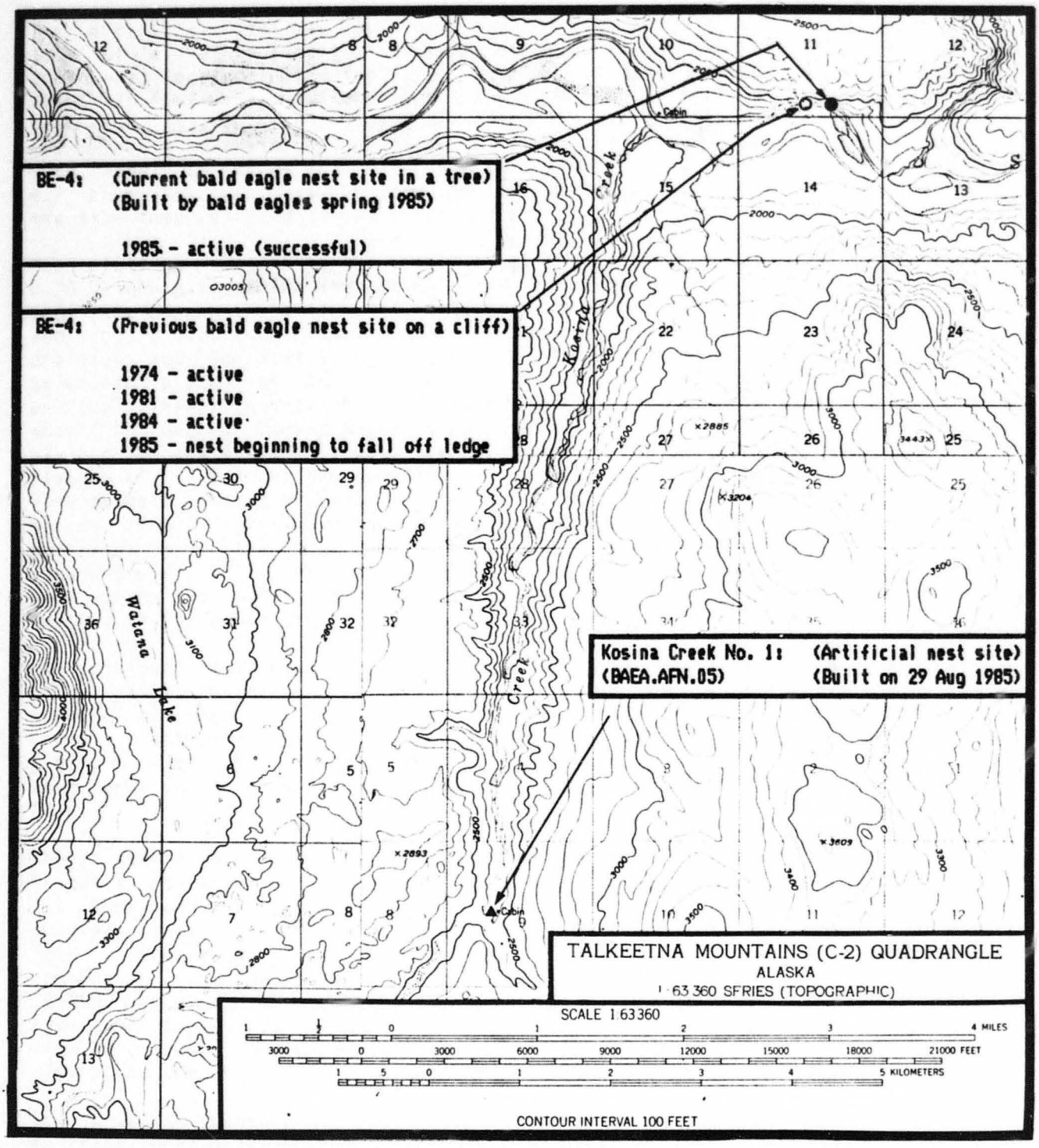

Figure 5. The location of artificial nest site Kosina Creek No. 1, Kosina Creek, Alaska and the nearest neighboring bald eagle nesting location (BE-4) in the middle basin of the Susitna River drainage. The artificial nest was built several miles away from BE-4, but within the hunting territory used by a pair of eagles nesting at BE-4 in 1985. The location was selected to provide a new previously unavailable alternate nesting location for the pair in subsequent years (the artificial nest might also serve as a new, previously unavailable nesting location that might attract another pair of bald eagles to the middle basin of the Susitna River drainage).

The ar tificial nest was installed about 33 feet above ground on the southwest side o a 43 foot-tall live white spruce tree on 29 August 1985. The nest tree wi s located near the point of land between Gilbert and Kosina creeks about 2 25 feet west of Gilbert Creek and about 75-100 feet east of Kosina Creek near tw o smaller spruce trees and a small stand of balsam poplar trees. The nest tr ee's diameter at breast height (DBH) and diameter at nest height (DNH) were ab out 18 inches and 7 inches, respectively. The nest was built in about 4.7 hou rs time (as measured from the time personnel first ascended the tree to the time they returned to the ground).

The pla tform supporting the nest was prefabricated from a 4 x 5 foot piece of 0.75 in ch-thick marine plywood cut into an octagonal shape by sawing 10 inches from th e corners. Patterns of vertical 1.25 inch-diameter holes, and vertical and ang led 0.75 inch-diameter holes were drilled in the platform to allow good drainage and for installing lengths of 0.75 inch-diameter hardwood doweling. Seventee n pieces of 16 inch-long 0.75 inch-diameter doweling were cut for eventual insertion into the outer round of 0.75 inch-diameter holes drilled at about 4 0 degree outward angles through 0.75 inch thick, 4.0 x 4.0 inch-square plywood blocks fastened around the perimeter of the platform. [Only seventeen pieces of 16.0 inch-long doweling are needed because at least one of the 0.75 inch-dia meter holes nearest the tree trunk is typically left empty]. Eighteen pieces of 12 inch-long and four pieces of 5 inch-long 0.75 inch-diameter dowe ling were also cut for eventual insertion into the inner round of 0.75 inch-dia meter holes drilled at about 20 degree outward angles several inches back fr om the first round of dowel-holes and the 0.75 inch-diameter holes drilled at 90 degree angles near the center of the platform.

The pla tform and doweling were sealed with two coats of flat gray exterior latex p aint (Glidden Exterior Latex in Kiwi tone). The edges and bottom surface of the platform were camouflaged by streaks of quick-drying flat brown, black and dark gray spray paint (Dap Inc. Derusto primer) before the platform was taken into the field. Several streaks of green spray paint were also ap plied to the bottom of the platform just before it was mounted in the tree.

The pla tform was mounted in the tree by bolting it down onto two support brackets prefabricated from Steel City slotted right-angle steel stock (three 1.5 inc -long, 0.38 inch-diameter bolts per side) after bolting the support brackets onto opposite sides of the tree trunk (one 3.5 inch-long and two 4.5 inch lo ng, 0.38 inch-diameter lagbolts per side). The two horizontal componen s for the support brackets were made from 5 foot-long pieces of RA-300 s tock, and the two vertical and two slanted components were made from 3 foot-long pieces of RA-300 stock. The back-brace was made from one 8 inch-long piece of RA-300 stock cut to length on-site. The back-brace was secured t o the tree by one 3.5 inch-long, 0.38 inch-diameter lagbolt.

The 3 fo ot-long and 5 foot-long support bracket components were given one coat of flat gray metal primer and camouflaged by streaks of brown and black metal primer b efore being taken into the field (Dap Inc. Derusto primers). The fresh-cut back-brace ends were painted on-site.

The nest was made from 8-10 foot lengths of 1 inch-diameter (at-the-butt) aspen sa plings cut and dried for one year, and similar-sized partially dried willow s aplings. The saplings were woven between the 16.0 inch-long and 12.0

inch-long hardwood dowels after the dowel-butts were coated with glue and driven into place on the platform (Weldwood waterproof resorcinol glue). Short 1-2 foot-long lengths of 1 inch-diameter and smaller dried aspen and willow were inserted at varying angles between the two rows of saplings to complete the woven rim of the nest.

The nest was filled with about 6-8 inches of tightly packed fresh-cut green spruce boughs. The spruce boughs were covered by 3-4 inches of short, criss-crossed dried and partially dried aspen and willow sticks followed by 3-4 inches of freshly picked sphagnum moss and freshly cut, chopped up leafy poplar twigs.

Fourteen-gauge stove wire was strung from the bases of the 16.0 inch-long dowels mounted around the edges of the platform to slots in the horizontal and slanted components of the support brackets. Stove wire was also strung in an open zig-zag fashion beneath the platform between the two horizontal components of the support brackets. Large, fresh-cut spruce boughs were inserted into the wire web to cover the bottom of the platform, and smaller spruce boughs were wedged at downward angles between the bottom of the nest and the top of the platform to hide the edges of the platform.

Several nearby balsam poplar trees and the top of the nest tree provide some potential perching places for resting eagles.

The nest tree is a prominent feature at the junction of the two Arctic grayling-filled clear-water creeks. It stands nearly alone on the point of land between the creeks accompanied by two smaller live and two smaller dead spruce trees, and a small stand of shorter balsam poplar trees. The completed nest faces
southwest.

Kosina Creek No. 1 was surveyed by light fixed-wing aircraft on 28 May 1986. The nest was empty and in good condition.

Indian River No. 1 (BAEA.AFN.06)

Indian River No. 1 is an artificial bald eagle stick nest in a tree on an island in the Susitna River about 4.8 air miles (5.3 river miles) upstream from the confluence of the Indian and Susitna rivers in Section 31, T32N R1W, Talkeetna Mountains D-6 Quadrangle (Figure 6). The nest was built to represent an entirely new nesting location within the middle basin of the Susitna River drainage (see Plates 16, 17 and 18).

The nearest known naturally-occurring bald eagle nesting location (Nesting Location BE-8) is located about 4.3 air miles (4.6 river miles) downstream from the artificial location. It contains only one known usable nest site in a dead, unstable balsam poplar tree. The nest was surveyed by aircraft and found to be active in 1974, 1980, 1981 and 1984. Bald eagles also attempted to nest at it in 1985; however, the pair failed. The failure was likely caused by heavy winter snowfalls, an unusually cool, late spring and snow remaining in the nest until well after normal egg-laying time. After failing, the pair continued frequenting the vicinity of the nest at least until early September (Susitna Hydroelectric Project Memorandum from D. G. Roseneau, P. J. Bente and J. D. Woolington, LGL Alaska to R. B. Sener, LGL Alaska, 6 December 1985).

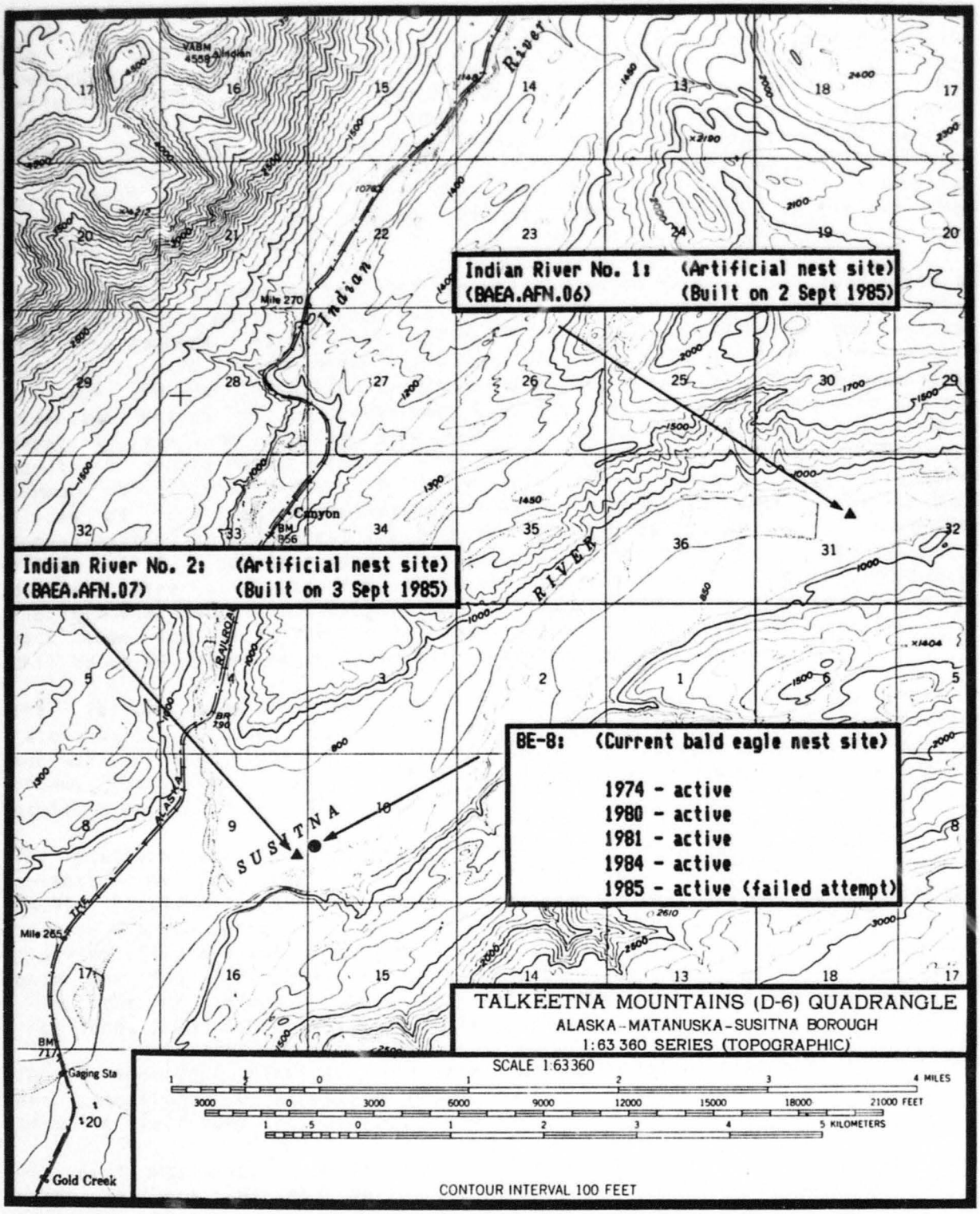

Figure 6. The location of artificial nest site Indian River No. 1, Susitna River, Alaska and the nearest neighboring bald eagle nesting location (BE-8) in the middle basin of the Susitna River drainage. The artificial nest was built several miles away from BE-8 and another artificial nest (Indian River No. 2) to provide a new, previously unavailable nesting location that might attract another pair of bald eagles to the middle basin of the Susitna River drainage.

The artificial nest was installed about 75 feet above ground in the southeasterly-opening crotch of a 100 foot-tall live balsam poplar tree on 2 September 1985. The nest tree was located on the narrow portion of a large island in the Susitna River about 100 feet south from the island's north shore. The nest tree's diameter at breast height (DBH) was about 42 inches. The diameters of the limbs forming the crotch containing the artificial nest were about 12-14 inches. The nest was built in about 11 hours time (as measured from the time personnel first ascended the tree to the time they returned to the ground).

The platform supporting the nest was prefabricated from a 4 x 5 foot piece of 0.75 inch-thick marine plywood cut into an octagonal shape by sawing 10 inches from the corners. Patterns of vertical 1.25 inch-diameter holes, and vertical and angled 0.75 inch-diameter holes were drilled in the platform to allow good drainage and for installing lengths of 0.75 inch-diameter hardwood doweling. Seventeen pieces of 16 inch-long 0.75 inch-diameter doweling were cut for eventual insertion into the outer round of 0.75 inch-diameter holes drilled at about 40 degree outward angles through 0.75 inch thick, 4.0 x 4.0 inch-square plywood blocks fastened around the perimeter of the platform. [Only seventeen pieces of 16.0 inch-long doweling are needed because at least one of the 0.75 inch-diameter holes nearest the tree trunk is typically left empty]. Eighteen pieces of 12 inch-long and four pieces of 5 inch-long 0.75 inch-diameter doweling were also cut for eventual insertion into the inner round of 0.75 inch-diameter holes drilled at about 20 degree outward angles several inches back from the first round of dowel-holes and the 0.75 inch-diameter holes drilled at 90 degree angles near the center of the platform.

The platform and doweling were sealed with two coats of flat gray exterior latex paint (Glidden Exterior Latex in Kiwi tone). The edges and bottom surface of the platform were camouflaged by streaks of quick-drying flat brown, black and dark gray spray paint (Dap Inc. Derusto primer) before the platform was taken into the field.

