APPENDIX A

Study Site Descriptions

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INTRODUCTION

This part of LGL's Terrestrial Studies Program for BPX provides detailed descriptions of all sites at which wildlife observations were made in summer, 1989. The kinds of sites described are (1) gravel well-pads and adjacent undisturbed tundra, (2) river alluvium sites and adjacent undisturbed tundra, and (3) impoundments and ponds. Included are site maps, verbal descriptions of biophysical features of the sites, and summaries of wildlife use. Some information from descriptions of ponds and impoundments was taken from McKendrick (1986).

As outlined in the methods section of this report, observations were conducted at each site for a period of 4 hours per day on four seperate occasions during the study. The only exception was at Lake State 1 gravel pad site where observations were conducted on three occasions instead of four.

A list of all wildlife species observed during the study can be found in Table A-2. For a quick reference to the vascular plant taxa found on gravel pad and alluvial study sites, see Table A-3.

Vegetation type and landform descriptions (Appendix Table A-1) use terminology after Walker et al. (1983). Other potentially unfamiliar terms used in these descriptions include the following:

- Thermokarst - surface subsidence caused by subsurface thaw
- Pad - the usually-raised gravel substrate from which drilling operations took place
- Reserve Pit - the sump where drilling muds and fluids were discharged during drilling. Berms surrounding these and the flare pits (below) are of gravel or overburden
- Flare Pit - the sump within which any natural gas that escaped to the surface during drilling was burned off

- Observer Station - the point from which standardized observations of wildlife were made during 2-hr intervals
- Casual Observations - wildlife activities noted outside the context of the standard 2-hr observation intervals
- Forb - broad-leaved, herbaceous plant
- Overburden - soil, often highly organic, removed from the tundra surface and heaped into mounds or berms
- Graminoids - grasslike plants, including grasses and sedges
- Gravel Spray - thin surface sheets or traces of gravel, usually occurring near margins of fill
- Shallow Pond - water depth generally less than 1 m, usually easy to wade
- Deep Pond - water depth generally greater than 1 m

SITE 1: WEST SAK 17

Location and Access

West Sak 17 (Fig. A-1) is located in the Kuparuk Unit in Sec. 26, T13N, R9E approximately 1.6 km northeast of Drill Site 3K. There is no road access to the pad, but it can be seen from the gravel road about 1.6 km beyond the access road to Drill Site 3K. From there it is a short walk southeastward across tundra to the site.

Description: Disturbed Area

The well was spudded on January 24, 1981, and suspended on March 4, 1981. The pad dimensions are approximately 115 m x 80 m and the gravel thickness varies from about 1 to 2 m. A gravel ramp at the southwest corner of the pad tapers to the tundra level. No thermokarsting is evident on the pad itself, other than on the gravel ramp. The well head is located on the east-central portion of the pad. A large-diameter section of culvert is buried vertically in the gravel surrounding the well head.

A reserve pit attached to the east side of the pad was filled with water during the early part of the summer. By July 20 the water level had receded, exposing extensive areas of mud on the south side. A flare pit south of the pad was also filled with water, but only trace amounts of mud became exposed during the summer. This pit also contained disturbed tundra with dense vegetation, some of which was emergent. Both pits are enclosed by gravel berms.

Description: Undisturbed Area

The undisturbed portion of the study site consisted of the tundra immediately east of the reserve pit. This was an area of moist tussock tundra with little relief; the primary landform was low-relief high-centered polygons. There was a small area of wet strangmoor in the northwest corner.

Observer Station

The observation point was located on the gravel at the southeast corner of the reserve pit. From here, most of the pad and the gravel levees around the pits could be seen. Most of the open water inside both the reserve pit and the flare pit could also be seen. Observations were made on June 21, July 7 and 20, and August 3.

Wildlife Observations

Few observations of caribou were made on the pad; however, caribou tracks were scattered over the pad surface. A trail on the north part of the pad indicated relatively heavy use by caribou in this area. One caribou was observed feeding on vegetation in the flare pit on August 3.

No waterfowl were observed on the pad, but the flare pit was used extensively by Oldsquaws during the first two observation periods. One pair of Oldsquaws spent two entire days (June 21 and July 7) resting and feeding in areas of open water and emergent vegetation.

Shorebirds used the area throughout the summer. The most heavily used areas were the flare and reserve pits. The flare pit was used for feeding particularly by phalaropes and, during the last two periods when water levels in the reserve pit dropped, several species of shorebirds fed continually by probing in exposed mud. Shorebirds were commonly seen perched on levees around the pits and on the gravel pad surface. No nests were found on the pad but 3 Dunlin nests and 2 Semipalmated Sandpiper nests were located within 50 m of gravel. Three nests were found close to the south side of the flare pit, and the presence of an adult Red-necked Phalarope with a downy chick in a wet area on the south side of the flare pit levee indicated that this bird also nested in the immediate area.

Lapland Longspur use was less extensive than at some other sites. There were few observations early in the season. Late-season activity centered around the well head where perched birds were easily seen. Longspurs were also seen resting,

preening, and feeding on the gravel pad surface, on the levee around the reserve pit, and on the mud inside the reserve pit.

SITE 2: UGNU #1

Location and Access

Ugnu 1 (Fig. A-2) is located in the Kuparuk Unit in Sec. 22, T12N, R9E, about 2.4 km south of CPF-3. There is no road access to the site. The best access point is from the gravel road about 1.6 km south of CPF-3. From here the site can be reached in about 40 min on foot.

Description: Disturbed Area

The well was spudded on approximately February 1, 1969, and suspended on June 1, 1969. There was occasional drilling activity at the site to at least March, 1978. A "plug and abandon" date of March 14, 1986, is on record.

The boundaries of this pad are not well defined because of the gradual gradation of pad edges into adjacent tundra. The dimensions of the main portion of the pad are approximately 90 m x 100 m. Small areas of thin gravel extend beyond this area on the north, south, and west sides of the pad. Nowhere is the gravel very thick; it is less than 0.5 m in the thickest areas. This gravel generally has smaller particle sizes and a higher percentage of sand and silt than do other sites in this study. Thermokarsting is well developed over the entire pad, forming deep, water-filled troughs in some areas. The well head is located on the southeast portion of the pad and consists of a pipe embedded in the gravel. Debris in the area includes scattered pieces of wood and metal, small sections of pipe, electrical cord, and cement. Wood pilings about 0.5 m high are located in most of the areas marked "debris" in Fig. A-2.

The site has been extensively colonized by many plant species; the vegetative cover is approximately 60%. *Carex aquatilis* and *Eriophorum* spp. are the primary

colonizers in the wet area around thermokarst troughs. Many grass and forb species are present on the drier areas.

A large reserve pit to the east of the pad is filled with water. A mound of overburden is present on the east side of this pit.

Description: Undisturbed Area

The undisturbed area of the study site consisted of moist graminoid tundra immediately to the west of the pad. The landform was high-centered polygons.

Observer Station and Schedule

The observation point was on the southwest corner of the pad. The surface of the pad was obscured by dense vegetation, making observations difficult. Only casual observations were made at the reserve pit and the overburden mound. Observations were made on June 23, July 9 and 24, and August 7.

Wildlife Observations

Caribou were frequently observed on the pad. Their behavior included feeding, resting, and moving through the area. On one occasion an adult laid down in a thermokarst trough on the pad and was often totally concealed from view. This same behavior had been noted the previous day at a different study site (West Sak 3) when an adult caribou concealed itself by reclining in the gravel depression around the well head.

Other mammals were scarce. An arctic fox adult with a kit passed through the study area on July 9, and one lemming was observed in the undisturbed portion.

One observation of a Brant feeding on vegetation growing on the gravel was the only observation of waterfowl using the gravel pad. However, Oldsquaws and King Eiders were observed swimming in the reserve pit. Waterfowl scat and tracks were common in the pit.

Shorebird activity was extensive in the study area, particularly on the gravel pad, during all observation periods. Sandpipers were observed displaying, feeding, and resting on the gravel pad. A number of birds landed, but their subsequent activities could not be observed because they disappeared into vegetation. Phalaropes often landed in wet areas of thermokarst troughs, presumably to feed. One Semipalmated Sandpiper nested on the gravel pad on top of a high-centered polygon in a small clump of grasses and *Carex* sp. measuring about 0.5 x 1.0 m in diameter. No nests were found in the undisturbed portion of the study site, but four Semipalmated Sandpiper nests were found on other areas of tundra adjacent to the pad. The pilings on the east side of the pad were used as perches by Ruddy Turnstones. A turnstone nest was found on a barren area north of the reserve pit, and an adult with a downy chick was observed on the mound of overburden on July 9.

In addition to shorebirds, Lapland Longspurs and Snow Buntings commonly used the pad. As with shorebirds, their behavior included displaying, resting, and feeding, and a number of birds disappeared as they landed in areas of thick vegetation on the gravel pad. Various kinds of debris such as pilings, pieces of wood, steel reinforcement bar (rebar), stakes, and pipe were often used as perches. The center of activity appeared to be the area around the pilings and well head where there was an abundance of perches. Three longspur nests were found on the gravel pad. Two of these nests were in small clumps of *Carex* sp.-- one was on the side of a thermokarst trough and the other was on top of a high-centered polygon near a trough. The third nest was in a clump of *Eriophorum* sp. at the very southern edge of the gravel pad on top of a well-vegetated, high-centered polygon.

Other species observed using the area were Rock Ptarmigan resting on the gravel pad surface and a Snowy Owl which used debris at the well head and the mound of overburden as perches.

SITE 3: WEST SAK 11

Location and Access

West Sak 11 (Fig. A-3) is located in the Kuparuk Unit in Sec. 36, T12N, R8E, about 2.7 km southwest of Drill Site 3F. There is no road access to the pad but it can be seen with binoculars from a point where a stream intersects the gravel road southwest of Drill Site 3F. The site is about 45 min on foot from this point.

Description: Disturbed Area

The well was spudded on January 4, 1978, and suspended on February 24, 1978.

The pad dimensions are about 130 m x 90 m and gravel thickness varies from about 0.6 to 1.3 m. A gravel ramp tapers from the pad to the tundra on the northern part of the pad. Moderate thermokarsting is evident on the southern portion of the pad, less so on the northern portion, and least evident in the northeast corner. Some thermokarst troughs contained water throughout the summer. The well head is located on the east-central portion of the pad. A section of large-diameter culvert is embedded vertically in the gravel and surrounds the well head. Resting on this culvert is a wooden platform with a metal railing about 1 m high. A series of timbers attached to the pad by metal supports surrounds this platform and extends to the north. Many forb and grass species are distributed uniformly over the pad surface, but overall vegetative cover is less than 1%.

A reserve pit to the east of the pad, filled with water and mud, approximates the size of the pad. A flare pit to the south is slightly smaller and is filled with water and disturbed tundra. The exposed mud in the reserve pit is partially vegetated; mud in the flare pit is more extensively vegetated. Both pits are surrounded by gravel levees. As summer progressed the water level dropped in both pits and more mud became exposed.

Description: Undisturbed Area

The undisturbed portion of the study site consisted of tundra immediately north of the pad. The southern part was moist graminoid tundra, and its land-form was low-relief, high-centered polygons and strangmoor. The northern part rose in elevation and was composed of moist tussock tundra; the land-form was high-centered polygons.

Observer Station and Schedule

The observation point was located on the northeast corner of the pad. Most of the pad could be seen but observations of animals on the southern thermokarsted area were more difficult than elsewhere. Most of the gravel levees around the reserve and flare pits could be seen, along with most of the area inside the reserve pit. Much of the inside of the flare pit was obscured from view. Observations were made on June 26, July 13 and 27, and August 10.

Wildlife Observations

Caribou were observed on the pad only during the last observation period, but the presence of tracks and scat indicated caribou use at the site throughout the summer. Many tracks were preserved in the mud of the reserve and flare pits, and tracks were also scattered over the pad surface. A distinct trail was on the levee between the two pits and, as evidenced by many caribou tracks, had considerable use.

Other mammal use was less obvious. There was fox scat near the debris around the well head, and an arctic ground squirrel was present on June 26.

During the first two observation periods, waterfowl were observed using the water impounded in the reserve and flare pits. More waterfowl were seen in the reserve pit, possibly due to its proximity to the observation point. The Oldsquaws fed extensively in the pits and also used the pits for resting and preening. King Eiders were seen resting and preening. Three Greater White-fronted Geese landed in the flare pit and eventually walked over the west levee where they began

feeding on tundra vegetation. No waterfowl were observed during the last two observation periods.

Shorebirds were observed using the reserve pit and, to a lesser extent, the gravel pad. They used the gravel edges and the exposed mud of the reserve pit for feeding and resting. Two Pectoral Sandpipers were observed feeding for a short period on the south-central and northeast areas of the gravel pad. Aerial displays were also observed over the gravel pad, the reserve pit, and the flare pit.

Lapland Longspurs used the area during all observation periods; their numbers increased during the last half of the season. Their activities centered around the well head and associated debris, where they engaged in feeding, resting and preening behavior. Flights back and forth from the well head area to nearby tundra or gravel pad surfaces were common. On August 10, longspurs were observed feeding over the entire surface of the pad.

Other bird observations were few. They included Sabine's Gull on the reserve pit and Rock Ptarmigan using the debris at the well head as a perch.

SITE 4: WEST SAK 9

Location and Access

West Sak 9 (Fig. A-4) is located in the Kuparuk Unit in Sec. 3, T11N, R9E, about half-way between Drill Site 2X and Drill Site 2W. It is readily visible to the north of Drill Site 2X from which it can be reached in about 20 min on foot.

Description: Disturbed Area

The well was spudded on March 2, 1978, and suspended on April 9, 1978.

The pad dimensions are approximately 130 m x 100 m, and gravel thickness varies from approximately 1 to 1.5 m. A small gravel ramp tapers from the pad to the tundra on the north part of the pad. Thermokarsting on the southwest

quadrant of the pad is extensive, and some thermokarst troughs are filled with water. Other areas of the pad exhibit little or no thermokarst activity. The well head is located on the east-central part of the pad and is surrounded by wooden planks and timbers fastened to the pad by metal supports.

There is high plant species diversity but low vegetative cover on the pad surface. Total vegetative cover on the pad is about 1%. Colonization is more pronounced in thermokarsted areas.

A reserve pit east of the pad is filled with water and is similar in size to the pad. A flare pit south of the reserve pit is slightly smaller than the reserve pit and is also filled with water. Both pits are surrounded by gravel levees. There is virtually no plant colonization associated with these pits. Large mounds of overburden 6 to 7 m high are present to the east of each pit.

Description: Undisturbed Area

The undisturbed portion of the study site, immediately north of the pad, was primarily wet graminoid tundra. The landform was discontinuous low-centered polygons, strangmoor, and frost-boil tundra.

Observer Station and Schedule

The observation point was located to the northeast corner of the pad. From here, most of the pad could be seen although observations in the thermokarsted areas were somewhat restricted. The gravel levees around the pits and the entire reserve pit could also be seen. Part of the flare pit was obscured from view. Observations were made on June 4, July 10 and 25, and August 8.

Wildlife Observations

Caribou were observed on the pad on a few occasions. Those on the pad generally stood or rested, though a few fed. Scat and tracks were scattered over the pad surface, on the levees around the reserve and flare pits, and on the overburden. A young male caribou used the northernmost overburden mound as a resting area on one occasion.

Waterfowl were observed in the reserve and flare pits on all visits to the site. Pacific Loons, Oldsquaws, and King Eiders were feeding extensively in both pits, but most observations were made in the reserve pit due to its proximity to the observation point. Twelve King Eiders were present on July 10, and a female with six young were feeding the entire day on August 8. A few observations of Brant were made, and a pair of Greater White-fronted Geese with two downy young was on the gravel levee south of the flare pit on July 10.

The most obvious shorebird activity was displaying on the pad by Buff-breasted Sandpipers and aerial displays by Pectoral and Semipalmated sandpipers. A number of birds were observed feeding at the edges of reserve or flare pits, and Red-necked Phalaropes fed on the surface of the water. A few individuals used the gravel pad for resting or preening; two Pectoral Sandpipers were noted feeding on the pad. No nests were found on the pad but one Semipalmated Sandpiper and one Pectoral Sandpiper nested in the undisturbed portion of the study area.

Lapland Longspurs were least active on the pad during the first half of the season, but their activity increased sharply in late summer. A good portion of their activity was centered around the well head and the surrounding timbers which were often used as perches. Longspurs often moved back and forth from the timbers to the pad surface. Longspurs were seen landing and feeding on all parts of the pad during the last two observation days. There were often rapid movements of flocks from the pad area to perches at the well head and back.

Other significant observations included the use of the perches around the well head by Rock Ptarmigan. Also, an immature Golden Eagle used the northernmost mound of overburden as a perch.

SITE 5: WEST SAK 3

Location and Access

West Sak 3 (Fig. A-5) is located in the Kuparuk Unit in Sec. 26, T11N, R9E, about 1.3 km southwest of Drill Site 2D. There is no road access to the pad but it can be seen from the gravel road west of Drill Site 2D and can be reached in 5 min on foot.

Description: Disturbed Area

The well was spudded on March 22, 1975, and suspended on April 26, 1975. The "plugged and abandoned" date is March 14, 1986.

The pad dimensions are approximately 70 m x 160 m. Gravel thickness on the eastern and southern portions is about 0.6 m. Two gravel ramps taper to the tundra surface; one is in the northeast corner and one is on the south side of the pad. A thicker raised area of gravel on the west side of the pad extends from the north side to the south about 80% the length of the pad. This gravel has a thickness of about 1.5 m. Moderate thermokarsting is evident on the thinner areas of the pad, but little thermokarsting occurs on the thicker areas. Water was present in thermokarst troughs. The well head is characterized by a pipe embedded vertically into a depression about 0.5 m deep in the gravel, located on the west central part of the pad. A number of wooden stakes delineate a revegetation study site on the raised portion of the gravel pad. This area was fertilized in 1986 (Jorgenson 1988).

Vegetative cover on the pad is less than 1%, even in the fertilized area. Several grass and forb species are colonizing the thermokarst troughs.

There is a reserve pit on the west side of the pad and a flare pit to the north. A third pit, possibly another flare pit, is adjacent to the southeast edge of the pad. All pits are surrounded by gravel levees which have been breached to allow water to escape. The flare pit to the southeast contains a large mound of overburden in the center, approximately 1.7 m high. The mound is sparsely vegetated and is surrounded by water and partially-disturbed, vegetated tundra. A smaller mound of overburden in the center of the north flare pit was fertilized and seeded in 1986

as part of a revegetation study (Jorgenson 1988). This area is now heavily vegetated and is surrounded by water and partially-disturbed tundra. The reserve pit has a large mound of mud and cuttings which was seeded in 1986 (Jorgenson 1988). This area is sparsely vegetated and is surrounded by water and partially-disturbed tundra.

Description: Undisturbed Area

The undisturbed portion of the study site consisted of tundra located adjacent to the northeastern section of the pad. It was composed of moist graminoid tundra and moist tussock tundra. The landform was primarily low-relief high-centered polygons.

Observer Station and Schedule

The observation point was located on the mound of overburden in the southeast flare pit. From this vantage point, the entire pad and the gravel levees around the flare pits could be seen. The reserve pit was concealed behind the gravel pad and only casual observations were made within it. Observations were made on June 22, July 7 and 23, and August 6.

Wildlife Observations

Caribou were observed on the pad during the last two observation periods. Most observations were of resting individuals including one which laid in the depression of gravel around the well head for approximately 1 hr. Another caribou fed extensively in the vegetation in the north flare pit. Tracks were scattered around the pad and were especially evident in the reserve and flare pits.

Waterfowl were observed at all reserve and flare pits, but many of these were casual observations. On June 22, a Snow Goose and two Greater White-fronted Geese, which were resting on the gravel levee around the north flare pit, flew away as the observer approached the study site. On several occasions Oldsquaws and Greater White-fronted Geese landed in the reserve pit, which could not be viewed from the observation point. Waterfowl tracks and scat were present in all reserve and flare pits.

Shorebirds observed were mainly preening or displaying. Buff-breasted Sandpipers used both the lower and elevated portions of the gravel pad for display purposes. Pectoral Sandpipers also displayed over the gravel pad surface. The levees around the eastern reserve pit and the flare pit served as resting and preening areas for Pectoral and Semipalmated sandpipers and Lesser Golden-Plovers. An adult and juvenile Dunlin were exploring the raised area of the pad on July 23. No shorebirds nested on the pad but a Semipalmated Sandpiper nest was found about 15 cm off the gravel levee on the south side of the southeast flare pit; a Pectoral Sandpiper nested in the same area about 1 m from the gravel levee. Both nests were successful.

Lapland Longspurs were seen throughout the study period. Numbers increased over the course of the season and longspurs were very common on August 6. Early in the season observations were mainly of individuals landing, resting, or preening on the gravel pad or levees around flare pits. The pipe at the well head was occasionally used as a perch. The southeast flare pit had high use during the latter half of the summer when feeding was a major activity. Longspurs frequently landed on the mound of overburden, the levee around the reserve pit, and the vegetated area inside. This vegetated area seemed to be a center of activity as birds moved back and forth between it and adjacent tundra and the gravel pad surface. One longspur nested in the undisturbed portion of the study site in moist tussock tundra, but this nest was destroyed by a predator.

SITE 6: WEST SAK 4

Location and Access

West Sak 4 (Fig. A-6) is located in the Kuparuk Unit in Sec. 7, T10N, R9E, approximately 2.4 km east southeast of Drill Site 2K. There is no road access to the pad. It can be seen with binoculars from Drill Site 2K, and can be reached in about 40 min on foot.

Description: Disturbed Area

The well was spudded on January 20, 1979, and plugged and abandoned on February 16, 1979.

The original dimensions of the pad were approximately 75 m x 160 m. There was a reserve pit to the west and flare pits to the north and east. Gravel from the levees has been pushed into the centers of the pits creating mounded areas. Some gravel from the pad itself may also have been pushed into the large mound of gravel now covering the reserve pit. (This area is delineated by a dashed line in Fig. A-6.) Gravel thickness of the pad ranges from less than 1 m to about 2 m; the thickest parts are in the former reserve pit. There are extensive areas of gravel spray on the western, northwestern, and southeastern sides of the pad. Thermokarsting is evident on the thinner portions of the pad; some troughs are filled with water. Large depressions in the mounded gravel over the old reserve pit also contain water. The well head is located just north of the pad center.

The total vegetative cover for the entire pad is approximately 4%. The thin thermokarsted area is approximately 15 to 20% vegetated; colonizing species include graminoids (*Carex* spp., *Eriophorum* spp., several grass species), and a number of forb species. The mounded portions of the pad are about 1% vegetated. The highly vegetated areas on the gravel spray are composed of graminoids and many forb species.

Description: Undisturbed Area

The undisturbed portion of the study area consisted of the tundra immediately south of the pad. The area was composed primarily of moist and wet graminoid tundra. The landform was discontinuous low-centered polygons and strangmoor. The plot also had scattered areas of frost-boil tundra.

Observer Station and Schedule

The observation point was located on the south side of the pad on the mounded gravel over the old reserve pit. Most of the gravel pad, along with parts of the mounds of gravel at the flare pits, could be seen. Some areas of spray and

some areas of the pad near the well head were obscured from view. Observations were made on June 25, July 12 and 26, and August 9.

Wildlife Observations

Caribou were observed on the pad on a few occasions. Most behavior was limited to standing and resting, but some feeding on *Eriophorum* sp. was noted. Caribou scat and tracks were scattered over the surface of the pad, and were also common in the southeast flare pit and other wet areas where they were more readily preserved.

No waterfowl were observed on the pad, but scat and tracks were found. In the southeast flare pit and in other wet areas of the pad, tracks and scat from ducks and/or geese occurred; scat and tracks of Tundra Swan were found in the north flare pit area.

Most shorebird activity was limited to an occasional bird using the pad for short periods. However, during the early part of the season Buff-breasted Sandpipers used the mounded gravel for display purposes.

Lapland Longspurs were the most abundant bird species on the pad. During the early part of the season small numbers used all parts of the pad for resting, preening, feeding, and displaying. The pipe at the well head was consistently used as a perch, and one bird would often displace another from it. One longspur nest was found on July 12 on the south side of the pad in a clump of *Eriophorum* sp. Adult longspurs were observed feeding their young with insects which were gathered from areas both on and off the pad. On August 9, larger numbers of longspurs were flocking onto the pad and seemed to prefer it over adjacent tundra areas. Their activities consisted of rapid movements as they flew, landed, hopped, and fed on the pad.

Rock Ptarmigan also used the pad on occasion.

SITE 7: HURL STATE

Location and Access

The Hurl State site (Fig. A-7) is located in the Prudhoe Bay Unit in Sec. 5, T10N, R13E, approximately 2.1 km southeast of P-Pad. There is no road access to the pad but it can be reached in about 30 min on foot from P-Pad.

Description: Disturbed Area

Two wells have been drilled on this pad. The first was spudded on May 11, 1969, and has a "plugged and abandoned" date of April 4, 1980. The second well was spudded on January 6, 1981, and was suspended on February 18, 1981.

The pad dimensions are about 60 m x 180 m and gravel thickness averages approximately 1.6 m. A gravel road from the airstrip enters the pad on the north side. The pad surface is flat with thermokarsting evident only in a small area at the west end where there is a water-filled trough. The well heads are located south and east of the pad center; one consists of a pipe embedded in the ground, and the other is a "christmas tree" with a railing around it. A shallow cement structure located east of the pad center is covered. A fairly extensive area of thin gravel and gravel spray surrounds much of the pad, particularly on the southern and eastern sides. Several small water bodies, possibly the remains of an old reserve pit, are present in this area. A large intact reserve pit adjacent to the southeast end of the pad was filled with mud and water. Another small pit to the east was also filled with water.

Very little vegetation was present on the gravel surface; total cover was less then 1%. Thick patches of *Eriophorum* sp. were colonizing some areas of gravel spray on the south side, and *Arctophila fulva* was present in the pond to the south.

Description: Undisturbed Area

The undisturbed portion of the study site consisted primarily of wet graminoid tundra to the southwest of the pad. The landform was non-patterned ground.

Observer Station and Schedule

The observation point was located on the west side of the pad. The pad and part of the gravel spray and associated water could be seen. The large reserve pit and the thin gravel and gravel spray to the east could not be seen. Observations were made on June 28, July 12 and 27, and August 12.

Wildlife Observations

Caribou were observed standing, resting, and moving across the pad on several occasions. A few feeding observations were made early in the season. Caribou were observed standing and lying down in the area of the "christmas tree" in particular, where many tracks and much scat were seen. Tracks were also noted in other areas of the pad, particularly in the areas of thin gravel and gravel spray and in the reserve pit.

Arctic foxes were observed on the pad on July 12 and July 27. They appeared to be hunting as they passed through the area.

No waterfowl were observed on the gravel pad; however, scat was present on the thin gravel areas near water bodies. A pair of Oldsquaws was seen in the reserve pit, and on two occasions Canada Geese landed on thin gravel near water.

Little shorebird activity was observed on the gravel pad surface, but shorebirds made extensive use of the areas around water bodies on the south side of the pad. During the final observation period on August 12, activity levels were high. Pectoral Sandpipers were particularly common, but several other species were also observed landing and probing in the mud around the pond edges.

Lapland Longspur activity was minimal until the final observation period on August 12. At this time observations of birds landing, resting, preening, and feeding were made on the gravel pad surface and gravel pad bank.

Common Ravens and Snow Buntings were also observed using the gravel pad on several occasions. On two occasions ravens used the "christmas tree" and the associated railing as a perch.

SITE 8: PUT STATE #1

Location and Access

Put State #1 (Fig. A-8) is in the Prudhoe Bay Unit in Sec. 7, T10N, R14E, about 0.6 km southwest of X pad. There is no road access to the pad but it can be seen with binoculars from X pad, and can be reached in approximately 30 min on foot.

Description: Disturbed Area

The well was spudded on May 12, 1969, and suspended on July 1, 1979. The status now appears to be "plugged and abandoned."

The pad dimensions are approximately 70 m x 160 m. Gravel thickness averages about 1.3 m, varying from about 1 to 1.6 m. Topography is fairly uniform, but some areas exhibit mild thermokarsting. No water was present in thermokarst troughs. The well head is located slightly north of the pad center and consists of a pipe imbedded in a gravel mound. A group of wood pilings is embedded in parts of the western portion of the pad. An old peat road passes through the area just north of the study site.

A wide diversity of plant species is uniformly distributed over the pad surface; total vegetative cover is approximately 10%. One *Festuca* sp. is quite dense over the entire pad surface. Mosses are colonizing the thermokarst troughs, and *Carex aquatilis* is growing on the thinner areas of gravel around the edges of the pad. *Salix* spp. and a number of forb species are also common.

A reserve pit bordering the northwest edge of the pad is filled with water surrounded by overburden/peat. This pit is being colonized by *Eriophorum vaginatum, Carex aquatilis,* and *Arctophila fulva.* Another pit bordering the southwest part of the pad is also filled with water surrounded by overburden (mostly peat) and is being colonized by *Carex* sp. and *Eriophorum* sp.

Description: Undisturbed Area

The undisturbed portion of the study site is composed of moist and wet graminoid tundra adjacent to the eastern pad edge. The predominant landform is high-centered polygons; non-patterned ground and low-centered polygons also occur. Thermokarst troughs are filled with water, and *Dryas* sp. characterize the tops of high-centered polygons.

Observer Station and Schedule

The observation point was located on the southeastern portion of the pad. Most of the pad could be seen but the reserve pits were not observed. Observations were made on June 26, July 11 and 26, and August 10.

Wildlife Observations

Caribou were observed standing or resting on the pad, or running across the pad. One caribou appeared to use the gravel mound at the well head as a vantage point. Caribou scat and tracks were scattered throughout the pad.

Arctic foxes were present on the pad on several occasions. Activities included passing through the area and digging in gravel in the area around the well head. Other evidence of fox activity included diggings in the peaty overburden of the northwest reserve pit, where several goose wings were found (evidence of probable predation). Fox scat was noted in several areas.

No waterfowl were observed using the study area; however, scat was scattered across the pad surface.

Shorebirds were observed in small numbers resting, preening, feeding, and displaying on the pad. The most significant observation was of a Baird's Sandpiper which nested in a clump of *Dryas integrifolia* on the southwest part of the pad.

Lapland Longspurs were observed in small numbers early in the season but on August 10 activity levels increased dramatically. Longspurs were observed resting, preening, and feeding in vegetated areas of the pad, and particularly on and

around the gravel mound at the well head. A longspur nest was found in some vegetation on the peat-rich overburden surrounding the northwest reserve pit.

SITE 9: LAKE STATE #1

Location and Access

Lake State 1 (Fig. A-9) is located in the Prudhoe Bay Unit in Sec. 18, T10N, R15E, approximately 0.3 km east of Drill Site 16. There is no road access to the pad. It can be seen from Drill Site 16 and can be reached in about 5 min on foot.

Description: Disturbed Area

The well was spudded on March 22, 1969, and was officially "plugged and abandoned" on January 25, 1981, although activity probably stopped well before this date.

The pad dimensions are approximately 105 m x 55 m. Gravel thickness is about 0.7 m. Areas of thin gravel and gravel spray are present beyond the northern, western, and eastern sides of the pad. A small area of gravel is connected to the northeast edge of the pad by a gravel berm. No observations were made on a gravel area southwest of the pad. Thermokarsting is not evident, and one small pool of water was present on the western part of the pad. A number of areas of standing water existed in the thin gravel. The well head is located south of the pad center and consists of a pipe embedded in the gravel.

This site is the object of an ARCO Alaska, Inc. revegetation study which was initiated in 1986 (Jorgenson 1988). The entire area was fertilized and specific plots were seeded with Tundra Blue Grass (*Poa glauca*) and Arctared Fescue (*Festuca rubra*). These areas are highlighted with dashed lines on Fig. A-9. The pads are currently about 20% vegetated; seeded areas are more heavily colonized than non-seeded areas. Primary forb colonizers include *Sagina intermedia, Draba* spp., and *Cochlearia officinalis*. No reserve pit is evident in the area.

Description: Undisturbed Area

The undisturbed portion of the study site included primarily wet graminoid tundra northwest of the gravel pad. The landform was low-centered polygons and discontinuous low-centered polygons.

Observer Station and Schedule

The observation point was located on the northwest edge of the pad. Observations were made at this pad and the small pad to the northeast on July 5, 18, and 30.

Wildlife Observations

No mammals were observed on the pad but caribou scat and tracks were present. Time-lapse video-photography, conducted during this study, revealed considerable use of the site by caribou (see RESULTS in body of this report).

Waterfowl were likewise observed only during time-lapse photography studies. In addition, waterfowl scat was found over much of the gravel pad surface and the presence of egg shells on the pad indicated possible nest predation in the area.

Observations of shorebirds included birds on the gravel pad surface and at the edges of water bodies. Again, time-lapse studies produced further evidence of shorebird use of the pad.

Lapland Longspurs were most abundant on July 30 when a number of birds were observed feeding in vegetated areas of the pad.

SITE 10: SAG DELTA 31-11-16

Location and Access

Sag Delta 31-11-16 (Fig. A-10) is located in the Prudhoe Bay Unit in Sec. 31, T11N, R16E, in the Sag River Delta about 6.5 km east-northeast of the Prudhoe Bay runway. Access to this site was by helicopter.

Description: Disturbed Area

The well was spudded on March 7, 1969, and suspended on April 18, 1969.

The pad is irregularly shaped, covering an area approximately 130 m x 90 m. The gravel is thickest (about 0.5 m) on the south and west sides. It has been spread out over the area to the north and east where a large area of gravel spray is present. A small patch of gravel separated from the pad is present to the southeast. Some areas of light thermokarsting are evident, and shallow furrows caused by heavy equipment are present. A number of pools existed in the spray area; some were ephemeral, appearing after periods of rain. The well head is located on the south-central pad and is surrounded by a heavy wooden fence. A number of heavy timbers are attached to the pad east of the well head. Debris south of the pad consisted of collapsed metal drums and pieces of pipe and wood.

Vegetation on the gravel is limited to scattered sedges, grasses, and forbs covering less than 1% of the pad surface. The gravel spray area is relatively heavily vegetated, particularly around areas where water persisted; the vegetation here consists of *Carex* spp., *Eriophorum* spp., grasses, and many forb species.

Description: Undisturbed Area

The undisturbed portion of the study area consisted primarily of moist graminoid and prostrate shrub tundra northwest of the pad. The landform was non-patterned ground and low-relief high-centered polygons.

Observer Station and Schedule

The observation point was located on the northern edge of the gravel spray. Most of the pad could be seen although observations were sometimes obscured by vegetation. Observations were made on July 6 and 22 and August 5 and 17.

Wildlife Observations

Mammals observed in the study area included an arctic fox and arctic ground squirrels. A fox passed through the area once, lingering around the well head before continuing on. Ground squirrel activities were confined to the undisturbed portion of the study area; squirrels were particularly numerous around a small mound in the northwest corner. Caribou tracks were scattered over the pad and were most abundant in the gravel spray.

No waterfowl were observed using the gravel pad, but their tracks and scat were present in wet areas of gravel spray. In addition to smaller tracks of ducks and/or geese, larger tracks and scat of swans were also present.

Shorebird use of the pad was limited to a few observations of birds landing or feeding for brief periods late in the season. Limited activity was also observed in the undisturbed portion of the study site.

Lapland Longspurs were observed throughout the study period and were particularly abundant on August 5 when several hundred birds passed through the area. Peak numbers were reached in the morning but the activity continued into the afternoon. As they passed through, longspurs would linger on the gravel pad surface, rapidly moving about while they fed, rested, and preened. Many birds which moved from the gravel pad to adjacent tundra returned to the gravel, seeming to prefer it. Walking around the perimeter of the pad at mid-day, the observer noted many more longspurs on the pad than on adjacent tundra surrounding it. The birds were using all parts of the pad including the bare gravel and vegetated spray, and were most obvious when using wooden perches around the well head.

The fence around the well head was also used as a perch also by other species. Snow Buntings were often in mixed flocks with longspurs. In addition, Snowy Owl and Peregrine Falcon perched at the well head fence.

SITE 11: SAG DELTA 2 & 2A

Location and Access

Sag Delta 2 and 2A (Fig. A-11) is located in the Prudhoe Bay Unit in Sec. 10, T11N, R16E, about 4.8 km southwest of the Endicott Main Production Island. Access to this site was by helicopter.

Description: Disturbed Area

Two wells were drilled at this site. The first was spudded on January 6, 1977, and plugged and abandoned on April 26, 1977. The second was spudded on November 27, 1977, and suspended on December 27, 1977.

The pad dimensions are approximately 90 m x 165 m. Gravel thickness is approximately 1.5 m. Some shallow thermokarsting was evident on the northern portion of the pad, but there was no standing water in the thermokarst troughs. The well head is located southeast of the center of the pad and is surrounded by timbers and other debris. The pad was sparsely vegetated by several species of forbs and grasses.

A reserve pit immediately to the east approximates the size of the pad. It is filled with standing water, mud/cuttings, and partially-disturbed tundra. A flare pit to the south of the reserve pit is about half its size and contains water and partially disturbed tundra. Vegetation is colonizing both pits.

Description: Undisturbed Area

The undisturbed portion of the study area, west of the gravel pad, was composed of tundra. The area was primarily coastal barrens; the landform was low-relief high-centered polygons.

Observer Station and Schedule

The observation point was located on the northwest corner of the pad. Most of the pad could be seen quite well, but the reserve and flare pits could not be seen. Observations were made on July 3 and 22 and August 5 and 17.

Wildlife Observations

Caribou were observed on the pad and adjacent tundra on July 3; they fed on the tundra and rested on the pad. Tracks and scat were scattered over much of the pad surface but were most abundant around the edges of the pad.

The only other mammal observed on the pad was an arctic fox that walked across the pad on July 22. It investigated some diggings that appeared to be remnants of arctic ground squirrel activity. No ground squirrels were seen during the study period.

No shorebirds were observed on the gravel pad, but on August 5, well over 100 individuals of several species were observed in the reserve pit. The pit could not be seen from the observation point and this was a casual observation made at mid-day. Shorebirds could be heard in the reserve pit during the entire course of the day.