The platform was mounted in the tree using methods improvised to take advantage of the tree's large natural crotch. Two 5 foot-long pieces of RA-300 Steel City slotted right-angle steel stock were bolted horizontally between three upright limbs to form a trapizoid-shaped support for the platform (two 6.0 inch-long lagbolts per piece). The platform was bolted down onto the two horizontal steel supports after it was modified to fit between the limbs by trimming about 10 inches from one of its corners (three 1.5 inch-long, 0.38 inch-diameter bolts per side).

The 5 foot-long steel supports were given one coat of flat gray metal primer and camouflaged by streaks of brown and black metal primer before being taken into the field (Dap Inc. Derusto primers).

The nest was made from 8-10 foot lengths of 1 inch-diameter (at-the-butt) aspen saplings cut and dried for one year, similar-sized partially dried willow saplings and similar-sized fresh-cut alder saplings The saplings were woven between the 16.0 inch-long and 12.0 inch-long hardwood dowels after the dowel-butts were coated with glue and driven into place on the platform (Weldwood waterproof resorcinol glue). Short 1-2 foot-long lengths of 1 inch-diameter and smaller dried aspen and willow were inserted at varying angles between the two rows of saplings to complete the woven rim of the nest.

The nest was filled with about 6-8 inches of dried and partilly dried aspen and willow saplings. The short, criss-crossed aspen and willow sticks were covered by 3-4 inches of freshly cut, chopped up leafy willow twigs followed by 2-3 inches of sphagnum moss and freshly picked grass.

The bottom of the platform was not covered by sticks because the painted plywood was relatively well hidden by shadows and the crotch of the tree.

Several dead or dying branches on several large neighboring poplar trees provide some potential perching places for resting eagles.

The nest tree is one of several large, scattered balsam poplar trees growing on the relatively narrow downstream portion of the island. The trees are clearly prominent features of the island. The understory consists of dense 15-20 foot-tall alder stands. A slough used by spawning chum salmon (Oncorhynchus keta) lies directly north of and in sight of the nest tree along the river's north bank.

Indian River No. 1 was surveyed by light helicopter on 2 October 1985. One adult bald eagle was perched opposite the nest in a neighboring tree about 30 feet from and at the level of the nest (R. Sener, pers. comm. 3 October 1985). The nest was resurveyed by fixed-wing aircraft on 28 May 1986. The nest was empty and in good condition. Several short poplar sticks were present in the nest cup. The sticks were not placed there during nest construction. They were probably placed there by the adult eagle seen near the nest the previous fall.

Indian River No. 2 (BAEA.AFN.07)

Indian River No. 2 is an artificial bald eagle stick nest in a tree on the northwest bank of the Susitna River about 0.4 air miles (also about 0.4 river miles) upstream from the confluence of the Indian and Susitna rivers in Section 10, T31N R2W, Talkeetna Mountains D-6 Quadrangle (Figure 7). It was built to represent an alternate nest site at an existing nesting location in the middle basin of the Susitna River drainage (see Plates 19, 20 and 21).

The nearest known naturally-occurring bald eagle nesting location (Nesting Location BE-8) is located about 150 yards upstream from the artificial location. It contains only one known usable nest site in a dead, unstable balsam poplar tree. The nest was surveyed by aircraft and found to be active in 1974, 1980, 1981 and 1984. Bald eagles also attempted to nest at it in 1985; however, the pair failed. The failure was likely caused by an unusually cool, late spring and snow remaining in the nest until well after normal egg-laying time. After failing, the pair continued frequenting the vicinity of the nest at least until early September (Susitna Hydroelectric Project Memorandum from D. G. Roseneau, P. J. Bente and J. D. Woolington, LGL Alaska to R. B. Sener, LGL Alaska, 6 December 1985).

The artificial nest was installed about 78 feet above ground on the eastnortheast side of a 110 foot-tall live balsam poplar tree on 3 September 1985. The nest tree was located along the northwest side of the Susitna River about 25 feet from the river's bank. The nest tree's diameter at breast height (DBH) and diameter at nest height (DNH) were about 28 inches and 16 inches, respectively. One of the tree's large limbs was cut off about 3 feet from the trunk to provide room for mounting the artificial nest (the cut was

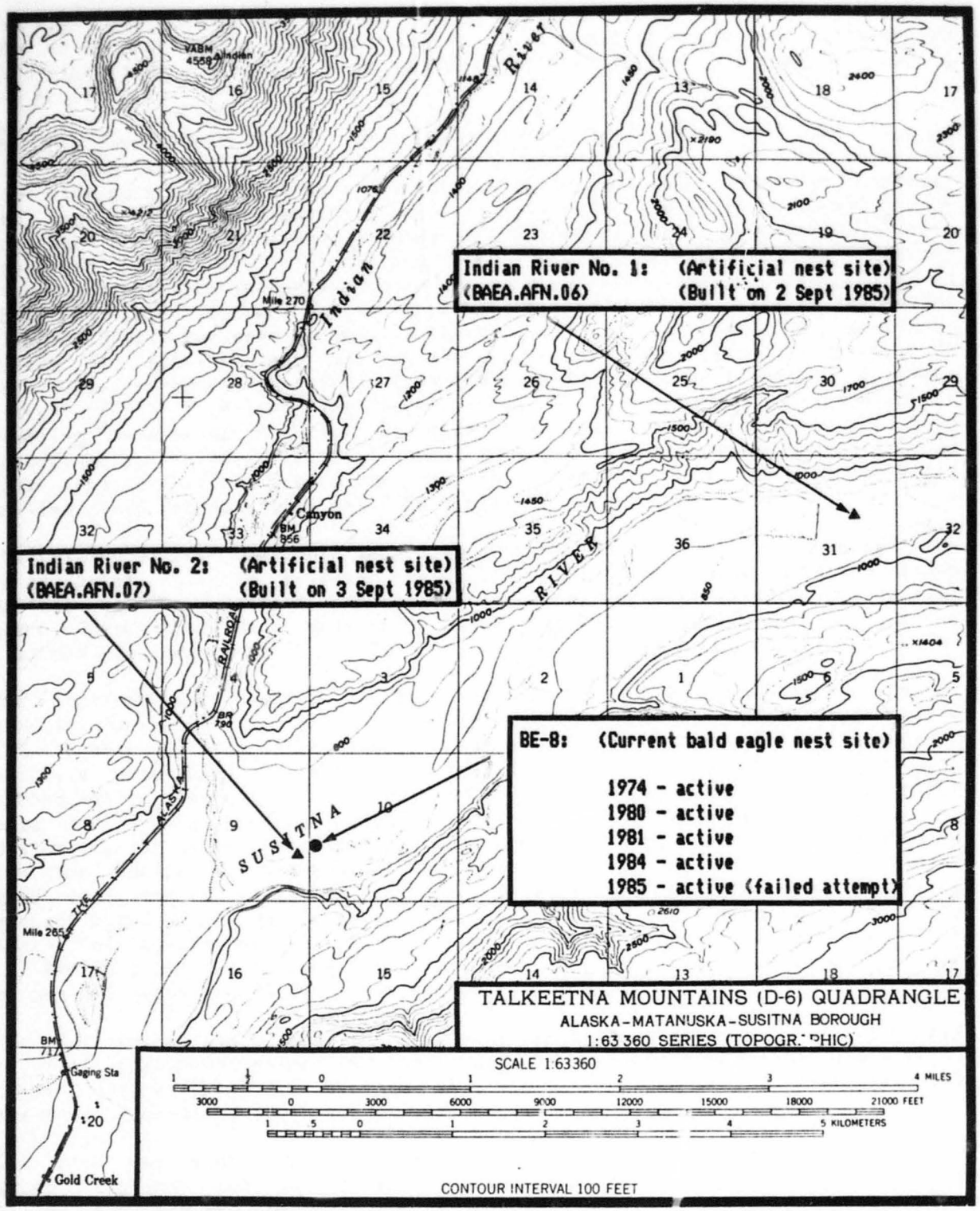

Figure 7. The location of artificial nest site Indian River No. 2, Susitna River, Alaska and the nearest neighboring bald eagle nesting location (BE-8) in the middle basin of the Susitna River drainage. The artificial nest was built in the immediate vicinity of the single nest site at bald eagle nesting location BE-8 to provide a new, previously unavailable alternate nest site at BE-8.

made so that the upward curving stub of the limb rested against the bottom of the nest platform). The nest was built in about 10 hours time (as measured from the time personnel first ascended the tree to the time they returned to the ground).

The platform supporting the nest was prefabricated from a 4 x 5 foot piece of 0.75 inch-thick marine plywood cut into an octagonal shape by sawing 10 inches from the corners. Patterns of vertical 1.25 inch-diameter holes, and vertical and angled 0.75 inch-diameter holes were drilled in the platform to allow good drainage and for installing lengths of 0.75 inch-diameter hardwood doweling. Seventeen pieces of 16 inch-long 0.75 inch-diameter doweling were cut for eventual insertion into the outer round of 0.75 inch-diameter holes drilled at about 40 degree outward angles through 0.75 inch thick, 4.0 x 4.0 inch-square plywood blocks fastened around the perimeter of the platform. [Only seventeen pieces of 16.0 inch-long doweling are needed because at least one of the 0.75 inch-diameter holes nearest the tree trunk is typically left empty]. Eighteen pieces of 12 inch-long and four pieces of 5 inch-long 0.75 inch-diameter doweling were also cut for eventual insertion into the inner round of 0.75 inch-diameter holes drilled at about 20 degree outward angles several inches back from the first round of dowel-holes and the 0.75 inch-diameter holes drilled at 90 degree angles near the center of the platform.

The platform and doweling were sealed with two coats of flat gray exterior latex paint (Glidden Exterior Latex in Kiwi tone). The edges and bottom surface of the platform were camouflaged by streaks of quick-drying flat brown, black and dark gray spray paint (Dap Inc. Derusto primer) before the platform was taken into the field.

The platform was mounted in the tree by bolting it down onto two support brackets prefabricated from Steel City slotted right-angle steel stock (three 1.5 inch-long, 0.38 inch-diameter bolts per side) after bolting the support brackets onto opposite sides of the tree trunk (three 6.0 inch long, 0.38 inch-diameter lagbolts per side). The platform was also lagbolted directly onto the upward curving butt of a large sawn off limb resting against the bottom center of the platform (one 4.5 inch-long, 0.38 inch-diameter lagbolt). The two horizontal and two vertical components for the support brackets were made from two 5 foot-long and two 3 foot-long pieces of RA-300 stock, respectively. The two slanted components were made from two 3 foot-long pieces of RA-225 stock. The back-brace was made from one 14 inch-long piece of RA-225 stock cut to length on-site. The back-brace was secured to the tree by one 4.5 inch-long, 0.38 inch-diameter lagbolt.

The 3 foot-long and 5 foot-long support bracket components were given one coat of flat gray metal primer and camouflaged by streaks of brown and black metal primer before being taken into the field (Dap Inc. Derusto primers). The fresh-cut back-brace ends were painted on-site.

The nest was made from 8-10 foot lengths of 1 inch-diameter (at-the-butt) aspen saplings cut and dried for one year, similar-sized partially dried willow saplings and similar-sized fresh-cut alder saplings. The saplings were woven between the 16.0 inch-long and 12.0 inch-long hardwood dowels after the dowel-butts were coated with glue and driven into place on the platform (Weldwood waterproof resorcinol glue). Short 1-2 foot-long lengths of 1 inch-diameter and smaller dried aspen and willow were inserted at varying angles between the two rows of saplings to complete the woven rim of the nest.

The nest was filled with about 6-8 inches of partially dried willow saplings. The short, criss-crossed willow sticks were covered by 3-4 inches of freshly cut, chopped up leafy willow and alder twigs mixed with 2-3 inches of sphagnum moss and freshly picked grass.

Fourteen-gauge stove wire was strung from the bases of the 16.0 inch-long dowels mounted around the edges of the platform to slots in the horizontal and slanted components of the support brackets. Stove wire was also strung in an open zig-zag fashion beneath the platform between the two horizontal components of the support brackets. Dry willow saplings and fresh-cut, leafy alder branches were inserted into the wire web to cover the bottom of the platform, and smaller alder and willow branches were wedged at downward angles between the bottom of the nest and the top of the platform to hide the edges of the platform.

A large perching place was made by selectively pruning one of the nest tree's limbs about 10 feet above the nest. The branches of several nearby poplar trees also provide some potential perching places for resting eagles.

The nest tree is located on the river side of a relatively dense stand of large balsam poplar trees. It directly overlooks the Susitna River, but it is not an especially prominent member of the stand. A slough used by spawning chum salmon runs directly behind the nest tree along the river's northwest bank. The completed nest faces eastnortheast. It is not in direct line-of-sight of the natural nest at Nesting Location BE-8.

Indian River No. 2 was surveyed by light helicopter on 2 October 1985. The nest was empty and in good condition (R. Sener, pers. comm. 3 October 1985). The nest was resurveyed by light fixed-wing aircraft on 28 May 1986. The nest was empty and in good condition. [One adult bald eagle was incubating in the nearby natural nest (BE-8)].

Deadman Creek No. 1 (BAEA.ANS/AFN.01)

Deadman Creek No. 1 is an artificial bald eagle stick nest on top of an artificial nesting structure standing along the northwest side of Deadman Creek about 5.0 air miles north of the Susitna River on the boundrary between Sections 34 and 35, T33N R5W, Talkeetna Mountains D-3 Quadrangle (Figure 8). The nest and nesting structure were built to represent an alternate nest site at an existing nesting location in the middle basin of the Susitna River drainage (see Plates 22, 23, 24, 25 and 26).

The nearest known naturally-occurring bald eagle nesting location (Nesting Location BE-6) is located about 75 yards southwest of the artificial location. It contains only one known usable nest site in a balsam poplar tree. The nest was surveyed by aircraft and found to be active in 1980, 1981 and 1984. Bald eagles also attempted to nest at it in 1985; however, the pair failed. The failure was likely caused by an unusually cool, late spring and snow remaining in the nest until well after normal egg-laying time. After failing, the pair continued frequenting the vicinity of the nest at least until late August (D. G. Roseneau, P. J. Bente and J. D. Woolington, unpubl. data).

The artificial nest and aluminum tripod nesting structure were assembled on the ground about 200 yards from the structure's final location on 30 August 1985. The completed nesting structure and nest were moved by light helicopter

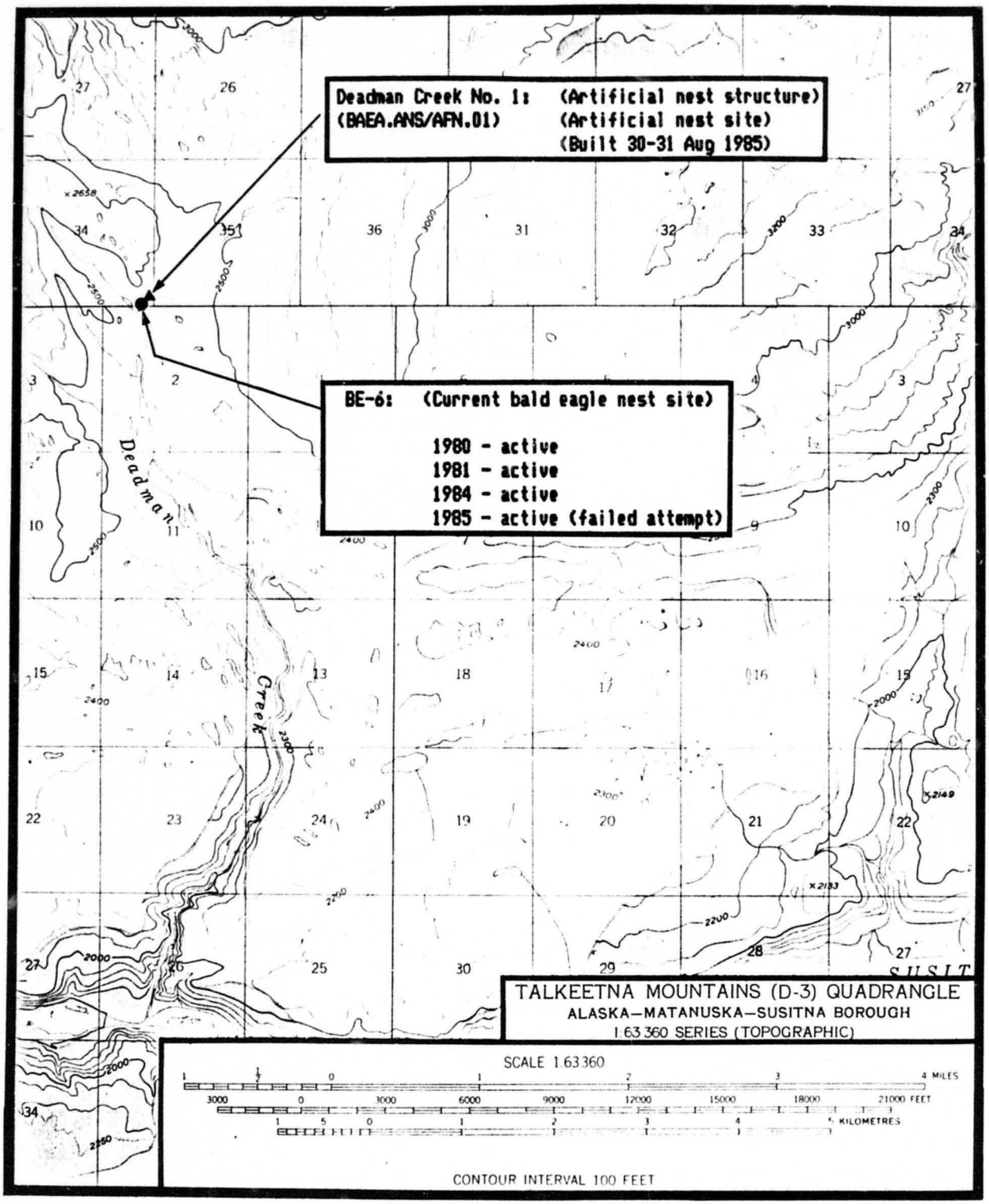

Figure 8. The location of artificial nesting structure and nest site Deadman Creek No. 1, Deadman Creek, Alaska and the nearest neighboring bald eagle nesting location (BE-6) in the middle basin of the Susitna River drainage. The artificial nest was built in the immediate vicinity of the single nest site at bald eagle nesting location BE-6 to provide a new, previously unavailable alternate nest site at BE-6.

into a small clearing in an open stand of white spruce trees about 75 yards northeast of the natural nest and about 100 yards north of Deadman Creek on 31 August 1985. The tripod and nest were built in about 12 hours time. Rigging, moving and anchoring the structure required another 2 hours time.

The 35 foot-tall tripod nesting structure was prefabricated from high-grade 0.25 inch-thick Reynolds Aluminum Supply Company aluminum plate and No. 6061 T6 Schedule 80 structural aluminum pipe. The 3 foot-diameter head-plate and six 17 inch-long, 7.5 inch-wide channel-plates were cut from 0.25 inch-thick aluminum plate. The channel-plates were heli-arc welded to the bottom surface of the head-plate, forming three evenly spaced, radiating 4.5 inch-wide, 7.5 inch-deep hinge-channels for the pipe legs. [Future models will have 6 inch-diameter brace plates cut from 0.25 inch-thick plate welded over the center of the channels to provide additional strength]. One 0.75 inch-diameter hole was drilled through the center of the head-plate. Three 0.38 inch-diameter holes were drilled at even intervals through the head-plate into the open channels for 0.38 inch-diameter, 1.5 inch-long platform bolts. Three 0.38 inch-diameter holes were also drilled at even intervals through the head-plate between the open channels for 0.38 inch-diameter, 6.0 inch-long perch-support bolts. One 0.5 inch-diameter hole was drilled horizontally through each of the hinge-channels 3 inches from the bottoms of the channel's side-plates and 4 inches back from the outer edge of the head-plate for 0.5 inch-diameter bolts for hinging the legs to the head-plate. [Future models will have two 0.38 inch-diameter holes drilled at even intervals between two of the three radiating hinge-channels for 0.38 inch-diameter, 2.0 inch-long perch-support bolts].

The three 40 foot-long tripod legs were prefabricated from six 20 foot-long pieces of 3.5 inch outside-diameter (3 inch inside-diameter), 0.25 inch-thick pipe (i.e., two pieces per leg) and three 5 foot-long inserts of 3 inch outside-diameter (2.5 inch outside-diameter), 0.25 inch-thick pipe (three pieces per tripod). [Future models will use 6 foot-long inserts]. The 5 foot-long inserts and 20 foot-long pieces of pipe were matched and holes were drilled for 5 inch-long, 0.38 inch-diameter hex-bolts fitted with flat and locking washers and lock-nuts at intervals of 6, 18 and 24 inches from the edges of the insert-filled joints (i.e., six bolts per leg). [Future models will have 0.38 inch-diameter holes drilled at 6, 18 and 30 inch intervals].

Single 0.5 inch-diameter holes were also drilled 4 inches from the ends of the 40 foot-long legs for 6 inch-long, 0.5 inch-diameter hex-bolts fitted with nylon bushings, flat and locking washers, and lock-nuts for hinging the prefabricated head-plate to the finished legs (i.e., one 0.5 inch-diameter hex-bolt per leg). Single 0.5 inch-diameter holes were also drilled 5 inches from the opposite ends (i.e., the foot-ends) of the 40 foot-long legs for 24 inch-long pieces of 0.5 inch-diameter threaded rod (one piece per leg) for hinging prefabricated foot-pads to the tripod legs. Single 0.38 inch-diameter holes were also drilled 3 feet from the foot-end of each 40 foot-long leg for 6 inch-long, 0.38 inch-diameter eye-bolts fitted with flat and locking washers and lock-nuts (one bolt per leg) for anchoring the tripod legs to the ground.

Three 20 x 21 inch foot-pads (one for each tripod leg) were prefabricated from three 8 foot-long pieces of treated 4 x 4 inch rough-cut cedar. Four 21 inch-long pieces of cedar were separated by two 6 inch-long pieces of cedar leaving a central hole measuring 4 inches wide and 9 inches long. The cedar 'square' was bolted together with three equal-spaced 24 inch-long pieces of 0.5 inch-diameter threaded rod fitted with flat and locking washers and lock

nuts. The central piece of threaded rod served as the hinge bolt for attaching the finished foot-pads to the respective tripod legs. [Future models will have foot-pads prefabricated from 20 x 20 inch pieces of 0.25-0.5 inch-thick aluminum treadplate and two pieces of 8 inch-long, 1 inch x 1 inch right-angle aluminum stock].

All exposed metal components of the tripod were painted with two coats of flat gray metal primer before being taken into the field (Dap Inc. Derusto primer). [Future models will use aluminum primer and marine-grade paint, and the legs will be partially camouflaged by streaks of flat brown, black and dark gray spray paints].

The platform supporting the nest on the tripod head-plate was prefabricated from a 4 x 5 foot piece of 0.75 inch-thick marine plywood cut into an octagonal shape by sawing 10 inches from the corners. Patterns of vertical 1.25 inch-diameter holes, and vertical and angled 0.75 inch-diameter holes were drilled in the platform to allow good drainage and for installing lengths of 0.75 inch-diameter hardwood doweling. Eighteen pieces of 16 inch-long 0.75 inch-diameter doweling were cut for eventual insertion into the outer round of 0.75 inch-diameter holes drilled at about 40 degree outward angles through 0.75 inch thick, 4.0 x 4.0 inch-square plywood blocks fastened around the perimeter of the platform. Eighteen pieces of 12 inch-long and four pieces of 5 inch-long 0.75 inch-diameter doweling were also cut for eventual insertion into the inner round of 0.75 inch-diameter holes drilled at about 20 degree outward angles several inches back from the first round of dowel-holes and the 0.75 inch-diameter holes drilled at 90 degree angles near the center of the platform.

The platform and doweling were sealed with two coats of flat gray exterior latex paint (Glidden Exterior Latex in Kiwi tone). The edges and bottom surface of the platform were camouflaged by streaks of quick-drying flat brown, black and dark gray spray paint (Dap Inc. Derusto primer) before the platform was taken into the field.

Holes were drilled in the platform to match the 0.38 inch-diameter holes in the aluminum head-plate. The platform was attached to the tripod head-plate with six 2.0 inch-long, 0.38 inch-diameter bolts.

The nest was made from 8-10 foot lengths of 1 inch-diameter (at-the-butt) aspen saplings cut and dried for one year, and similar-sized partially dried willow saplings. The saplings were woven between the 16.0 inch-long and 12.0 inch-long hardwood dowels after the dowel-butts were coated with glue and driven into place on the platform (Weldwood waterproof resorcinol glue). Short 1-2 foot-long lengths of 1 inch-diameter and smaller dried aspen and willow were inserted at varying angles between the two rows of saplings to complete the woven rim of the nest.

The nest was filled with about 6-8 inches of dried aspen saplings. The short, criss-crossed aspen sticks were covered by 3-4 inches of freshly cut, chopped up leafy, dwarf birch branches mixed with 2-3 inches of sphagnum moss, lichens and freshly picked grass.

The tripod perch was made by bolting two 15-16 inch-long pieces of 4 x 4 inch cedar to the bottom of the tripod head-plate (before the nesting platform was attached). Two 7-8 foot-long pieces of 4-5 inch-diameter dried spruce poles were lagbolted to the ends of the cedar and further secured by side-supports

and knee-braces of RA-225 slotted right-angle steel stock. One 9-10 foot-long, 4-5 inch-diameter dried spruce pole was secured between the two upright poles with wire wrapping. [Future perches for aluminum tripods will be bolted onto short pieces of RA-225 slotted right-angle steel stock bolted to two sides of the bottoms of the tripod head-plates and supported by RA-225 knee-braces].

The tripod legs were individually anchored to the ground by pieces of 0.38 inch-diameter plastic-coated cable running between 0.38 inch-diameter eye-bolts mounted on each leg, large aluminum turnbuckles and 30 inch-long, 0.5 inch-diameter steel screw-anchors sunk into the ground. The cable was fastened to each component by standard, heavy-duty cable-clamps. The screw-anchors were set about 3-4 feet inside from the ends of the legs along lines projecting directly under the center of the standing tripod.

The completed structure and nest are in direct line-of-sight of the nearby natural nest (BE-6). The artificial nest faces southsouthwest.

Deadman Creek No. 1 was surveyed by light helicopter on 2 October 1985. The nest was empty and in good condition (R. Sener, pers. comm. 3 October 1985). The nest was resurveyed by light fixed-wing aircraft on 28 May 1986. The nest was empty and in good condition. [One adult bald eagle was incubating in the nearby natural nest (BE-6)].

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APPENDIX

APPENDIX

APPENDIX

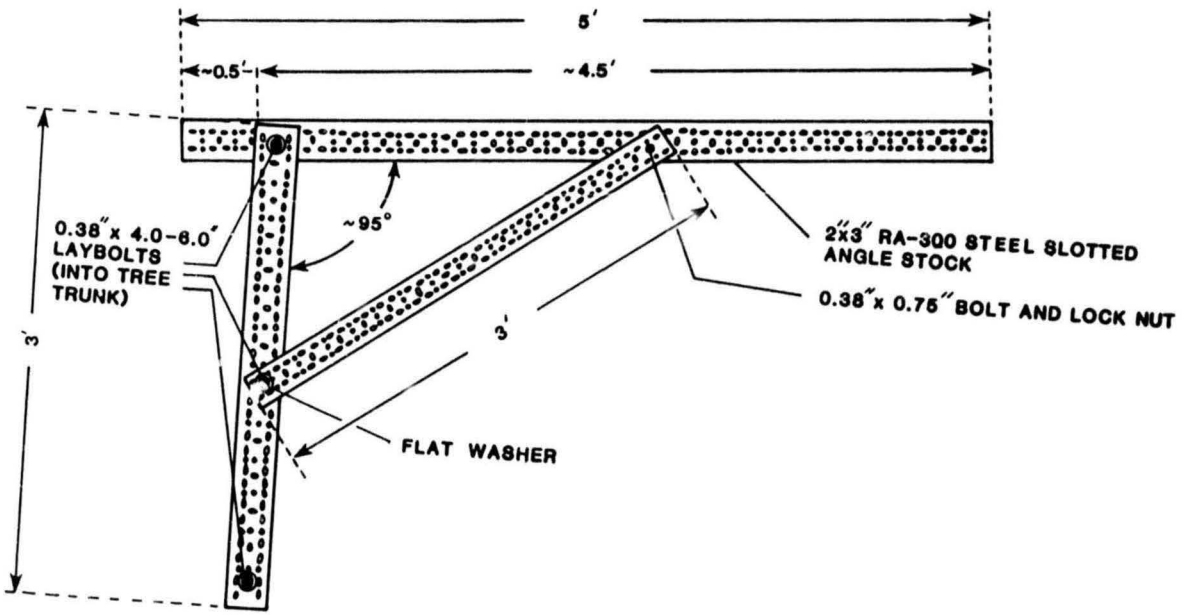


Figure 1. Nest support bracket.

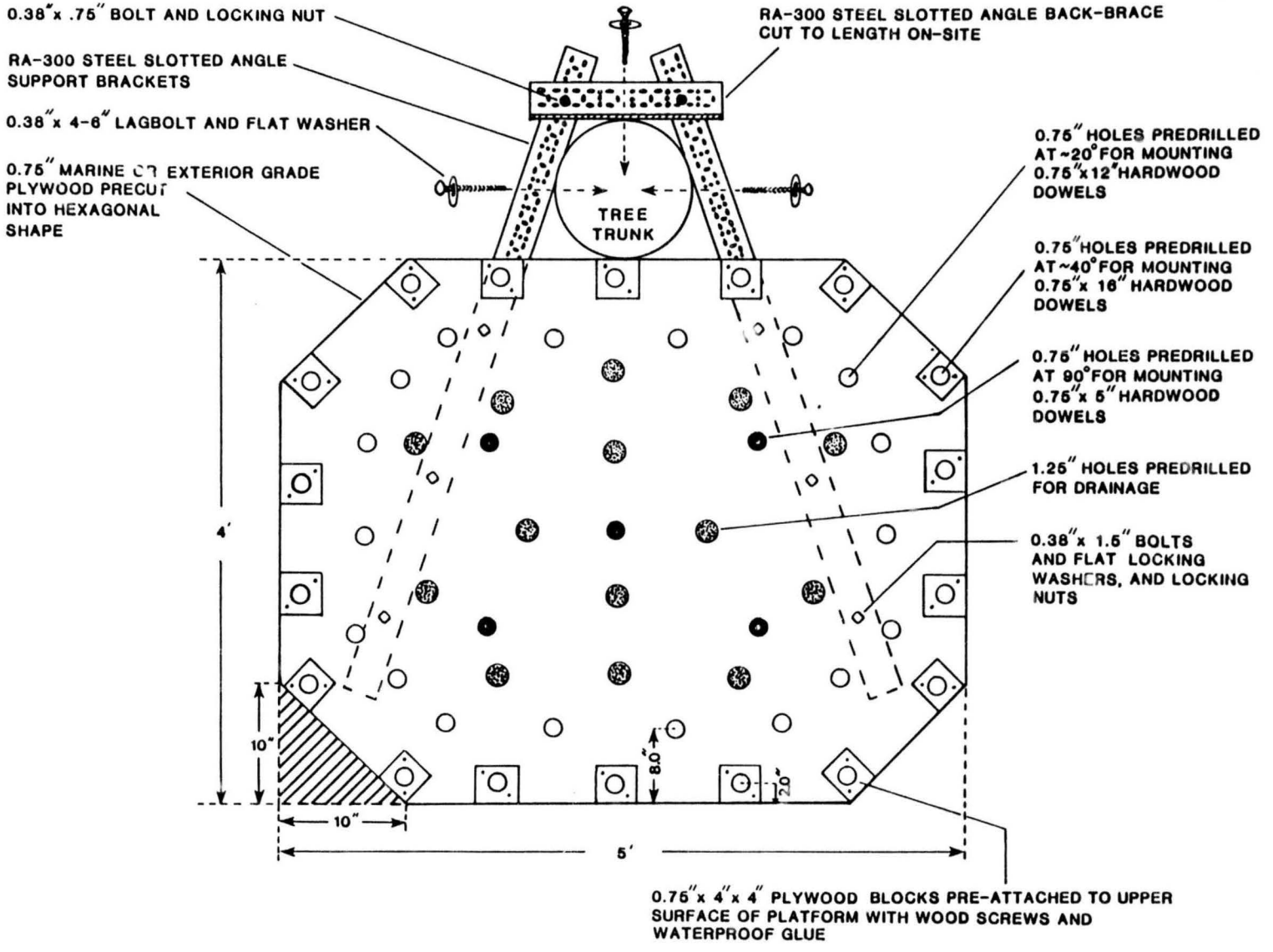


Figure 2. Overhead view of hexagonal nesting platform.