Lapland Longspurs were observed during the entire field season, but most observations were on August 5. Longspurs were feeding on the gravel pad and perching on the debris around the well head. Activity in the undisturbed tundra also increased on August 5.

SITE 12: DELTA STATE 2

Location and Access

Delta State 2 (Fig. A-12) is located just outside the east end of the Prudhoe Bay Unit in Sec. 35, T11N, R16E. It is visible from the Endicott road about 8.0 km east of Duck Island gravel pit and can be reached in 5 min on foot.

Description: Disturbed Area

The well was spudded on March 5, 1975, and suspended on May 17, 1975.

The pad dimensions are approximately 75 m x 175 m. The gravel is approximately 0.5 m thick. Much of the gravel has been spread over the area; it has filled two flare pits, one each on the north and east sides of the pad. The reserve pit on the west side has also been partially filled in with gravel but primarily contains water and mud. Areas of gravel spray are present on both the east and west sides of the pad. No thermokarsting is evident, but shallow furrows caused by heavy equipment are present. There are a number of small ephemeral pools on the pad surface and in the areas of gravel spray. The well head is located northwest of pad center.

The pad was sparsely vegetated; total plant cover was approximately 1%. Most of the vegetation occurred around the edges of the pad. The gravel spray was characterized by heavily vegetated areas of disturbed tundra.

Description: Undisturbed Area

The undisturbed portion of the study area consisted of primarily wet graminoid tundra to the northeast of the pad. The landform was non-patterned ground.

Observer Station and Schedule

The observation point was located on gravel spray at the northeast edge of the pad. Most of the pad as well as the gravel at the flare pits could be seen. Neither the reserve pit and the area to the west, nor the gravel spray south of the

eastern flare pit could be seen. Observations were made on June 17, July 5 and 18, and August 2.

Wildlife Observations

The only mammal observations were of an arctic fox which spent almost two hours sleeping on gravel on the east side of the pad near the gravel spray, and an arctic ground squirrel that passed through the undisturbed area. However, caribou tracks and scat were abundant over all parts of the pad. Fox scat was also present in several areas.

The only waterfowl observed using the area were Canada Geese and Tundra Swans. The Canada Geese were feeding on vegetation in the wet gravel spray area northwest of the observation point. The Tundra Swans spent at least several hours in wet gravel spray south of the east flare pit. These were casual observations of the swans made outside of the regular observation periods. There were also many waterfowl tracks and scat around the perimeter of the pad in wet areas and around the reserve pit, including swan scat near the north flare pit.

Shorebirds were active throughout the study period but the area received particularly heavy use on August 2. Semipalmated Sandpipers and a few Red-necked Phalaropes consistently fed around the edges of pools on the pad and in gravel spray. A male Red Phalarope that nested east of the undisturbed areas also used these same pools for feeding earlier in the season. Lesser Golden-Plovers and a Semipalmated Plover were seen feeding on the gravel pad surface.

Lapland Longspurs were also active in the area. Activities included resting, preening, displaying, and feeding on both the unvegetated gravel pad surface and the vegetated areas of gravel spray. A pair of longspurs nested on the south side of the undisturbed area. The adults made frequent food gathering trips to the gravel spray south of the east flare pit.

SITE 13: KEMIK #1

Location and Access

Kemik #1 (Fig. A-13) is located in the northern foothills of the Brooks Range approximately 72 km southeast of Franklin Bluffs in Sec. 17, T1N, R20E, U.M. There is no road access and the site was reached by helicopter.

Description: Disturbed Area

The well was spudded on January 1, 1971, and suspended on June 17, 1972.

The pad dimensions are approximately 45 m x 180 m. Gravel thickness is about 1 m. An area of thin gravel and gravel spray extends beyond the pad to the east and leads to the road and an old airstrip. Thermokarsting is well pronounced on a large portion of the gravel pad but there was no standing water in the troughs. The well head is located slightly northeast of the pad center and is surrounded by various kinds of debris including timbers, several types of pipe, and a group of metal drums.

Densely vegetated areas are present among the pieces of debris around the well head and in the area immediately to the east. Vegetation is widely distributed over the rest of the pad but is more abundant in the thermokarst troughs. The thin gravel also exhibited dense vegetative cover.

A reserve pit made of overburden is adjacent to the pad on the north side. It is dry with heavy vegetative cover on the south side and thermokarsting on the north side.

Description: Undisturbed Area

The undisturbed portion of the study site was moist low shrub tundra dominated by *Salix* spp. The area was slightly sloping with an area of disturbance on the north side characterized by a section of exposed peat. Some thermokarsting was also evident.

Observer Station and Schedule

The observation point was located on the eastern edge of the pad. The thick areas of gravel could be seen, but no observations were made on the spray to the west or in the reserve pit. Observations were made on July 2 and 21 and August 4 and 16.

Wildlife Observations

Moose were seen on the pad and in the reserve pit but only as casual observations. Tracks and scat of moose and caribou were present on the pad and reserve pit. A number of shrubs on the pad and in the reserve pit showed evidence of browsing.

Arctic ground squirrels were observed during all observation periods. Burrows lined the rim of the reserve pit. Activity was observed over the entire pad, but was centered around the area of debris and the well head.

Passerine species active on the pad included Lapland Longspur and Savannah Sparrow. Much of the activity centered around the debris and well head; at other times birds landed in shrubs and on the gravel pad surface. Little activity was noted in the undisturbed portion of the study site but visibility was partly obscured by dense vegetation.

SITE 14: KEMIK #2

Location and Access

Kemik 2 (Fig. A-14) is located in the northern foothills of the Brooks Range approximately 72 km southeast of the Franklin Bluffs in Sec. 6, T1S, R21E, U.M. Access was by helicopter.

Description: Disturbed Area

The well was spudded on January 31, 1975, and plugged and abandoned May 16, 1975.

The dimensions of the pad are approximately 130 m x 180 m. This includes the area formerly occupied by the reserve pit adjacent to the northwest edge of the pad. The gravel over the southern portion of the pad is approximately 1.0 m thick. In the northeastern part of the pad, the gravel is about 0.5 m and in the northwest it is mounded to almost 2 m where it covers the old reserve pit. A small area of gravel spray is present south of the pad and an old flare pit, covered with a thin layer of gravel, is attached to the northeast corner. Little thermokarsting is evident other than in the thin gravel in the northeast portion of the pad where water is present in some troughs. Some small pools of water are also present in the northwestern portion of the pad where gravel tapers down to the tundra level. The well head is located to the northwest of the pad center where a pipe protrudes from a mound of gravel.

The pad exhibits a great degree of plant colonization; total plant cover is approximately 50%. Dominant species include *Artemisia* spp., *Salix* spp., *Epilobium angustifolium,* and *Arctagrostis latifolia.*

Description: Undisturbed Area

The undisturbed portion of the study site consisted of tundra west of the gravel pad. Moist dwarf shrub tundra dominated; *Betula nana, Sphagnum* spp., and *Rubus chamaemorus* were common plant species. The landform included low-relief, high-centered, and discontinuous low-centered polygons.

Observer Station

The observation point was located on the west-central pad edge. Much of the pad surface was obscured by heavy vegetation. Observations were made on July 2 and 21 and August 4 and 16.

Wildlife Observations

Adult male moose were observed feeding on the pad on several occasions. Moose scat was distributed throughout, and caribou and bear scat was also present.

The most commonly observed mammal was arctic ground squirrel. All ground squirrels observed were on the pad; none were in the undisturbed area. As many as eight individuals were seen on one occasion, but the actual number present could have been substantially higher because visibility was obscured by dense vegetation. Activities included resting and feeding on all areas of the pad. Burrows were located in several areas.

Lemmings were also seen. These observations were made as the observer walked across the pad and were most common in the thin gravel in the northeast and along the east and southwest edges of the pad. Some areas on the pad had well-developed lemming runways.

No waterfowl were observed in the area, and shorebird activity was limited to observations of two species, Least Sandpiper and Semipalmated Plover. Least Sandpipers were observed in the undisturbed portion of tundra on July 2. On July 21 they were observed on the pad where adults and juveniles spent most of the day. Because of the thick vegetation, observation of behavior was difficult and birds were usually seen perched on shrubs or the well head. A Semipalmated Plover was also present on the pad and on an area of mud to the north.

Passerine species using the gravel pad included Lapland Longspur, Redpoll, and Savannah Sparrow. Birds were usually perched on shrubs or landing in vegetated areas.

Several avian predators, including Short-eared Owls and Long-tailed Jaegers, actively hunted in the area, particularly around the edges of the gravel pad. Both of these species were observed capturing lemmings. A Peregrine Falcon made a swooping flight above the pad surface on one occasion, but the purpose of this movement was unclear. Rough-legged Hawks and Gyrfalcons were also observed

in the general area but their activities did not seem to be associated with the gravel pad.

SITE 15: KUPARUK RIVER 1

Location and Access

Kuparuk River 1 (Fig. A-15) is located in the Prudhoe Bay Unit in Sec. 19, T11N, R13E, approximately 0.5 km southwest of U-Pad. It can be accessed from the gravel road southwest of U-Pad which dead ends at the Kuparuk River. The southeast corner of the study site is approximately 90 m from a point on the gravel road 230 m northeast of the Kuparuk River.

Description: Disturbed Area

The disturbed area consists of exposed alluvial gravel of the Kuparuk River. The dimensions of the alluvium are approximately 200 m x 100 m. Surface relief is varied, with a mound of gravel located on the north central part of the site and two parallel furrows about 50 m to the south. Dunes of mixed sand and gravel about 1 m high occur on the south part of the site. There is a small body of water in the northwest corner. Total vegetative cover is approximately 10%, most of which is concentrated in an area of riparian shrub on the western side. Dominant species include *Salix* spp., *Dryas* spp., *Artemisia* spp., and *Epilobium latifolium.*

Description: Undisturbed Area

The undisturbed portion of the study site included tundra to the east of the alluvium. The dimensions were approximately 200 m x 100 m. The dominant vegetation types were dry prostrate shrub and moist graminoid tundra. Land-forms included mainly reticulate and non-patterned ground; there were small areas of mixed high and low-centered polygons and strangmoor in the south. A small disturbed area of exposed gravel was centrally located and was bisected by vehicle tracks.

Observer Station and Schedule

The observation point was located on the alluvium near the border of the undisturbed area about 50 m south of the northern boundary of the site. Observations were made on June 29, July 13 and 28, and August 11.

Wildlife Observations

Caribou were observed in the study area on June 29, July 28, and August 11. More caribou were observed on the alluvial gravel than on adjacent tundra. Caribou did not linger but were observed for short periods as they passed through the area. On June 29, a group of 20 caribou were observed feeding on *Artemisia* spp. on the alluvial area. Caribou were observed in the undisturbed area only on August 11. Tracks and scat were abundant over the entire alluvial area.

Arctic ground squirrel was the only other mammal observed on the study site. Observations were limited to a few individuals which passed through the area. Arctic fox were not seen but scat was present in the alluvium.

Waterfowl were not observed on the study site, but tracks were present in the alluvium.

Baird's Sandpiper was the only shorebird observed on the alluvium. This species was also seen on the undisturbed area. Lesser Golden-Plover was the only other shorebird observed, and a pair nested in the undisturbed area. Most activity occurred on June 29; very few observations occurred after this date.

Lapland Longspurs were the only passerines observed using the study site. They were present in both the alluvium and tundra areas. Activities included landing, resting, and feeding.

SITE 16: KUPARUK RIVER 3

Location and Access

Kuparuk River 3 (Fig. A-16) is located in the Prudhoe Bay Unit in Sec. 6, T10N, R13E, approximately 1.1 km west southwest of the Hurl State airstrip. A gravel road from the Hurl State airstrip dead ends at the Kuparuk River. The study site includes alluvium and undisturbed tundra north of this road as it intersects the river.

Description: Disturbed Area

The disturbed area consisted of exposed alluvial gravel of the Kuparuk River. The dimensions were approximately 200 m x 90 m. The alluvium was flat with little relief. Primary plant species included *Dryas integrifolia, Salix* spp., *Artemisia* spp., scattered *Carex* spp., and various forb species. Water was present on the eastern part of the plot adjacent to the undisturbed portion on the study site. Snow and ice were present early in the season along an embankment separating the alluvium from the undisturbed area.

Description: Undisturbed Area

The undisturbed portion of the study site included tundra to the east of the alluvium. An embankment at the western edge adjacent to the river was characterized by a band of dry prostrate shrub tundra on reticulate patterned ground. The remaining portion was composed of moist and wet graminoid tundra. The land form was primarily strangmoor and discontinuous low-centered polygons. Three small water bodies were also present.

Observer Station and Schedule

The observation point was located in the center of the study site on tundra near the embankment at the river edge. Observations were made on June 28, July 12 and 27, and August 12.

Wildlife Observations

Only one caribou was observed on the alluvium. Two sets of tracks were present on June 28, and no new tracks were observed later in the season. Small numbers of caribou were observed on the undisturbed portion of the study site on July 27 and August 12. They were observed feeding and resting as they passed through the study plot. A high of five individuals was present on August 12.

Arctic ground squirrels were observed once on the alluvium, but were present throughout the summer on the undisturbed area. Their activity centered around the embankment of dry prostrate shrub adjacent to the river where they were observed feeding and resting. Burrows were located in several areas on the embankment.

A pair of Oldsquaws was present in the alluvial area on June 28. They landed on water and were present for a short period. No other waterfowl were observed on the study site.

Lapland Longspur was the only passerine observed in the study area. They were active in small numbers on the tundra of the undisturbed area throughout the summer. No longspurs were observed on the alluvium.

SITE 17: SAG RIVER 3

Location and Access

Sag River 3 (Fig. A-17) is located in the Prudhoe Bay Unit in Sec. 21, T10N, R15E, approximately 0.6 km west of Drill Site 17. A gravel road from Drill Site 17 crosses a peat road before reaching the Sagavanirktok River. The southeast corner of the site is approximately 150 m northeast of this point.

Description: Disturbed Area

The disturbed area consisted of alluvial gravel and sand of the Sagavanirktok River. The dimensions of the gravel area were approximately 200 m x 100 m. The site was primarily flat with mild undulations. Water was present on the east side. Most of the vegetation occurred on the northern half of the site and on sandy areas at the southern end. Dominant species include *Artemisia* spp., *Stellaria* spp., *Oxytropis* spp., and *Epilobium latifolium*.

Description: Undisturbed Area

The undisturbed area consisted of tundra east of the alluvium. The dimensions were approximately 200 m x 100 m. An old peat road passed through the eastern and southern part of the site. The primary vegetation type was moist graminoid tundra; the landform was low-centered polygons. An area of dry prostrate shrub tundra on hummocky terrain was associated with the river bank.

Observer Station and Schedule

The observation point was located in the center of the study site on the hummocky terrain of the river bank. Observations were made on June 25, July 10 and 25, and August 9.

Wildlife Observations

Two caribou were observed feeding on the alluvial area on August 9, and one was feeding on the adjacent tundra on July 25. On August 9, a group of 9 caribou that were in the general area but not on the study site, spent most of the time feeding in alluvial areas as opposed to tundra. Tracks were scattered over the alluvium and *Artemisia* spp. had been heavily grazed.

Other evidence of mammal use included ground squirrel burrows in the river bank and fox scat near the observation point. An arctic fox passed through the alluvial area on August 9.

Oldsquaw was the only waterfowl species observed on the study site. On two occasions, birds used the open water in the alluvial area for brief periods of feeding and resting or preening.

Shorebirds were observed in the alluvial area both on open water and feeding at the water's edge, although few observations were made. No shorebirds were observed on the undisturbed area, but a Semipalmated Sandpiper nested there.

Lapland Longspurs were observed in small numbers in both alluvial and tundra areas. Few observations were made and there appeared to be little use of the area by longspurs.

SITE 18: SAG RIVER 2

Location and Access

Sag River 2 (Fig. A-18) is located in the Prudhoe Bay Unit in Sec. 21, T10N, R15E, approximately 0.6 km west of Drill Site 17. A gravel road from Drill Site 17 crosses a peat road before reaching the Sagavanirktok River. The east corner of the site is immediately south of Sag River 3 (Site 17).

Description: Disturbed Area

The disturbed area consisted of gravel alluvium of the Sagavanirktok River. The dimensions were approximately 200 m x 100 m. It was irregular in shape with some gravel areas extending into the undisturbed portion of the study site. Water of the Sag River occupied a portion of the plot. Dominant plant species included *Artemisia* spp., *Stellaria* spp., *Salix* spp., *Oxytropis* spp., and *Epilobium latifolium.*

Description: Undisturbed Area

The undisturbed portion of the study plot consisted of tundra southeast of the alluvium. The dimensions were approximately 200 m x 100 m. It was irregularly shaped with two small tundra streams passing through the eastern

portion. The vegetation type was dry prostrate shrub tundra; the landform was reticulate and non-patterned ground.

Observer Station and Schedule

The observation point was located on undisturbed tundra adjacent to alluvium near the center of the study plot. Observations were made on June 25, July 10 and 25, and August 9.

Wildlife Observations

Two caribou were observed feeding briefly on vegetation on the alluvium on August 9. No other caribou were observed on the study plot. Fresh caribou tracks were observed on the alluvium on July 10.

On August 9 an Arctic ground squirrel was observed briefly both on the disturbed and undisturbed portions of the study site. Fox scat was present in the western corner of the alluvium, and a fox was hunting in the area between morning and afternoon observation periods on July 25.

Two Oldsquaws were feeding in open water briefly on June 25. No other waterfowl were observed in the area. Waterfowl tracks and scat were present on the alluvium and tundra near the observation point.

Shorebirds were observed in both disturbed alluvium and undisturbed tundra on June 25. Two Semipalmated Sandpipers were feeding along the edge of the river water in the central part of the alluvial plot. Up to three Buff-breasted Sandpipers were observed feeding, preening, and displaying on the southeastern portion of the undisturbed tundra. On August 9 two Common Snipes were observed briefly on gravel in the alluvial plot.

Lapland Longspurs were observed through much of the season. They were feeding, resting, preening, and displaying on the undisturbed tundra. A maximum of seven longspurs was observed on August 9. No longspurs were observed using the alluvium.

SITE 19: SAG RIVER 4

Location and Access

Sag River 4 (Fig. A-19) is located in the Prudhoe Bay Unit in Sec. 16, T10N, R15E, approximately 1.3 km east northeast of Drill Site 17. It can be reached from the gravel road between drill sites 17 and 3. It lies 914 m at a bearing of 302° from the second expansion loop in the flow-line northeast of Drill Site 17.

Description: Disturbed Area

The disturbed area consisted of alluvium of the Sagavanirktok River. The dimensions were approximately 200 m x 110 m. The site was uniformly flat and was composed of gravel and sand. An intermittent watercourse ran through the middle of the site. The vegetation complex was similar to that at Sag River 3 (Site 17); conspicuous species included *Salix* spp., *Epilobium latifolium*, *Artemisia* spp., and *Dryas integrifolia*. There was a noticeable absence of the common *Draba* spp. and *Arabis* spp. which had been observed to colonize gravel pads at exploratory well sites.

Description: Undisturbed Area

The undisturbed portion of the study site consisted of tundra southeast of the alluvium. The dimensions were approximately 200 m x 90 m. The area was composed of dry prostrate shrub tundra on reticulate patterned ground adjacent to the alluvium, and moist graminoid tundra on non-patterned ground to the southeast.

Observer Station and Schedule

The observation point was located near the center of the study plot on tundra adjacent to the alluvium. Observations were made on June 26, July 11 and 26, and August 10.

Wildlife Observations

Caribou and arctic ground squirrel were observed only on undisturbed tundra. One caribou was feeding briefly on July 11, and ground squirrels were observed on June 26 and August 10.

Two Oldsquaws were observed for much of the afternoon on July 26 in open water on the alluvial plot. The pair was feeding, resting, and preening.

Small numbers of shorebirds were observed both in the alluvium and on the undisturbed plot. Single Semipalmated Sandpipers feeding briefly on June 26 and July 26 were the only shorebirds observed using the alluvium. Two Lesser Golden-Plovers feeding on July 26 were the only shorebirds observed in the undisturbed plot.

A few Lapland Longspurs were observed feeding, resting, preening, and displaying on the alluvium on June 26 and August 10. None were observed using the undisturbed tundra.

SITE 20: OLIKTOK POND NORTH

Location and Access

Oliktok Pond North (Fig. A-20) is located in the Kuparuk Unit in Sec. 16, T13N, R9E, approximately 50 m north of Oliktok Pond (Site 21).

Description

Oliktok Pond North is shallow with abrupt margins, has a surface area of approximately 0.3 ha, and is surrounded by tundra. Sparse stands of *Arctophila fulva* were present near the north and south margins of the pond. Individual *Arctophila* and *Carex aquatilis* plants were scattered around the rest of the pond.

Observer Station and Schedule

The observation point was located on the gravel road about 40 m east of the south end of the pond. Oliktok Pond (Site 21) was also observed from this point. Most of the pond could be clearly observed with the exception of the area immediately beyond the west bank which was obscured from view. Observations were made on July 4 and 16 and August 1 and 15.

Wildlife Observations

Wildlife use of this pond was restricted to a few observations of shorebirds. Dunlin, Lesser Golden-Plover, and Semipalmated Sandpiper were observed feeding around the pond edge, and Red-necked Phalaropes were feeding in open water. A Rock Ptarmigan was observed feeding on the tundra at the pond edge, but this activity may not have been related to the pond. All observations of wildlife were made on July 4 and 16. Although no waterfowl were present during observation periods, exposed *Arctophila* shoot-tops showed evidence of grazing.

SITE 21: OLIKTOK POND

Location and Access

Oliktok Pond (Fig. A-20) is located in the Kuparuk Unit in Sec. 16, T13N, R9E, approximately 3.4 km south of the Oliktok Dock. It is on the east side of the gravel road adjacent to the access road to Drill Site 3Q.

Description

Oliktok Pond is shallow with a surface area of approximately 0.4 ha. It is part of the *Arctophila* Feasibility Project (McKendrick 1988). Gravel from Oliktok Road borders the western side of the pond, forming a mud/gravel bank. The remaining portion is surrounded by tundra. Dense, emergent *Carex aquatilis* was present on the southern part of the pond. A narrow stand of *Arctophila fulva* was growing

immediately north of the *Carex*. Another small stand of *Arctophila* was present at the north end of the pond, and a few individual *Arctophila* plants were scattered around the pond margin.

Observer Station and Schedule

The observation point was located on the gravel road above the north end of the pond. This was also the observation point for Oliktok Pond North (Site #20). Observations were made from a parked vehicle on July 4 and 16 and August 1 and 15.

Wildlife Observations

Waterfowl were observed on July 4 and 16. A pair of Oldsquaws was feeding in open water on July 4 for several hours. On July 16 a male and four female Spectacled Eiders were observed for several hours feeding as they moved around the perimeter of the pond. They rested briefly at the mud/gravel bank of the western pond edge and continued to feed during the morning observation period. They flew from the area just prior to the beginning of the afternoon observations. There was no evidence of waterfowl grazing on emergent vegetation, but scat was present in several locations on the pond bank.

Shorebirds were observed in small numbers during all four observation periods but most observations occurred on July 4 and 16. Red-necked Phalaropes were observed feeding in open water and in areas of emergent vegetation. Semipalmated Sandpipers were observed feeding along the western and northern pond edges where gravel and mud was exposed. Very few shorebirds were present on August 1 and 15.

SITE 22: OLIKTOK 3N POND

Location and Access

Oliktok 3N Pond (Fig. A-21) is located in the Kuparuk Unit in Sec. 33, T13N, R9E. It is on the southwest side of the road approximately 0.6 km southeast of Drill Site 3N.

Description

Oliktok 3N Pond is large with a surface area of approximately 6.4 ha and is part of the *Arctophila* Feasibility Project. The northeastern part of the pond is adjacent to the gravel road accessing Drill Site 3N; the remaining portion is surrounded by tundra. It is deep with abrupt margins around much of the perimeter. A deep, narrow channel on the east side connects this pond with Oliktok 3N Pond East (Site 23). A channel and two bays extend beyond the south edge of the pond. These areas were beyond the limit of the study site and are marked with a dotted line on the site map. Flowlines from Drill Site 3N are mounted on support structures which are embedded in the northeast end of the pond. Emergent *Carex aquatilis* was virtually absent, although a few scattered plants were present around the pond margin. *Arctophila fulva* was not present.

Observer Station and Schedule

The observation point was located on tundra at the northeast edge of the pond, immediately south of the flowlines. This was also the observation point for Oliktok 3N Pond East (Site 23). Observations were made on June 27, July 11 and 28, and August 11.

Wildlife Observations

Pacific Loons were active in the general area during the entire summer, but were observed on this pond only late in the season, on July 28 and August 11. A pair spent much of these days feeding, resting, and preening on open water. They had nested unsuccessfully at Oliktok 3N Pond East (Site 23) and used the channel between the two ponds to move from one to the other.

One to 2 Greater White-fronted Geese were observed on the southwest portion of the pond near the bank on June 27 and July 11. These geese fed in open water and rested on the bank. No other waterfowl were observed on the pond; however, many tracks were present in the mud borders of the bays on the southern end.

Pectoral Sandpipers were common in the area. Three nests were located within 50 m of the west bank of the pond. However, few observations of birds feeding around the pond edge were made. Two Red-necked Phalaropes and a single Lesser Golden-Plover were the only other shorebirds noted using the area.

SITE 23: OLIKTOK 3N POND EAST

Location and Access

Oliktok 3N Pond East (Fig. A-21) is located in the Kuparuk Unit in Sec. 33, T13N, R9E. It is approximately 0.6 km southeast of Drill Site 3N. It is immediately east of Oliktok 3N Pond (Site 22).

Description

Oliktok 3N Pond East is deep and has a surface area of approximately 1.9 ha. It is surrounded by tundra on the north and east. Beyond the southern end is a wet, marshy area. On the west it is separated from Oliktok 3N Pond (Site 22) by a narrow peninsula. The two ponds are connected by a narrow channel. Another peninsula divides the southern portion of the pond. Trace amounts of emergent *Carex aquatilis* were distributed around the pond margin; *Arctophila fulva* was not present.

Observer Station and Schedule

The observation point was located approximately 35 m northwest of the north end of the pond. This was the same observation point used for Oliktok 3N Pond (Site 22). Observations were made on June 27, July 11 and 28, and August 11.

Wildlife Observations

A pair of Pacific Loons was present for much of the summer. They nested unsuccessfully on the west side of the peninsula which divided the southern portion of the pond. The pair was observed feeding, resting, and preening on open water, and they occasionally moved through the channel to Oliktok 3N Pond (Site 22). No other waterfowl were observed on the pond but tracks and scat of ducks and/or geese were present around the perimeter.

There were few observations of shorebirds and passerines on the pond. A Black-bellied Plover and a Snow Bunting were observed at the pond edge.

SITE 24: DRILL SITE 3B POND

Location and Access

Drill Site 3B Pond (Fig. A-22) is located in the Kuparuk Unit in Sec. 16, T12N, R9E. It is immediately east of the gravel road at Drill Site 3B.

Description

Drill Site 3B Pond is elongated with a surface area of approximately 4.6 ha. It is surrounded by tundra on the north and south, and a pond system to the east. A band of disturbed tundra about 30 m wide was present on the west side between the pond and the gravel road. This area was flooded early in the season. Mud became exposed as the water level dropped. Trace amounts of emergent *Carex aquatilis* were dispersed around the edges of the pond.

Observer Station and Schedule

The observation point was located on the gravel road above the western part of the pond. Observations were made on June 28, July 14 and 29, and August 12.

Wildlife Observations

Pacific Loons were present throughout the summer. A pair had a nest which was unsuccessful in the southwestern part of the pond. Loons were present much of the time feeding, resting, and preening on open water. They used all parts of the pond.

Other waterfowl and shorebirds used the wet bays and flooded tundra on the west side of the pond. King Eiders, Northern Pintails, and Greater White-fronted Geese were feeding and resting in this area early in the season. As the water level dropped, shorebirds were commonly observed feeding in exposed mud and tundra. Numbers of individuals were higher than at most other sites in this study.

SITE 25: DRILL SITE 1A IMPOUNDMENT

Location and Access

Drill Site 1A Impoundment (Fig. A-23) is located in the Kuparuk Unit in Sec. 5, T11N, R10E. It is immediately north of the gravel pad at Drill Site 1A.

Description

Drill Site 1A Impoundment is a shallow, irregularly shaped impoundment. The portion of this impoundment that was observed was bordered on the north by a pipeline and on the west by a powerline. The southern border was a continuation of a line formed by the northern edge of Drill Site 1A pad. The eastern boundary was formed by a line from the observation point to a patch of vegetated tundra immediately west of the expansion loop in the pipeline. This portion of the impoundment had a surface area of approximately 1.7 ha. Dense emergent *Carex aquatilis* was present over much of the north-central portion of the pond. Small areas of exposed mud appeared in late summer when water levels dropped. Small vegetated islands were present on the western part of the impoundment. Aquatic invertebrates were common is some areas.

Observer Station and Schedule

The observation point was located on the Drill Site 1A gravel pad approximately 30 m east of the northwest corner. Observations were made on June 29, July 15 and 31, and August 13.

Wildlife Observations

A pair of King Eiders was present on June 30. They spent the entire morning and afternoon observation periods resting on one of the vegetated islands on the west side of the impoundment. A Greater White-fronted Goose spent the afternoon observation period feeding on *Carex* and resting in the northwest corner of the pond. No other waterfowl were observed during the study.

Shorebirds were present in small numbers throughout the summer. Red-necked Phalaropes were observed feeding on open water and often disappeared into emergent *Carex*. Baird's Sandpipers were feeding at the gravel edges of the impoundment on June 30. Semipalmated Sandpipers were observed later in the season probing in exposed mud.

SITE 26: KUPARUK 55 POND

Location and Access

Kuparuk 55 Pond (Fig. A-24) is located in Sec. 13, T11N, R11E, on the south side of the Prudhoe Bay Oilfield Spine Road approximately 24.0 km west of the BPX Base Operations Camp (BOC).

Description

Kuparuk 55 is a large, deep pond and is part of the *Arctophila* Feasibility Project. The observed area consisted of a portion (13.9 ha) of the pond at the north end. The pond has a well-defined rim and had a band of shallow, emergent *Carex aquatilis* around the perimeter. Beyond the *Carex* in deeper water, *Arctophila fulva* formed a dense cover. A large area of open water was present in the center of the pond. The Kuparuk Oil Sales Line passes through the northern edge of the pond outside the area observed.

Observer Station and Schedule

The observation point was located on the northeast rim of the pond about 60 m south of the Spine Road. The area observed included emergent vegetation on the northeast side of the pond and open water beyond. Emergent vegetation on the west side of the pond was not included. Observations were made on June 29, July 15 and 31, and August 13.

Wildlife Observations

Pacific Loons were present during all observation periods. A pair nested in dense *Arctophila* on the southeast edge of the observed area. The loons were observed feeding, resting, and preening on open water and in emergent *Arctophila*. Several other loons were usually present further south outside the area observed.

Northern Pintails were observed during much of the season. Observations were difficult because pintails were usually concealed in emergent *Arctophila* or *Carex*. A pair of Oldsquaws was observed feeding in open water on June 29.

Shorebirds were present much of the season but observation was obscured by dense emergent vegetation. Red-necked Phalaropes were active in emergent *Carex* and *Arctophila* but seemed to prefer areas of *Carex*. Most observations were of birds landing and disappearing into vegetation. Pectoral Sandpipers were also present in the area but remained in drier areas on the rim of the pond.

SITE 27: J PAD POND

Location and Access

J Pad Pond (Fig. A-25) is located in the Prudhoe Bay Unit in Sections 9 and 10, T11N, R13E, approximately 7.1 km west of the BOC. It lies immediately east of the J Pad access road, and south of the Spine Road.

Description:

The areal extent of J Pad Pond was approximately 5.0 ha. The pond is part of the *Arctophila* Feasibility Project, and is deep with abrupt edges. Thick stands of *Arctophila fulva* were located around the pond perimeter. A channel in the southeast connects J Pad Pond to another pond system to the east. Gravel roads are immediately adjacent to the northwest part of the pond. Three culverts allow water to pass under these roads. The rest of the pond is surrounded by tundra.

Observer Station and Schedule

The observation point was located on the J Pad rear access road approximately 140 m south of the Spine Road. The area observed was limited by the channel in the southeast end of the pond and is marked with a dotted line on the site map. Observations were made on June 27, July 14 and 29, and August 13.

Wildlife Observations

Waterfowl were present throughout the summer. Pacific Loons were observed during all observation periods. They were observed feeding, resting, and preening in open water in the central part of the pond, and to a lesser extent in emergent *Arctophila*. A nest located on a small peninsula in the northwest part of the pond was inactive on July 29 and may have failed. Tundra Swans had a nest east of the J Pad Pond and spent much of the day on July 14 feeding in open water and emergent vegetation near the shoreline on the northwest part of J Pad Pond. A Northern Pintail landed and disappeared in thick emergent *Arctophila* on August 13.

SITE 28: GC-1 IMPOUNDMENT

Location and Access

GC-1 Impoundment (Fig. A-26) is located in the Prudhoe Bay Unit in Sec. 13, T11N, R13E, immediately north of Gathering Center 1 (GC-1). It lies on the north side of the GC-1 Spur Road to the flare pit.

Description

GC-1 Impoundment is a large area of impounded water with an areal extent of approximately 19.0 ha. It is surrounded by gravel roads and levees. The northeast end of the area observed is bounded by the back of a flare pit; it is marked by a dotted line on the site map (Fig. A-26). The impoundment continues beyond this point. Most of the impoundment was covered by dense emergent *Carex*

aquatilis. A small area of open water on the south-central portion contained *Arctophila fulva* in several locations around the perimeter. A fence from the access road to the flare pit bisects the open water and continues through the emergent *Carex* on the eastern portion of the impoundment.

Observer Station and Schedule

The observation point was located on the gravel road south of the impoundment adjacent to the open water. Observations in much of the impoundment were obscured by dense emergent vegetation. Observations were made on June 27, July 14 and 29, and August 13.

Wildlife Observations

Waterfowl were present in small numbers. Two adult Pacific Loons spent much of the day on August 13 feeding a chick in areas where *Arctophila* was present. Prior to this, loons had been observed on only one other occasion. An eider (species unknown) was observed on a nest in emergent *Carex* on the western part of the impoundment June 27, but was not seen after this date. A Northern Pintail and two Canada Geese were also observed feeding in areas with emergent vegetation on June 27.

Shorebirds were observed in small numbers on June 27 and July 29. Red-necked Phalaropes were observed feeding on open water or landing in emergent vegetation. A Semipalmated Sandpiper was feeding at the edge of the impoundment.

SITE 29: VASCOTT POND

Location and Access

Vascott Pond (Fig. A-27) is located in the Prudhoe Bay Unit in Sec. 5, T11N, R14E, between E Pad and K Pad. It lies on the northwest side of the road approximately 200 m southwest of the access road to K Pad.

Description

Vascott Pond is a shallow pond with a surface area covering approximately 1.0 ha. It is part of the *Arctophila* Feasibility Project. *Arctophila fulva* was transplanted here in 1986 and was still present in the areas of transplant during this study. Nevertheless, it was classified as a pond without *Arctophila* due to the sparseness of the transplants. The pond is adjacent to the road on the south side and is otherwise surrounded by tundra.

Observer Station and Schedule

The observation point was located on the gravel turn-out at an expansion loop about 40 m east of the southeast corner of the pond. Observations were made on June 24, July 9 and 24, and August 8.

Wildlife Observations

Waterfowl were observed on the pond on two occasions. A Greater White-fronted Goose rested briefly at the pond edge on June 24, and two Pacific Loons were feeding and resting for 40 min on July 9.

Shorebirds were also present in small numbers. Most observations were made on August 8 when White-rumped and Pectoral sandpipers were active around the pond edge.

SITE 30: POWERLINE POND

Location and Access

Powerline Pond (Fig. A-28) is located in the Prudhoe Bay Unit in Sec. 30, T11N, R14E, between the Central Power Station and Gathering Center 3 (GC-3). It lies about 100 m from the northeast side of the Spine Road immediately east of the gathering lines from GC-3.

Description

Powerline Pond is a shallow pond with abrupt edges and covers a surface area of approximately 1.4 ha. It is part of the *Arctophila* Feasibility Project. *Arctophila fulva* was sparsely distributed on the northern, eastern, and southern parts of the pond. The gathering lines from GC-3 are adjacent to the western side, and another pond is separated from the northern part by a band of tundra.

Observer Station and Schedule

The observation point was located on tundra approximately 30 m east of the north end of the pond. Observations were made on June 24, July 9 and 24, and August 8.

Wildlife Observations

A pair of Pacific Loons was present from July 9 to the end of the study. They nested on a small island on the west-central portion of the pond. On August 8 the adults were observed feeding at least one chick.

The only shorebird species observed on the pond was Red-necked Phalarope. Scattered observations of individuals were made through most of the observation periods. Most observations were of birds feeding in areas of open water near emergent *Arctophila*.

SITE 31: LAKE CAROL

Location and Access

Lake Carol (Fig. A-29) is located in the Prudhoe Bay Unit in Sec. 33, T11N, R14E, approximately 400 m east of Pump Station 1. It lies about 50 m southwest of the Spine Road. The ARCO Flowline passes through the north end of the pond.

Description

Lake Carol is a shallow pond with abrupt edges and a surface area covering approximately 0.6 ha. It is part of the *Arctophila* Feasibility Project. *Arctophila fulva* was transplanted here in 1986, but it was not present in the areas of transplant during the summer of 1989.

Observer Station and Schedule

The observation point was located on tundra about 30 m east of the southeast part of the pond. Observations were made on June 23, July 8 and 23, and August 7.

Wildlife Observations

The only birds observed on this pond were Northern Pintails on July 8. Two adults and five young were resting and feeding in open water and around the pond edge for about 40 min. A single adult remained for much of the day.

SITE 32: DRILL SITE 7 IMPOUNDMENT

Location and Access

Drill Site 7 Impoundment (Fig. A-30) is located in the Prudhoe Bay Unit in Sec. 34, T11N, R14E, east of Drill Site 7. It lies on the east side of the Oxbow Road opposite the east pad at Drill Site 7.