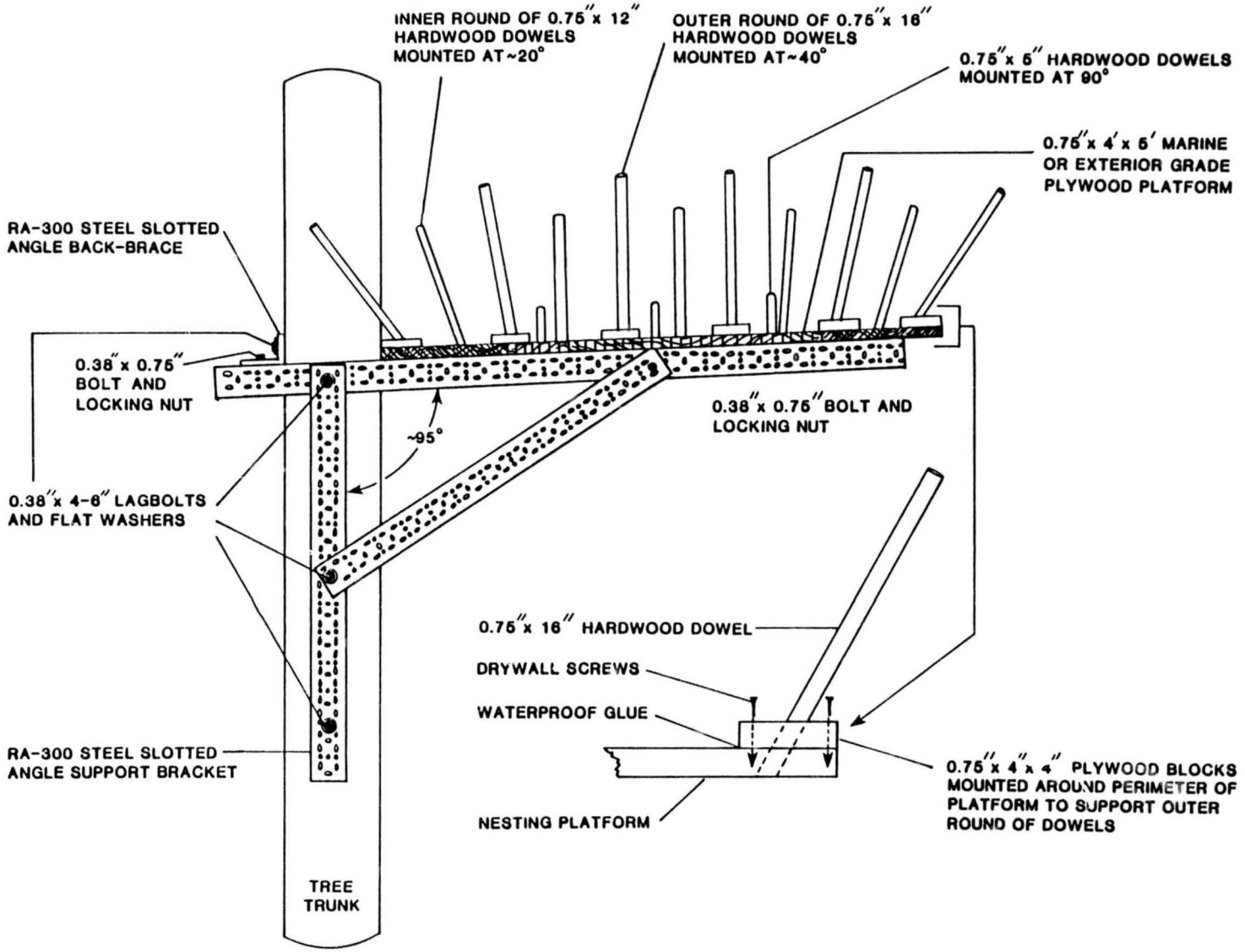


Figure 3. Side view of attached nesting platform.

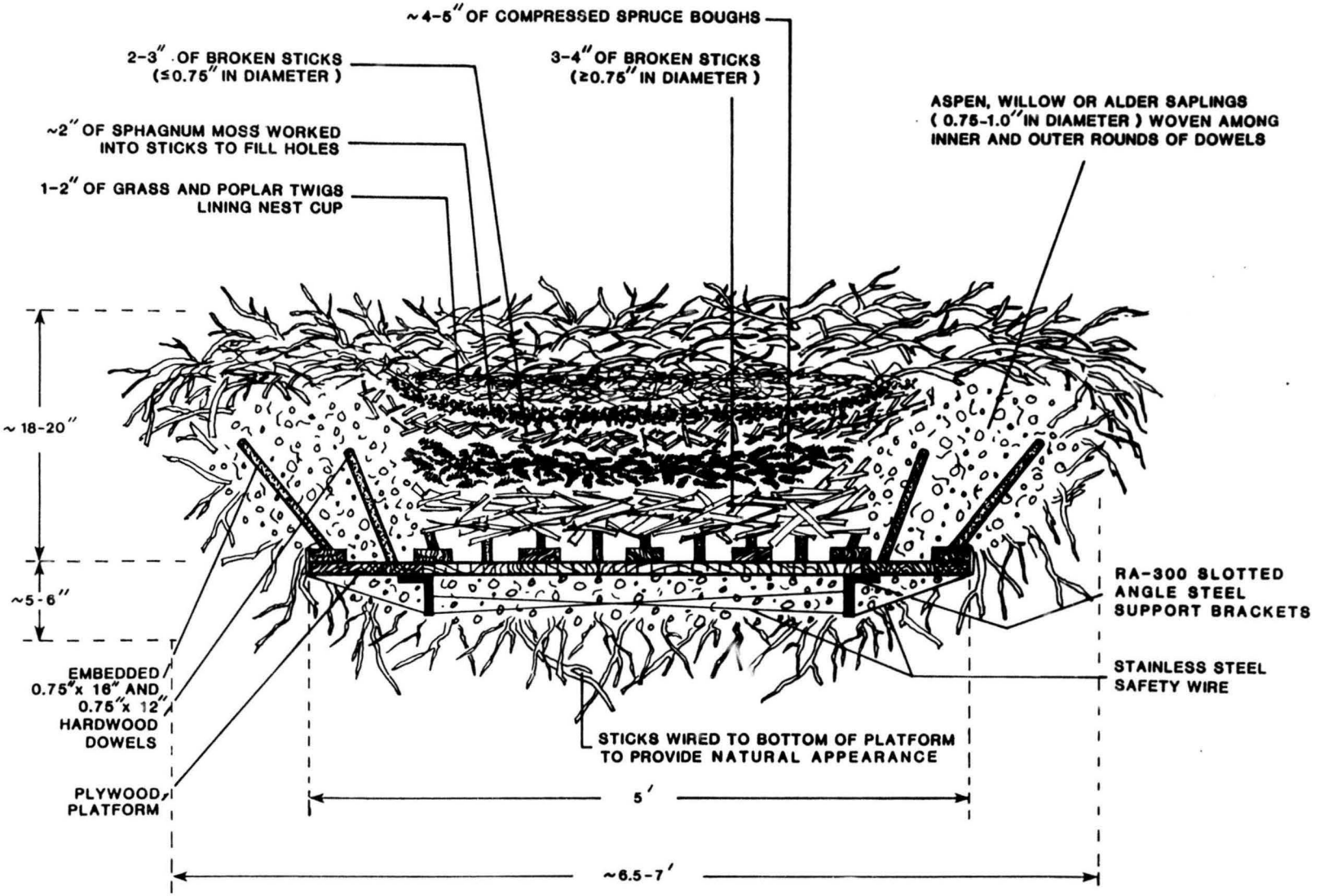


Figure 4. Cross-section of completed nest.

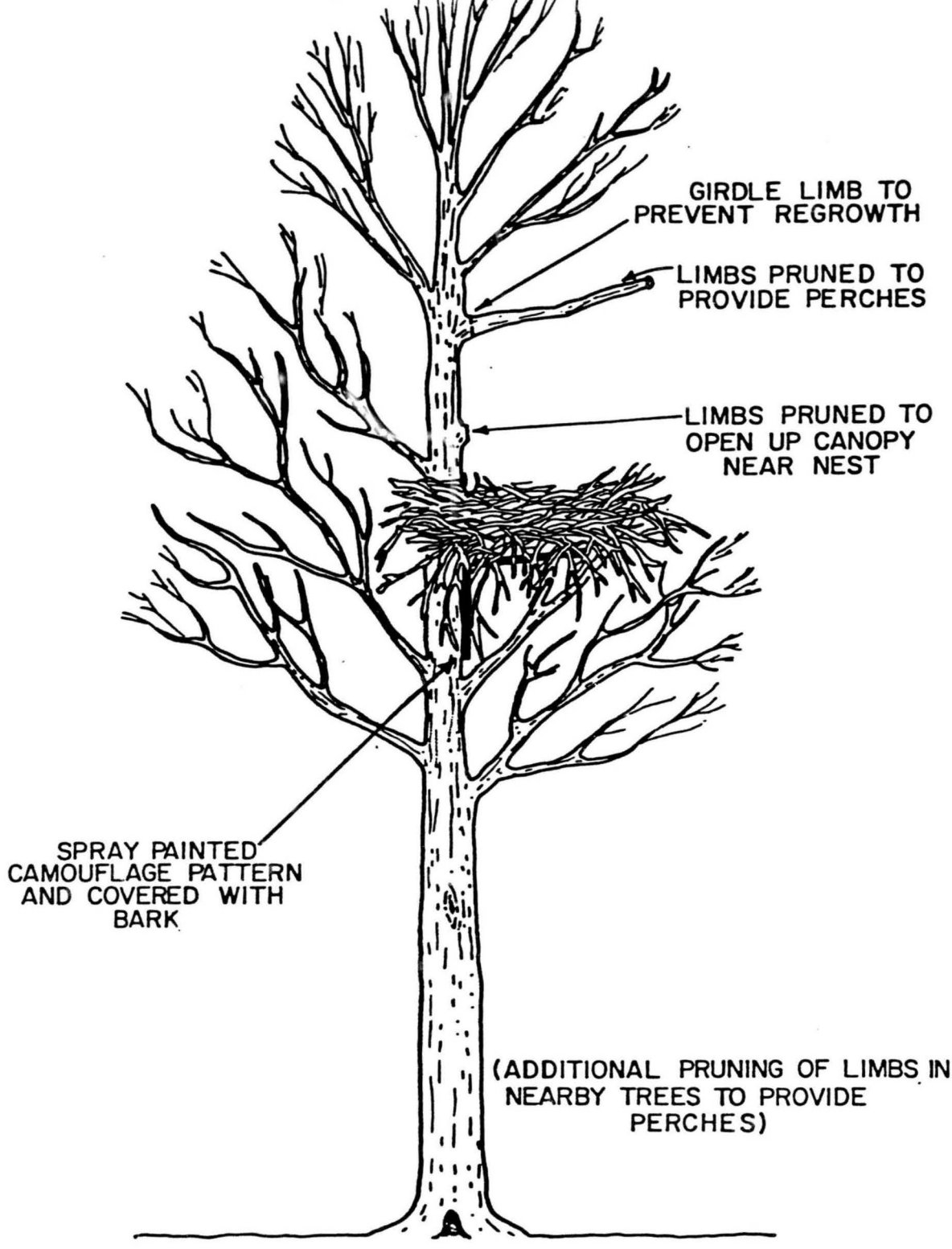


Figure 5. Side view of completed nest in balsam poplar.

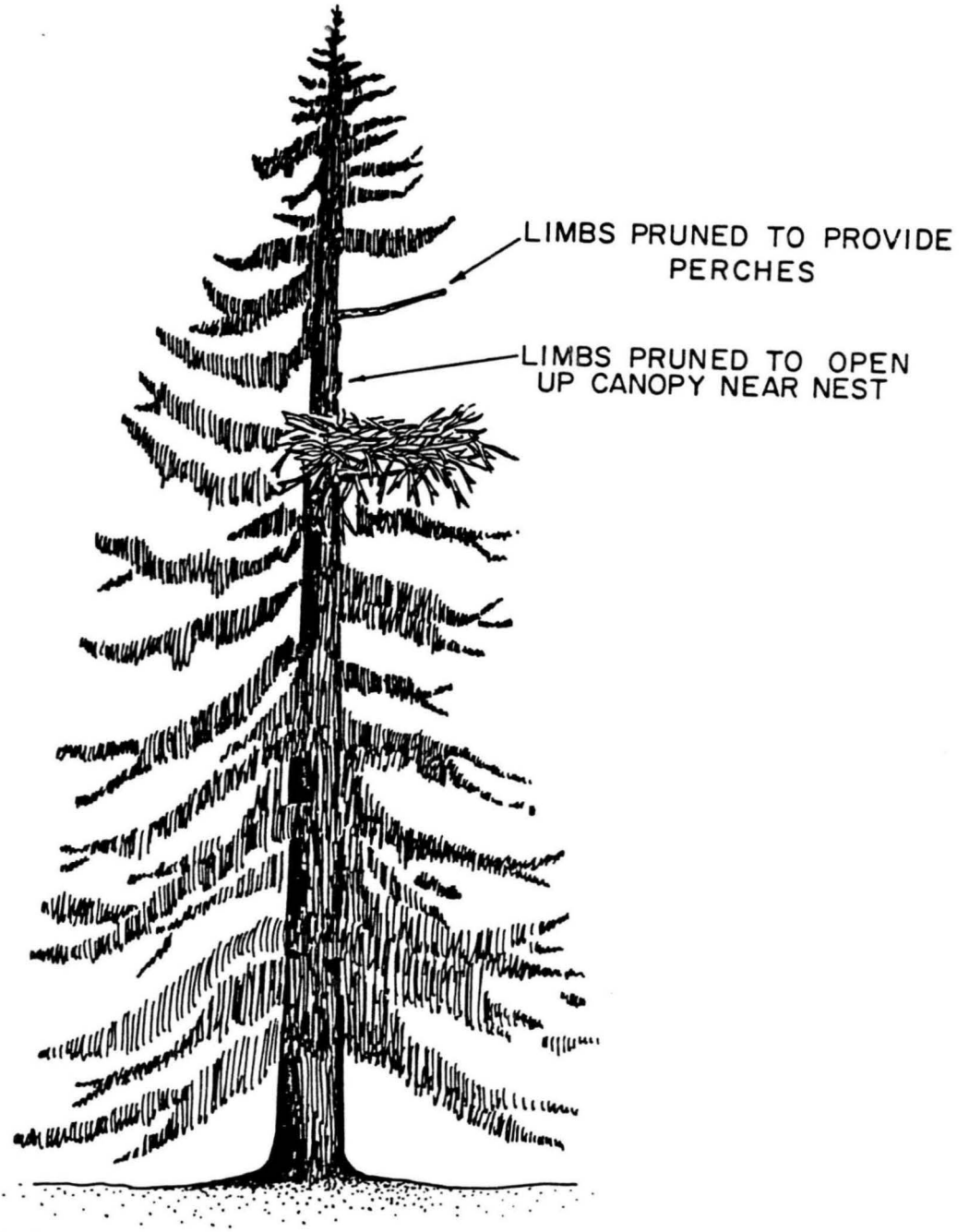


Figure 6. Side view of completed nest in white spruce.