Description

Drill Site 7 Impoundment is surrounded by gravel roads. It is large with a surface area covering approximately 7.9 ha. This impoundment is part of the *Arctophila* Feasibility Study. *Arctophila fulva* was transplanted in three locations in 1986 and 1987. During the summer of 1989, small stands of *Arctophila* were present but very sparse; the impoundment was classified as one without *Arctophila*. The Drill Site 15 flowlines border the eastern part of the impoundment.

Observer Station and Schedule

The observation point was located at the north end of the impoundment on the gravel road at the intersection of the Oxbow Road and the Drill Site 15 pipeline construction road. Waterfowl could be identified over the entire impoundment; shorebirds could not be identified south of the northernmost expansion loop in the Drill Site 15 flowline. Observations were made on June 23, July 8 and 23, and August 7.

Wildlife Observations

Oldsquaws were observed feeding in open water on June 23 and July 23. A King Eider was also feeding in open water on June 23. No other waterfowl were observed on the impoundment.

Scattered observations of shorebird activity were also made. Red-necked Phalaropes, Baird's Sandpipers, and Semipalmated Sandpipers were observed feeding on the gravel along the pond edge.

SITE 33: DRILL SITE 7 IMPOUNDMENT (NE)

Location and Access

Drill Site 7 Impoundment (NE) (Fig. A-30) is located in the Prudhoe Bay Unit in Sec. 34, T11N, R14E. It is immediately east of Drill Site 7 Impoundment (Site 32).

Description

Drill Site 7 Impoundment (NE) is a large impoundment. It is bordered on the west by the gravel road between the Lisburne flowline and the Drill Site 15 flowline. The east and south margins are bordered by tundra. The area observed included only the portion east of a line from the bend in the Lisburne flowline to a peninsula on the south side of the impoundment. The areal extent of the observed area was approximately 8.2 ha. This impoundment is part of the *Arctophila* Feasibility Project. *Arctophila fulva* was transplanted north of the bend in the Lisburne flowline in 1987. Sparse *Arctophila* was present in the area of transplanting. Sparse emergent *Carex aquatilis* was present along the east shoreline.

Observer Station and Schedule

The observation point was located on the gravel road at the intersection of the Oxbow Road and the Drill Site 15 pipeline construction road. This also served as the observation point for Drill Site 7 Impoundment (Site 32). Observations were made on June 23, July 8 and 23, and August 7.

Wildlife Observations

Waterfowl were observed on Drill Site 7 Impoundment (NE) through much of the summer. Pacific Loons were observed feeding on open water on June 23, and July 8 and 23. Two adult Tundra Swans with four young were feeding in open water on July 23. An Oldsquaw was active briefly in emergent vegetation along the shoreline on June 23. Five Northern Pintails were resting near the bank on July 8.

Shorebirds were observed on July 8 and 23. Red-necked Phalaropes were the most commonly observed species. They were observed feeding in emergent vegetation and open water. Baird's and Semipalmated sandpipers were observed feeding along the pond edge, particularly along the gravel road bank.

SITE 34: BP DISCOVERY WELL IMPOUNDMENT

Location and Access

BP Discovery Well Impoundment (Fig. A-31) is located in the Prudhoe Bay Unit in Sec. 27, T11N, R14E, immediately south of the access road to BP Discovery Well. It can be reached from Drill Site 7 by proceeding north on the Oxbow Road and taking the first road to left (north). BP Discovery Well Impoundment is on the west side of this road about 1.1 km north of the Oxbow Road.

Description

BP Discovery Well Impoundment is relatively shallow with a surface area covering approximately 3.1 ha. It is bordered by the BP Discovery Well access road on the north and the Drill Site 15 pipeline construction road on the east. The Drill Site 15 flowlines are on the eastern part of the impoundment adjacent to the road. This impoundment is part of the *Arctophila* Feasibility Project. *Arctophila fulva* was sparsely distributed around the edges. Emergent *Carex aquatilis* was dense on the western and southern portion of the impoundment.

Observer Station and Schedule

The observation point was located on the BP Discovery Well access road above the northeastern corner of the impoundment. Observations were made on June 22, July 7 and 22, and August 6.

Wildlife Observations

Waterfowl were observed during the first half of the summer. Up to four Greater White-fronted Geese and two Canada Geese were feeding in emergent vegetation on June 22. Also on this date, a pair of Oldsquaws was feeding in open water. Three Tundra Swans were observed feeding and resting both in emergent vegetation and open water for much of the day on July 7.

Most shorebird observations were made on July 7. Red-necked Phalaropes were feeding and resting near emergent vegetation around the impoundment edge. A Dunlin and a Semipalmated Sandpiper were also observed for a brief period feeding around the impoundment edge. A few other shorebird observations were also made on July 22.

SITE 35: BP POND

Location and Access

BP Pond (Fig. A-32) is located in the Prudhoe Bay Unit in Sec. 27, T11N, R14E, approximately 70 m south of the Putuligayuk (Put) River. It lies on the east side of the Drill Site 15 access road about 0.5 km north of the Oxbow Road.

Description

BP Pond is a small, shallow pond with a surface area covering approximately 0.6 ha. The eastern and western ends lie within a few meters of gravel roads. The northern and southern margins are surrounded by tundra. This pond is part of the *Arctophila* Feasibility Project. *Arctophila fulva* was dense over much of the surface; an area of open water was present in the center and on the north side. Observations were sometimes obscured by dense *Arctophila*. Small amounts of emergent *Carex aquatilis* were also present around the perimeter.

Observer Station and Schedule

The observation point was located on the Drill Site 15 access road above the western edge of the pond. Observations were made on June 30, July 15, and August 2 and 15.

Wildlife Observations

Waterfowl were present only on July 15. One Oldsquaw landed and remained at the pond for about 30 min.

Shorebirds were active in small numbers throughout much of the summer. Most activity occurred on August 15 when up to five Red-necked Phalaropes were observed feeding in emergent *Arctophila*. A few phalaropes were also observed earlier in the summer along with Semipalmated Sandpipers, which were feeding around the pond edge.

SITE 36: DRILL SITE 15 PIPELINE IMPOUNDMENT

Location and Access

Drill Site 15 Pipeline Impoundment (Fig. A-33) is located in the Prudhoe Bay Unit in Sec. 27, T11N, R14E, approximately 1.3 km south of Drill Site 15. It lies on the west side of the Drill Site 15 access road immediately south of the first expansion loop north of the Put River.

Description

Drill Site 15 Pipeline Impoundment has a surface area covering approximately 1.3 ha and is part of the *Arctophila* Feasibility Project. *Arctophila fulva* was present over much of the surface. Dense areas of *Arctophila* occurred on the north, west, and southwest portions of the impoundment. *Arctophila* was sparsely distributed over the remaining portion.

Observer Station and Schedule

The observation point was located on the gravel at the expansion loop overlooking the north side of the impoundment. Observations were made on June 22, July 7 and 21, and August 6.

Wildlife Observations

Most waterfowl observations were made on June 22. Two Red-throated Loons spent the entire day feeding in areas with both dense and sparse emergent *Arctophila* on the western part of the impoundment. Up to four King Eiders were also present for part of the day. The only other observations of waterfowl were on July 21 when a Red-throated Loon was present for a brief period in the afternoon.

Shorebirds were observed through much of the summer. Red-necked Phalarope was the most consistently observed species. Most phalarope observations were made on July 7 and 21. They were observed feeding, resting, and preening in emergent *Arctophila*, open water, and at the impoundment edge. Areas of consistent feeding were located in the south-central portion of the impoundment and near the gravel bank at the expansion loop. One Semipalmated Sandpiper feeding at the impoundment edge near the gravel road was the only other shorebird observed.

SITE 37: TRANSPLANT POND

Location and Access

Transplant Pond (Fig. A-34) is located in the Prudhoe Bay Unit in Sec. 26, T11N, R14E, approximately 3.0 km northeast of Drill Site 7. It can be reached by proceeding north from Drill Site 7 on the Oxbow Road, continuing northeast for approximately 1.5 km, and turning on the Lisburne Pipeline Construction Road, a

gravel road to the right. The pond is located 0.6 km down this road on the south side.

Description

Transplant Pond is a small, shallow pond with a surface area covering approximately 0.3 ha. It had been drained as late as 1972. After 1973, drainage was blocked and this pond developed. It is part of the *Arctophila* Feasibility Project and in 1985, *Arctophila fulva* was transplanted into this pond. In 1989, a few plants were observed scattered over the surface. Due to the sparseness of the transplants, this pond was classified as being without *Arctophila*. *Carex aquatilis* was also sparsely distributed around the pond edges.

Observer Station and Schedule

The observation point was located approximately 40 m southeast of the southern edge of the pond. From here both Transplant Pond and Transplant Control Pond (Site 38) could be observed. Observations were made on June 20, July 4 and 19, and August 3.

Wildlife Observation

Few observations of wildlife use at this pond were made. Two Semi-palmated Sandpipers were feeding at the pond edge on July 19, and a Lapland Longspur was feeding briefly on July 4. Scat from caribou, fox, and microtine rodents were present around the pond perimeter.

SITE 38: TRANSPLANT CONTROL POND

Location and Access

Transplant Control Pond (Fig. A-34) is located in the Prudhoe Bay Unit in Sec. 26, T11N, R14E. It lies about 50 m south of Transplant Pond (Site 37). Access to this pond is described in Site 37: Transplant Pond "Location and Access".

Description

Transplant Control Pond is irregularly shaped and covers a surface area of approximately 0.7 ha. The pond is shallow with abrupt edges and is part of the *Arctophila* Feasibility Project. Sparse emergent *Carex aquatilis* was scattered around the perimeter of the pond. *Arctophila fulva* was not present.

Observer Station and Schedule

The observation point was located approximately 50 m east of the northern lobe of the pond. From here, both Transplant Control Pond and Transplant Pond (Site 37) could be observed. Observations were made on June 20, July 4 and 19, and August 3.

Wildlife Observations

Waterfowl were observed on Transplant Control Pond during the first three observation periods. A pair of Oldsquaw was feeding and resting on June 20 during the morning and afternoon. A single Oldsquaw was present on July 19. A Northern Pintail was resting at the pond edge on July 4. On July 19, two Pacific Loons were present during the afternoon. Waterfowl scat was present in two locations at the pond bank.

Shorebird activity was limited to observations of a Lesser Golden-Plover on July 20. This bird was observed feeding at the pond edge.

SITE 39: DRILL SITE 5 POND

Location and Access

Drill Site 5 Pond (Fig. A-35) is located in the Prudhoe Bay Unit in Sec. 31, T11N, R15E, approximately 250 m northwest of the northwest corner of Drill Site 5 pad. It can be seen from the gravel pad and can be reached in 5 min on foot.

Description

Drill Site 5 Pond is irregular in shape and covers a surface area of approximately 4.5 ha. It is part of the *Arctophila* Feasibility Project. A narrow band of emergent *Carex aquatilis* was present along the north and south edges. *Arctophila fulva* was dense on the northern, eastern, and southern parts of the pond and extended about 50 m from the shoreline into the pond. The western and central portions of the pond were open water. Aquatic invertebrates were common along the shoreline. On June, 20 small blocks of ice were floating in the pond center.

Observer Station and Schedule

The observation point was located on tundra about 100 m south of the pond. Drill Site 5 Trail Pond (Site 40) could also be observed from this point. Observations were made on June 20, July 4 and 19, and August 3.

Wildlife Observations

Waterfowl were observed during much of the summer. Pacific Loons were present on June 20, July 4, and August 3. One to three individuals were observed feeding, resting, and preening both in open water and emergent *Arctophila*. On July 4, two Northern Pintails and a Tundra Swan were observed feeding in emergent *Arctophila*.

SITE 40: DRILL SITE 5 TRAIL POND

Location and Access

Drill Site 5 Trail Pond (Fig. A-35) is located in the Prudhoe Bay Unit in Sec. 31, T11N, R15E, approximately 110 m west of the northwest corner of Drill Site 5 pad. It is about 50 m southeast of Drill Site 5 Pond (Site 39).

Description

Drill Site 5 Trail Pond has a surface area of approximately 1.4 ha and is part of the *Arctophila* Feasibility Project. Very sparse emergent vegetation consisted of a small stand of *Arctophila* near the south shore and *Carex aquatilis* scattered around the pond margin. Aquatic invertebrates appeared to be less common than in Drill Site 5 Pond (Site 39). Ice covered about 50% of the pond surface on June 20.

Observer Station and Schedule

The observation point was located on tundra approximately 100 m west of the pond. Drill Site 5 Pond (Site 39) was also observed from this point. Observations were made on June 20, July 4 and 19, and August 3.

Wildlife Observations

Pacific Loon and Canada Goose were the only species observed at Drill Site 5 Trail Pond. Two loons were observed resting, preening, and feeding on open water on June 20. A single loon fed briefly on July 19. A single Canada Goose was present briefly on June 20.

SITE 41: CULVERT LAKE COLEEN

Location and Access

Culvert Lake Coleen (Fig. A-36) is located in the Prudhoe Bay Unit in Sec. 24, T10N, R14E, approximately 1.1 km northwest of Deadhorse. The lake is on the left (west) side of the road from Deadhorse to Drill Site 13.

Description

Culvert Lake Coleen is a shallow pond with a surface area of approximately 4.9 ha and is part of the *Arctophila* Feasibility Project. Early in the season the area

was flooded and the surface area was greater. Dense *Arctophila fulva* covered much of the surface, but there were several areas of open water. Sparse *Carex aquatilis* was also scattered along the pond margin. A culvert on the east side supplied water from Lake Coleen. The culvert lies beneath a gravel road which forms much of the eastern boundary of the pond.

Observer Station and Schedule

The observation point was located on the gravel road approximately 30 m southeast of the culvert. The pond could be seen from this point but observations were sometimes obscured by dense *Arctophila*. Observations were made on June 21, July 6 and 20, and August 4.

Wildlife Observations

Waterfowl were present during most of the observation periods, and species richness was greater than at most sites in this study. Much of the activity was observed in open water; fewer observations were made in emergent *Arctophila*, but this may have been due to the poor visibility in dense vegetation. Feeding observations included diving by Pacific Loons, Spectacled Eiders, and Oldsquaws; and dabbling by Northern Pintails, Green-winged Teal, and Northern Shoveler. *Carex* and *Arctophila* near the road showed signs of heavy grazing. A Pacific Loon appeared to be nesting in dense emergent vegetation on the northern part of the pond on June 21, but was not observed after this date. A pair of Brant with four young was present on July 6.

Shorebirds were also observed feeding around the pond edge, in shallow areas of emergent vegetation, and in open water. They were active throughout the summer. The species observed most consistently was Red-necked Phalarope. Other species included Black-bellied Plover, Stilt Sandpiper, and Semipalmated Sandpiper.

SITE 42: DRILL SITE 12 IMPOUNDMENT

Location and Access

Drill Site 12 Impoundment (Fig. A-37) is located in the Prudhoe Bay Unit in Sec. 19, T10N, R15E, approximately 350 m southwest of Drill Site 12. It lies on the southeast side of the road from Lake Coleen to Drill Site 12.

Description

Drill Site 12 Impoundment is bordered by the road to Drill Site 12 on the north and northwest and by a gravel pad on the east. Wet tundra, which was flooded early in the season, surrounds the western and southern borders. A small area of tundra borders the northeast edge of the impoundment. The impoundment has an irregular shape with an areal extent of approximately 1.7 ha. Most of the surface area was open water during the study, although stands of emergent *Carex aquatilis* were located in several areas.

Observer Station and Schedule

The observation point was located on elevated tundra near the western edge of the pond. Observations in the northeastern portion were obscured by emergent vegetation. Observations were made on June 21, July 6 and 20, and August 5.

Wildlife Observations

Waterfowl were most active on June 21 and July 6. Up to seven Northern Pintails were feeding primarily in areas with emergent *Carex*, but also in open water. Two Oldsquaws were resting at the pond edge on June 6.

Red-necked Phalarope was the only shorebird species observed consistently during the season. Phalaropes were observed feeding, resting, and preening on open water and in emergent vegetation. Most activity occurred on June 21 and July 6, and was reduced in late season.

SITE 43: SAND DUNE LAKE

Location and Access

Sand Dune Lake (Fig. A-38) is located in the Prudhoe Bay Unit in Sec. 26, T11N, R15E, approximately 3.4 km south of East Dock. It lies about 50 m east of the gravel road to East Dock.

Description

Sand Dune Lake is a shallow pond with a surface area of approximately 1.6 ha. A small area in the center was open water; *Arctophila fulva* formed dense emergent vegetation over the rest of the surface.

Observer Station and Schedule

The observation point was located on tundra about 20 m north of the pond. Observations were made on June 18, July 3 and 17, and August 1.

Wildlife Observations

One Oldsquaw was observed feeding briefly in open water on June 18. No other wildlife was observed at this pond during the summer. However, a Red-throated Loon concealed itself in dense *Arctophila* on September 5, several weeks after the period of observation had ended.

SITE 44: EAST DOCK POND

Location and Access

East Dock Pond (Fig. A-39) is in the Prudhoe Bay Unit in Sec. 15, T11N, R15E, immediately south of the East Dock facility. It lies west of the East Dock road approximately 150 m north of the road to Drill Site L5.

Description

East Dock Pond is a small, circular pond with a surface area of approximately 3.7 ha. *Carex aquatilis* was growing adjacent to the eastern and southern shoreline. Beyond this, *Arctophila fulva* was dense on the northern, eastern and southern parts of the pond and extends about 50 m into the water from the shoreline. The western and central portions of the pond were open water. Two small areas of open water in the northeastern part of the pond were surrounded by *Arctophila fulva* and the gravel shoreline formed by the East Dock pad. Aquatic invertebrates were common along the shoreline.

Observer Station and Schedule

The observation point was located on the gravel pad above the northeast shoreline of the pond. The blind was placed to the west of a gravel mound. The entire pond could be observed, although the thick *Arctophila* sometimes concealed birds. Observations were made on June 18, July 2 and 17, and August 1.

Wildlife Observations

Waterfowl were consistently present on East Dock Pond. A pair of Pacific Loons was active for most of the day on June 18. Their activity centered around the thick emergent *Arctophila* and adjacent open water on the northern part of the pond. The loons were observed feeding, resting, and preening. During the break between morning and afternoon observation periods, the pair was observed copulating on the northwest bank of the pond.

Northern Pintails were also present on June 18 for most of the day. They remained in thick *Arctophila* on the southeastern part of the pond where most of their behavior consisted of feeding.

Two Oldsquaws were present briefly on June 18. They were observed resting at the pond edge and flew off at the beginning of the afternoon observation period. Eight Mallards landed in emergent *Arctophila* early in the afternoon observation period of August 1. They were immediately concealed by the vegetation and were not seen during the remaining portion of the observation period.

Shorebirds were active throughout the summer. Red-necked Phalaropes were observed feeding primarily in areas of emergent *Arctophila,* but also in open water. Phalaropes were present throughout the season. Baird's and Semipalmated sandpipers were occasionally observed feeding around the pond edge.

SITE 45: E-2 ARFU POND

Location and Access

E-2 ARFU Pond (Fig. A-40) is located on open access land in Sec. 3, T10N, R16E, approximately 10.4 km east of the Endicott security checkpoint. It is approximately 90 m south of the Endicott Spine Road. It can be seen from the Spine Road beyond an area of sand dunes. It is immediately west of E-2 Non-ARFU Pond (Site 46).

Description

E-2 ARFU Pond is shallow with abrupt edges and covers a surface area of approximately 2.7 ha. It is part of the *Arctophila* Feasibility Project. Dense stands of *Arctophila fulva* were located around much of the perimeter. The center of the pond was open water. *Carex aquatilis* was present near the shore.

Observer Station and Schedule

The observation point was located on tundra about 40 m north of the east end of the pond. This also served as the observation point for E-2 Non-ARFU Pond (Site 46). Observations were made on June 17, and July 1, 16, and 31.

Wildlife Observations

Waterfowl were observed on the pond in small numbers. A pair of Oldsquaws was present on open water briefly on June 17. Tundra Swans were observed briefly on July 1 and 16.

Shorebirds were observed on the pond only on July 16. A Red-necked Phalarope was feeding in open water during the afternoon.

SITE 46: E-2 NON-ARFU POND

Location and Access

E-2 Non-ARFU Pond (Fig. A-41) is located on open access land in Sec. 3, T10N, R16E. It is immediately east of E-2 ARFU Pond (Site 45).

Description

E-2 Non-ARFU Pond has a surface area covering approximately 1.6 ha and is part of the *Arctophila* Feasibility Project and emergent vegetation was absent during this study.

Observer Station and Schedule

The observation point was located on tundra approximately 80 m northwest of the western end of the pond. This also served as the observation point for E-2 ARFU Pond (Site 45). Observations were made on June 17, and July 1, 16, and 31.

Wildlife Observations

A Red Phalarope was observed feeding briefly on open water on June 17. No other observations of wildlife use were made during the summer.

SITE 47: ENDICOTT DRY AND SUMMIT IMPOUNDMENTS

Location and Access

Endicott Dry and Summit impoundments (Fig. A-42) are located on open access land in Sec. 35, T11N, R16E. They are on the southeast side of the Endicott Spine Road approximately 1.6 km northeast of the Delta State 2 Pad (Site 12). A gravel "caribou crossing" over the pipeline borders the southwest side of Summit Impoundment. Endicott Dry Impoundment is immediately to the northeast and is bordered by the Endicott Spine Road.

Description

Endicott Dry Impoundment and Summit Impoundment are two small, shallow impoundments covering a combined surface area of approximately 0.4 ha. The two impoundments were treated as one study site. They are part of the *Arctophila* Feasibility Project. *Arctophila fulva* was not present; small amounts of emergent *Carex aquatilis* were present in both impoundments. The Endicott flowline passes through both impoundments.

Observer Station and Schedule

The observation point was located on the gravel of the "caribou crossing" at the southwest end of Summit Impoundment. Observations were made on June 17, and July 1, 16, and 31.

Wildlife Observations

Waterfowl were observed only on June 17. Two Oldsquaws were observed briefly feeding and resting on open water. However, waterfowl tracks were present around the edges of the impoundments.

Shorebirds were observed throughout the summer. Most observations were made on July 31. Up to seven Semipalmated Sandpipers were observed feeding, resting, and preening around the edges of the impoundments. Smaller numbers of Semipalmated Sandpipers had been observed earlier in the summer.

Few mammals were active around the impoundments. Several arctic ground squirrel burrows were located on the embankment between the two impoundments. A ground squirrel appeared to drink from the pond on one occasion. Caribou tracks were observed around the edges of the impoundments.

Table A-1. Summary of the vegetation types and surface form units used in classifying tundra plots (after Walker et al. 1983). This information is displayed in fractional form on the maps, with the vegetation code in the numerator and the surface form code in the denominator.

VEGETATION		SURFACE FORM	
Code	Dominant Vegetation	Code	Dominant Surface Form
1	Riparian shrub tundra	1	High-centered polygons, center-relief > 0.5 m
1a	Riparian prostrate shrub, forb, grass tundra	2	High-centered polygons, center-relief ≤ 0.5 m
2	Dry prostrate shrub, crustose lichen tundra	3	Low-centered polygons, center-relief > 0.5 m
3	Moist sedge, prostrate shrub tundra	4	Low-centered polygons, center-relief ≤ 0.5 m
3a	Moist tussock sedge, prostrate shrub tundra	5	Mixed high- and low-centered polygons
4	Wet sedge tundra	6	Frost-scar tundra
5	Aquatic sedge tundra	7	Strangmoor and/or discontinuous low-centered polygons rims
5a	Aquatic grass tundra	8	Hummocky terrain associated with steep slopes
6	Riverine barrens	9	Pingo
7	Moist snowbank dwarf shrub tundra	10	Non-patterned ground or with pattern occupying < 20%
Dd	Heavily disturbed tundra with debris, gravel, vehicle tracks, thermokarst, etc.	11	Reticulate pattern
		12	Active sand dune
		A	Floodplain alluvium

Table A-2. Wildlife species observed during study of disturbed and undisturbed habitats, Arctic Alaska, 1989.

Birds		Birds (cont'd)	
Scientific Name	Common Name	Scientific Name	Common Name
Gavia pacifica	Pacific Loon	*Tryngites subruficollis*	Buff-breasted Sandpiper
Gavia stellata	Red-throated Loon	*Stercorarius pomarinus*	Pomarine Jaeger
Cygnus columbianus	Tundra Swan	*Stercorarius parasiticus*	Parasitic Jaeger
Anser albifrons	Greater White-fronted Goose	*Stercorarius longicaudus*	Long-tailed Jaeger
Branta canadensis	Canada Goose	*Larus hyperboreus*	Glaucous Gull
Branta bernicla	Brant	*Larus thayeri*	Thayer's Gull
Anas platyrhynchos	Mallard	*Xema sabini*	Sabine's Gull
Anas crecca	Green-winged Teal	*Sterna paradisaea*	Arctic Tern
Anas acuta	Northern Pintail	*Circus cyaneus*	Northern Harrier
Anas clypeata	Northern Shoveler	*Buteo lagopus*	Rough-legged Hawk
Aythya marila	Greater Scaup	*Falco peregrinus*	Peregrine Falcon
Somateria spectabilis	King Eider	*Lagopus mutus*	Rock Ptarmigan
Somateria fischeri	Spectacled Eider	*Lagopus lagopus*	Willow Ptarmigan
Clangula hyemalis	Oldsquaw	*Asio flammeus*	Short-eared Owl
Charadrius semipalmatus	Semipalmated Plover	*Nyctea scandiaca*	Snowy Owl
Pluvialis squatarola	Black-bellied Plover	*Corvus corax*	Common Raven
Pluvialis dominica	Lesser Golden-Plover	*Anthus spinoletta*	Water Pipit
Limosa lapponica	Bar-tailed Godwit	*Motacilla flava*	Yellow Wagtail
Phalaropus lobatus	Red-necked Phalarope	*Passerculus sandwichensis*	Savannah Sparrow
Phalaropus fulicaria	Red Phalarope	*Calcarius lapponicus*	Lapland Longspur
Limnodromus scolopaceus	Long-billed Dowitcher	*Plectrophenax nivalis*	Snow Bunting
Calidris himantopus	Stilt Sandpiper	*Carduelis flammea*	Common Redpoll
Gallinago gallinago	Common Snipe		
Arenaria interpres	Ruddy Turnstone	Mammals	
Calidris alpina	Dunlin		
Calidris pusilla	Semipalmated Sandpiper	*Dicrostonyx groenlandicus*	Collared Lemming
Calidris minutilla	Least Sandpiper	*Spermophilus parryii*	Arctic Ground Squirrel
Calidris fuscicollis	White-rumped Sandpiper	*Alopex lagopus*	Arctic Fox
Calidris bairdii	Baird's Sandpiper	*Rangifer tarandus*	Caribou
Calidris melanotos	Pectoral Sandpiper	*Alces alces*	Moose

Table A-3. Checklist of vascular plant taxa found on gravel pads and alluvium during study of disturbed and undisturbed habitats, Arctic Alaska, 1989.

SPECIES	Site: West Sak 3	West Sak 4	West Sak 9	West Sak 11	West Sak 17	Put State 1	Hurl State Pad	Delta State Ugnu 1	Delta State Sag Delta 2	Sag Delta 31-11-16	Sag Delta 2	Kemik 1	Kemik 2	Lake State 1	Sag River 2	Sag River 3 & 4	Kup River 1	Kup River 3
Graminoids																		
Agropyron macrourum	X											X					X	
Agropyron yukonense																	X	
Alopecurus alpinus		X				X				X				X			X	
Arctagrostis latifolia	X					X			X	X		X	X	X		X	X	
Bromus Pumpellianus	X					X						X					X	
Calamagrostis canadensis																	X	
Carex aquatilis		X			X	X		X		X						X	X	
Carex Bigelowii																	X	
Carex capitata		X								X							X	
Carex rotundata																		
Carex sp.	X	X	X	X		X	X											
Deschampsia caespitosa										X				X		X	X	X
Elymus arenarius										X								
Eriophorum angustifolium								X										
Eriophorum vaginatum	X								X						X	X	X	X
Festuca baffinensis						X			X					X		X		
Festuca brachyphylla	X							X				X						
Festuca rubra								X									X	
Festuca vivipara						X		X		X	X						X	
Hierchloe alpina								X										
Juncus arcticus		X				X	X			X		X	X		X		X	
Juncus sp.								X										
Kobresia myosuroides												X						
Luzula arctica	X																	
Luzula multiflora								X										
Luzula tundricola								X										
Poa arctica				X							X	X					X	
Poa glauca												X						
Poa lanata								X										
Poa sp.	X							X		X								
Puccinellia Langeana														X				
Puccinellia sp.	X		X						X									
Trisetum spicatum			X		X					X		X		X			X	X

cont.

Table A-3. Cont.

SPECIES	Site: West Sak 3	West Sak 4	West Sak 9	West Sak 11	West Sak 17	Put State 1	Hurl State Pad	Ugnu 1	Delta State 2	Sag Delta 31-11-15	Sag Delta 2	Kemik 1	Kemik 2	Lake State 1	Sag River 2	Sag River 3 & 4	Kup River 1	Kup River 3
Forbs																		
Androsace septentrionalis												X						
Arabis arenicola	X									X		X		X				
Armeria maritima						X				X						X	X	
Artemisia alaskana																X		
Artemisia arctica	X															X	X	
Artemisia borealis						X				X	X			X		X	X	X
Artemisia glomerata						X										X	X	X
Artemisia Tilesii		X					X			X	X	X				X	X	X
Artemisia sp.							X		X			X	X				X	
Aster sibiricus										X			X		X		X	
Astragalus alpinus	X								X					X				
Astragalus sp.		X																
Braya humilis		X		X														
Braya pilosa			X						X		X				X			
Braya purpurascens			X	X										X				
Braya sp.	X	X																
Cardamine sp.										X								
Cerastium Beeringianum		X				X		X	X			X		X			X	X
Chrysanthemum integrifolium		X	X	X			X		X	X				X		X	X	X
Cochlearia officinalis								X						X	X	X		
Crepis nana		X	X				X						X					X
Descurainia sophioides												X						
Draba alpina	X		X	X		X			X	X								X
Draba cinerea	X	X				X		X										X
Draba hirta								X										
Draba lactea	X	X	X			X	X	X	X								X	X
Draba macrocarpa				X	X				X									
Draba sp.								X						X				
Epilobium angustifolium													X					
Epilobium latifolium		X	X	X		X	X		X			X	X	X		X	X	X
Equisetum arvense														X				
Equisetum pratense		X										X	X			X	X	X
Equisetum variegatum												X						
Erigeron grandiflorus						X											X	
Erysimum sp.												X						
Eutrema Edwardsii	X	X	X		X									X				
Gentiana propinqua												X					X	
Hedysarum Mackenzii																X		
Hedysarum sp.		X										X	X					
Lupinus sp.													X					
Melandrium apetalum	X	X	X	X	X	X	X		X					X		X	X	

cont.

Table A-3. Cont.

SPECIES	Site																		
	West Sak 3	West Sak 4	West Sak 9	West Sak 11	West Sak 17	Put State 1	Hurl State Pad	Ugnu 1	Delta State 2	Sag Delta 31-11-16	Sag Delta 2	Kemik 1	Kemik 2	Lake State 1	Sag River 2	Sag River 3 & 4	Kup River 1	Kup River 3
Forbs (cont.)																		
Minuartia arctica										X				X				
Minuartia obtusiloba			X	X		X				X		X	X			X	X	X
Minuartia sp.		X															X	
Oxyria digyna							X											X
Oxytropis arctica							X		X							X		X
Oxytropis deflexa																	X	
Oxytropis Maydelliana	X																	
Oxytropis nigrescens																		X
Oxytropis sp.						X						X	X				X	
Papaver Hultenii		X				X												
Papaver lapponicum	X	X															X	X
Papaver Macounii		X		X					X							X		X
Papaver sp.			X											X				X
Parrya nudicalis	X			X		X	X			X								
Pedicularis Kanei						X										X		
Pedicularis sudetica																	X	
Pedicularis sp.										X								
Polemonium boreale							X										X	
Polygonum bistorta		X															X	
Polygonum viviparum	X	X				X		X						X		X	X	
Potentilla Hookeriana											X							
Potentilla pulchella								X										
Potentilla uniflora						X						X					X	
Ranunculus nivalis								X										
Sagina intermedia		X						X						X		X		
Saussurea angustifolia				X					X									
Saussurea viscida		X																
Saxifraga caespitosa														X				
Saxifraga cernua		X	X	X	X			X	X									
Saxifraga hieraciifolia			X			X												
Saxifraga hirculus	X		X			X	X	X									X	
Saxifraga oppositifolia	X	X	X	X		X			X					X		X	X	
Saxifraga tricuspidata										X		X						
Sedum rosea										X								
Senecio atropurpureus								X										
Senecio resedifolius										X								X
Silene acaulis		X	X							X				X			X	X
Solidago multiradiata		X											X		X			
Stellaria Edwardsii			X					X										
Stellaria monantha	X			X								X			X	X	X	
Stellaria sp.												X		X				
Tripleurospermum phaeocephalum			X															
Wilhelmsia physodes							X									X	X	

cont.

Table A-3. Cont.

SPECIES	Site																	
	West Sak 3	West Sak 4	West Sak 9	West Sak 11	West Sak 17	Put State 1	Hori State Pad	Ugnu 1	Delta State 2	Sag Delta 31-11-16	Sag Delta 2	Kemik 1	Kemik 2	Lake State 1	Sag River 2	Sag River 3 & 4	Kup River 1	Kup River 3
SHRUBS																		
Dryas integrifolia	X	X	X			X							X	X		X	X	X
Potentilla fruticosa												X						
Salix arctica								X						X			X	
Salix fuscedscens									X									
Salix glauca													X					X
Salix ovalifolia								X						X		X		
Salix reticulata			X			X							X					
Salix rotundifolia			X			X	X									X	X	
Salix sp.	X	X				X		X		X	X	X						X
Sherperdia canadensis												X						

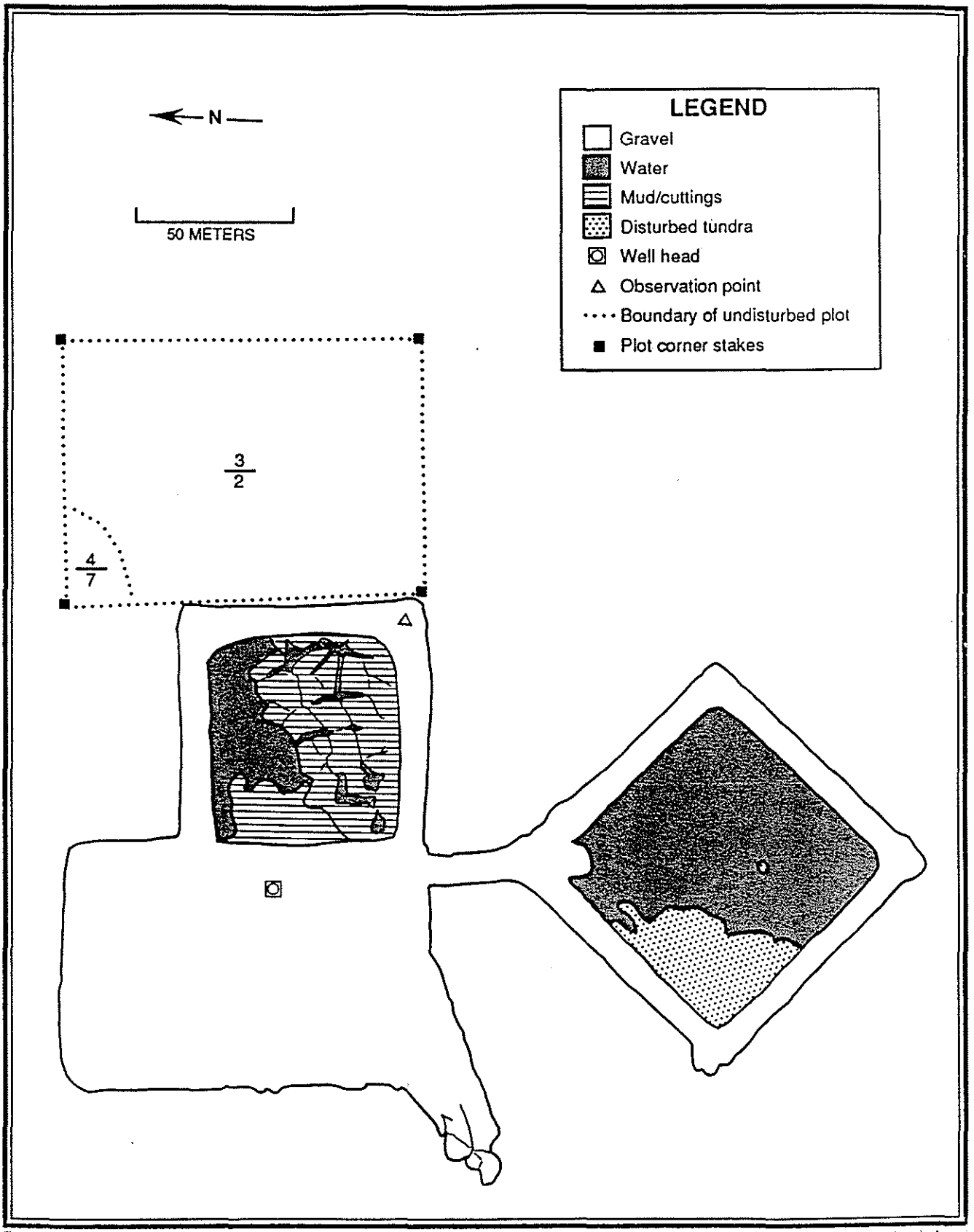


Fig. A-1. West Sak 17 (Site 1). Produced from Exploration Well Photography, 1989, Color Infrared Aerial Photography, 1:500. (Photography by Aeromap U.S., Anchorage, AK.)