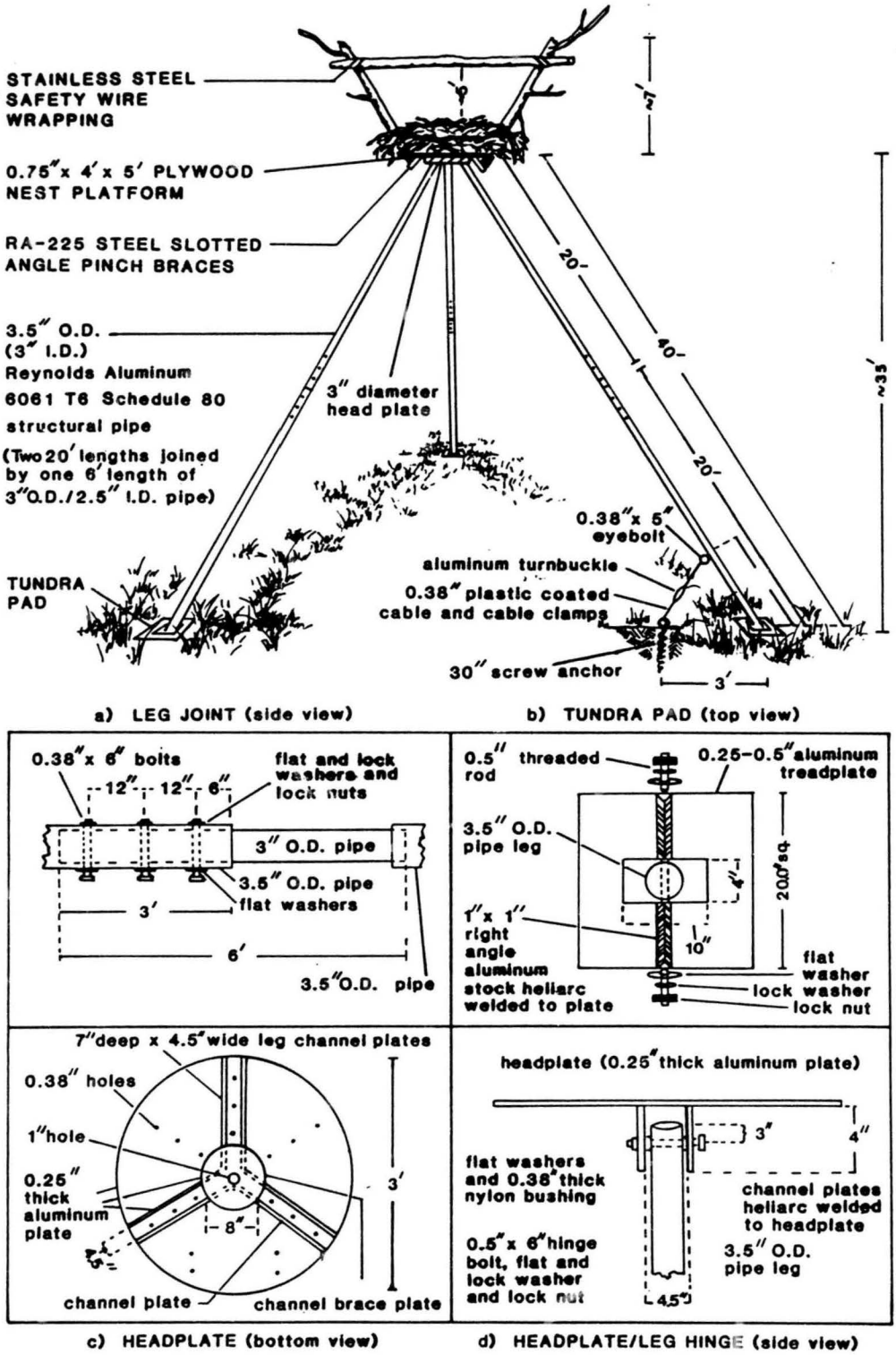


Figure 7. Aluminum tripod nesting structure.

Plate 1

Tanana River No. 1

17 Apr 86

Plate 2

Tanana River No. 1

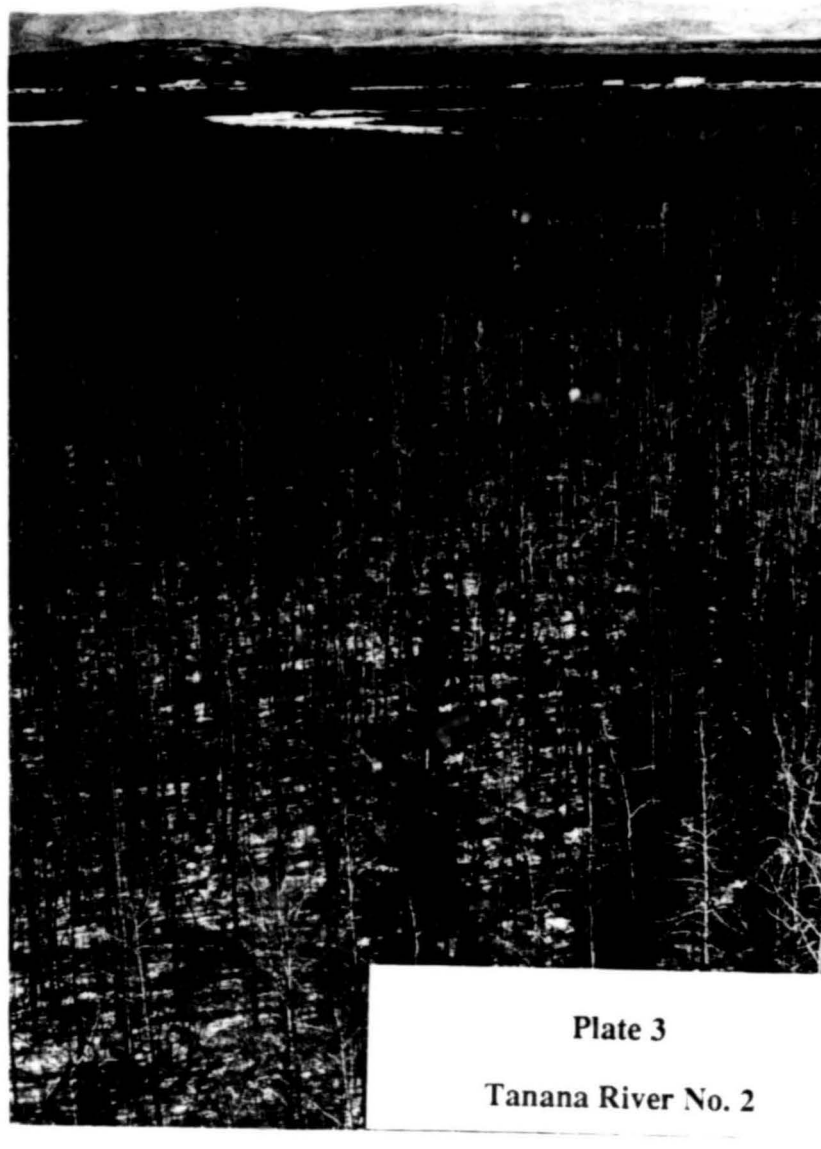


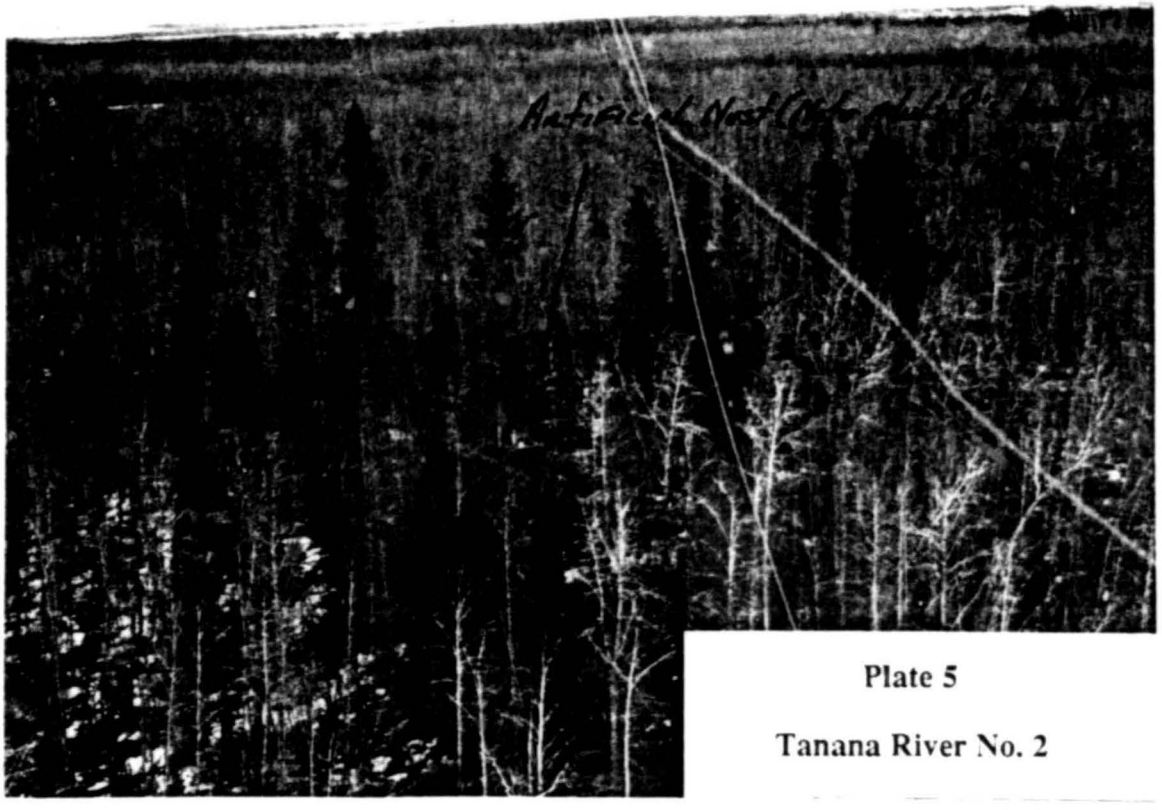
Plate 3

Tanana River No. 2

(Note adult ♀ IN Nest - 29 Apr 86)