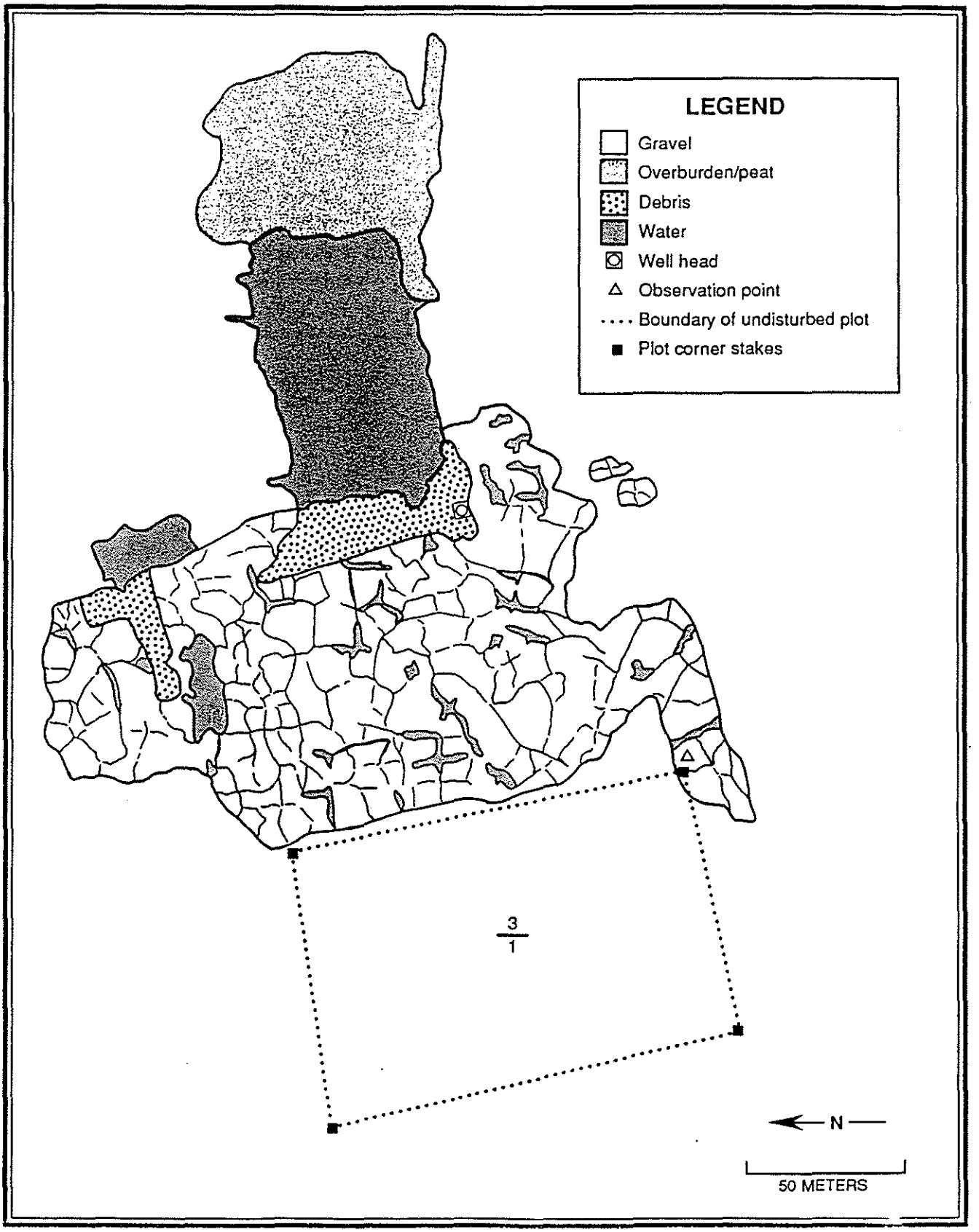


Fig. A-2. Ugnu 1 (Site 2). Produced from Exploration Well Photography, 1989, Color Infrared Aeria. Photography, 1:500. (Photography by Aeromap U.S., Anchorage, AK.)

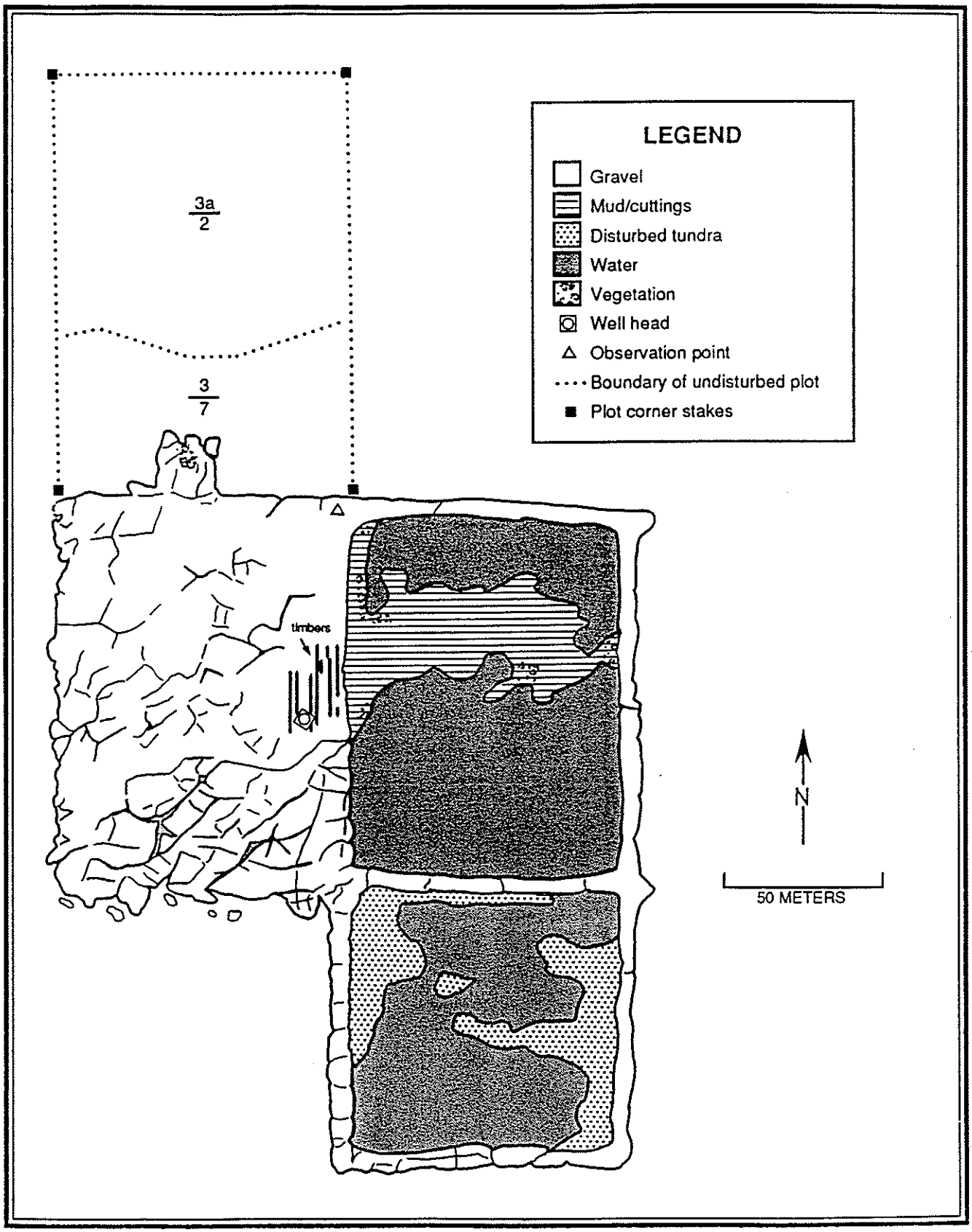


Fig. A-3. West Sak 11 (Site 3). Produced from Exploration Well Photography, 1989, Color Infrared Aerial Photography, 1:500. (Photography by Aeromap U.S., Anchorage, AK.)

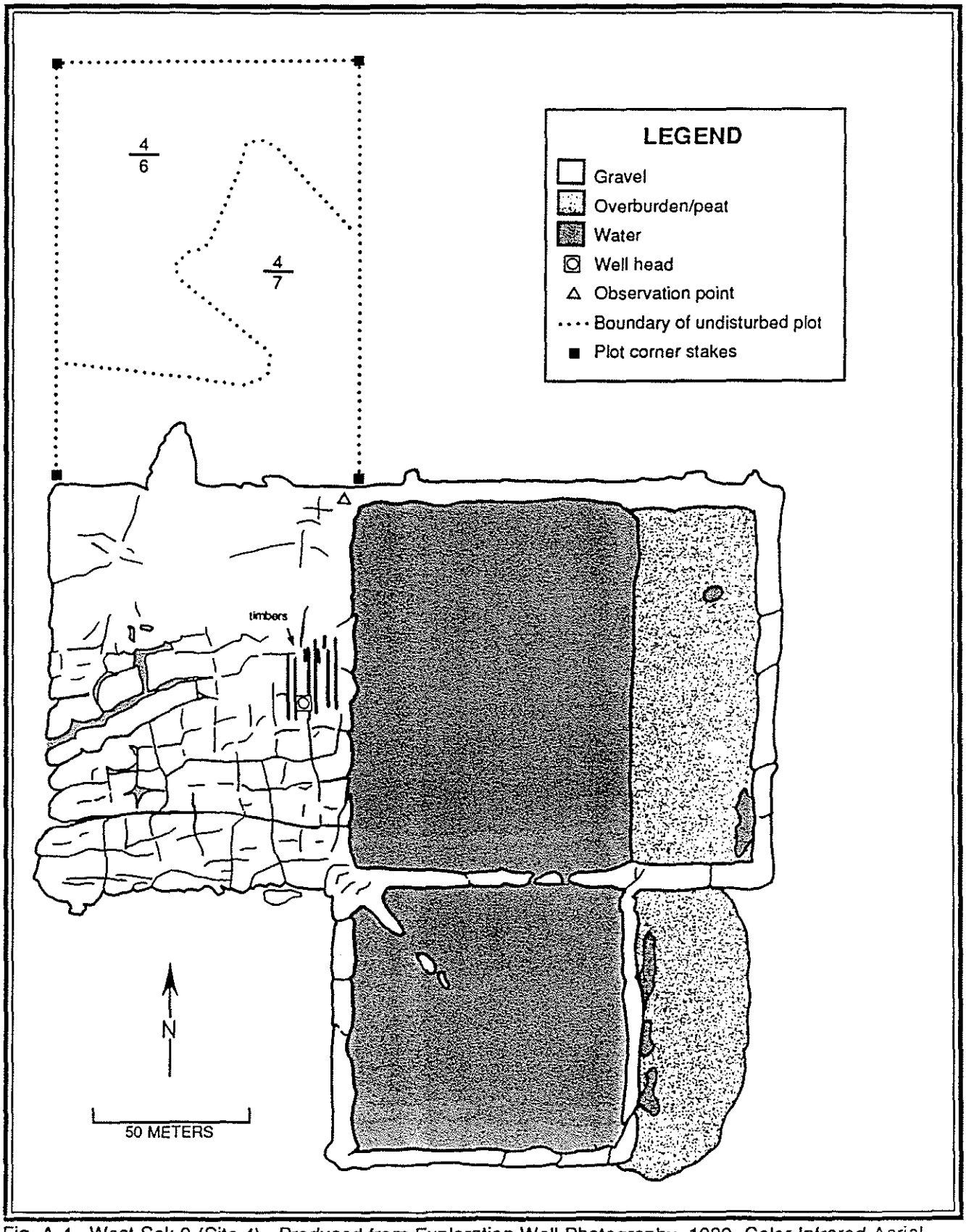


Fig. A-4. West Sak 9 (Site 4). Produced from Exploration Well Photography, 1989, Color Infrared Aerial Photography, 1:500. (Photography by Aeromap U.S., Anchorage, AK.)

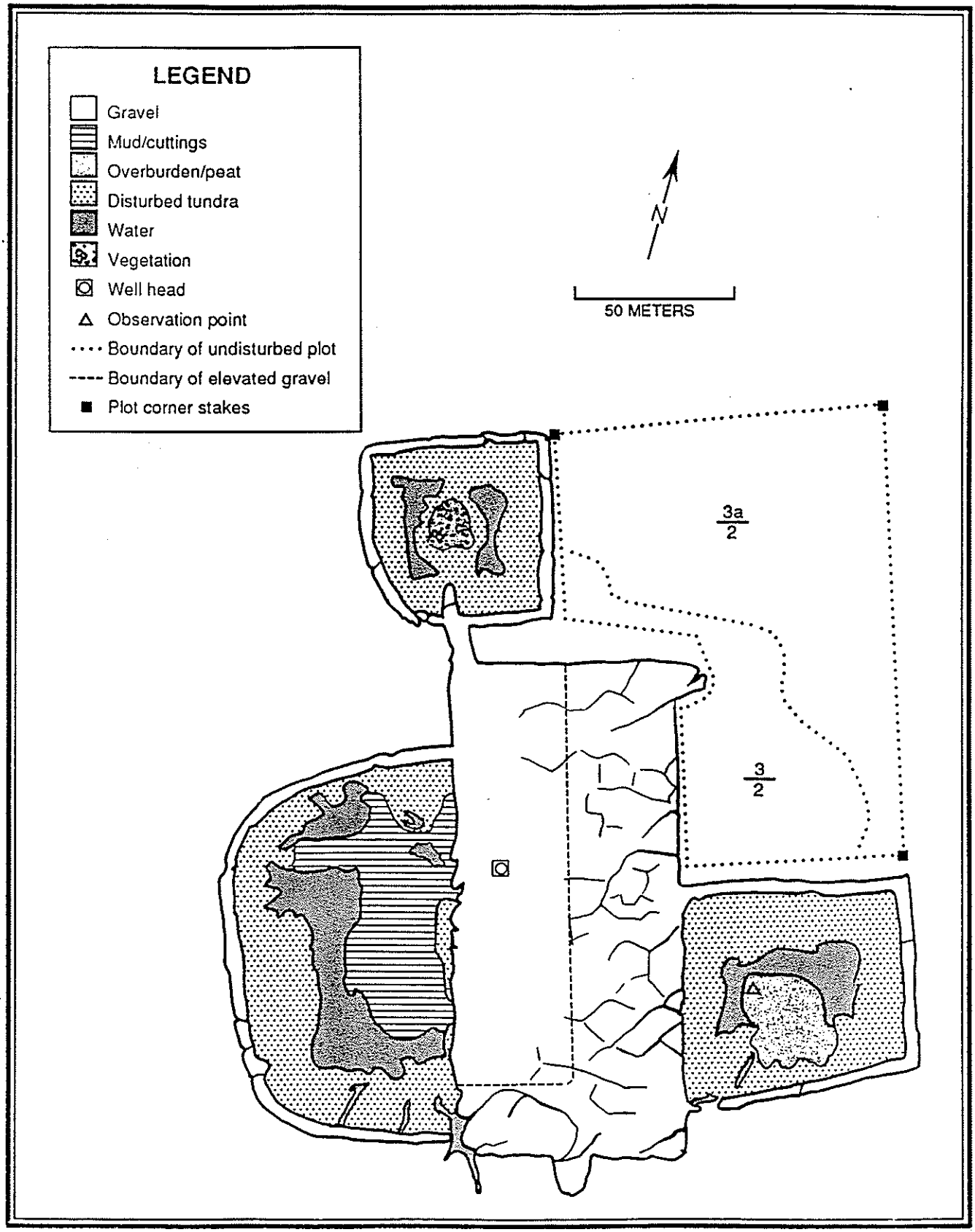


Fig. A-5. West Sak 3 (Site 5). Produced from Exploration Well Photography, 1989, Color Infrared Aerial Photography, 1:500. (Photography by Aeromap U.S., Anchorage, AK.)

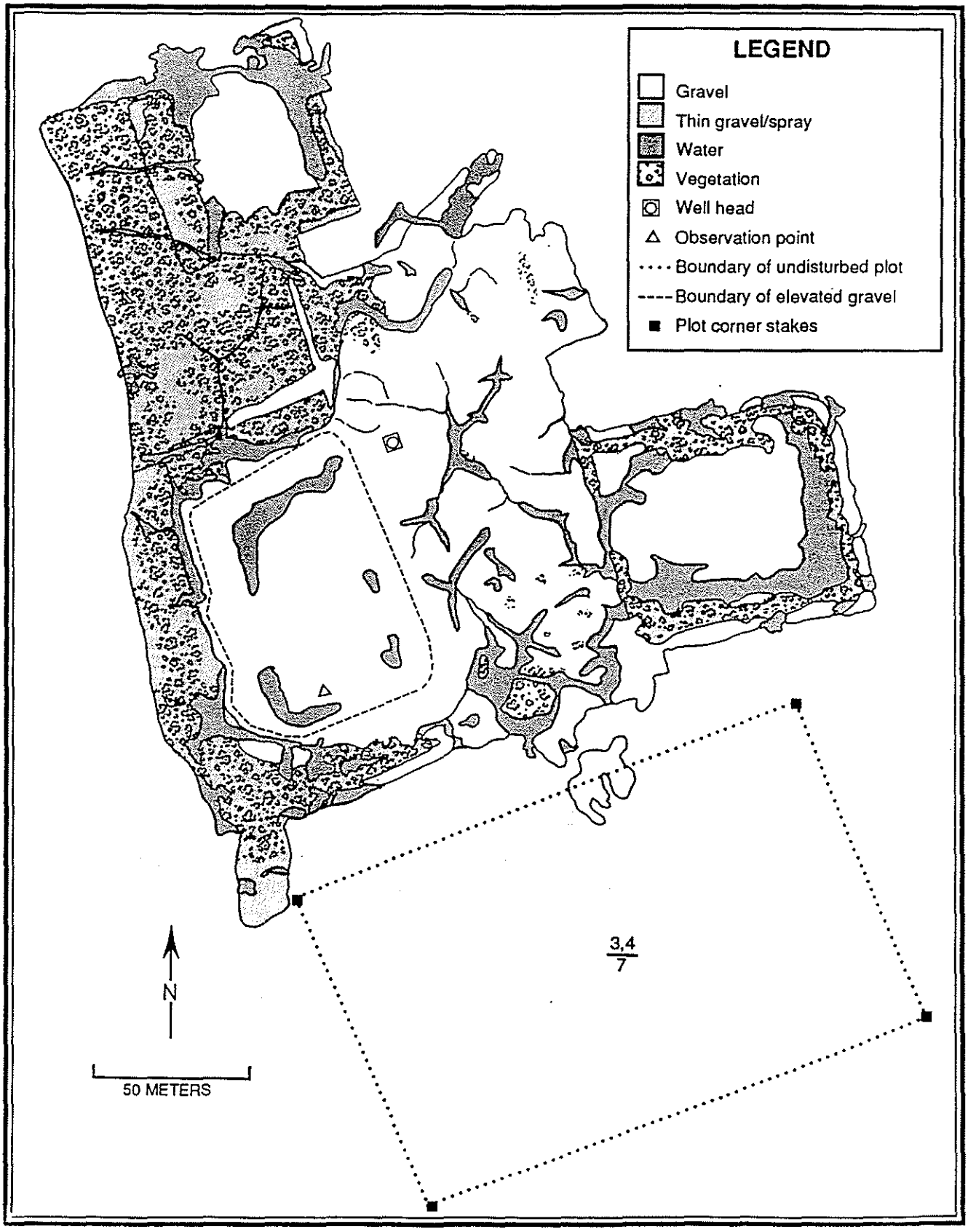


Fig. A-6. West Sak 4 (Site 6). Produced from Exploration Well Photography, 1989, Color Infrared Aerial Photography, 1:500. (Photography by Aeromap U.S., Anchorage, AK.)

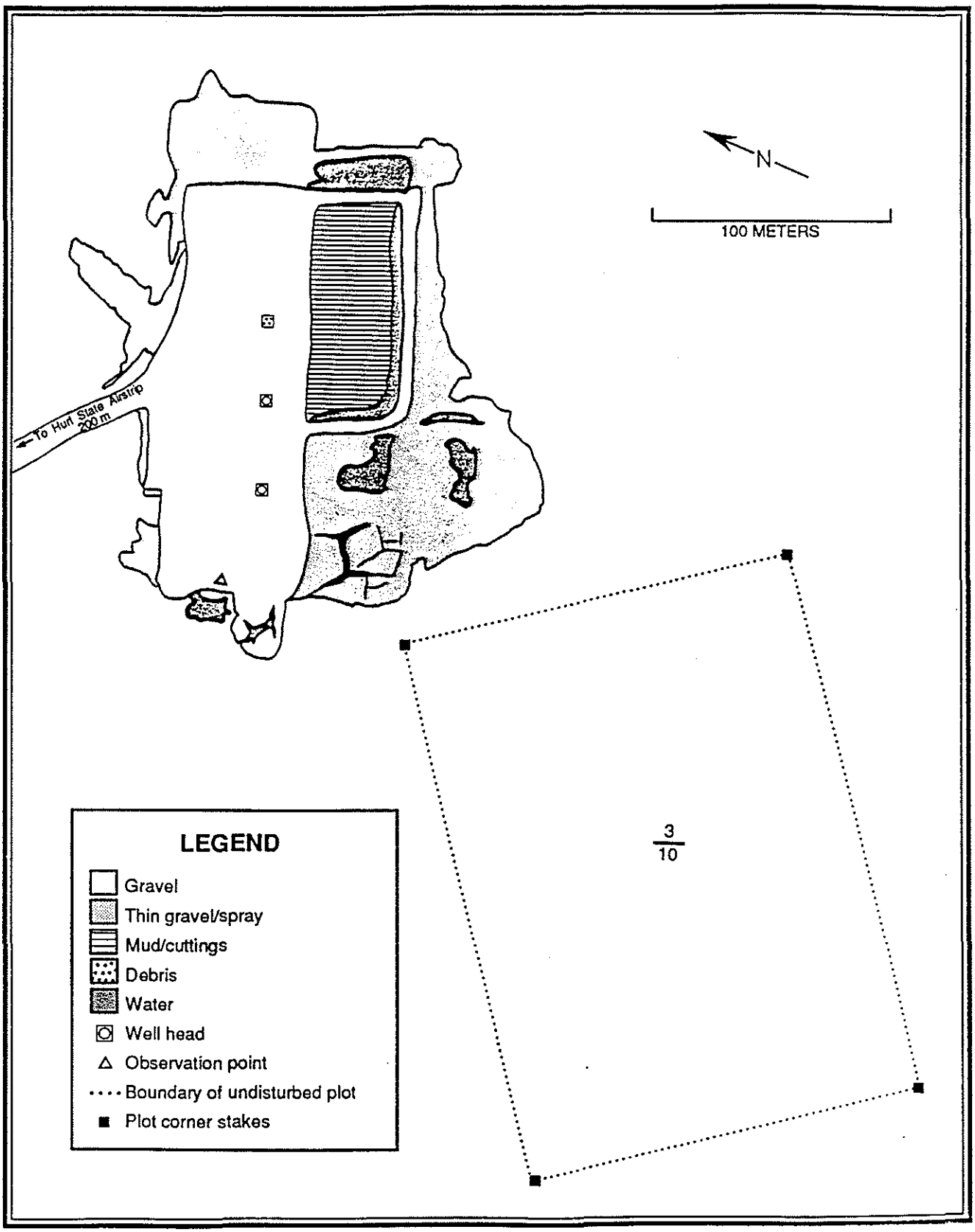


Fig. A-7. Hurl State (Site 7). Produced from Prudhoe Bay Color Infrared Aerial Photography. 1988. 1:500. flightline 33, frame 12. (Photography by Aeromap U.S., Anchorage, AK.)

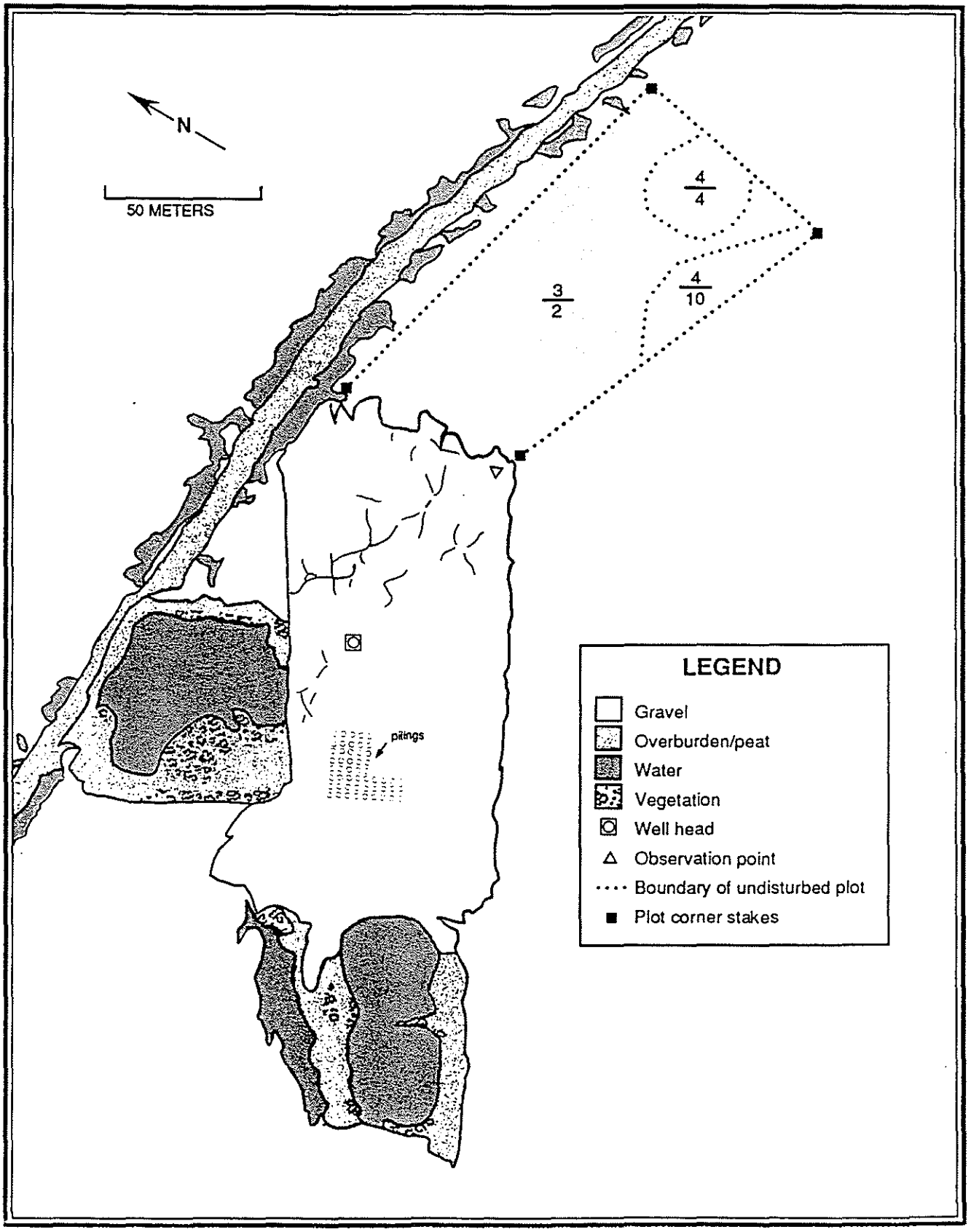


Fig. A-8. Put River 1 (Site 8). Produced from Prudhoe Bay Color Infrared Aerial Photography. 1988. 1:500. flightline 16, frame 15. (Photography by Aeromap U.S., Anchorage, AK.)

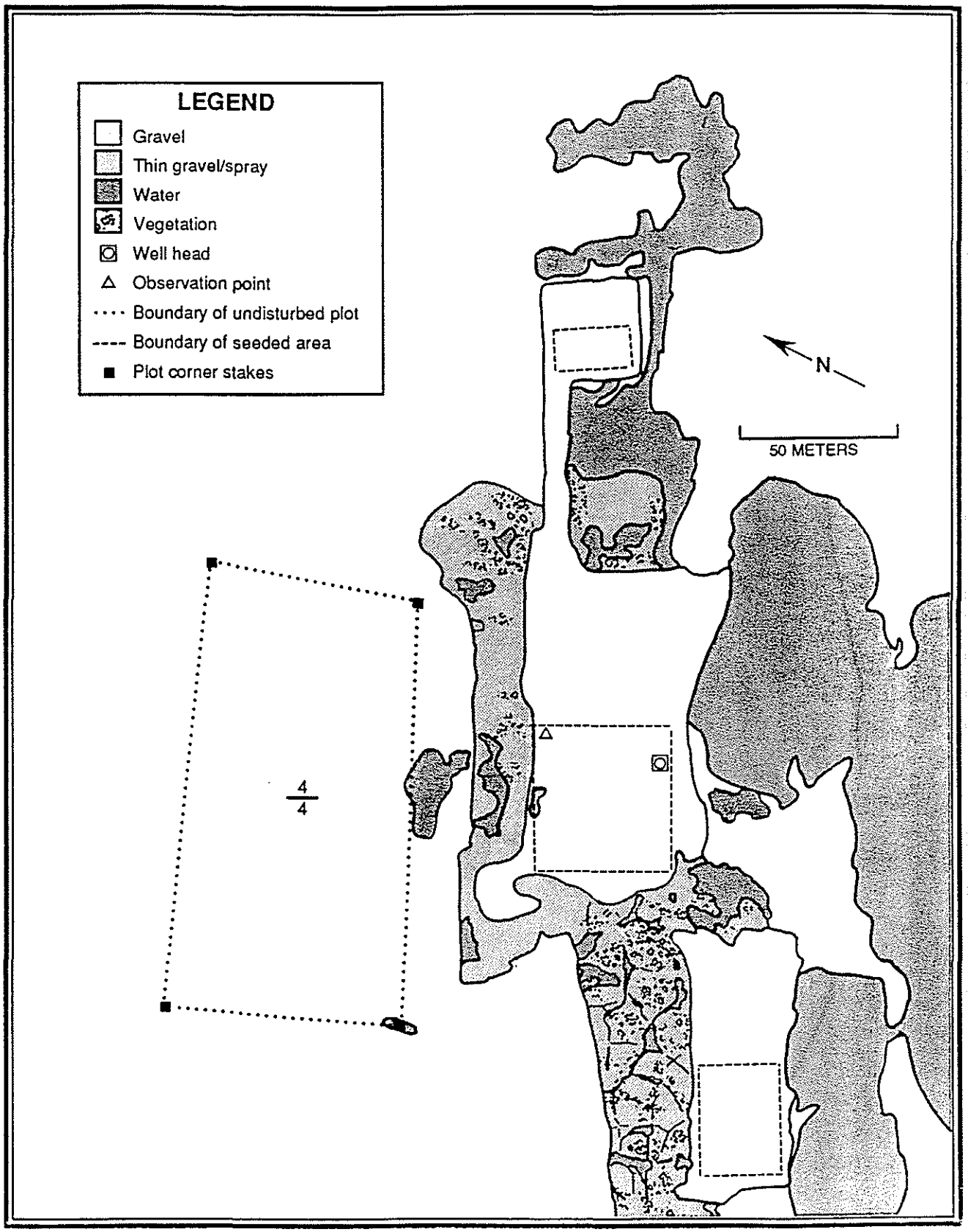


Fig. A-9. Lake State 1 (Site 9). Produced from Prudhoe Bay / Duck Island Color Infrared Aerial Photography, 1989, 1:500, flightline 53, frame 6. (Photography by Aeromap U.S., Anchorage, AK.)

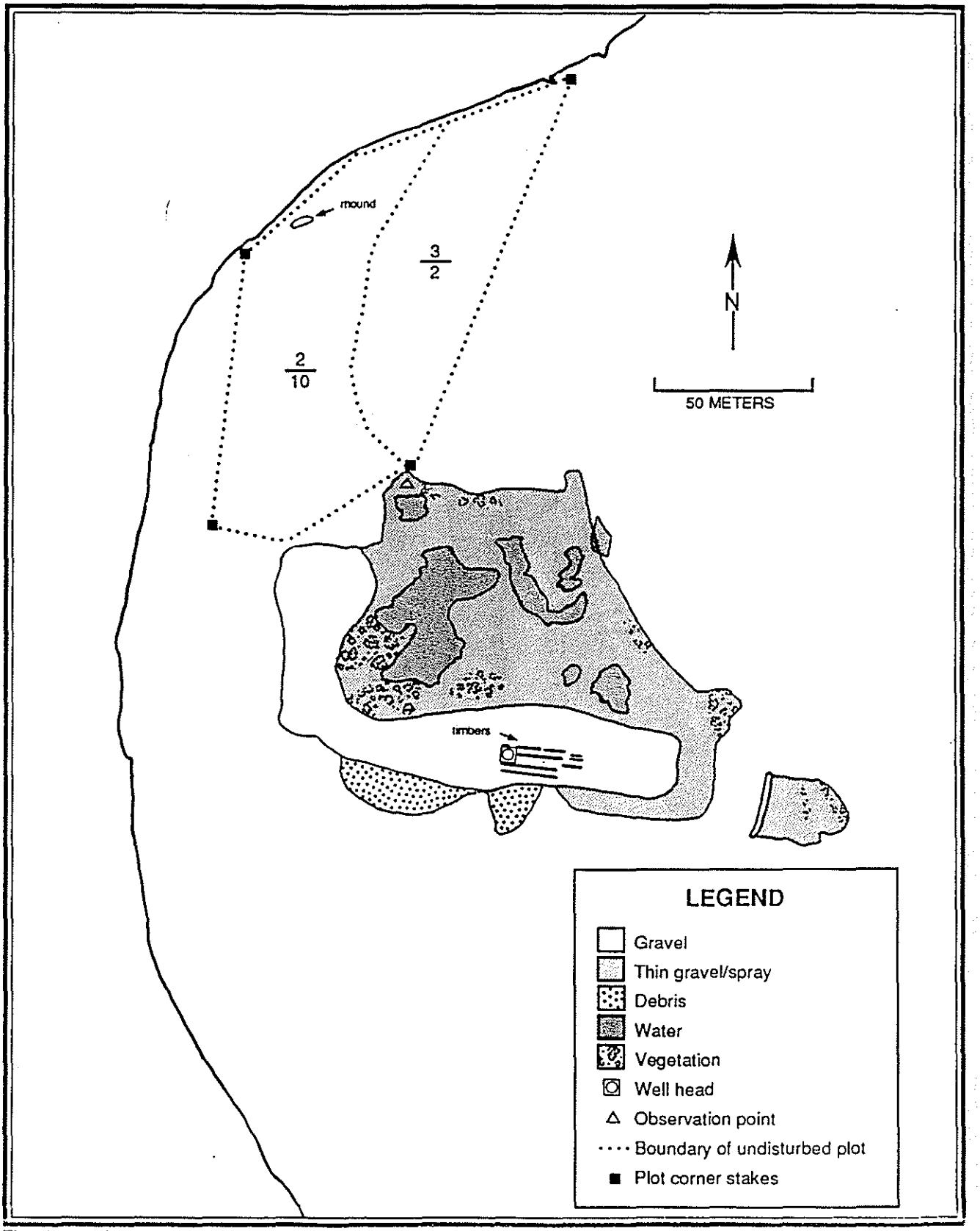


Fig. A-10. Sag Delta 31-11-16 (Site 10). Produced from Exploration Well Photography, 1989, Color Infrared Aerial Photography, 1:500. (Photography by Aeromap U.S., Anchorage, AK.)

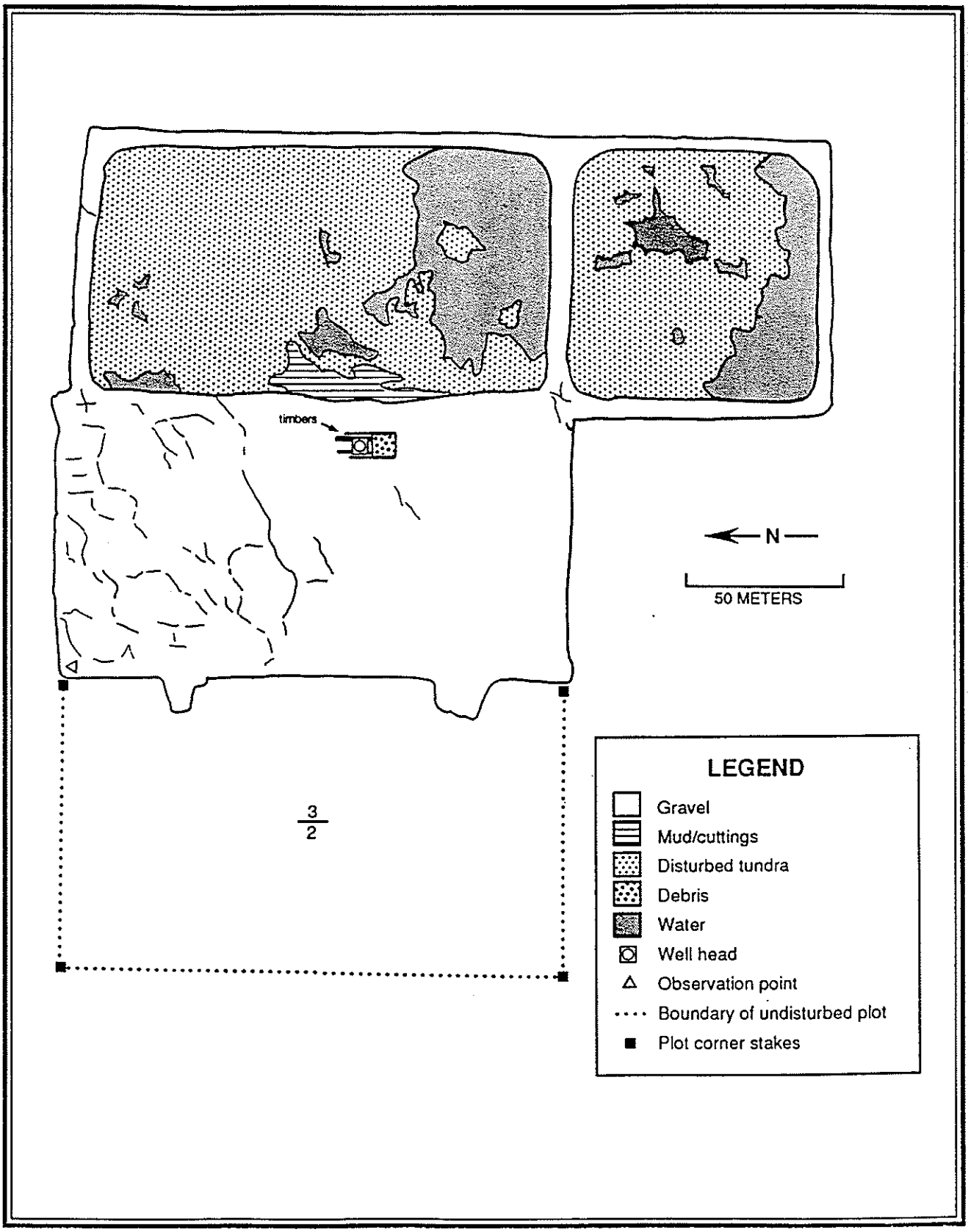


Fig. A-11. Sag Delta 2 & 2a (Site 11). Produced from Exploration Well Photography, 1989, Color Infrared Aerial Photography, 1:500. (Photography by Aeromap U.S., Anchorage, AK.)