Plate 4

Tanana River No. 2



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Tanana River No. 2

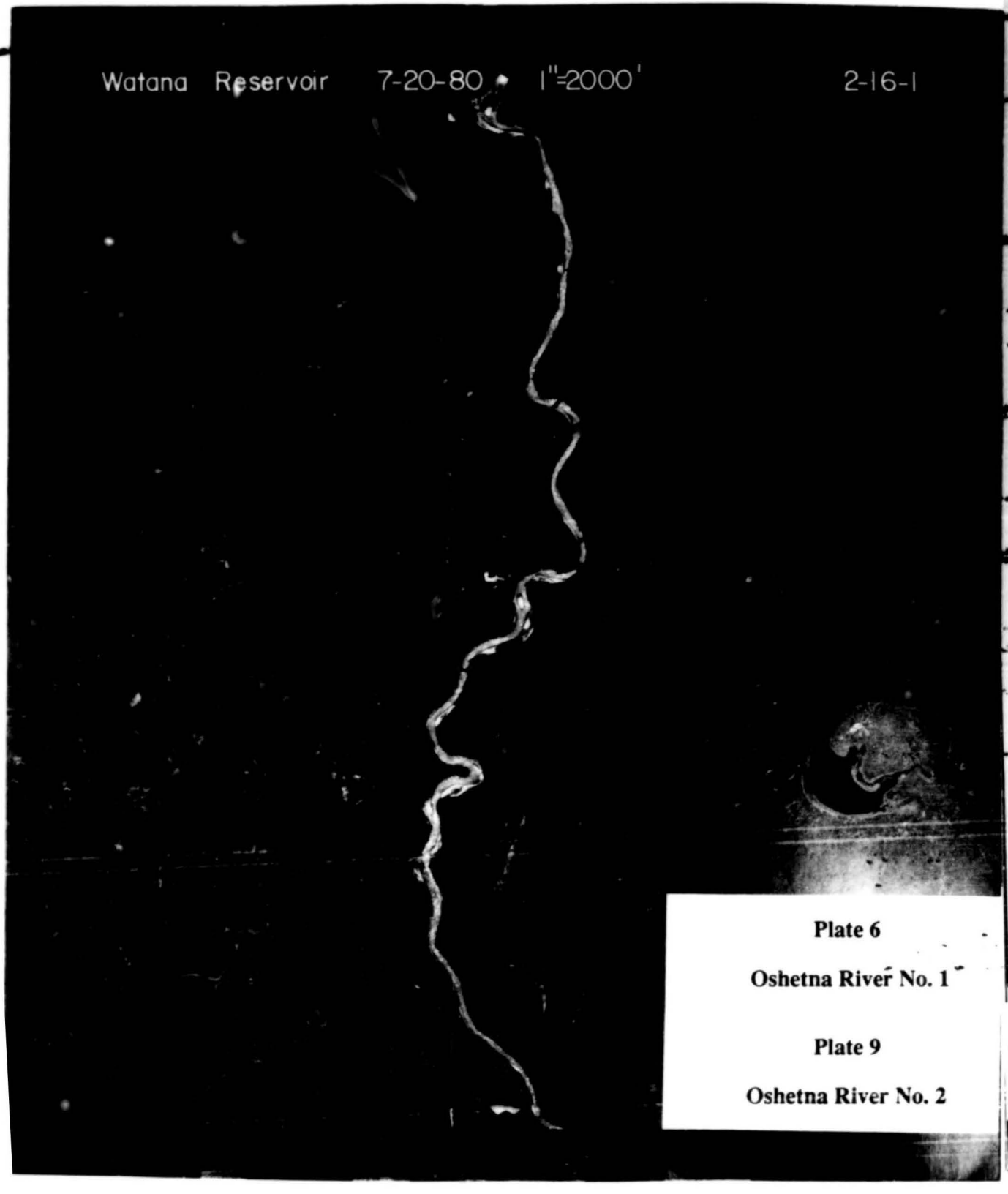


Plate 6

Oshetna River No. 1

Plate 9

Oshetna River No. 2

Plate 7

Oshetna River No. 1

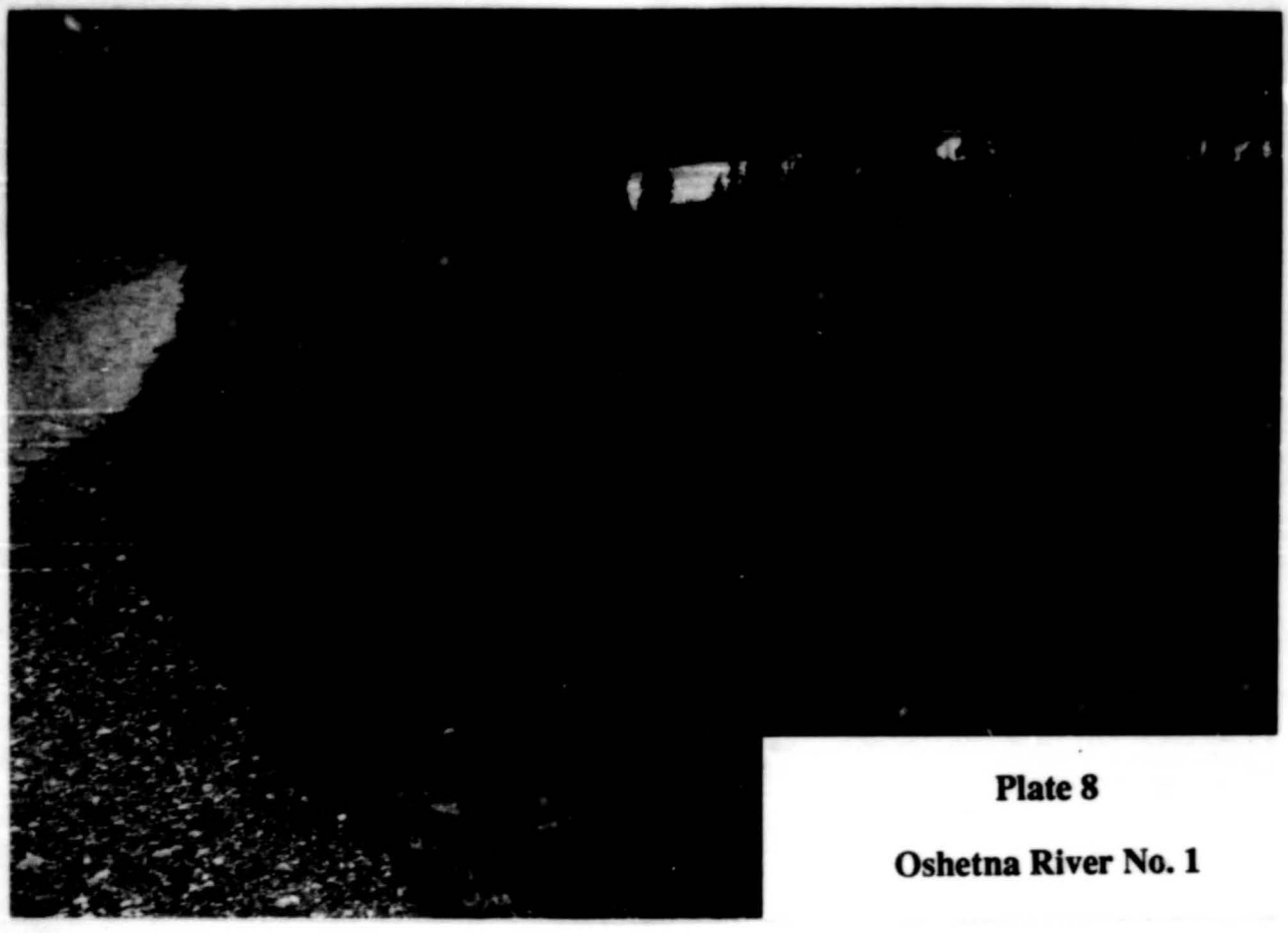


Plate 8

Oshetna River No. 1

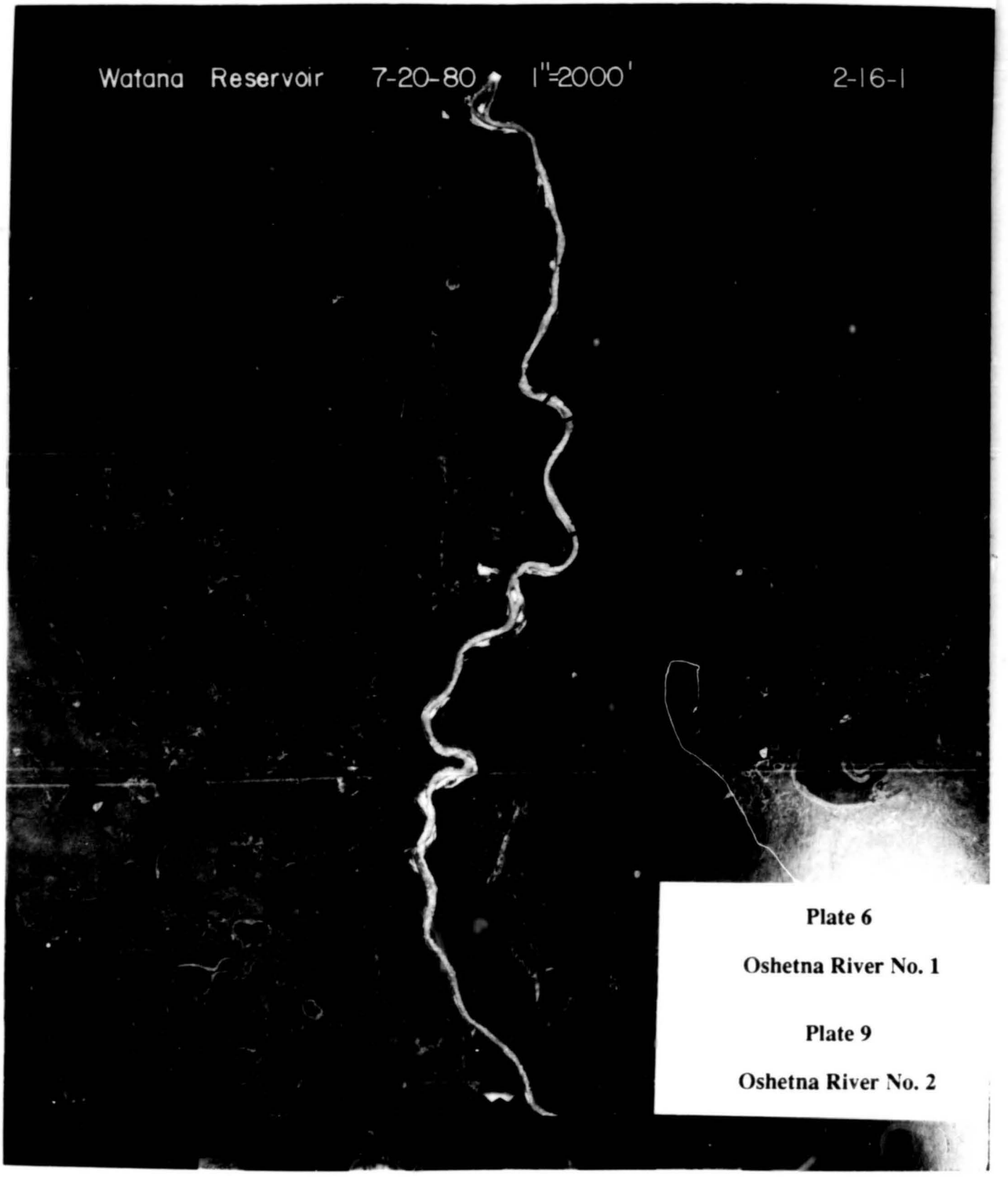


Plate 6

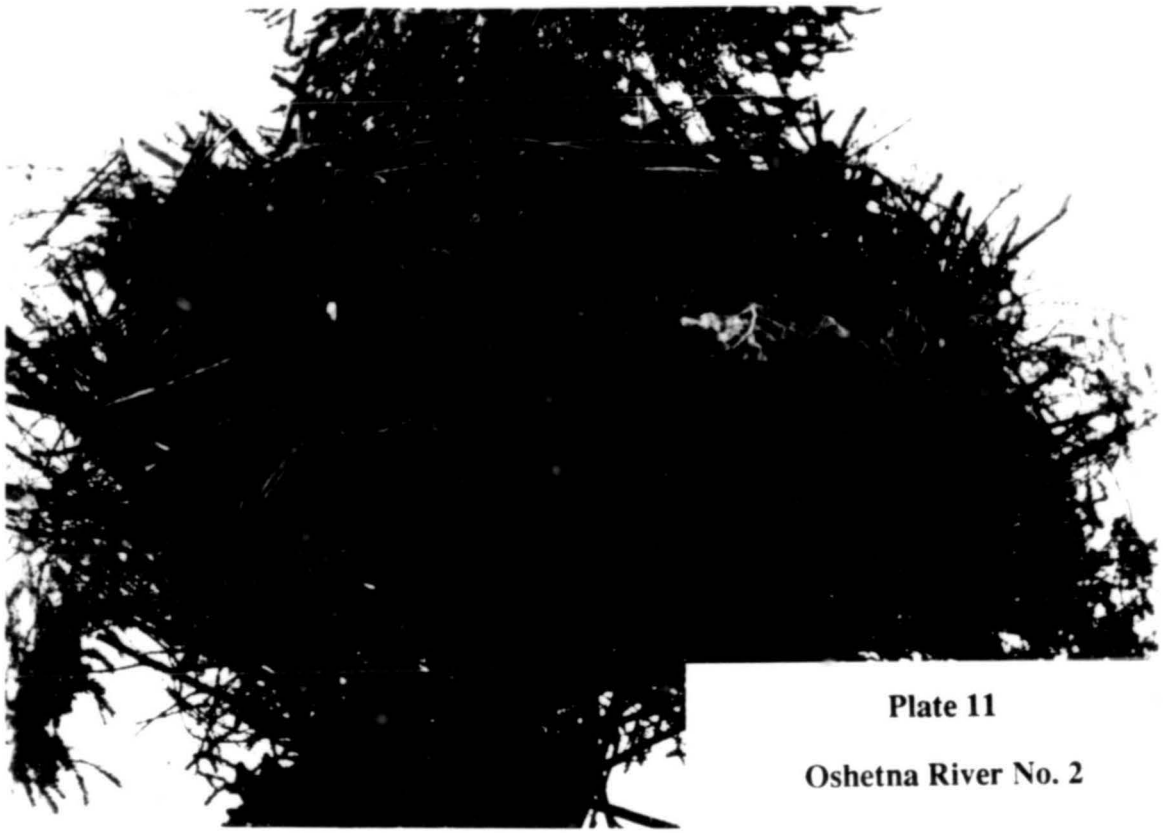
Oshetna River No. 1

Plate 9

Oshetna River No. 2

Plate 10

Oshetna River No. 2



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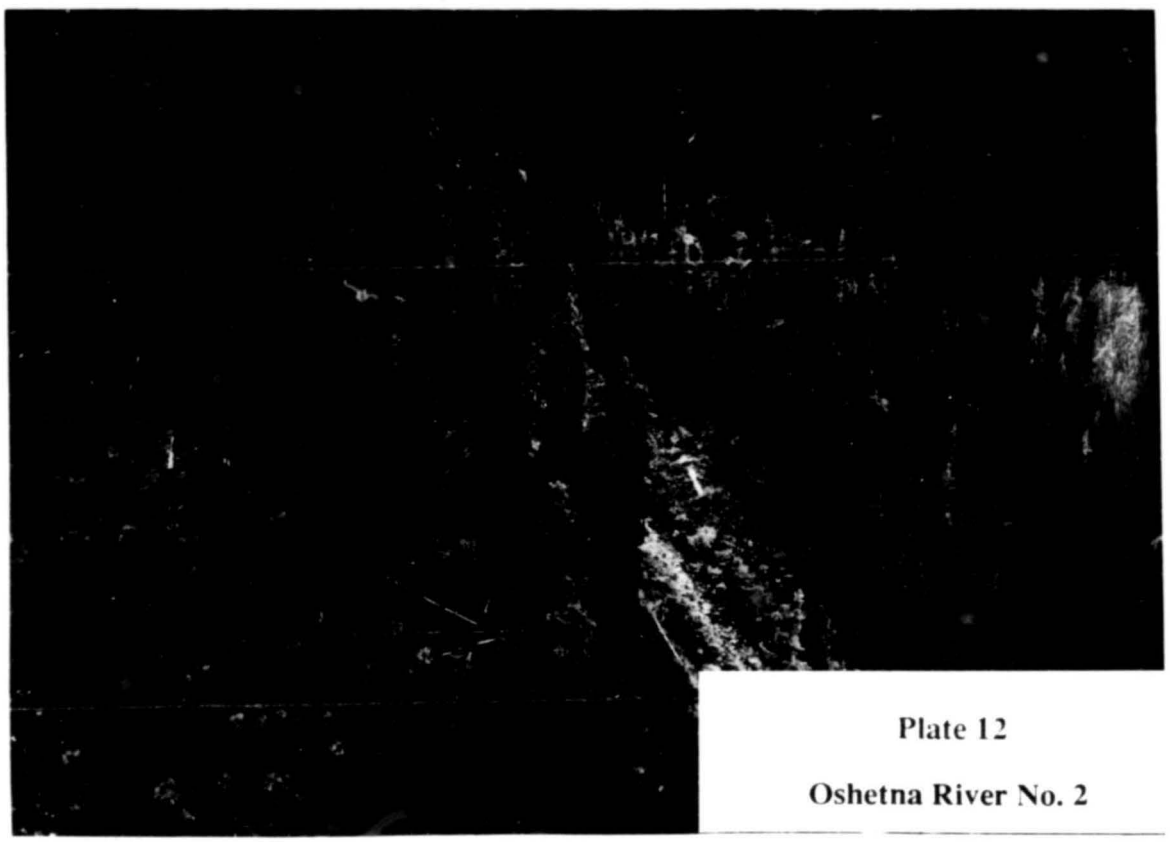

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Oshetna River No. 2

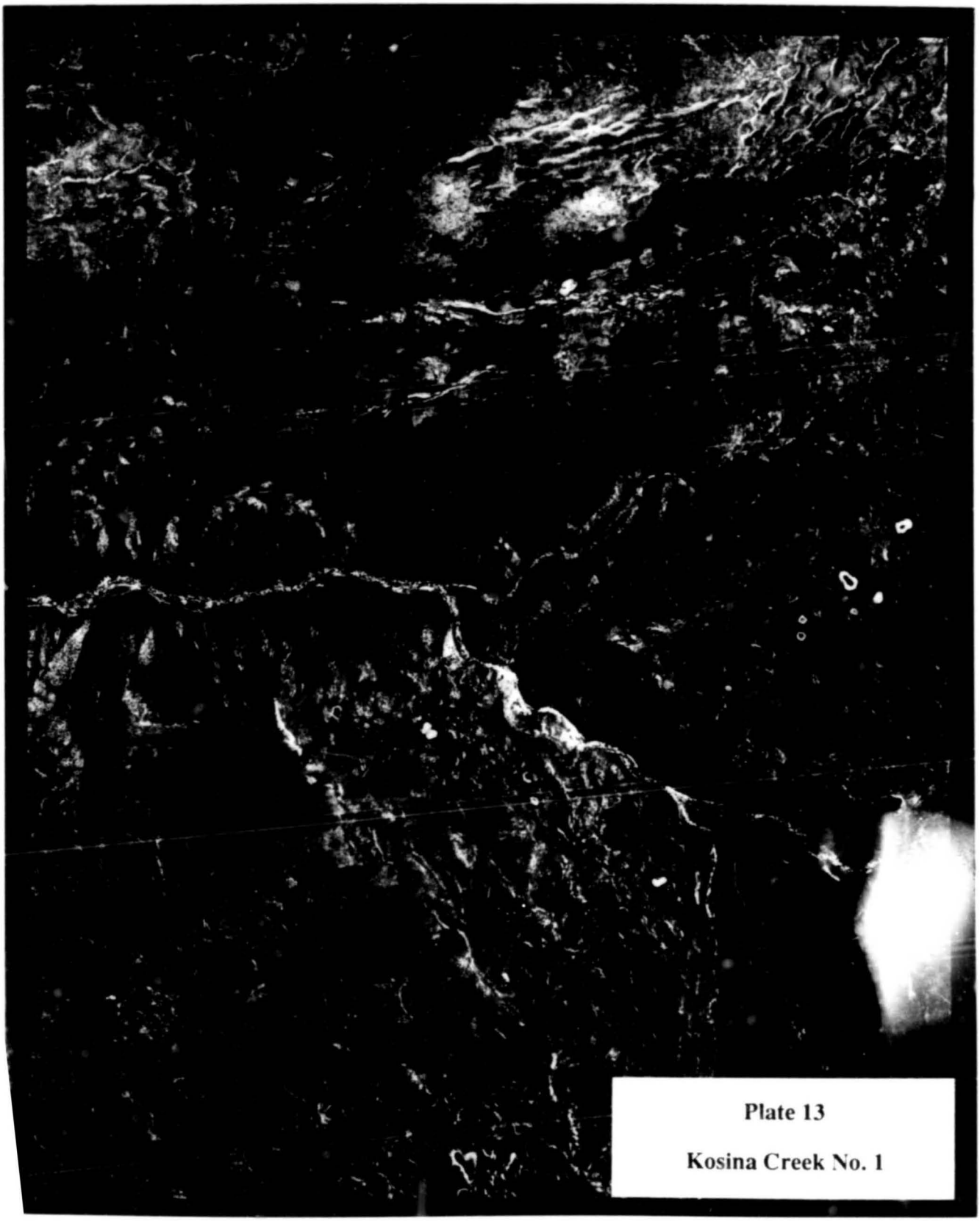
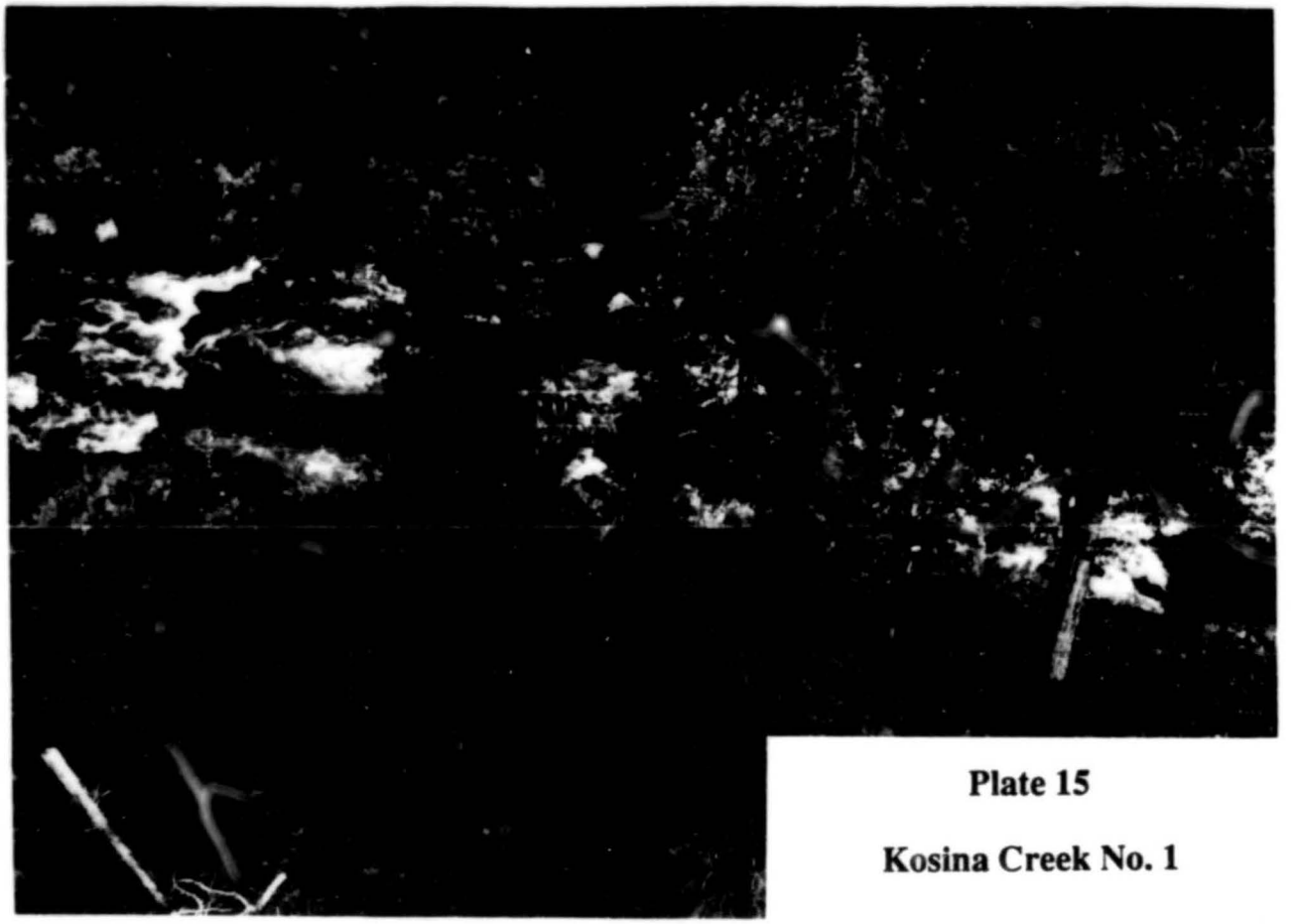