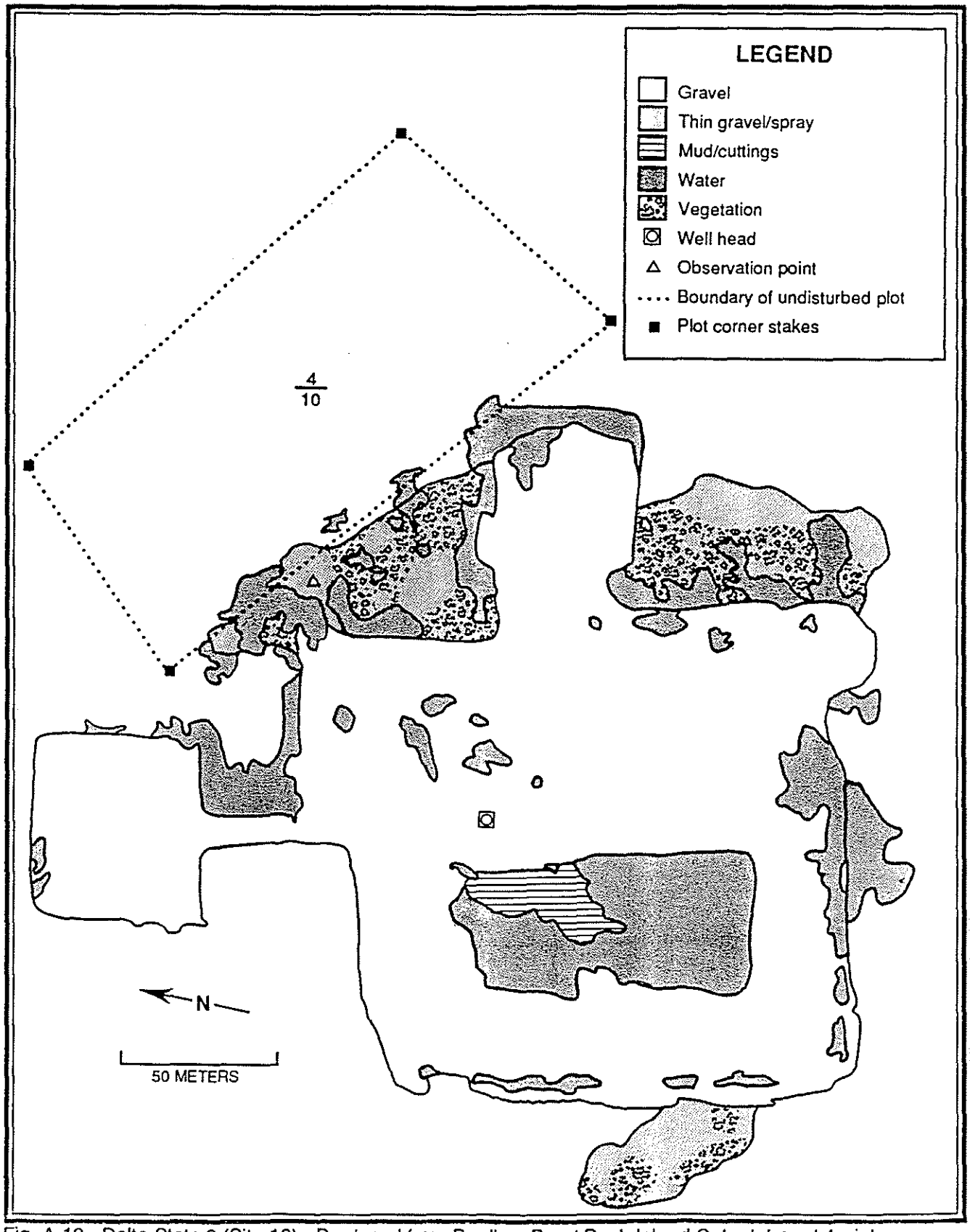


Fig. A-12. Delta State 2 (Site 12). Produced from Prudhoe Bay / Duck Island Color Infrared Aerial Photography, 1989, 1:500, flightline 39, frame 4. (Photography by Aeromap U.S., Anchorage, AK.)

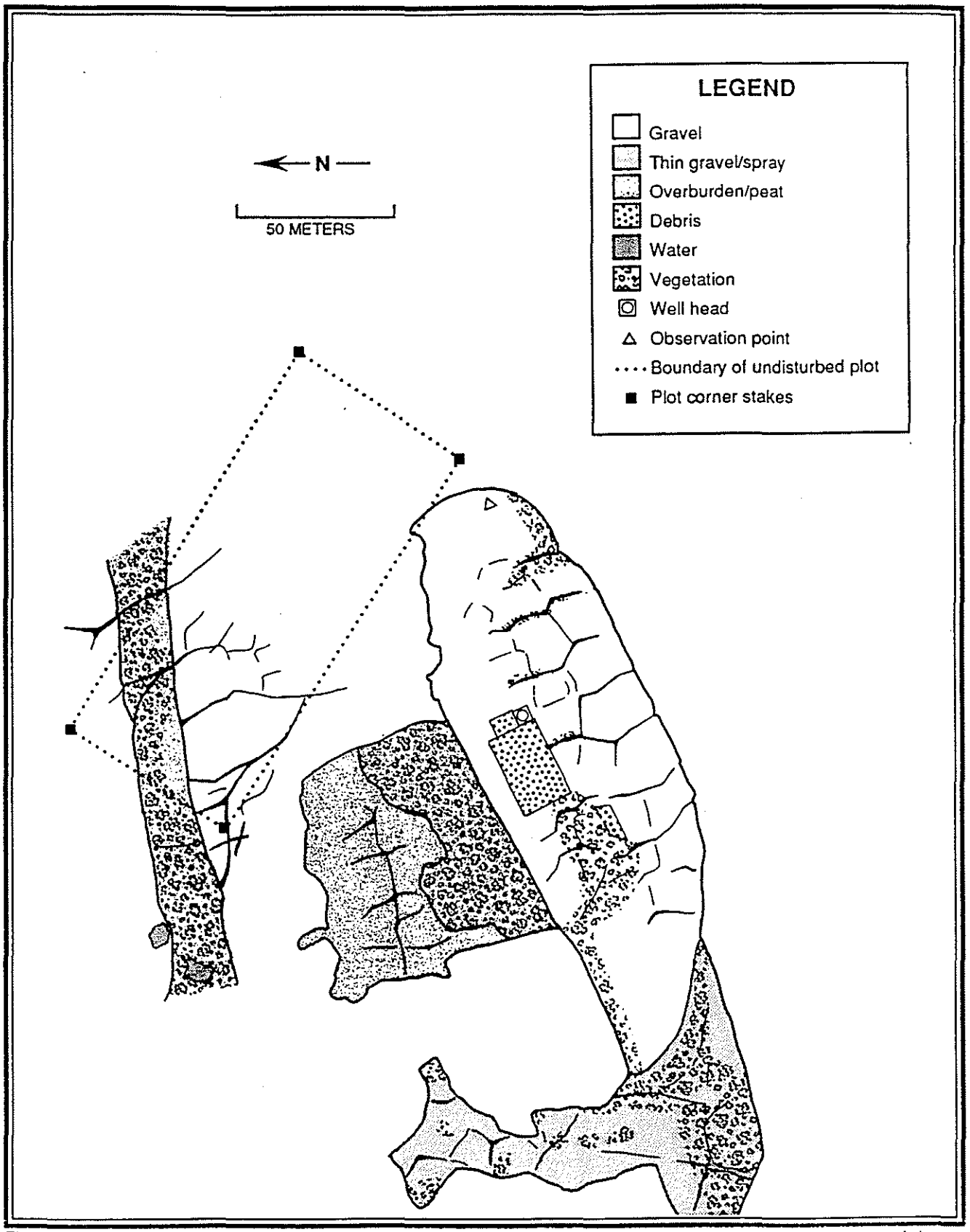


Fig. A-13. Kemik 1 (Site 13). Produced from Exploration Well Photography, 1989, Color Infrared Aerial Photography, 1:500. (Photography by Aeromap U.S., Anchorage, AK.)

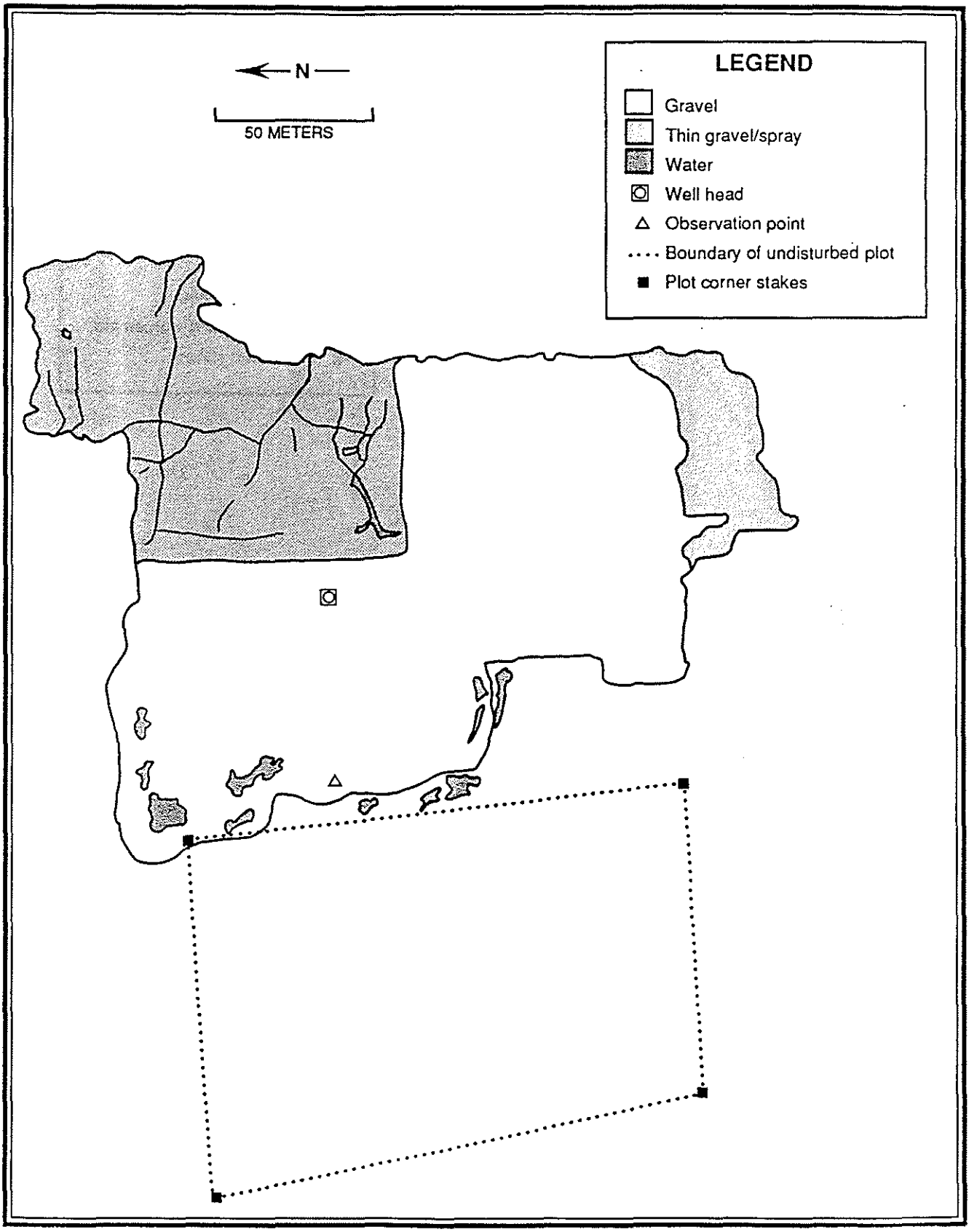


Fig. A-14. Kemik 2 (Site 14). Produced from Exploration Well Photography, 1989, Color Infrared Aerial Photography, 1:500. (Photography by Aeromap U.S., Anchorage, AK.)

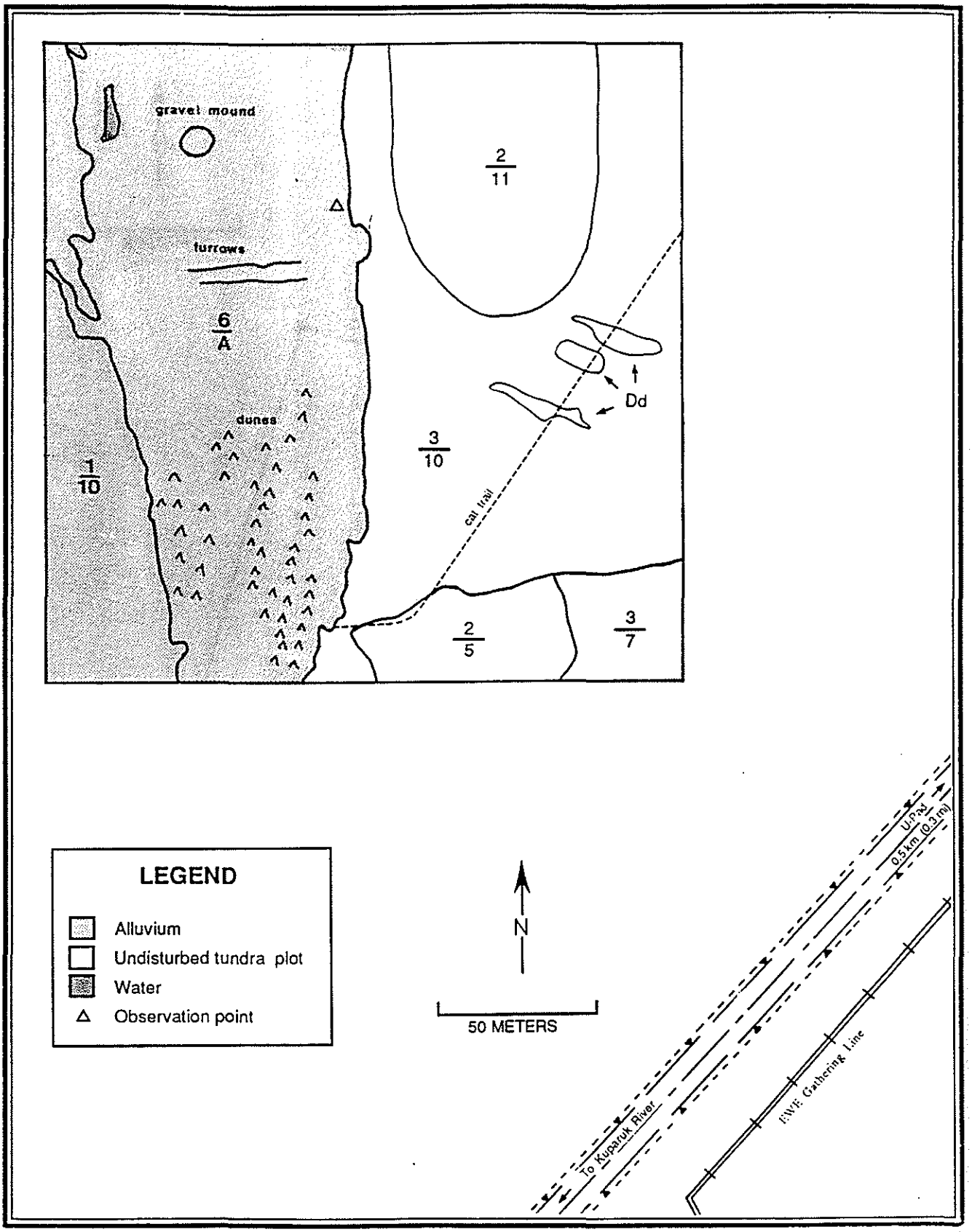


Fig. A-15. Kuparuk River 1 (Site 15). Produced from Prudhoe Bay Color Infrared Aerial Photography, 1988. 1:500, flightline 26, frame 4. (Photography by Aeromap U.S., Anchorage, AK.)

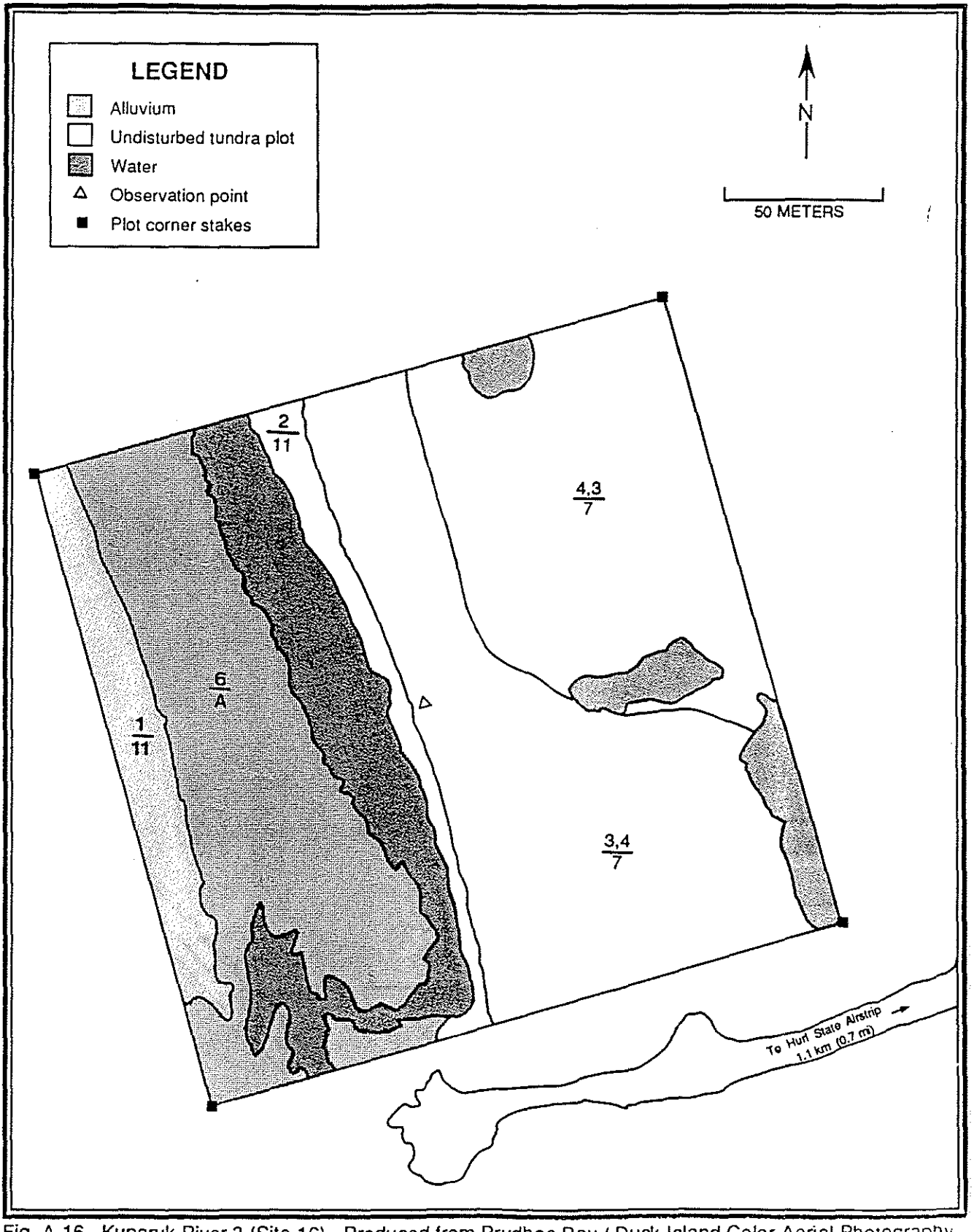


Fig. A-16. Kuparuk River 3 (Site 16). Produced from Prudhoe Bay / Duck Island Color Aerial Photography. 1989, 1:1500, flighline 12, frame 24. (Photography by Aeromap U.S., Anchorage, AK.)

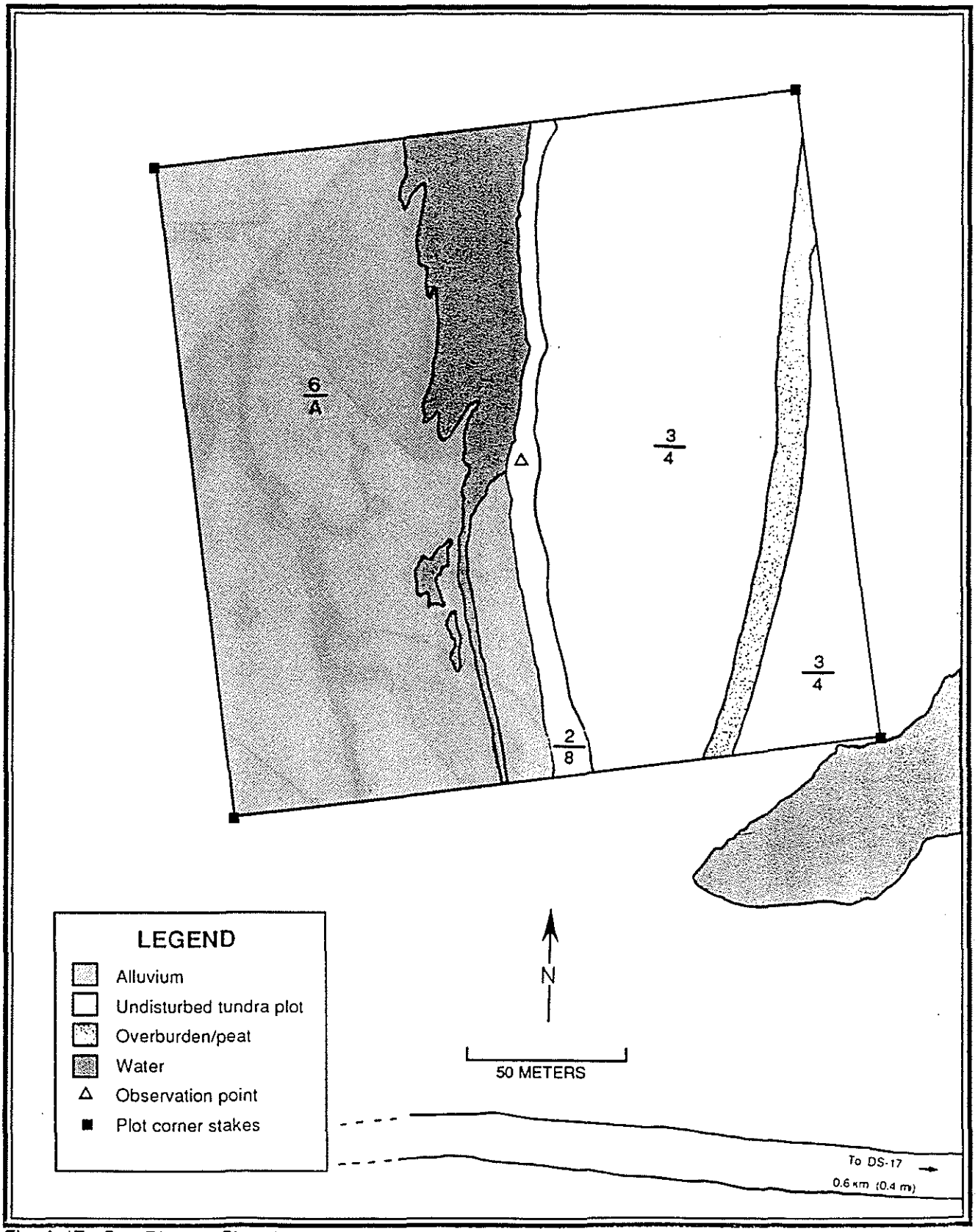


Fig. A-17. Sag River 3 (Site 17). Produced from Prudhoe Bay / Duck Island Color Infrared Aerial Photography, 1989, 1:500, flightline 54, frame 3. (Photography by Aeromap U.S., Anchorage, AK.)

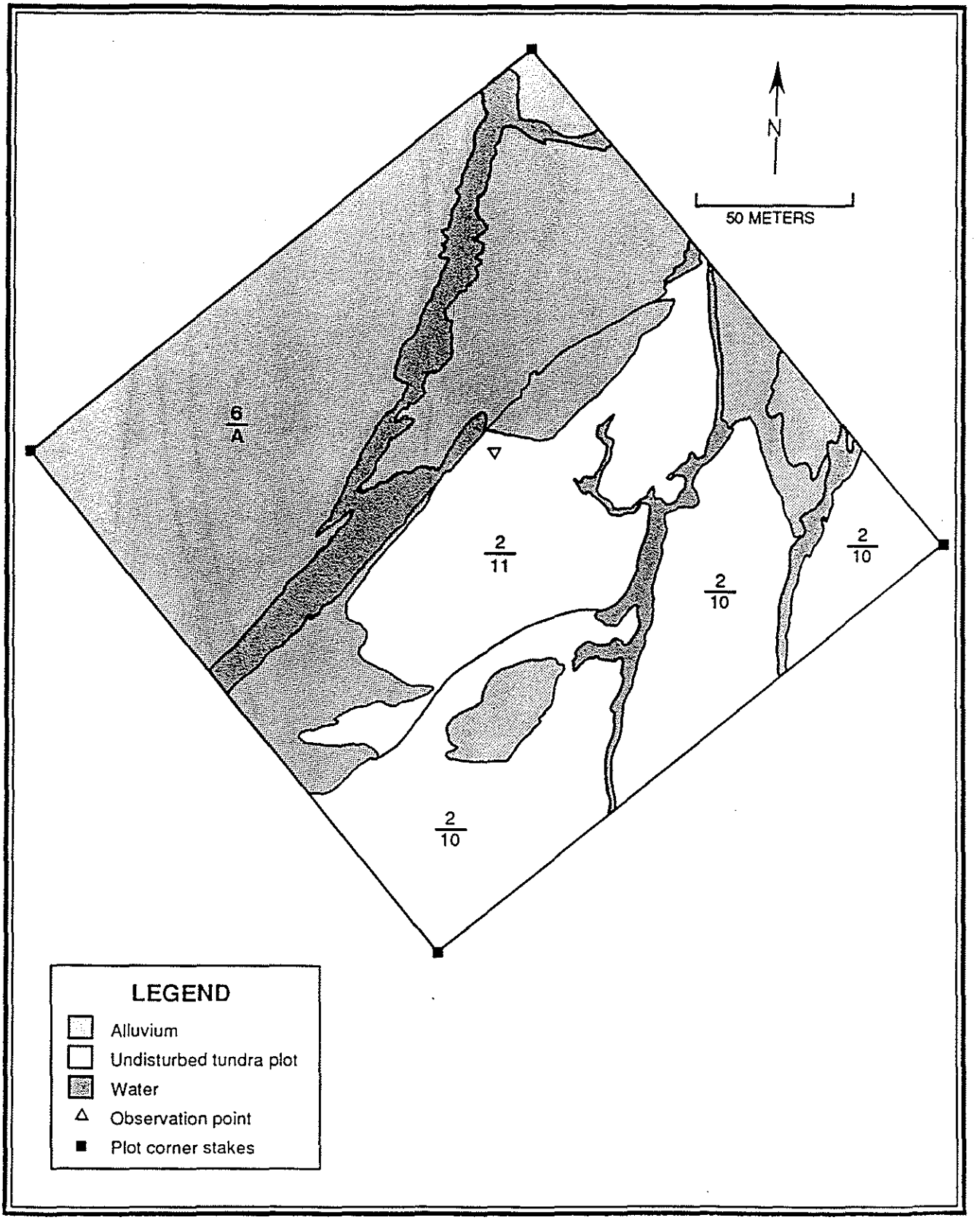


Fig. A-18. Sag River 2 (Site 18). Produced from Prudhoe Bay / Duck Island Color Infrared Aerial Photography, 1989, 1:500, flightline 54, frame 4. (Photography by Aeromap U.S., Anchorage, AK.)

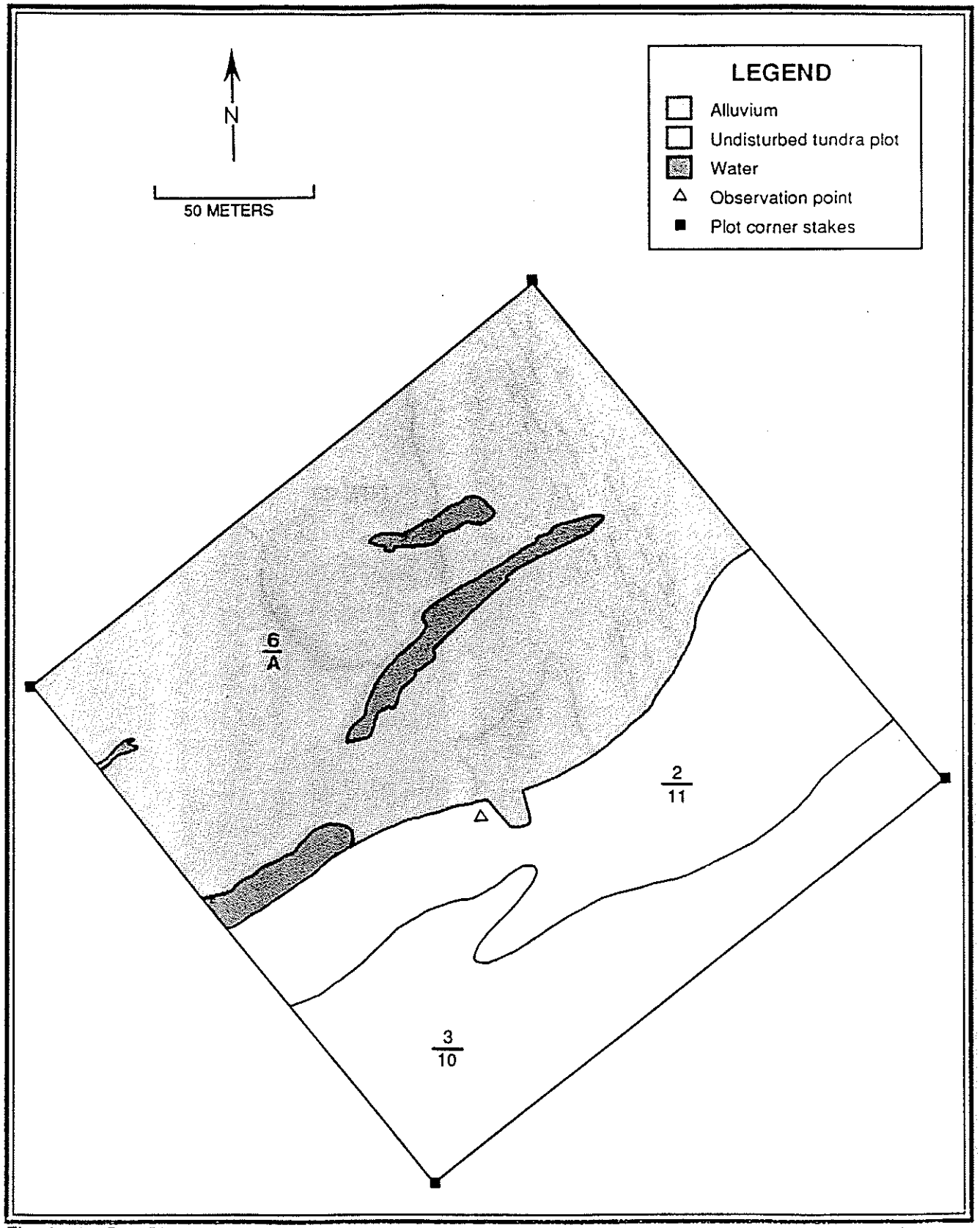


Fig. A-19. Sag River 4 (Site 19). Produced from Prudhoe Bay / Duck Island Color Aerial Photography. 1989, 1:1500, flighline 9, frame 17. (Photography by Aeromap U.S., Anchorage, AK.)

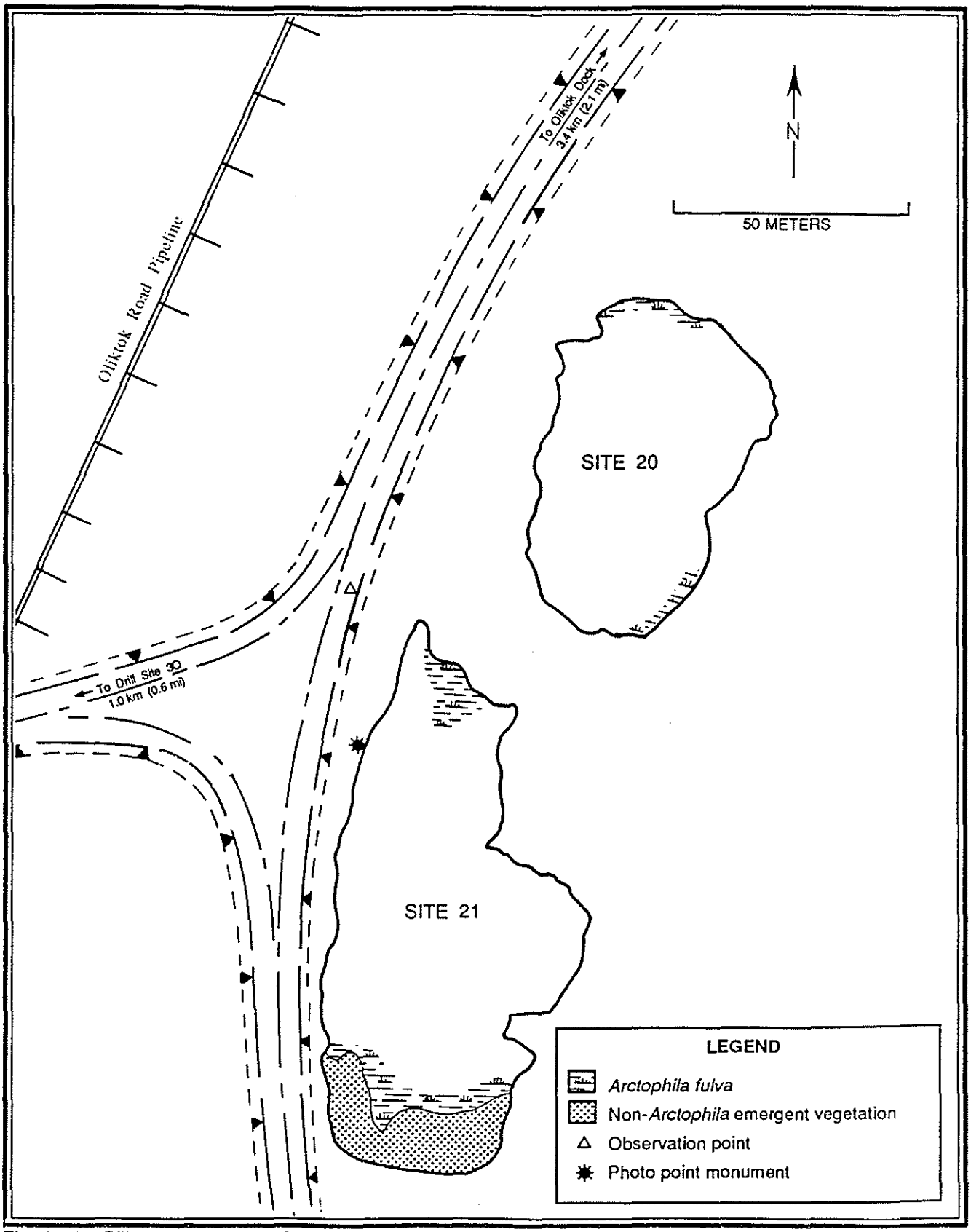


Fig. A-20. Oliktok Pond North (Site 20) and Oliktok Pond (Site 21). Produced from Prudhoe Bay Infrared Aerial Photography, 1986, 1:500, flightline 12, frame 9. (Photography by Aeromap U.S., Anchorage, AK.)

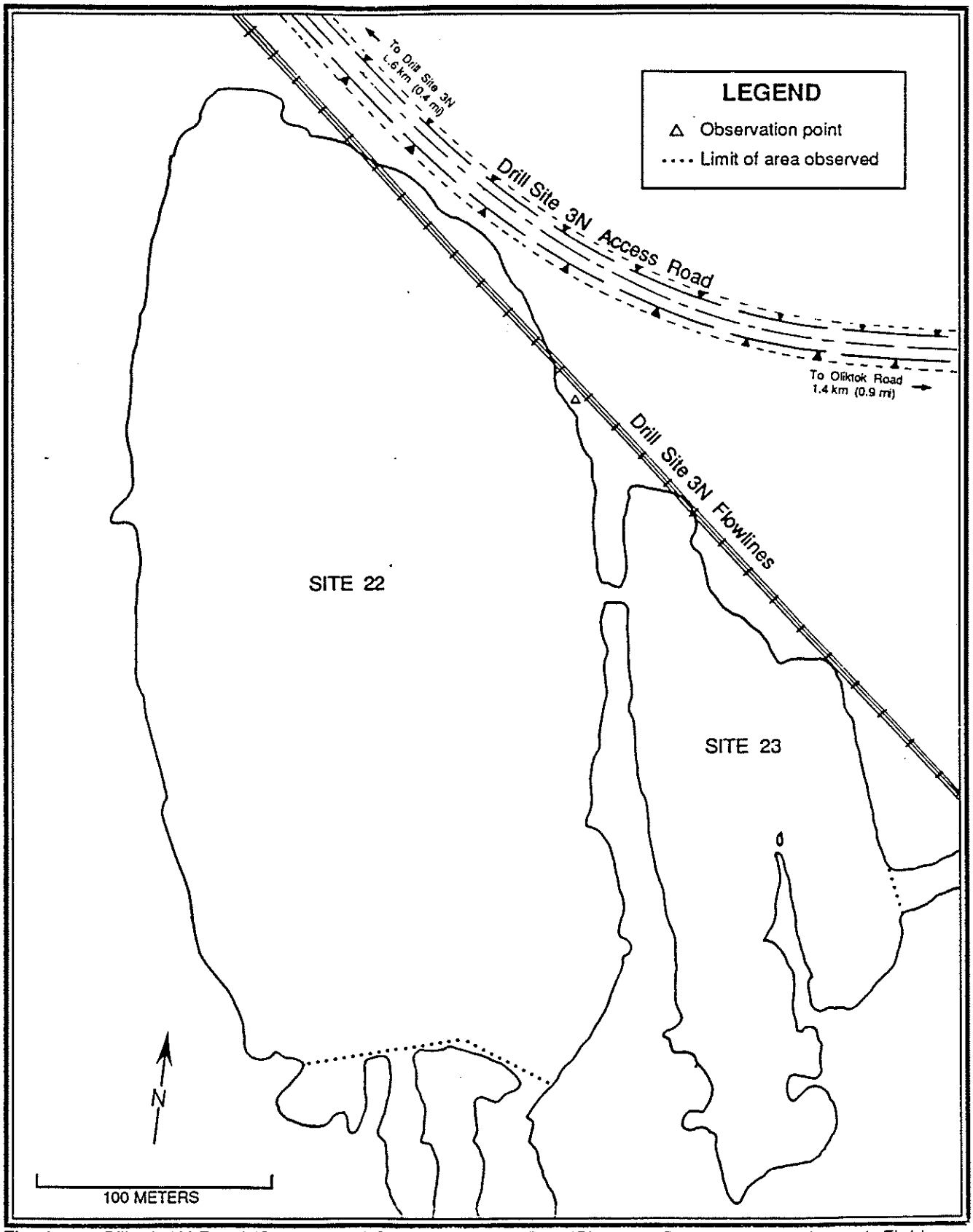


Fig. A-21. Oliktok 3N Pond (Site 22) and Oliktok 3N Pond East (Site 23). Produced from Kuparuk Field Color Aerial Photography, 1988, 1:1500, flightline 10, frame 15. (Photography by Aeromap U.S., Anchorage, AK.)

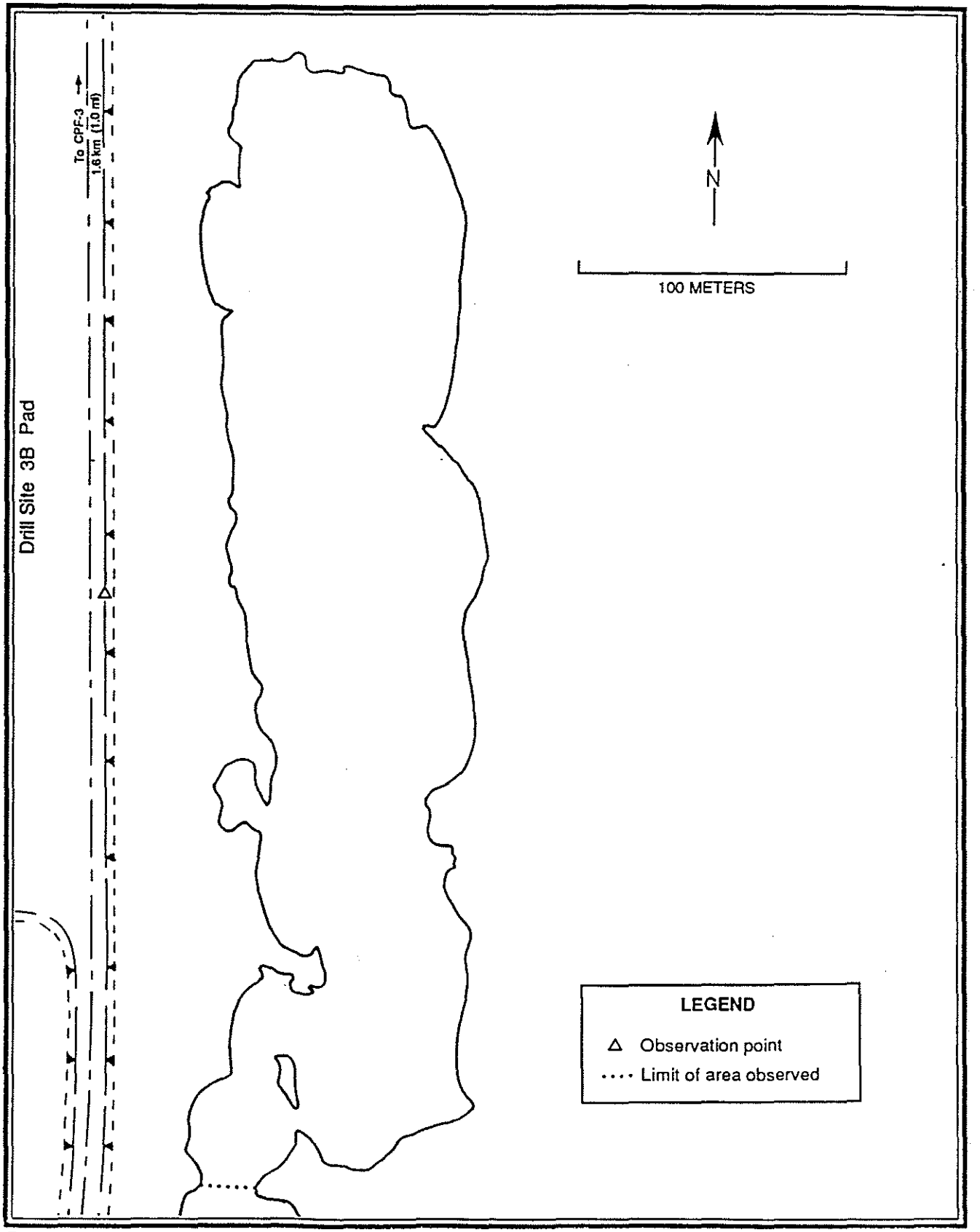


Fig. A-22. Drill Site 3B Pond (Site 24). Produced from Kuparuk Field Facility Photography, 1988. 1:500. flightline 3B, frame 2. (Photography by Aeromap U.S., Anchorage, AK.)

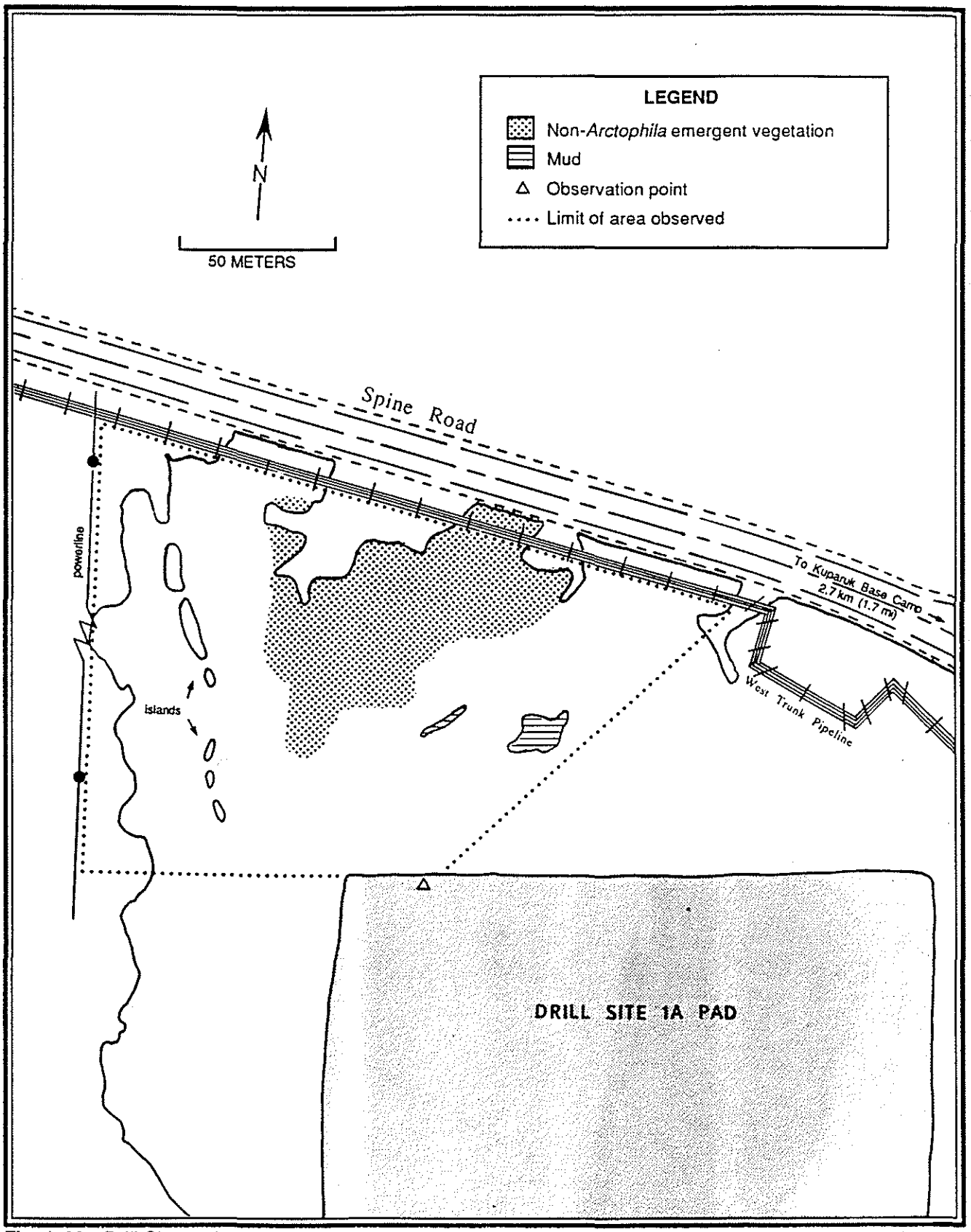


Fig. A-23. Drill Site 1A Impoundment (Site 25). Produced from Prudhoe Bay / Duck Island Color Aerial Photography, 1989, 1:1500, flighline 13, frame 38,31. (Photography by Aeromap U.S. Anchorage, AK.)

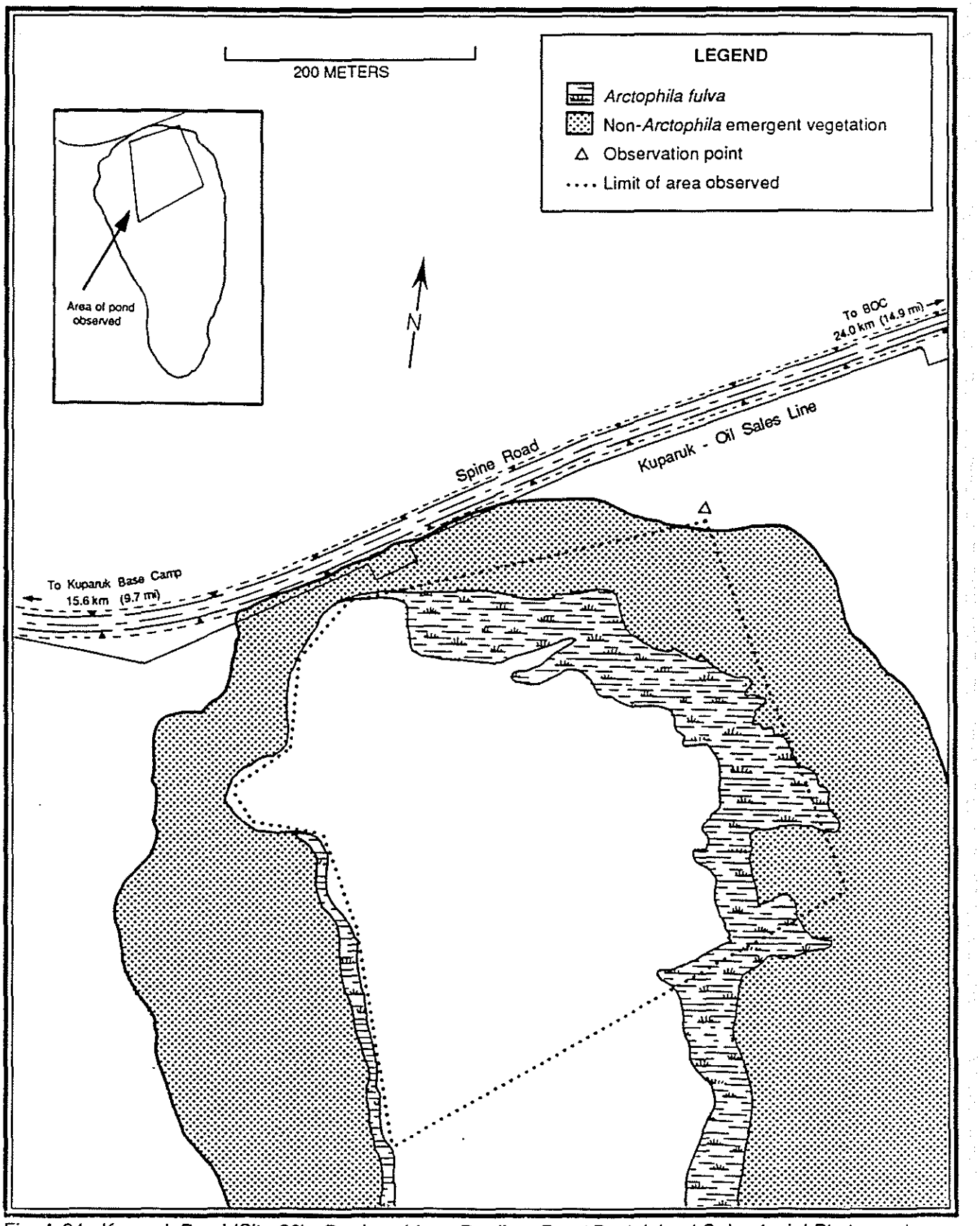


Fig. A-24. Kuparuk Pond (Site 26). Produced from Prudhoe Bay / Duck Island Color Aerial Photography. 1989, 1:1500, flighline 11, frame 30. (Photography by Aeromap U.S., Anchorage, AK.)

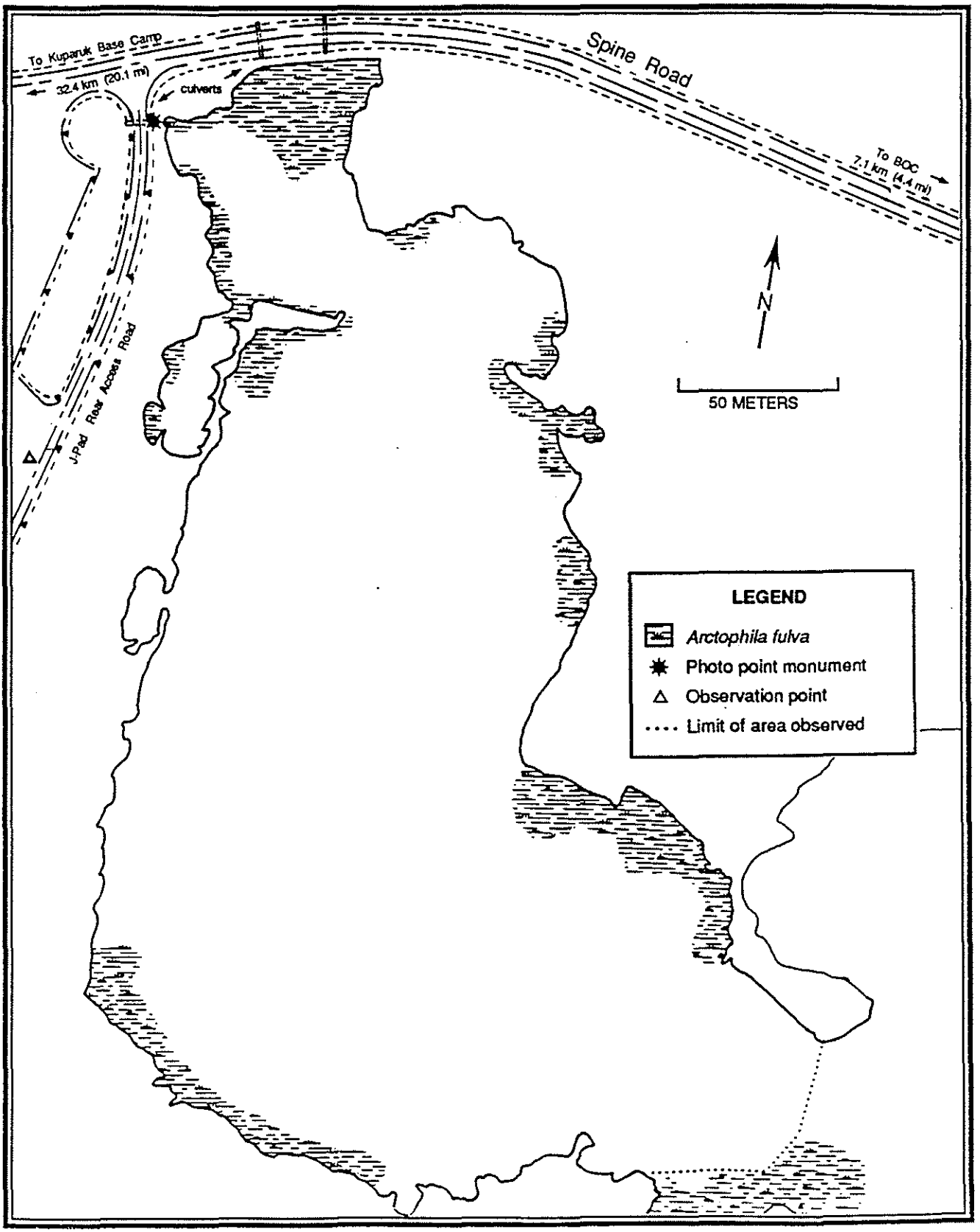


Fig. A-25. J Pad Pond (Site 27). Produced from Prudhoe Bay / Duck Island Color Infrared Aerial Photography, 1989, 1:500, flightline 50, frame 3. (Photography by Aeromap U.S., Anchorage, AK.)

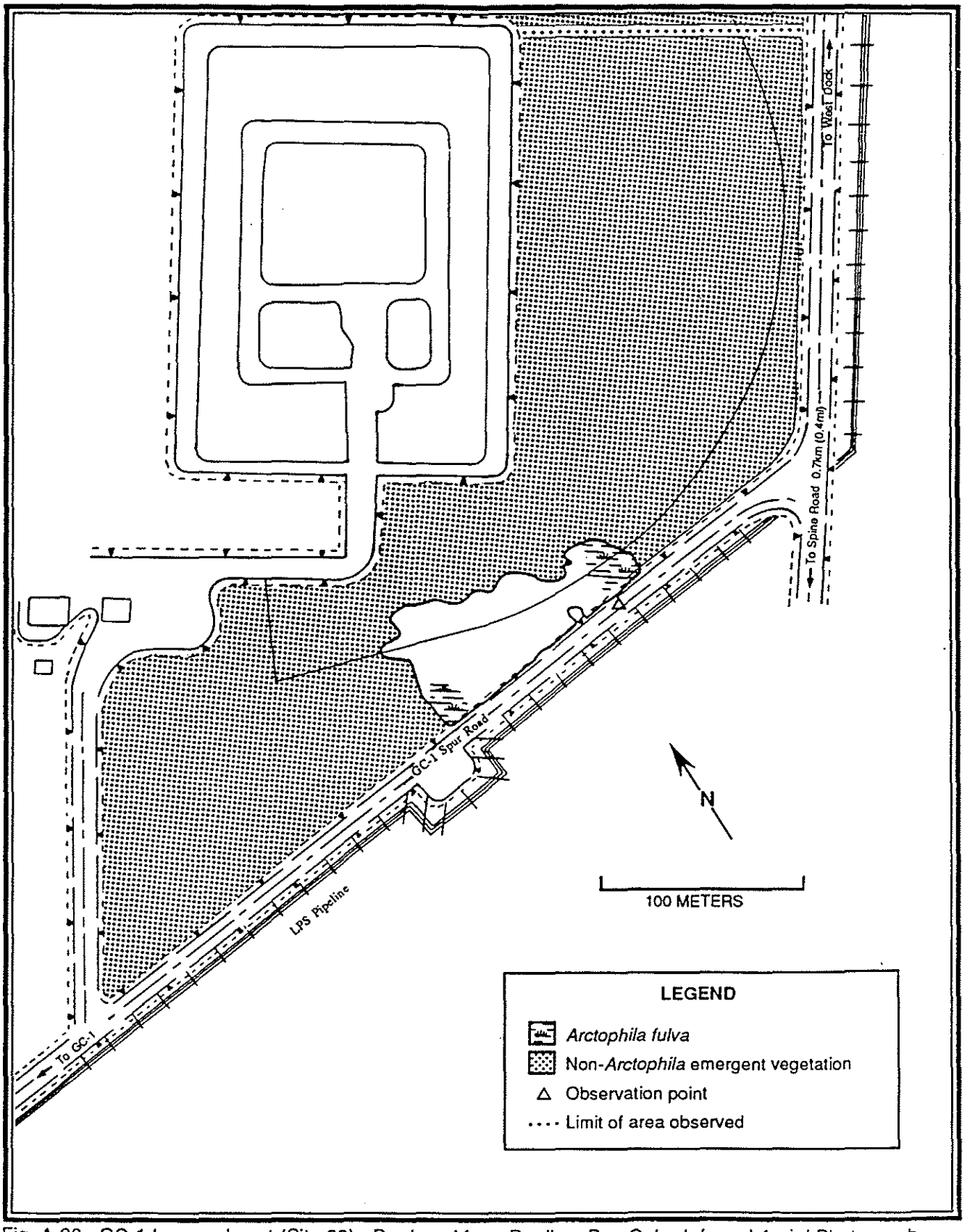


Fig. A-26. GC-1 Impoundment (Site 28). Produced from Prudhoe Bay Color Infrared Aerial Photography, 1988, 1:500, flightline 23 frames 6 and 7. (Photography by Aeromap U.S., Anchorage, AK.)

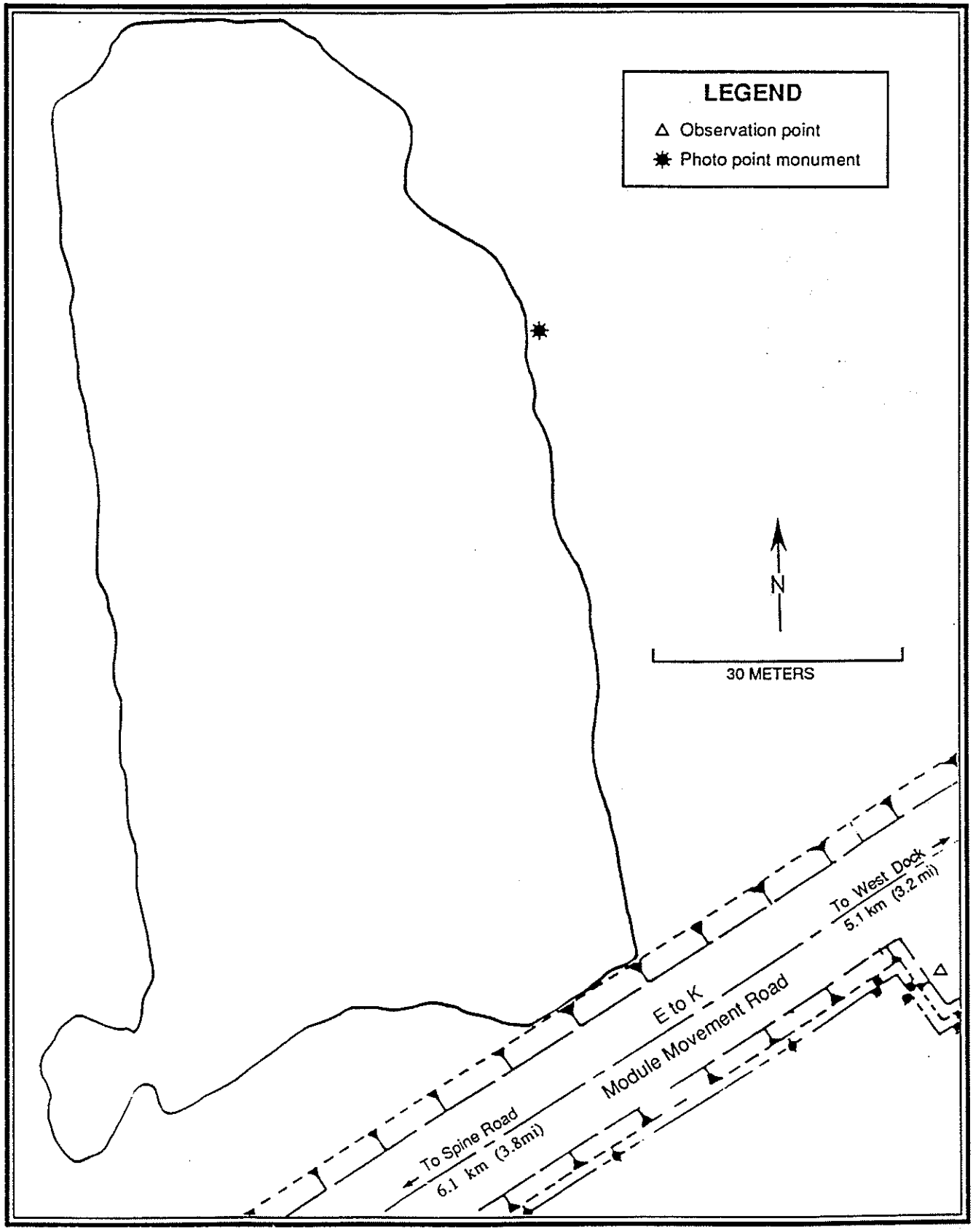


Fig. A-27. Vascott Pond (Site 29). Adapted from McKendrick (1990).

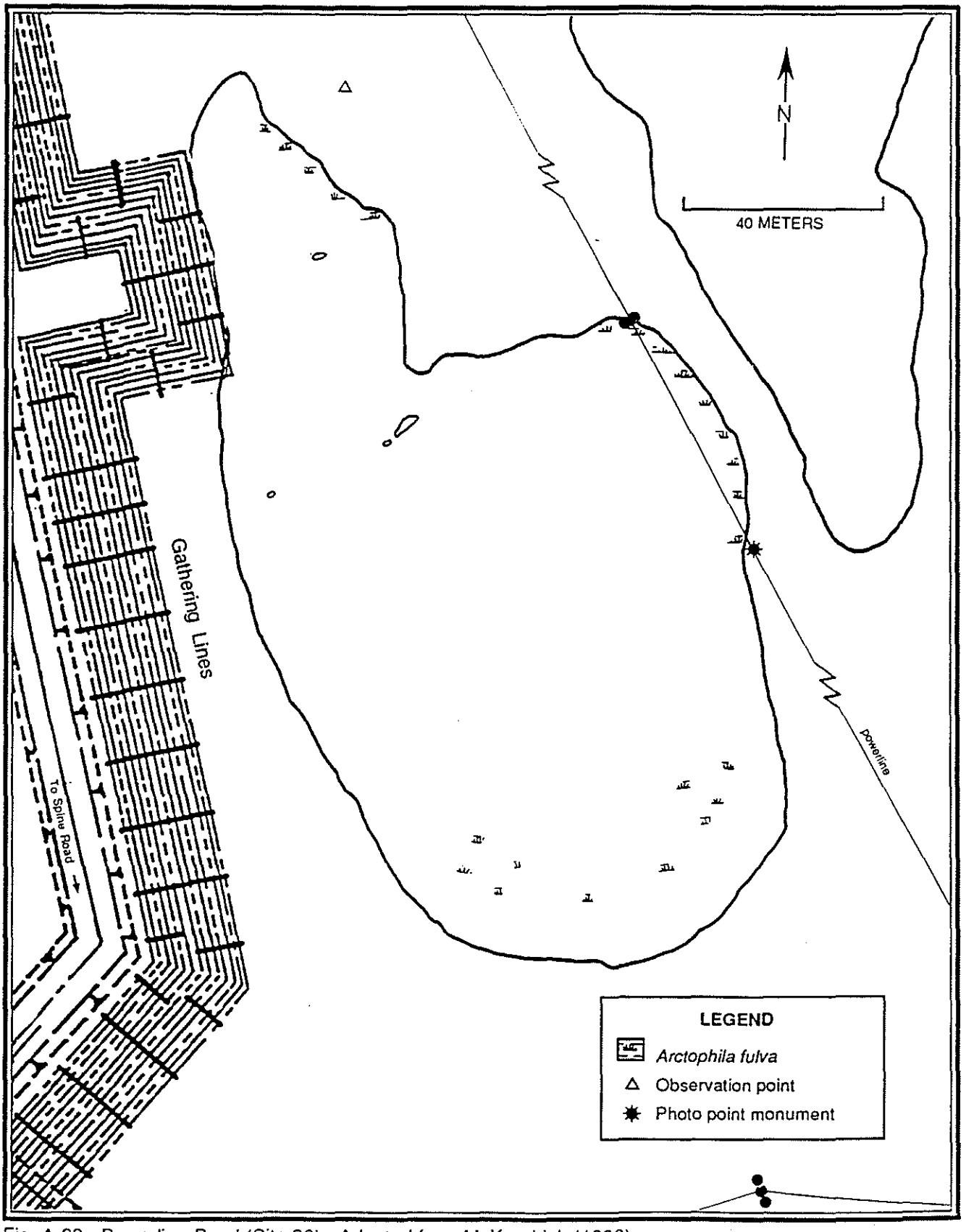


Fig. A-28. Powerline Pond (Site 30). Adapted from McKendrick (1990).

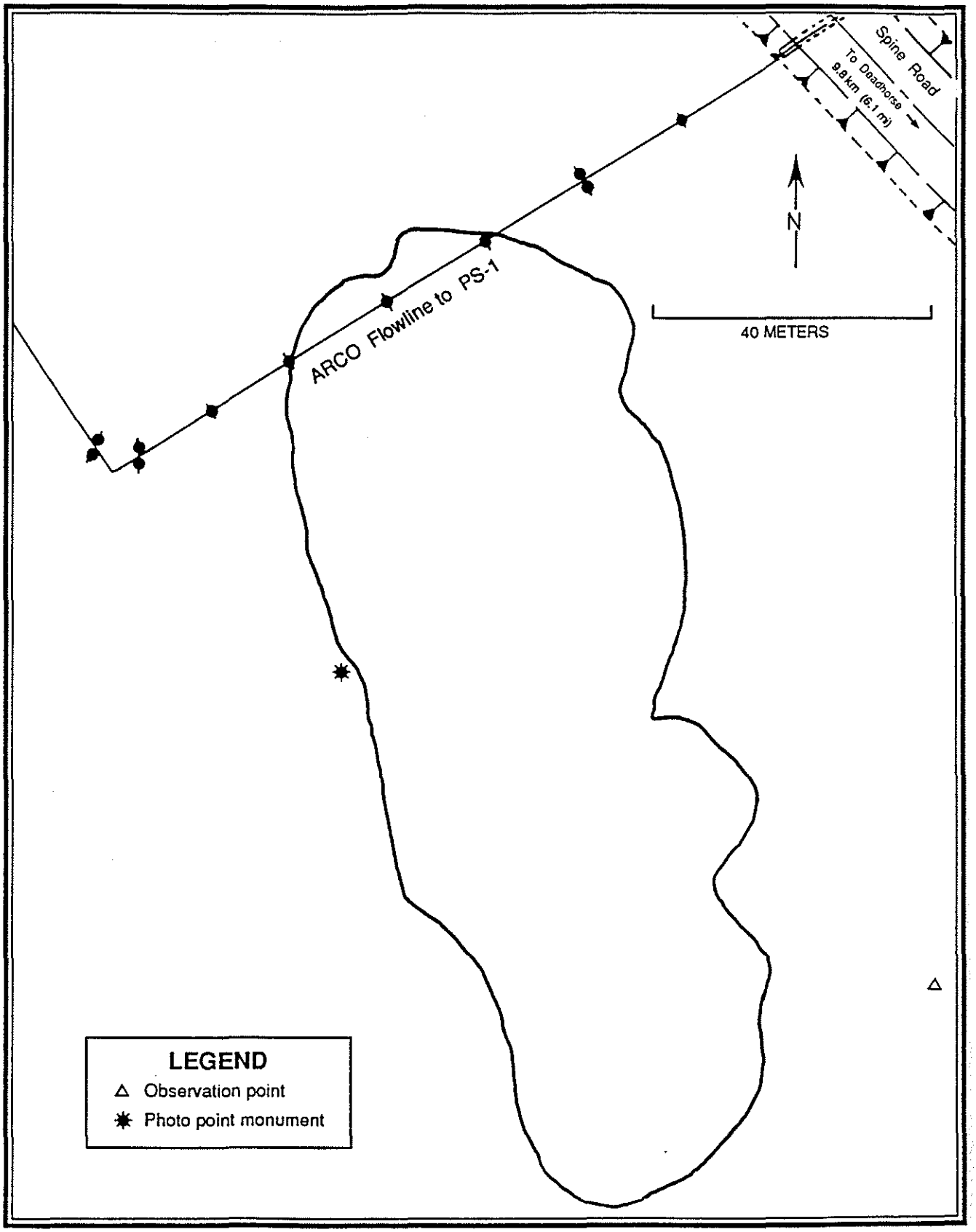


Fig. A-29. Lake Carol (Site 31). Adapted from McKendrick (1990).

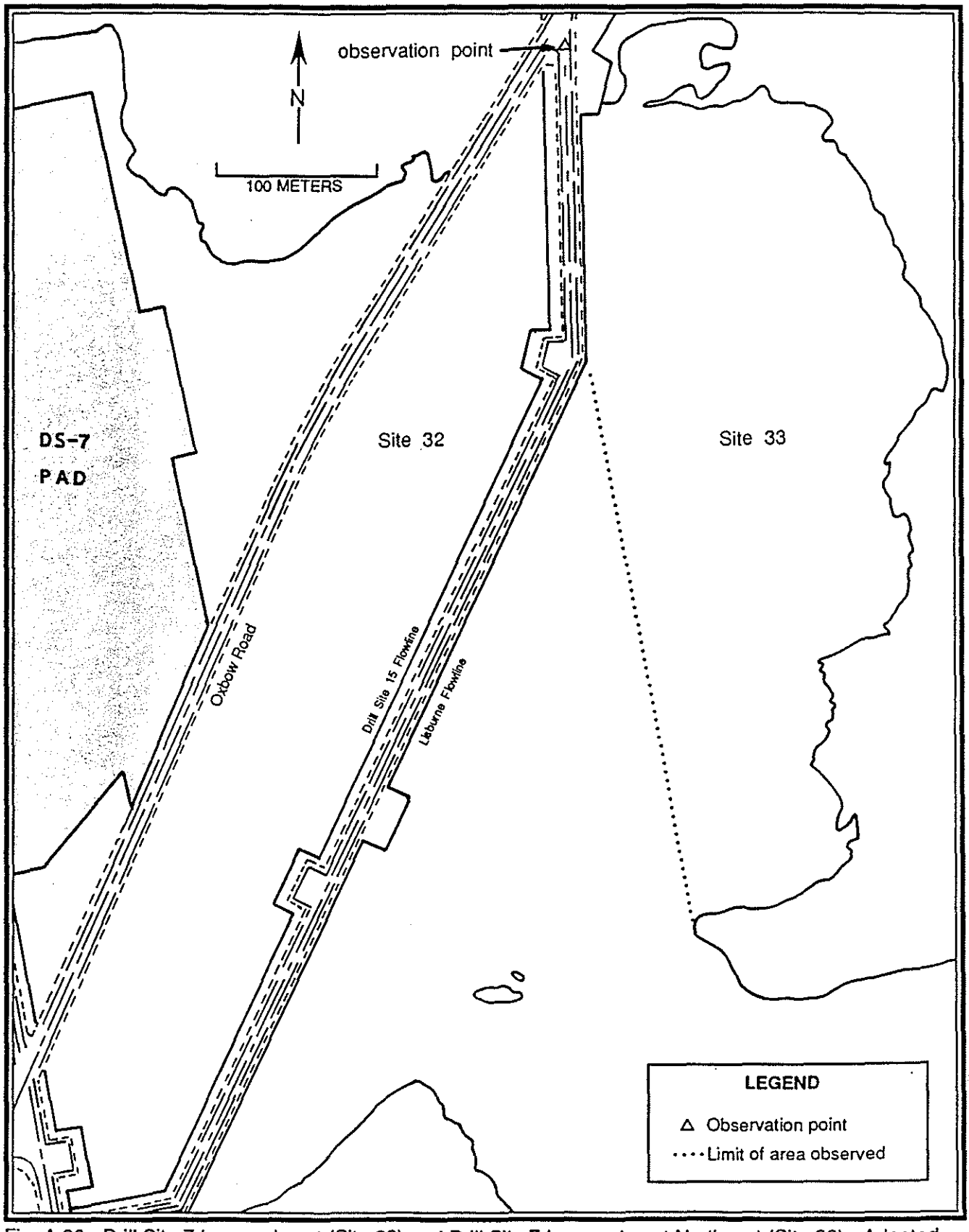


Fig. A-30. Drill Site 7 Impoundment (Site 32) and Drill Site 7 Impoundment Northeast (Site 33). Adapted from McKendrick (1990).