Plate 13

Kosina Creek No. 1



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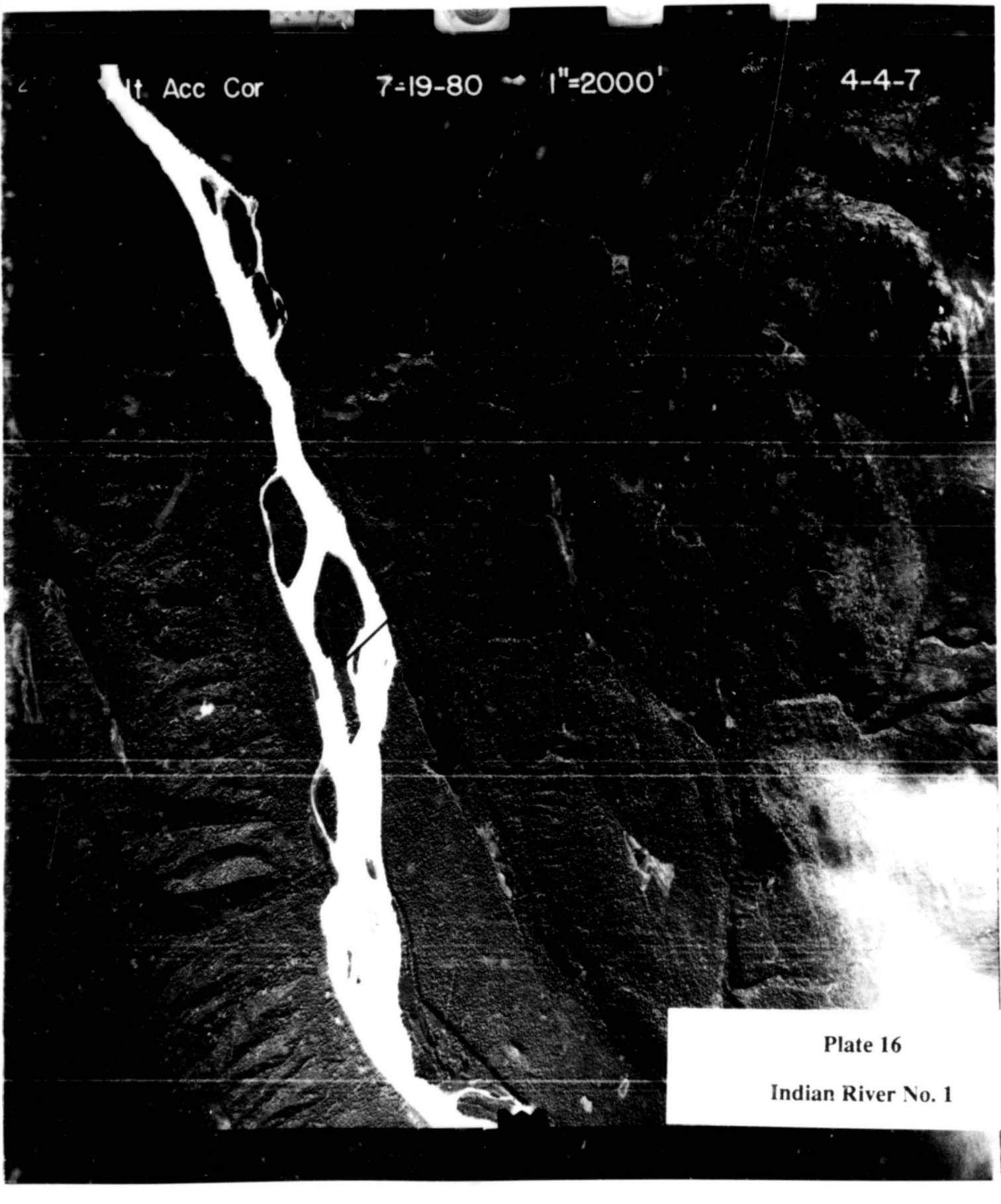
Kosina Creek No. 1



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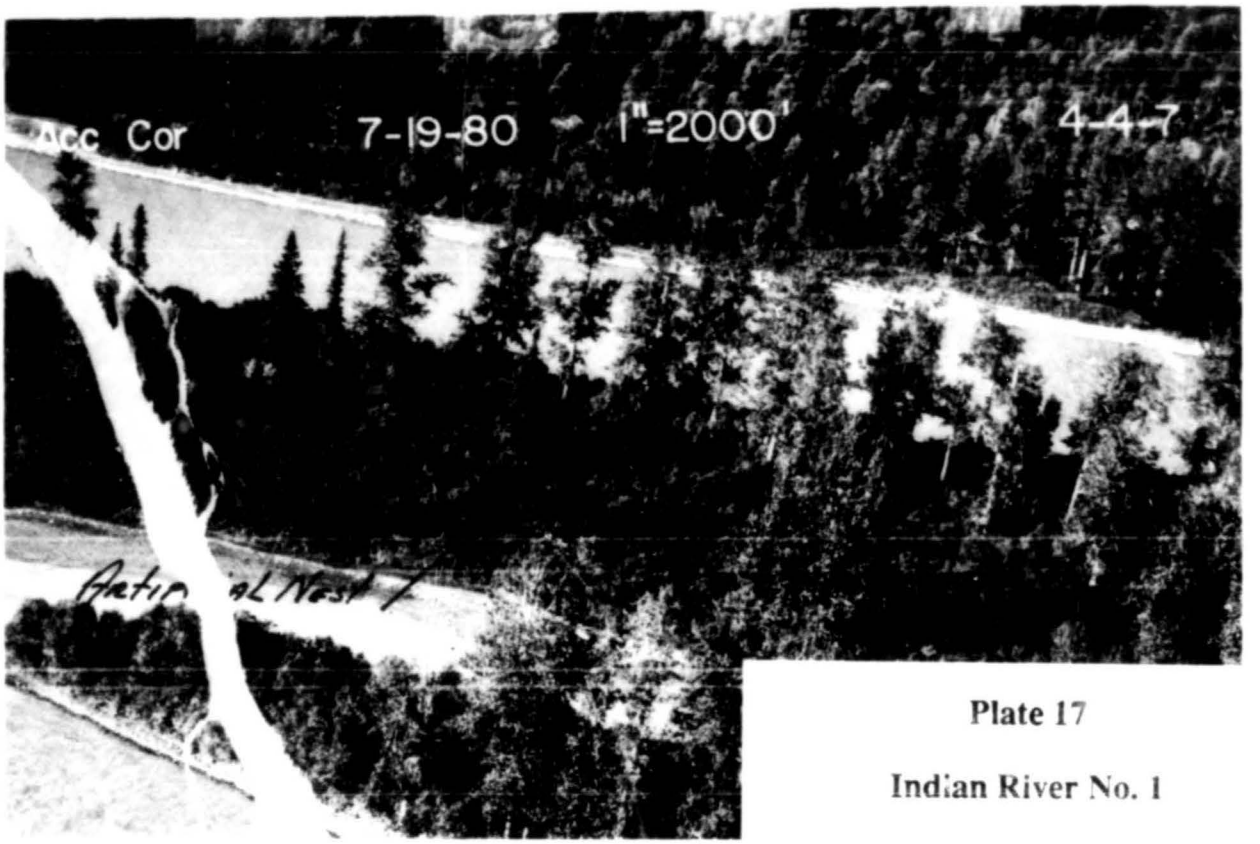
Indian River No. 1



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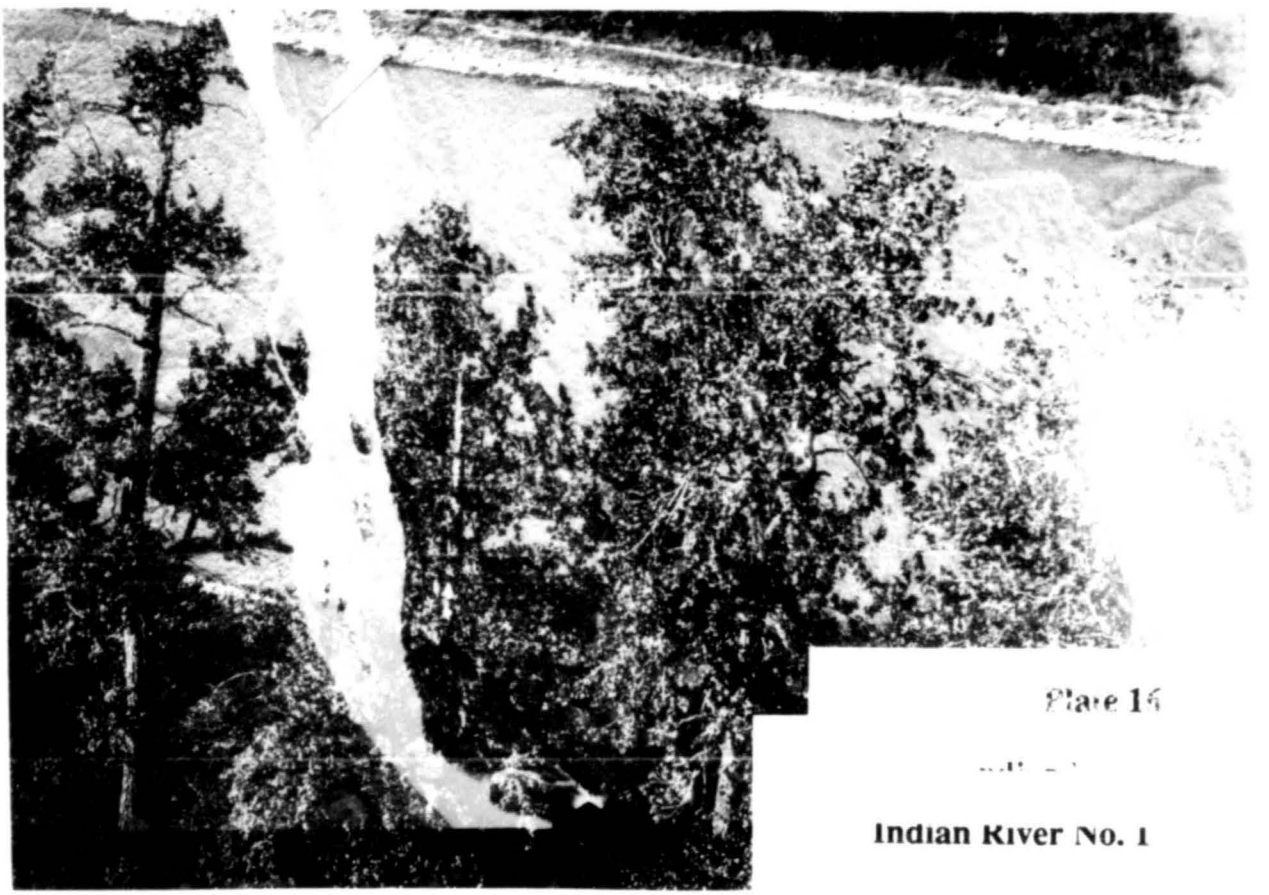
Indian River No. 1



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Indian River No. 1

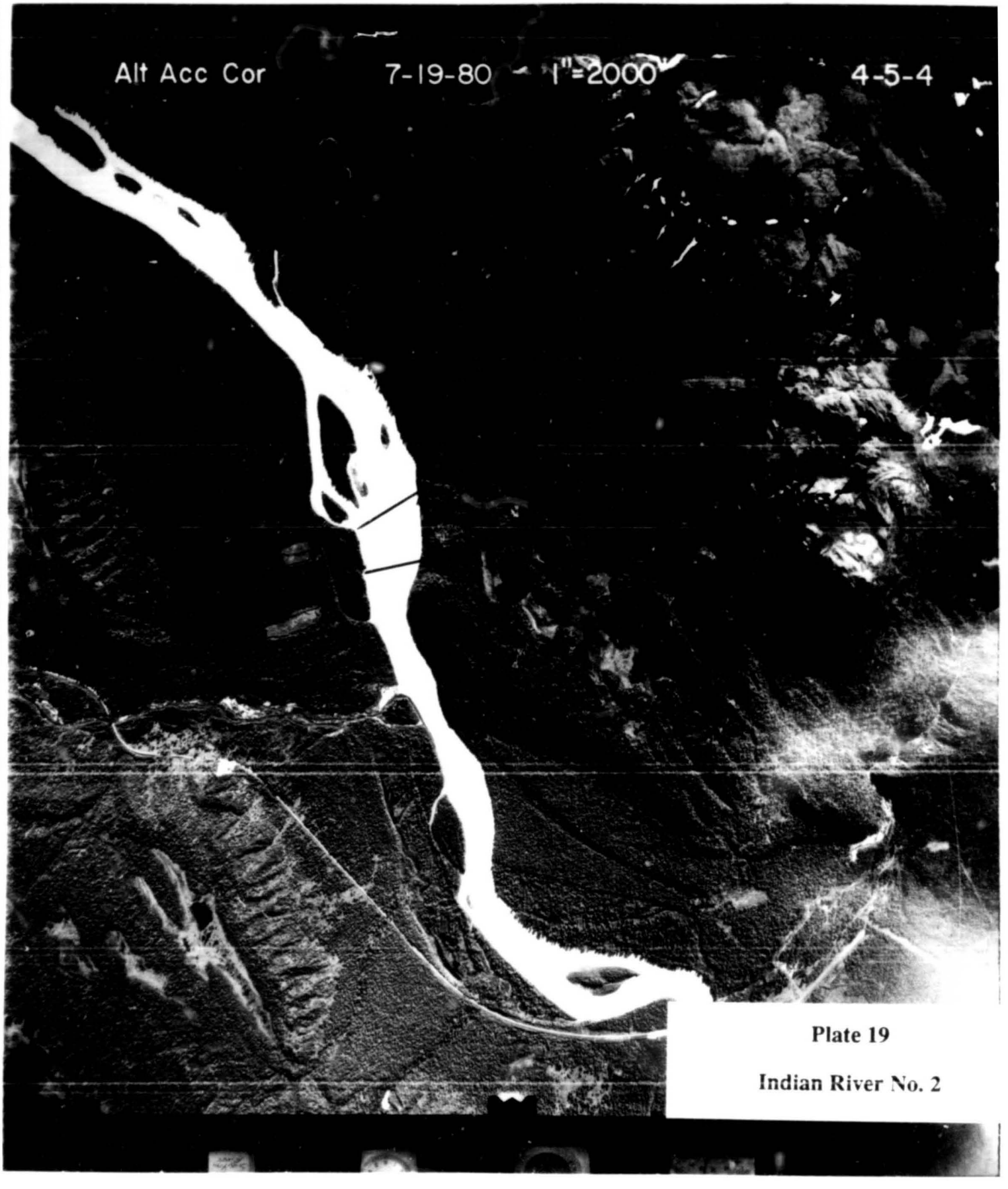

Plate 19

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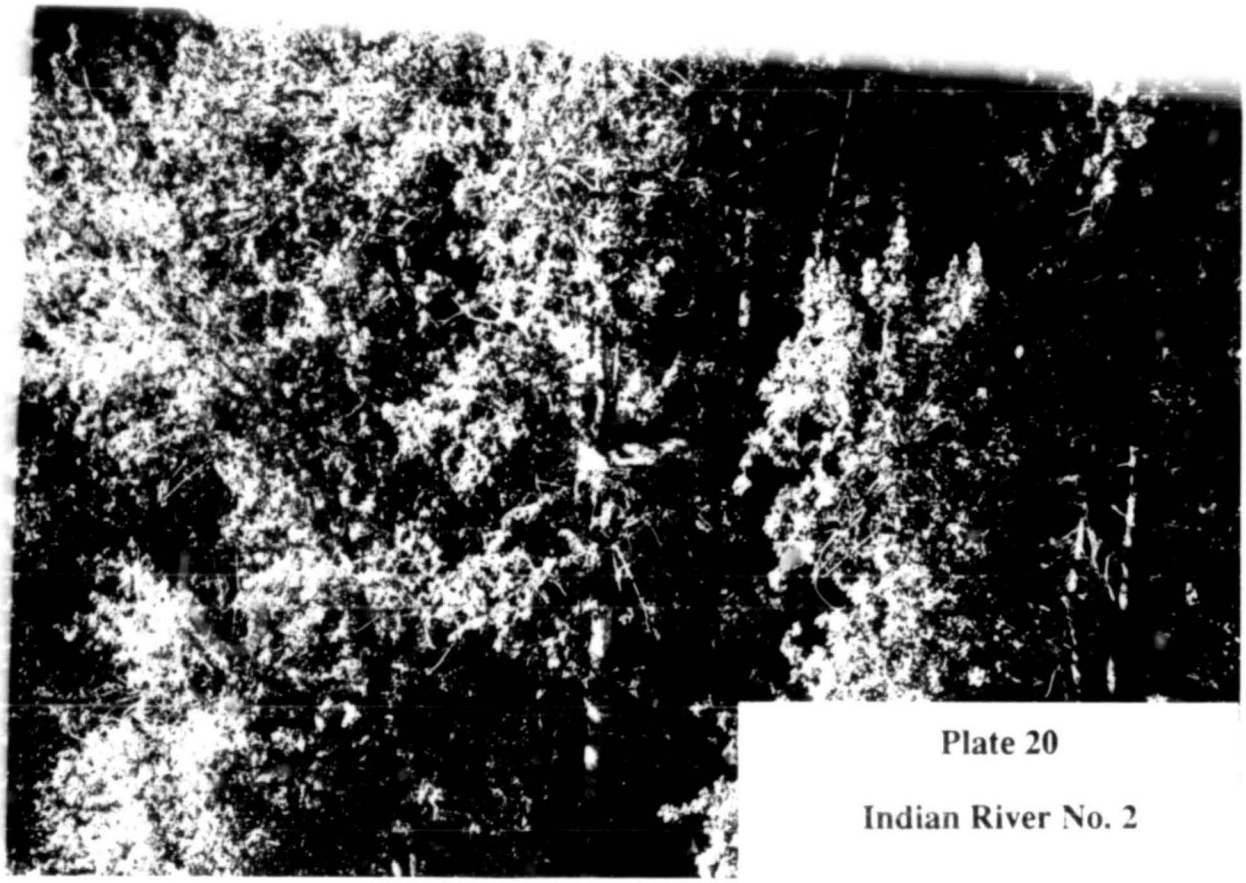