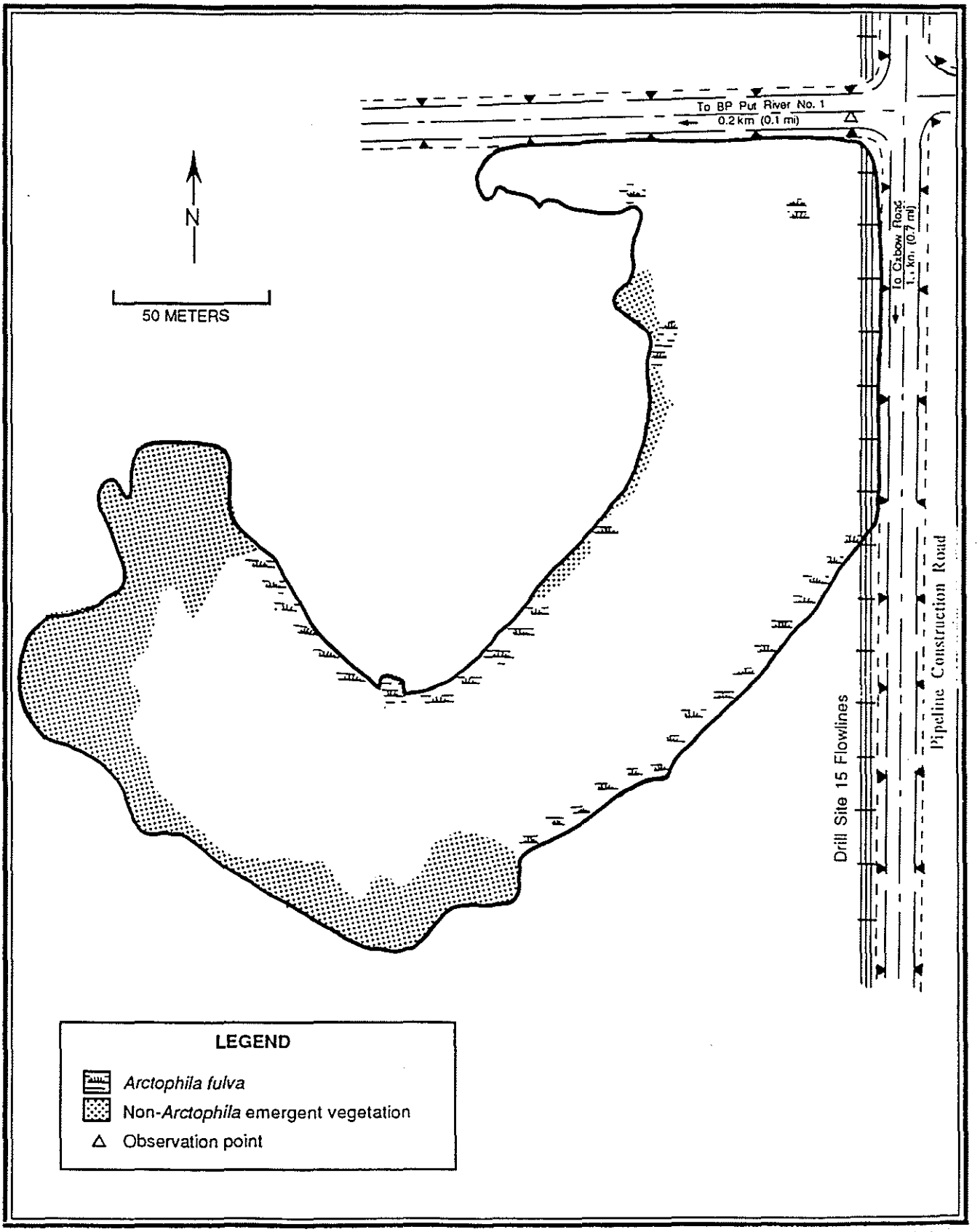


Fig. A-31. BP Discovery Well Impoundment (Site 34). Produced from Prudhoe Bay Color Infrared Aerial Photography, 1988, 1:500, flightline 15, frame 5. (Photography by Aeromap U.S., Anchorage, AK.)

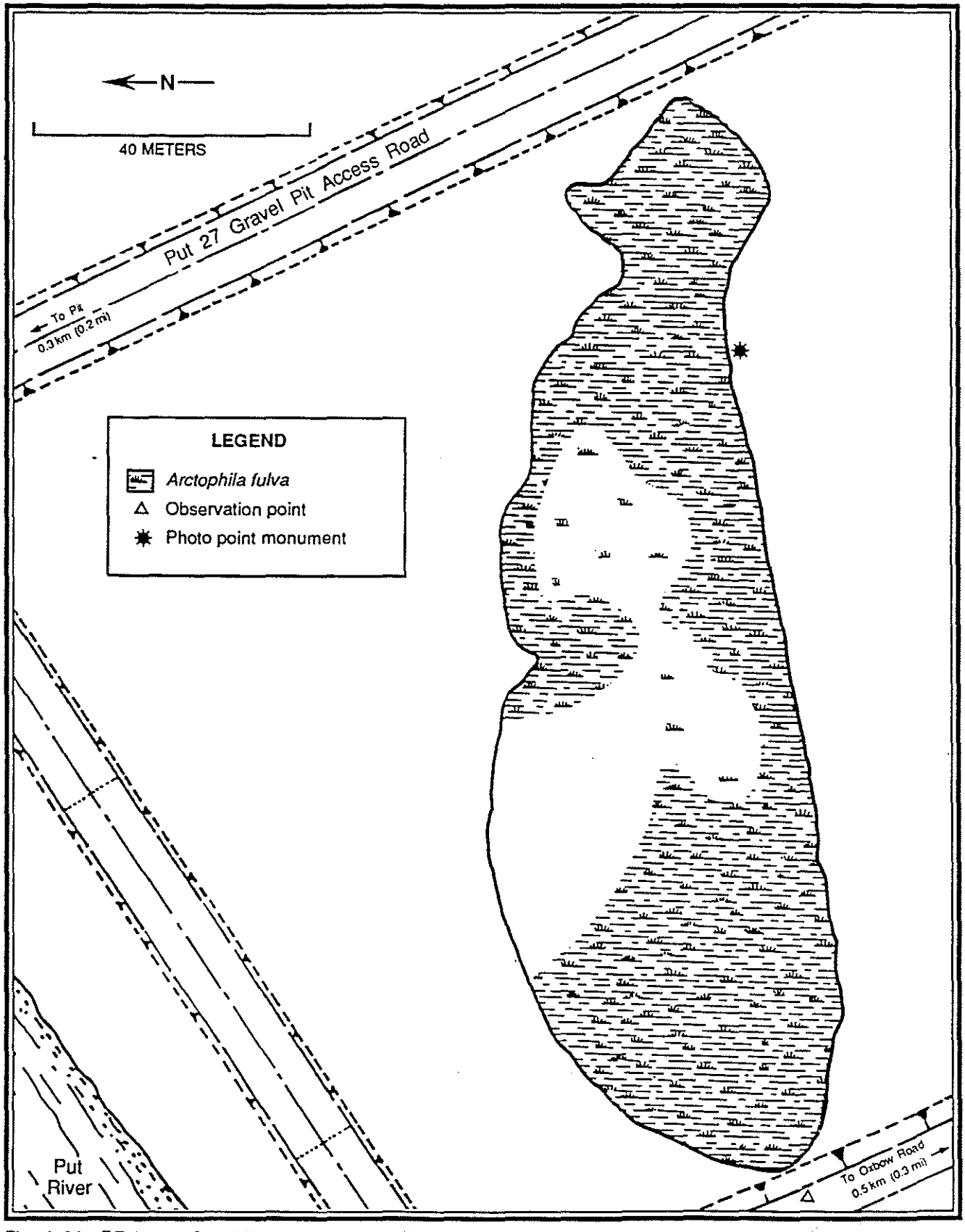


Fig. A-32. BP Pond (Site 35). Adapted from McKendrick (1990).

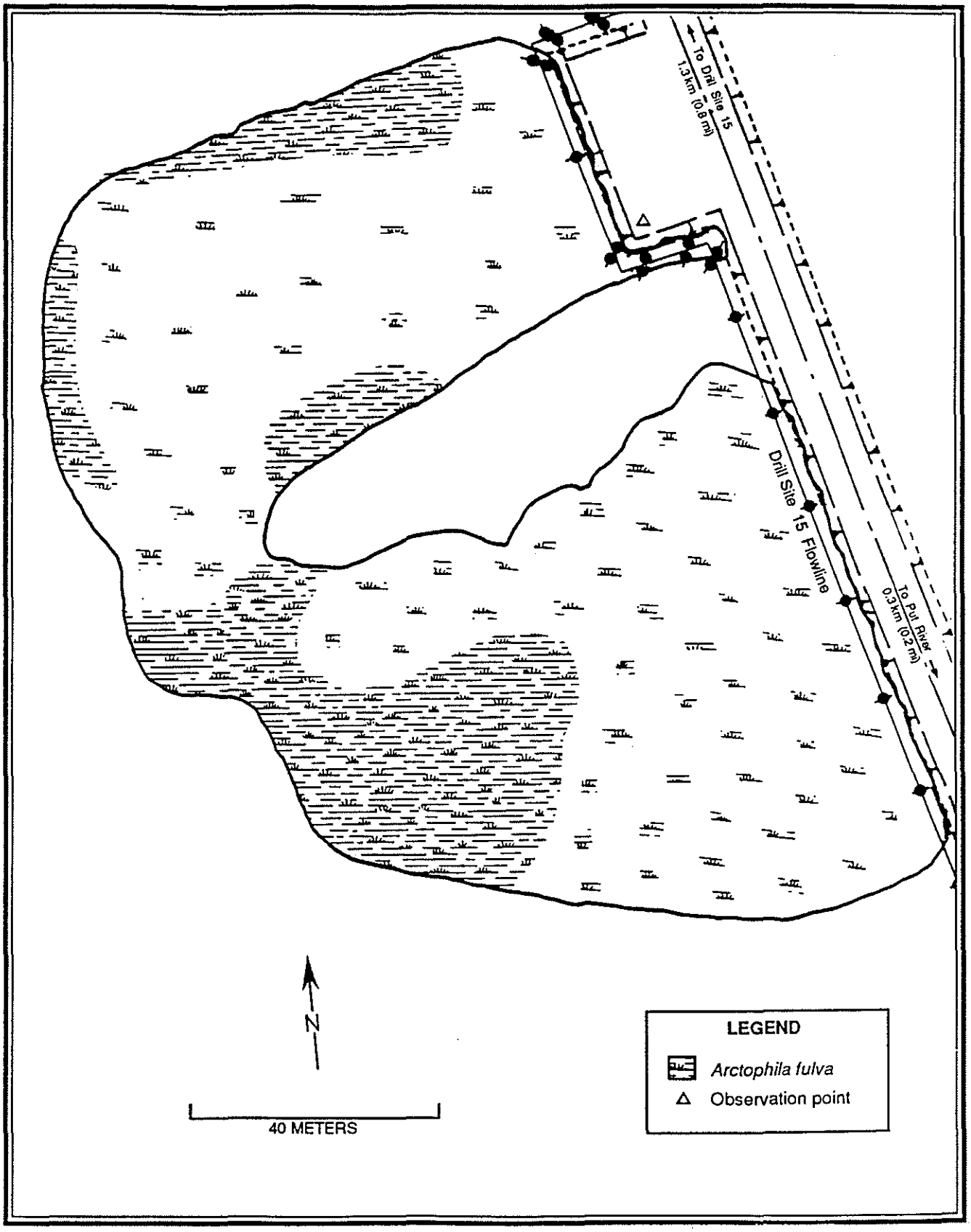


Fig. A-33. Drill Site 15 Pipeline Impoundment (Site 36). Adapted from McKendrick (1990).

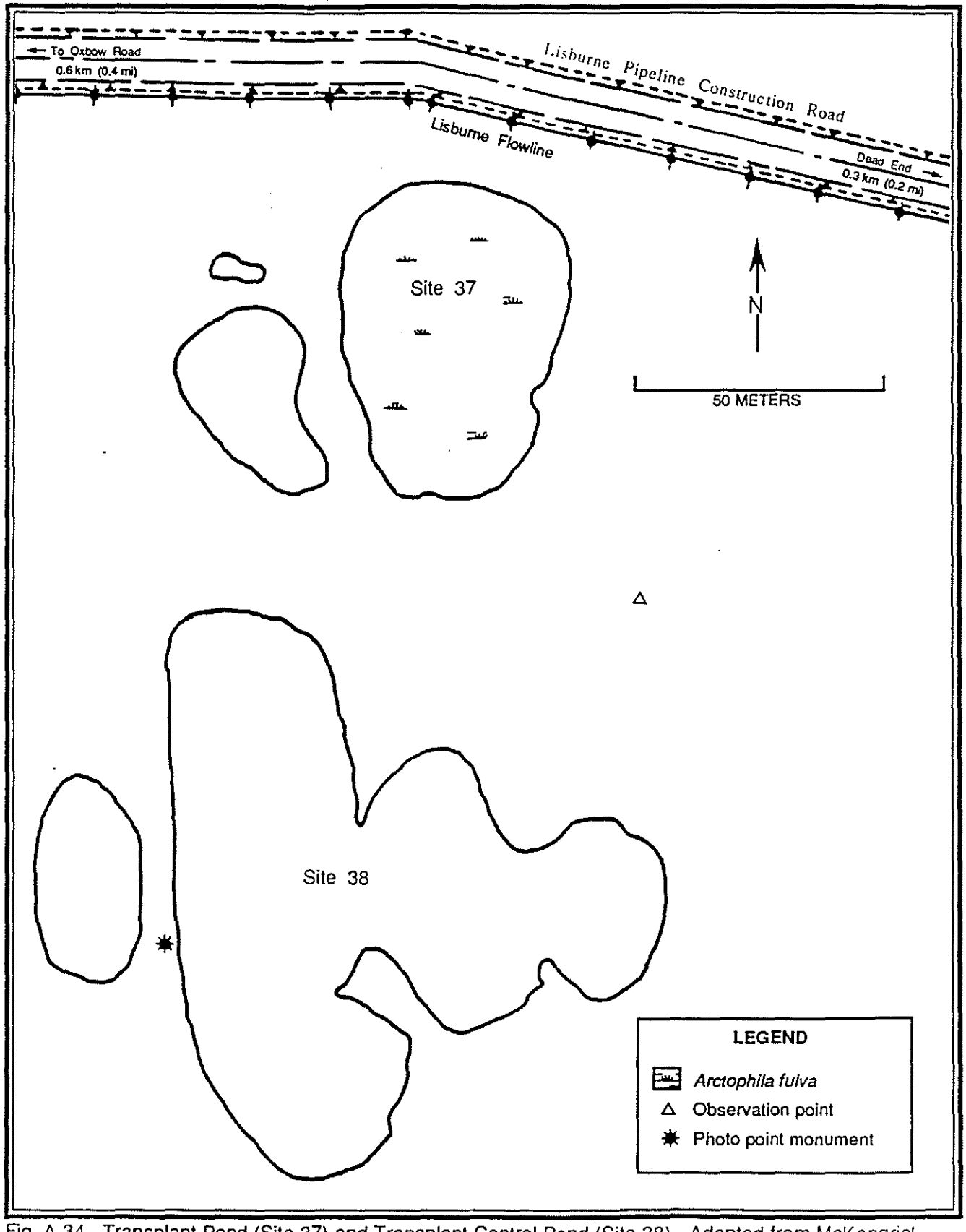


Fig. A-34. Transplant Pond (Site 37) and Transplant Control Pond (Site 38). Adapted from McKendrick (1990).

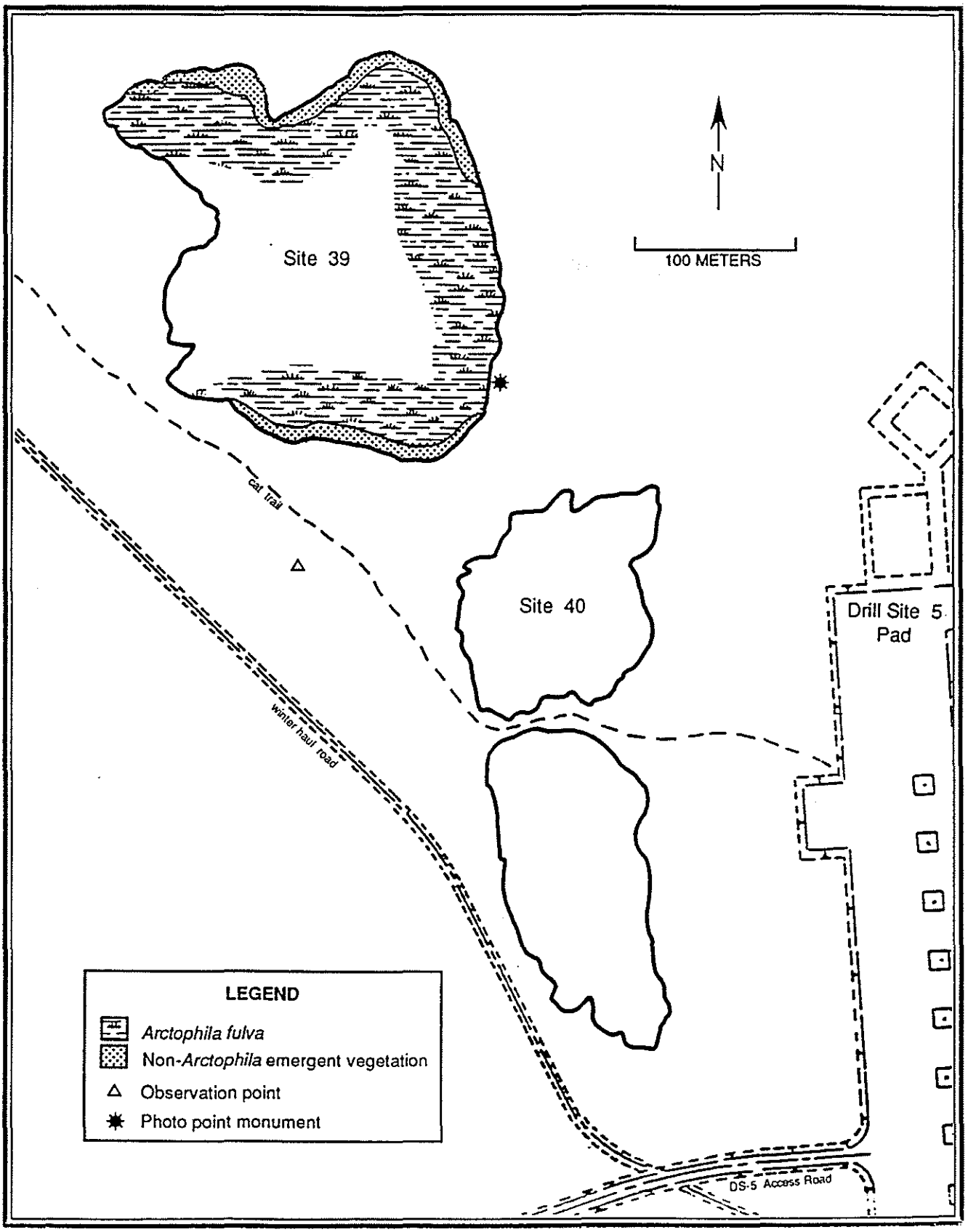


Fig. A-35. Drill Site 5 Pond (Site 39) and Drill Site 5 Trail Pond (Site 40). Adapted from McKendrick (1990

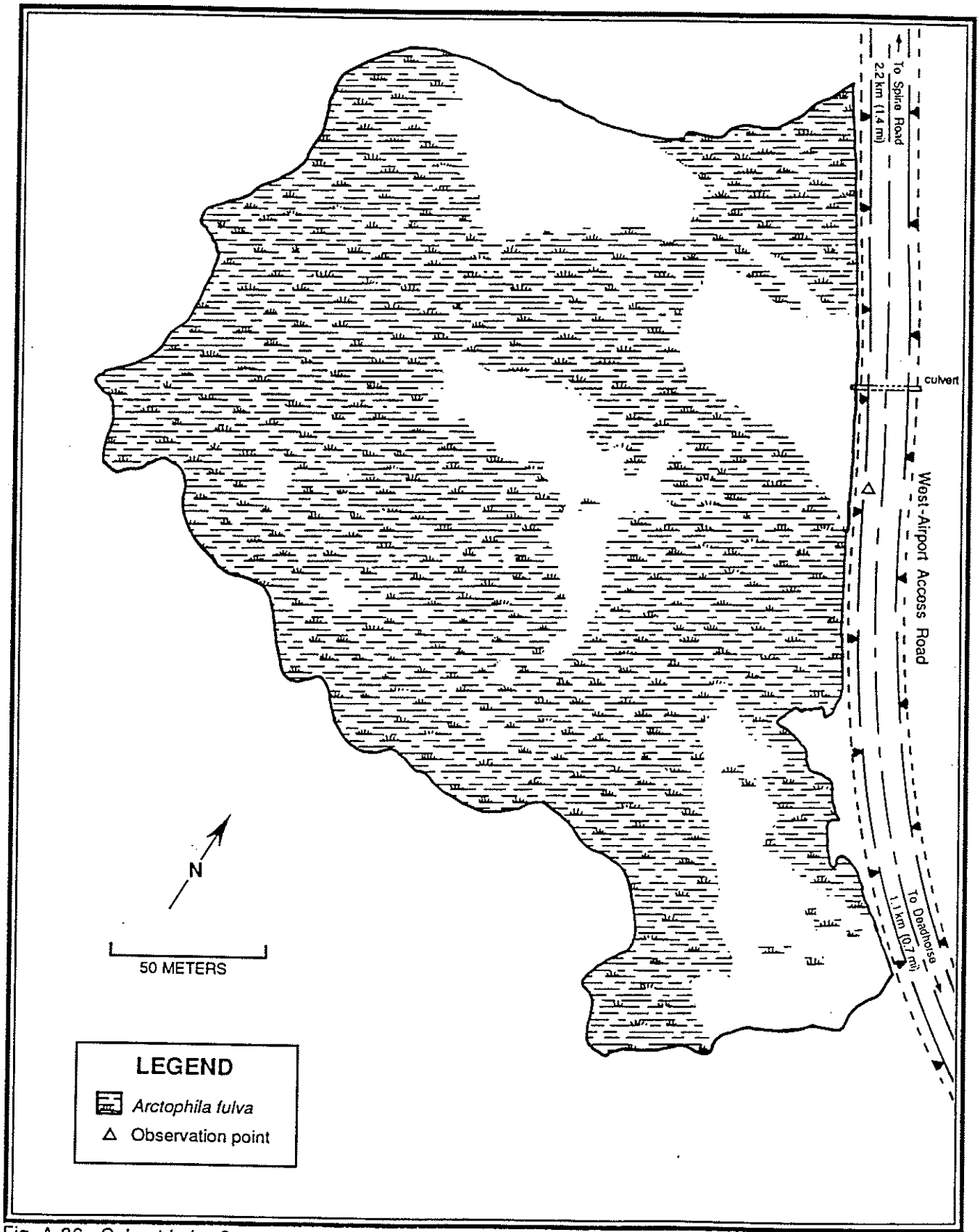


Fig. A-36. Culvert Lake Coleen (Site 41). Produced from Prudhoe Bay / Duck Island Color Aerial Photography, 1989, 1:1500, flighline 11, frame 14. (Photography by Aeromap U.S., Anchorage, AK.)

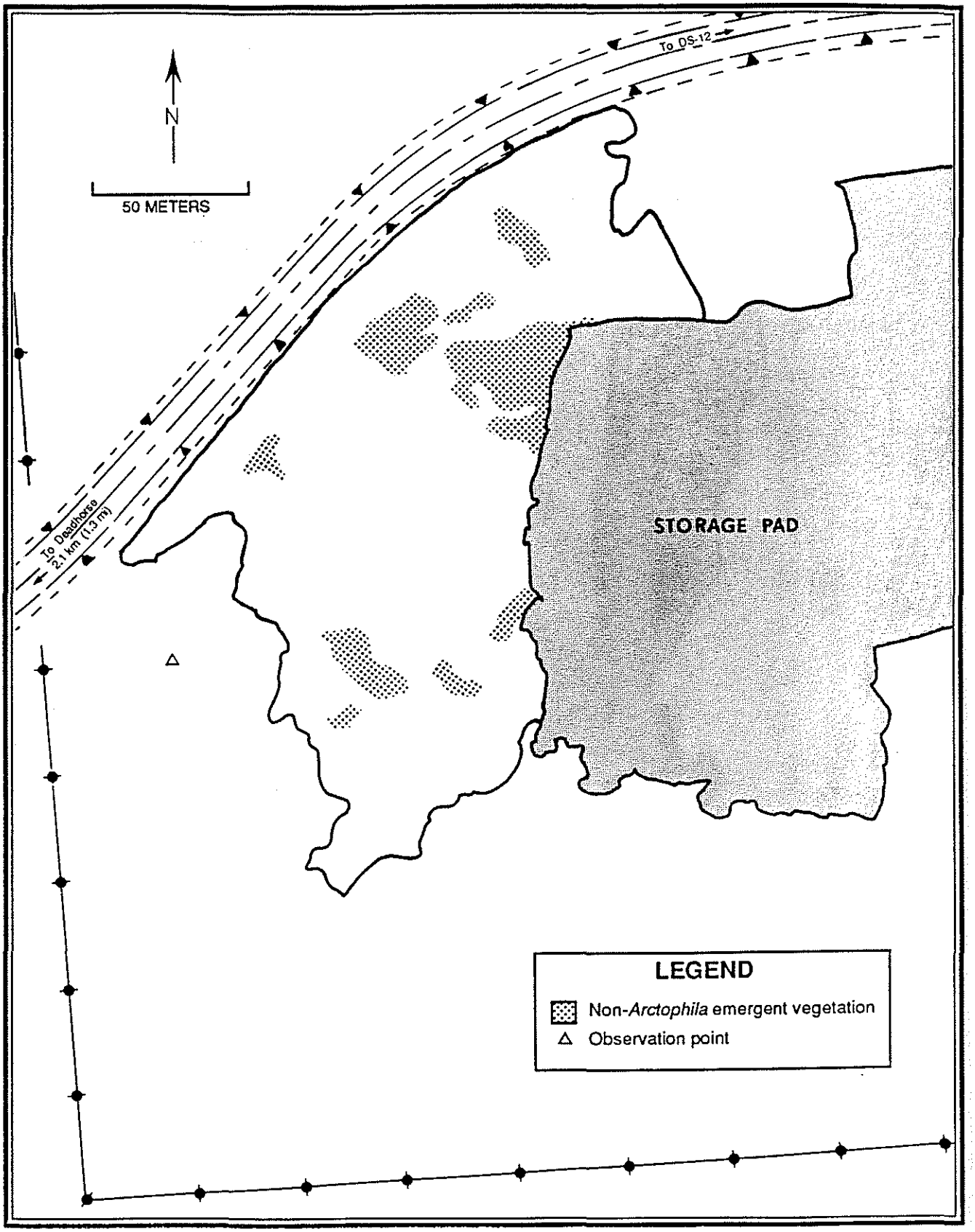


Fig. A-37. Drill Site 12 Impoundment (Site 42). Produced from Prudhoe Bay Color Infrared Aerial Photography, 1988, 1:500, flightline 12, frame 10. (Photography by Aeromap U.S., Anchorage, AK.)

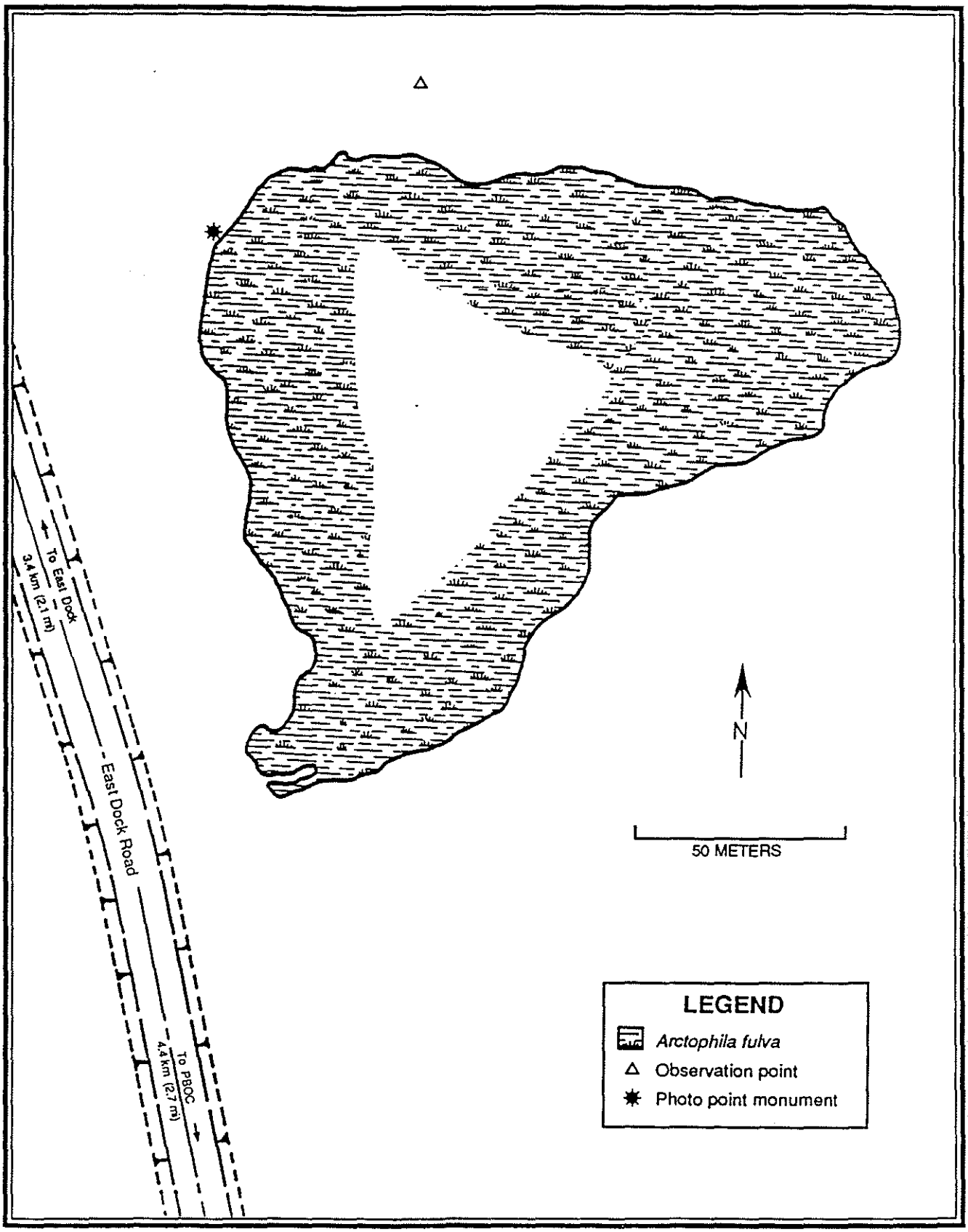


Fig. A-38. Sand Dune Lake (Site 43). Adapted from McKendrick (1990).

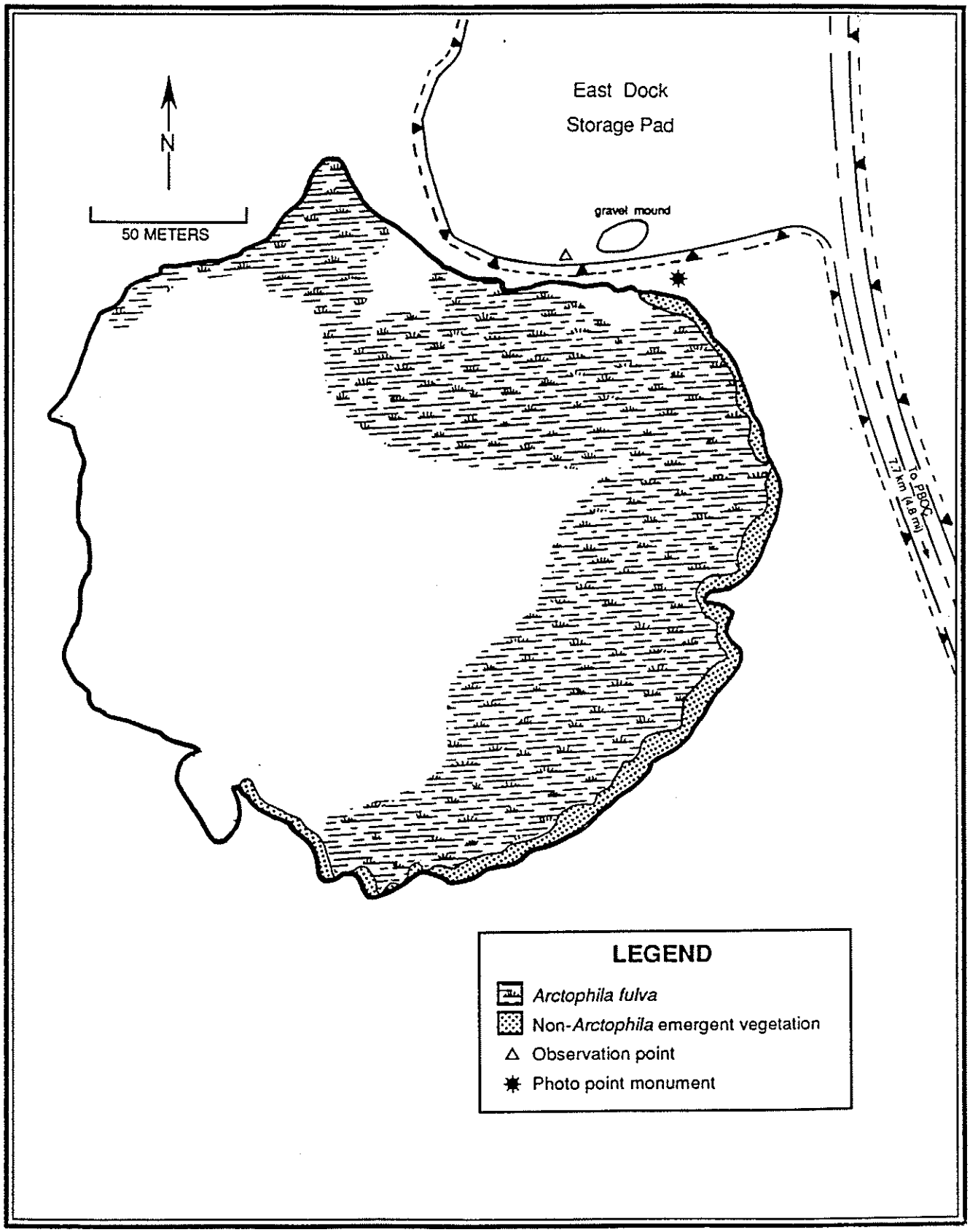


Fig. A-39. East Dock Pond (Site 44). Produced from Prudhoe Bay Color Infrared Aerial Photography, 1988. 1:500, flightline 3, frame 3. (Photography by Aeromap U.S., Anchorage, AK.)

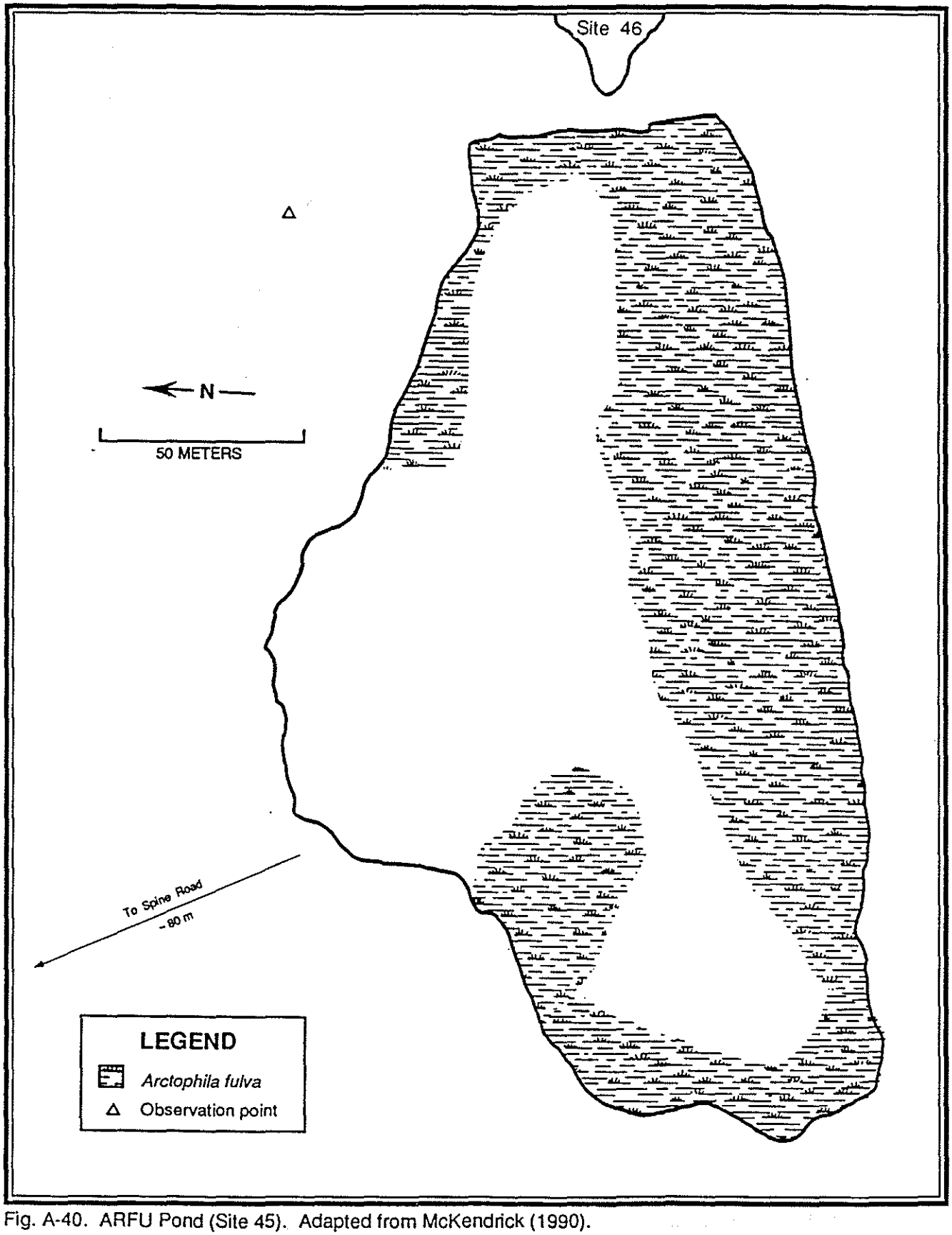


Fig. A-40. ARFU Pond (Site 45). Adapted from McKendrick (1990).