Plate 20

Indian River No. 2

Indian River

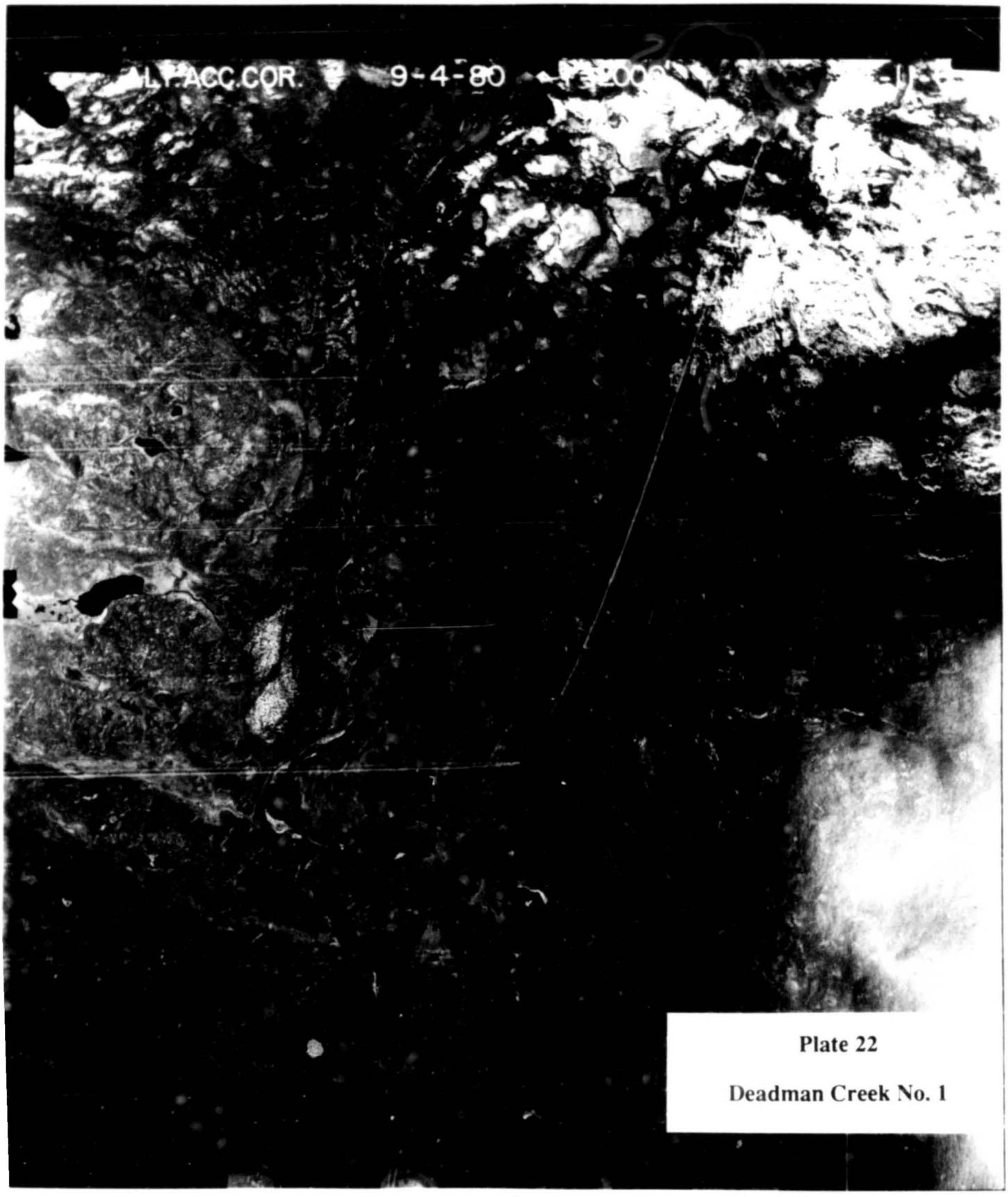


Plate 22

Deadman Creek No. 1

Plate 23

Deadman Creek No. 1

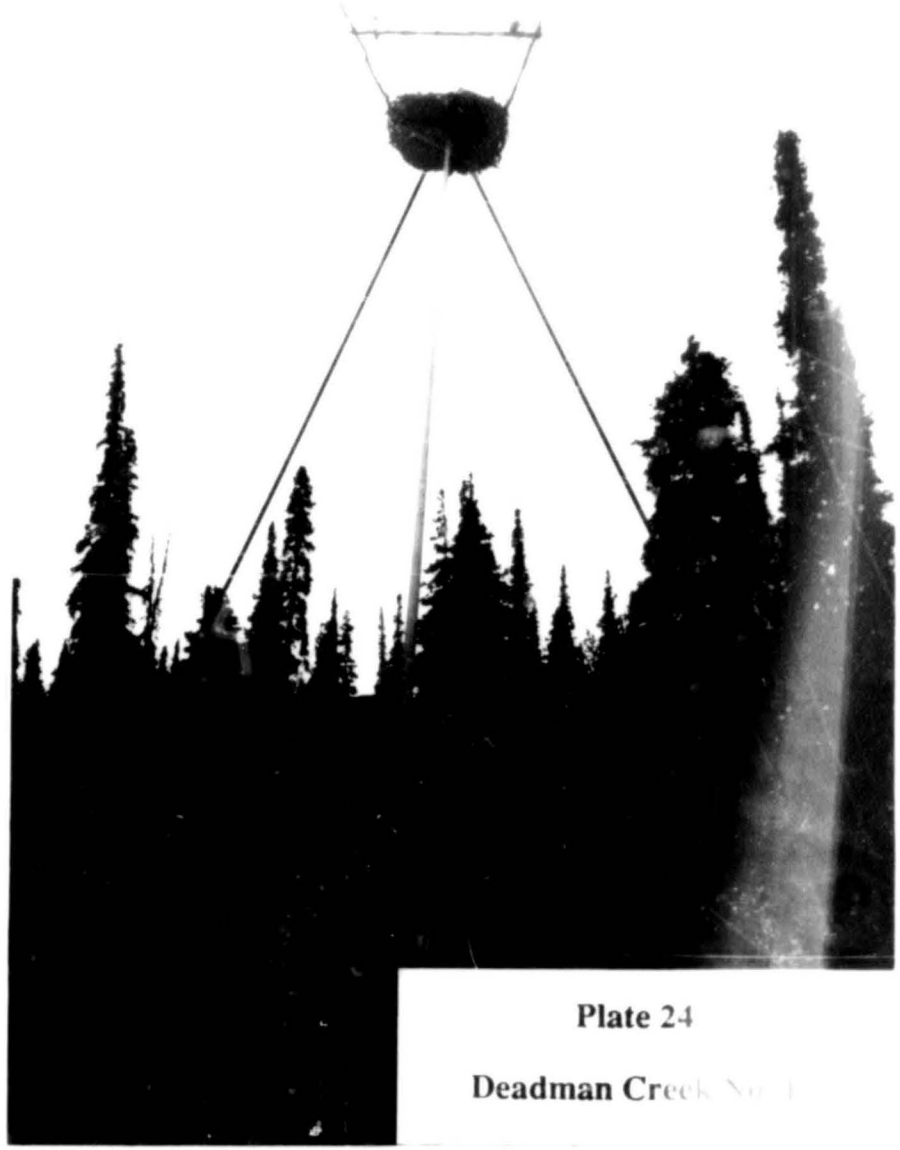
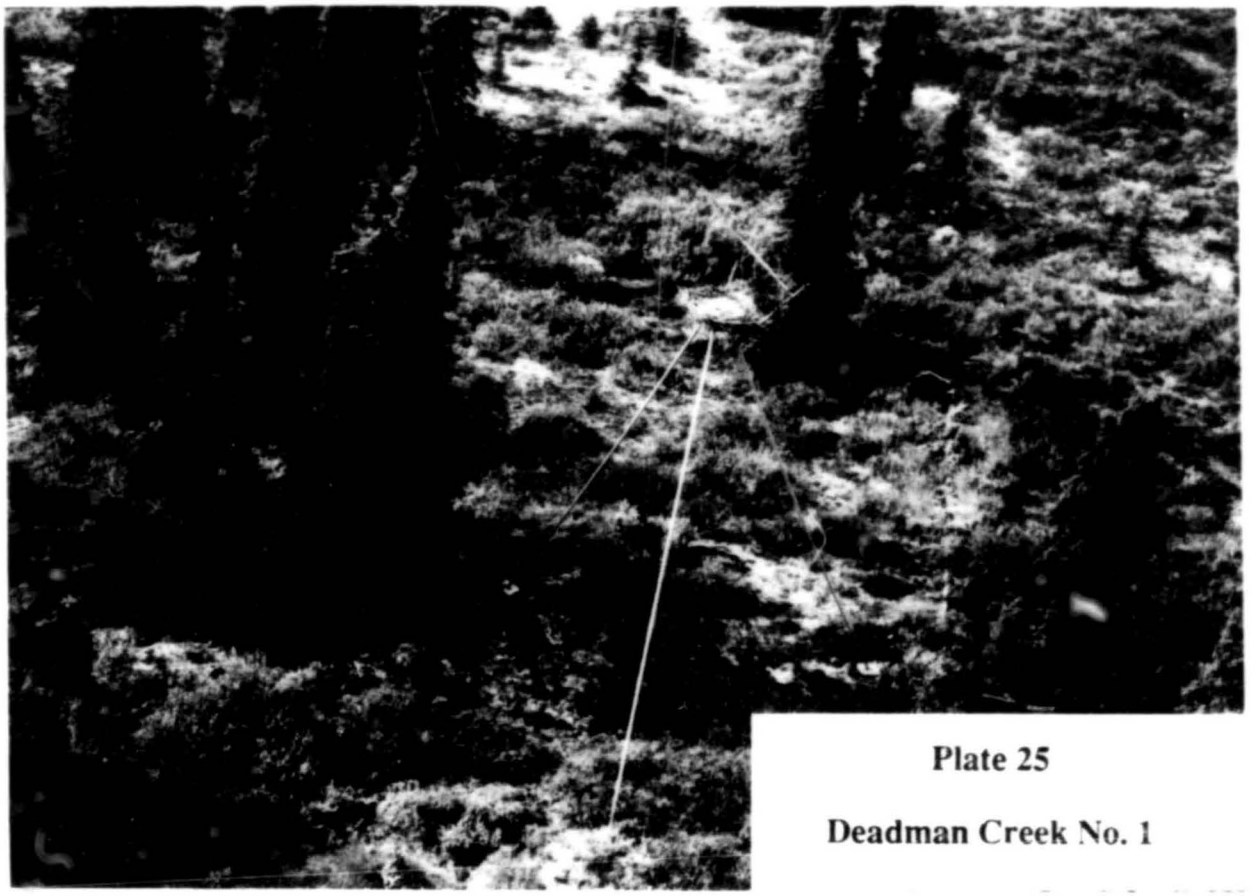


Plate 24

Deadman Creek No. 1



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Deadman Creek No. 1

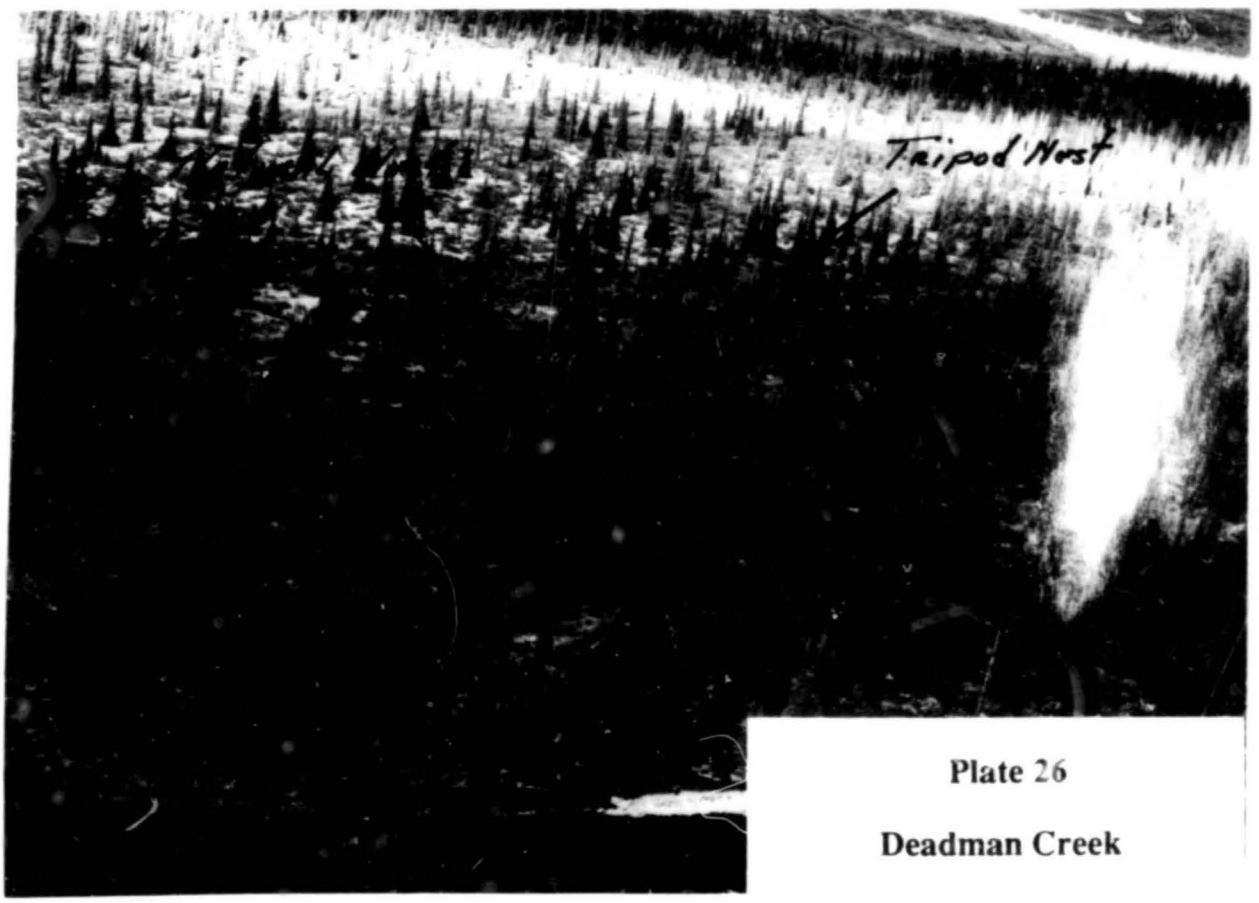

Plate 26

Deadman Creek