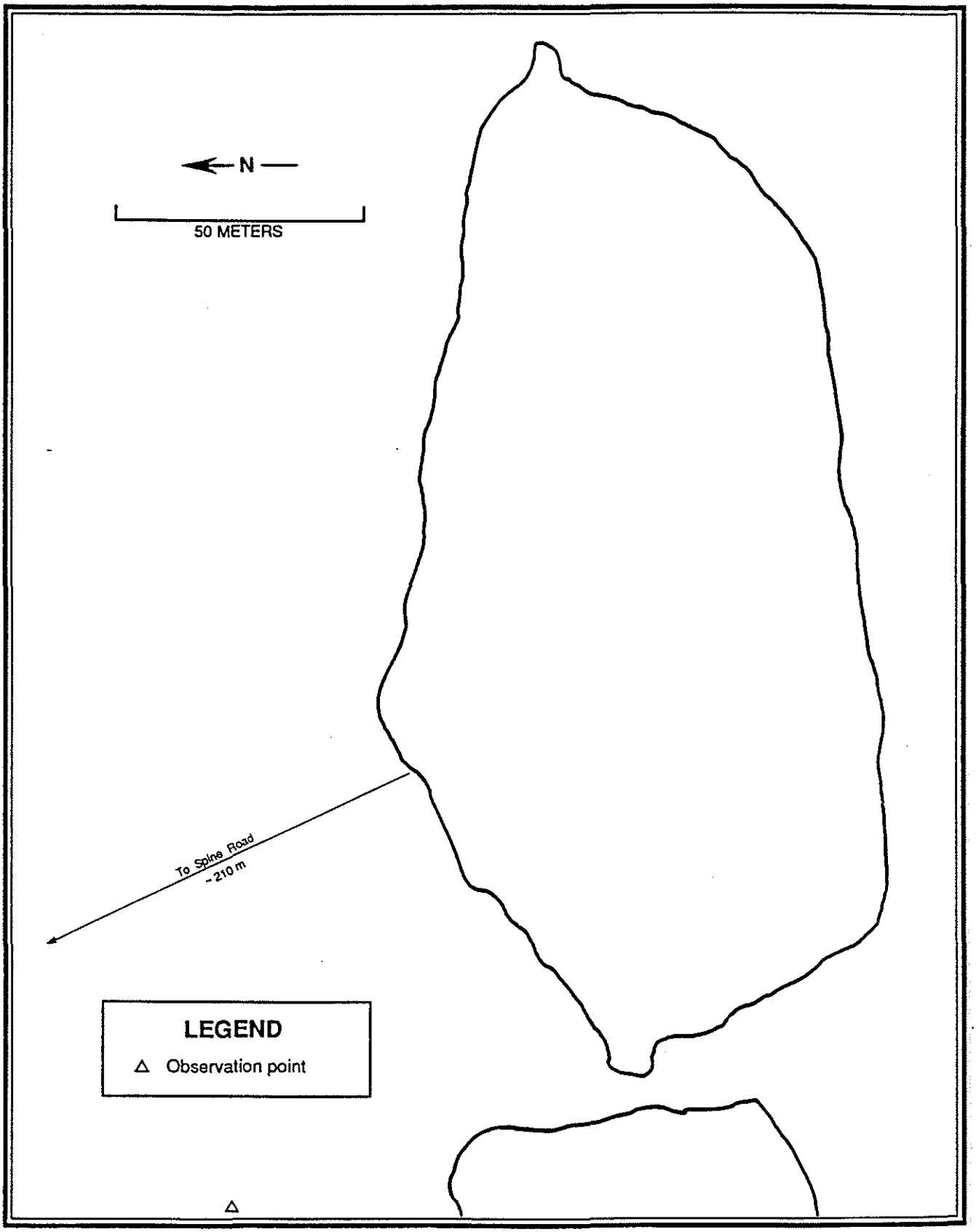


Fig. A-41. Non-ARFU Pond (Site 46). Adapted from McKendrick (1990).

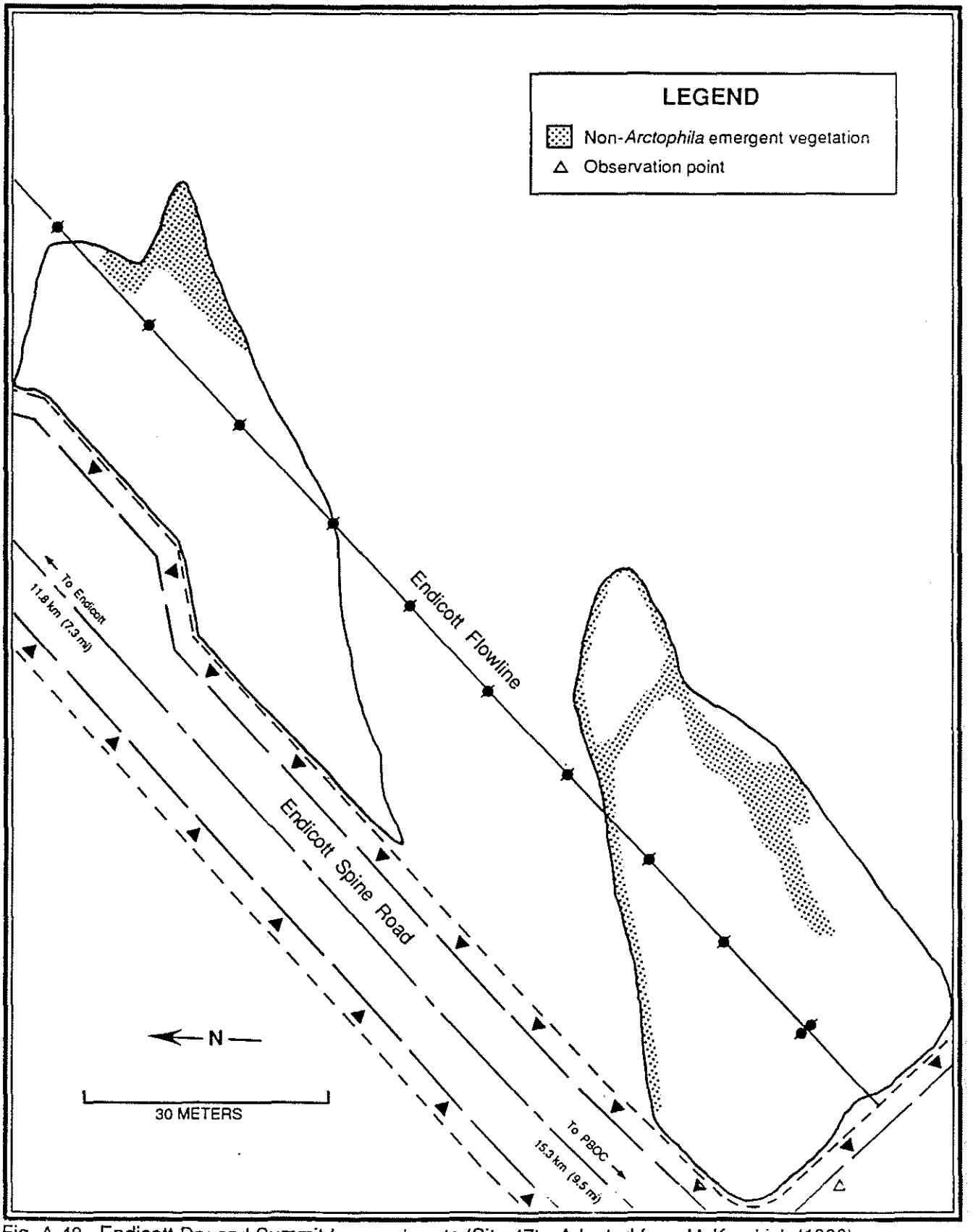


Fig. A-42. Endicott Dry and Summit Impoundments (Site 47). Adapted from McKendrick (1990).

APPENDIX B

Environmental and Behavioral Descriptors and Field Forms Used to Record Observations of Wildlife Using Study Plots

Environmental and behavioral descriptors used to record observations of animal use.

VEGETATION

DPS Dry prostrate shrub tundra
MGT Moist graminoid tundra
WGT Wet graminoid tundra
WST Wet saline graminoid tundra
ACE Aquatic graminoid tundra (*Carex, Eriophorum)*
AAR Aquatic graminoid tundra (*Arctophila*)
COB Coastal barrens
BSP Barren of sand covered peat
WTR Water
IMP Impounded water caused by man-made structures
SNI Snow/Ice
DST Disturbed
MTT Moist tussock tundra
UNK Unknown/not applicable

SURFACE-FORM

HCP High-centered polygons
LCP Low-centered polygons
MCP Mixed high- and low-centered polygons
FBT Frost-boil tundra
STR Strangmoor and/or discontinuous low-centered polygons
HUM Hummocky terrain associated with steep slopes
PGO Pingo
NPG Non-patterned ground
RET Reticulate pattern on creek banks, ridges, or inactive dunes
PNE Pond (shallow, no emergent vegetation)
PWE Shallow pond/lake with *Carex* or *Arctophila*
LAK Lake (too deep to wade)
STR Stream
FTP Flat-top polygon (low-relief high-centered polygon)
PRS Peat road surface
PRD Peat road ditch
PRB Peat road bank
GPS Gravel pad surface
GPB Gravel pad bank
GPD Gravel pad ditch
GRS Gravel road surface
GRB Gravel road bank
GRD Gravel road ditch
ALL Alluvium
OVB Overburden
UNK Unknown/not applicable

MICROHABITAT

RIM Low-centered polygon rim or strangmoor ridge
TRO Polygon trough
BAS Polygon basin
IWP Ice wedge pool (thermokarst pit)
TUS Tussock
HUM Hummock
FRB Frost boil
OPW Open water
EMV Emergent vegetation
SNI Snow/Ice
MEW Melt water
FLV Flat-vegetated
FLB Flat-barren
PPL Pipeline
ISV Isolated vegetation
ISL Island
PEB Pond edge/bank
DST Disturbed
GRR Gravel roadside
STK Stake (plot marker)
UNK Unknown/not applicable

BEHAVIOR

DI Displaying
NI Nesting/incubation
AD Alarm/distraction
FD Feeding
RP Resting/preening/standing
FS Flushed
FL Flying
IN Interacting (non-display)
LD Landing
HU Hunting
AT Attracted from off plot (mobbing)
TR Transport
UN Unknown

SIGN

SC Scat
TR Tracks
GR Grazing
RE Remains

SITE ____________________ Page ___ of ___

DATE _ _ _ _ _ _ (m m d d y y) CONTROL/DIST ☐ OBSERVER ____________

Time: Start _ _ _ _ End _ _ _ _

WEATHER: Temp. _ _ Wind _ _ _ _ Cloud Cover _ _ _

Species Name	Ind	HABITAT			No. Seen	BEH	SEX		AGE			B	COMMENTS
		VEG	LND	MCR			M	F	AD	SUB	Fled		

SITE _____ Page ____ of ____

CONTROL/DIST ☐ OBSERVER _____

DATE _____ (m m d d y y)

Time: Start _____ End _____

COMMENTS:

APPENDIX C

Statistical Analyses and Distributions of Selected Data

INFERENTIAL STATISTICAL ANALYSES

Relatively few data sets were subjected to inferential analysis due to the limited objectives of the study. As mentioned earlier, the study was not designed with the stated purpose of testing hypotheses. Thus, those data sets chosen were selected for their ability to give a broad impression of pertinent trends, and because it was possible to convert them into an appropriately testable format.

Bird use of coastal plain gravel pads was compared with that of adjacent tundra by analyzing differences between mean numbers of bird observations per day and over the summer. During the second and fourth 2-wk study periods, as well as during the summer as a whole, there was a statistically significant difference between the mean numbers of bird observations noted on gravel and tundra (Table C-1).

Similar analyses compared ponds to impoundments, and waterbodies with *Arctophila fulva* to waterbodies without *A. fulva*. In neither case did the compared habitat types differ with respect to the mean number of bird observations per time period, irrespective of the time period under consideration (Table C-1).

Coastal plain gravel pads and undisturbed tundra were also compared with respect to proportions of bird behavior observed on them over the length of the summer (Table C-2). In addition to the general conclusion that proportions of bird behavior on gravel and tundra are significantly different, several specific differences are apparent. On gravel pads, fewer observations were made of displaying, hunting, landing, and alarming/distracting behaviors than would have been expected if behavior occurred in identical proportions on gravel and tundra. Resting/preening accounted for a higher proportion of bird behavior on gravel pads than would have been expected. The large discrepancies between observed and expected frequencies in each of these five behavioral categories were enough individually to conclude that gravel pads and tundra differ with respect to bird behavior. Discrepancies in feeding and interacting behaviors were relatively less important, quantitatively.

Table C-1. Statistical analysis of bird use by habitat type. For each habitat comparison, the analysis tested for a difference between mean numbers of bird observations per day, (i.e. for 24 3-min periods), and for the entire summer, (96 3-min periods). Observations were made at each site one day per each of the 4 observational periods.

2-Wk Observational Period	Coastal Gravel Pads versus Undisturbed Tundra		Ponds versus Impoundments		Ponds/Impoundments with ARFU versus Ponds/Impoundments w/o ARFU	
	P	n	P	n	P	n
1	0.51	9	0.05<P<0.10	19 / 9	> 0.20	14 / 14
2	0.02 *	10	> 0.20	19 / 9	> 0.20	14 / 14
3	0.18	9	> 0.20	19 / 9	> 0.20	14 / 14
4	< 0.01 *	10	> 0.20	19 / 9	> 0.20	14 / 14
Entire Summer	< 0.01 *	10	0.05<P<0.10	19 / 9	> 0.20	14 / 14
	(sign test)		(Mann-Whitney)		(Mann-Whitney)	

* significant difference at alpha = 0.05.

Table C-2. Frequencies of bird behavior on gravel pads and tundra. Data are numbers of actual observations per behavioral category, and what would have been expected if behaviors had occurred in the same proportions on both types of habitat. Behaviors are ranked by their contribution to the overall chi-square statistic.

	Gravel Pads		Tundra		
Behavior	Observed	Expected	Observed	Expected	Chi-square Contribution
Displaying	27	74	63	16	172.77 *
Hunting	4	22	22	5	81.59 *
Resting / Preening	907	810	74	171	66.66 *
Landing	734	787	219	166	20.37 *
Alarming / Distracting	13	21	12	4	16.22 *
Feeding	949	910	153	192	9.64
Interacting	20	24	9	5	3.72
Other	93	100	28	21	2.74
	n = 2747		n = 580		Chi-square = 373.71 df = 7 P < 0.01

* chi-square contributions that, alone, would have made test significant.

DESCRIPTION OF VARIABLE DISTRIBUTIONS

In order to better describe the variability of the data concerning wildlife use of disturbed and undisturbed habitats, bivariate scatter/boxplots were generated with the computer package SYGRAPH (Wilkinson 1988:188) and are included following Fig. C-1. Each pair of plots corresponds to a specific habitat-use comparison addressed in the text, and appears in the same sequence. The individual graphs are simple scatter diagrams which plot the number of distinct species observed per two-hour interval by the average number of individuals observed per 3-minute period during that same interval. Opposite the axes, data variability is summarized by boxplots. A notational explanation of the boxplots themselves is presented in Fig. C-1.

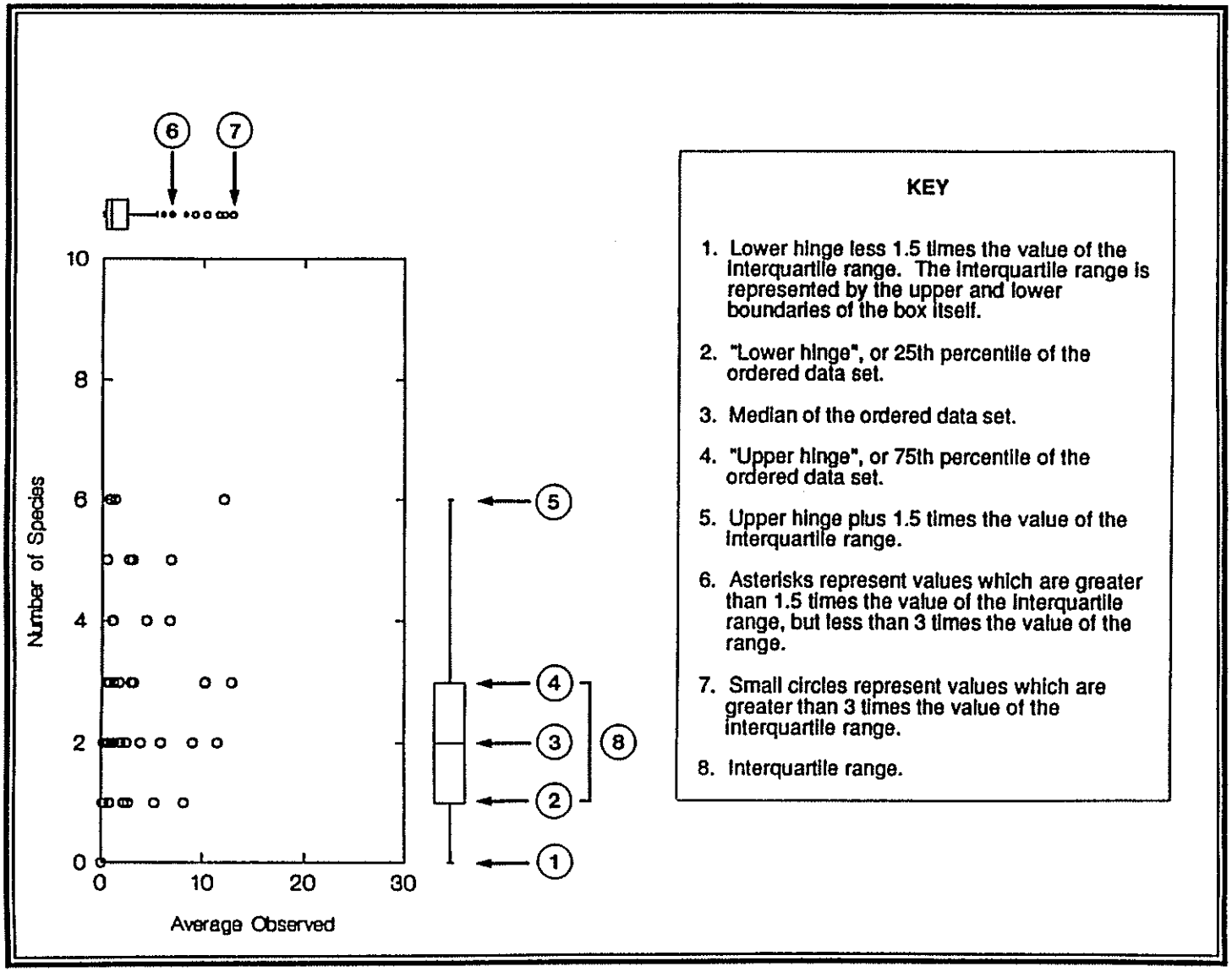
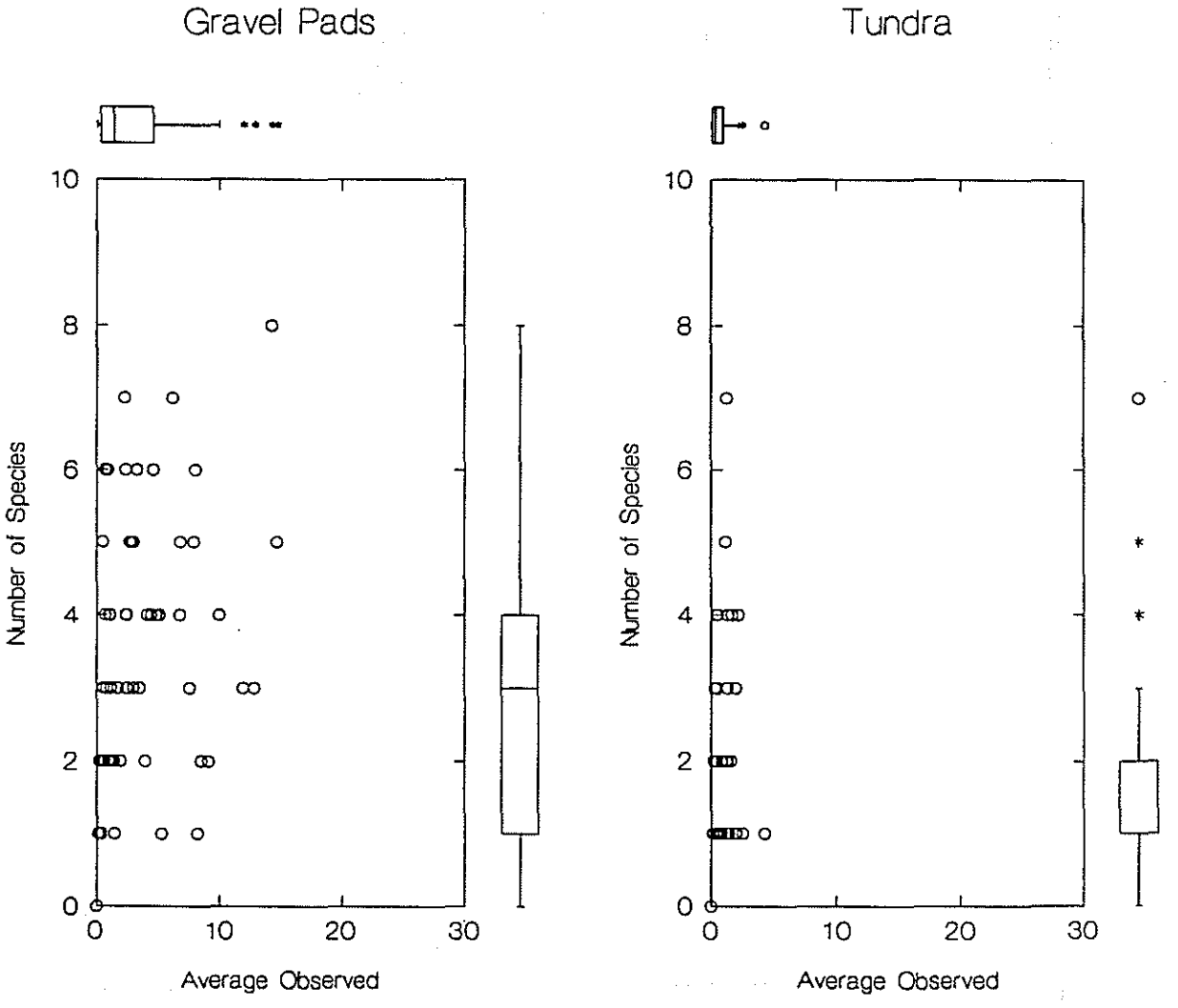
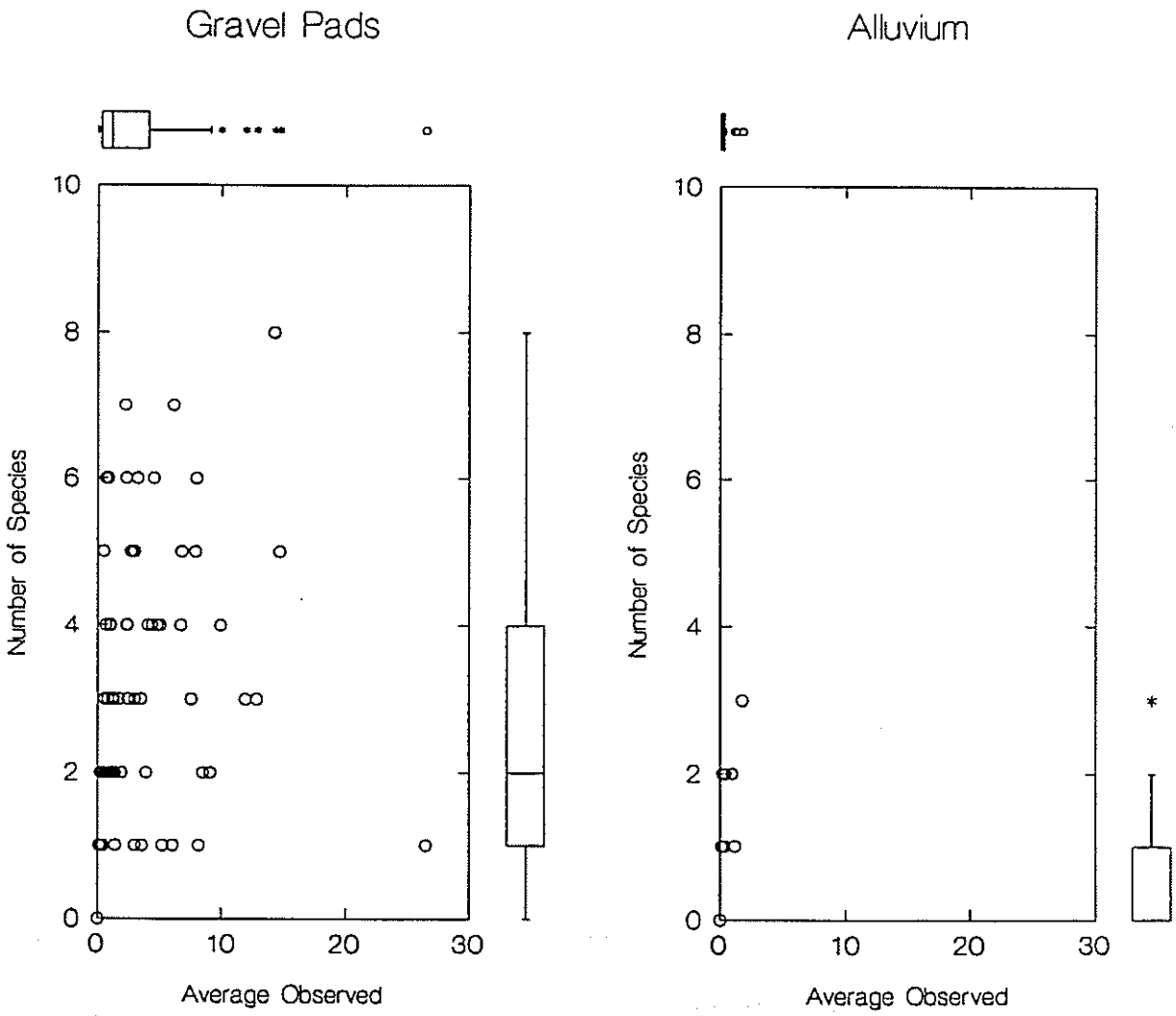


Fig. C-1. Notational key to boxplots which graphically describe the variability of data concerning wildlife use of disturbed and undisturbed habitats.

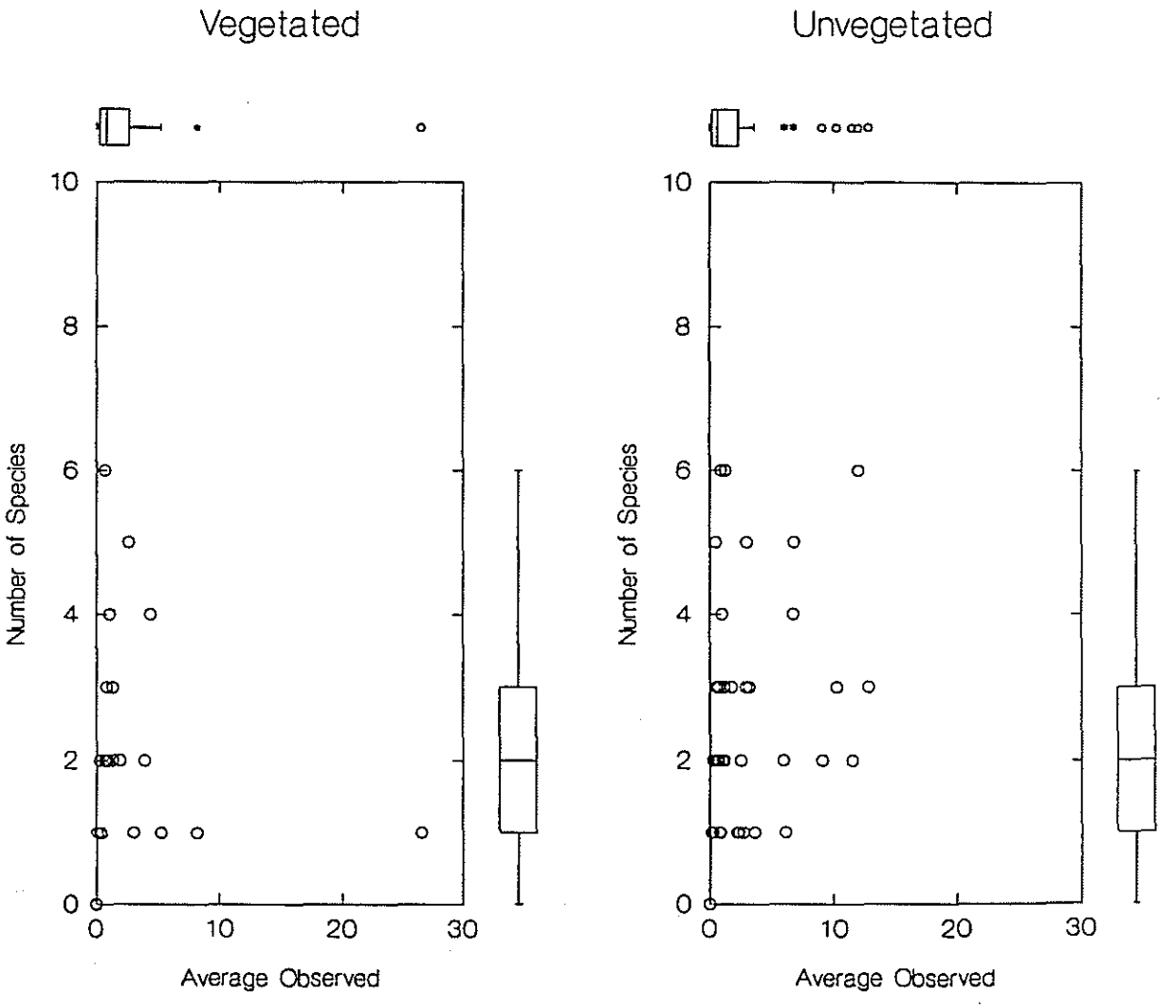
Bird Use of Coastal Gravel Sites



Bird Use of Coastal Gravel Pads and Alluvium

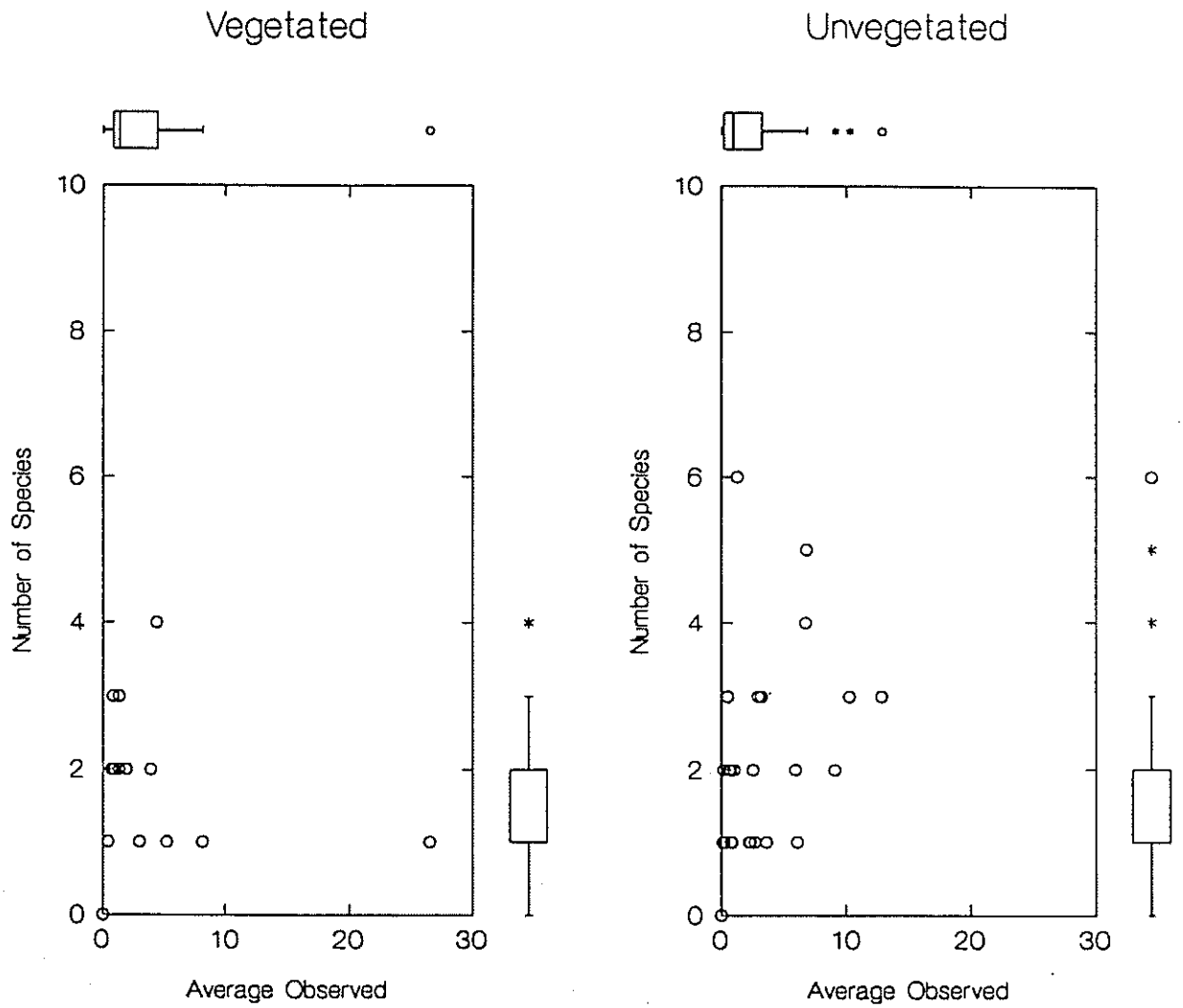


Bird Use of Gravel Pads
excluding observations on impoundments

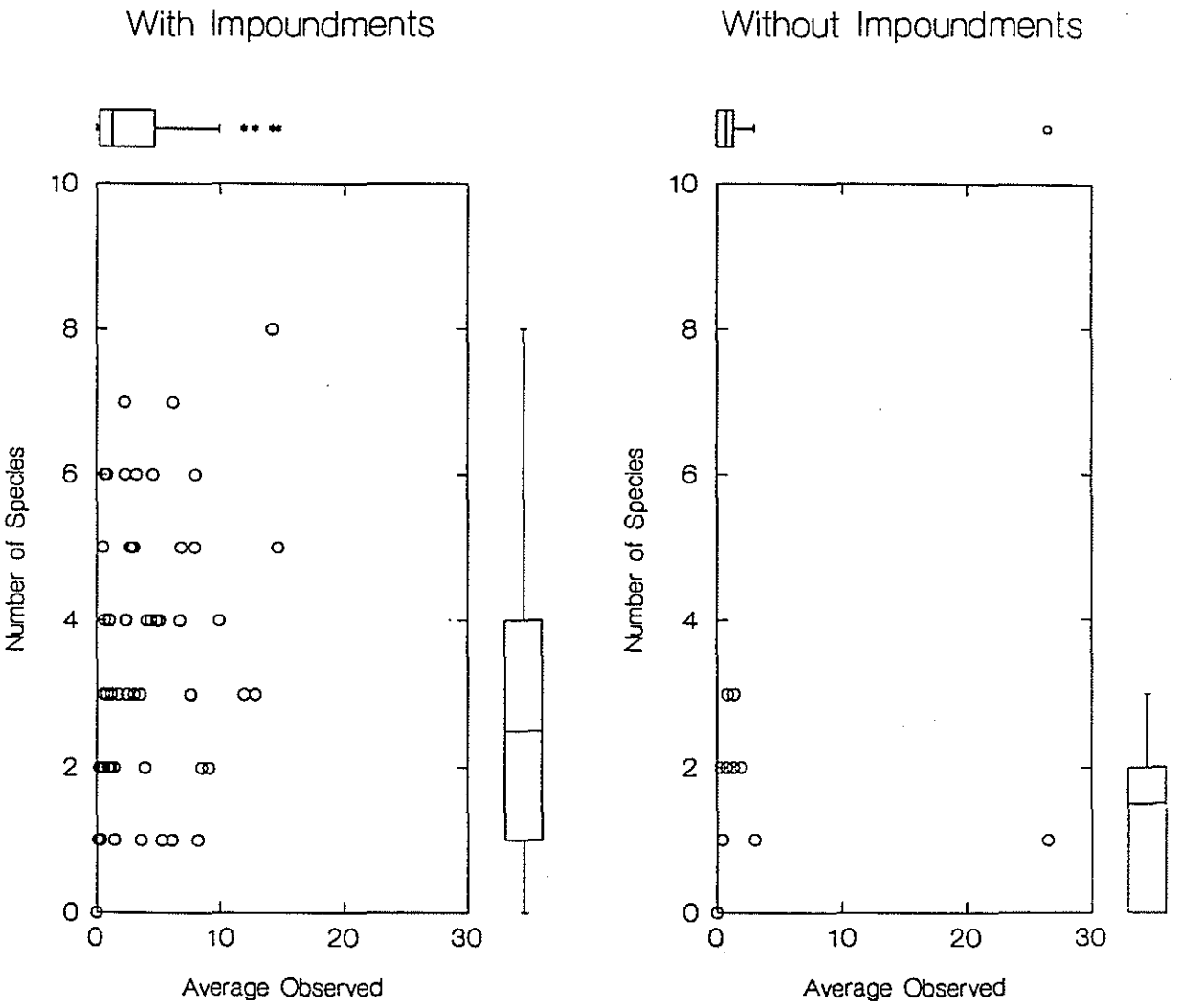


Bird Use of Gravel Pads

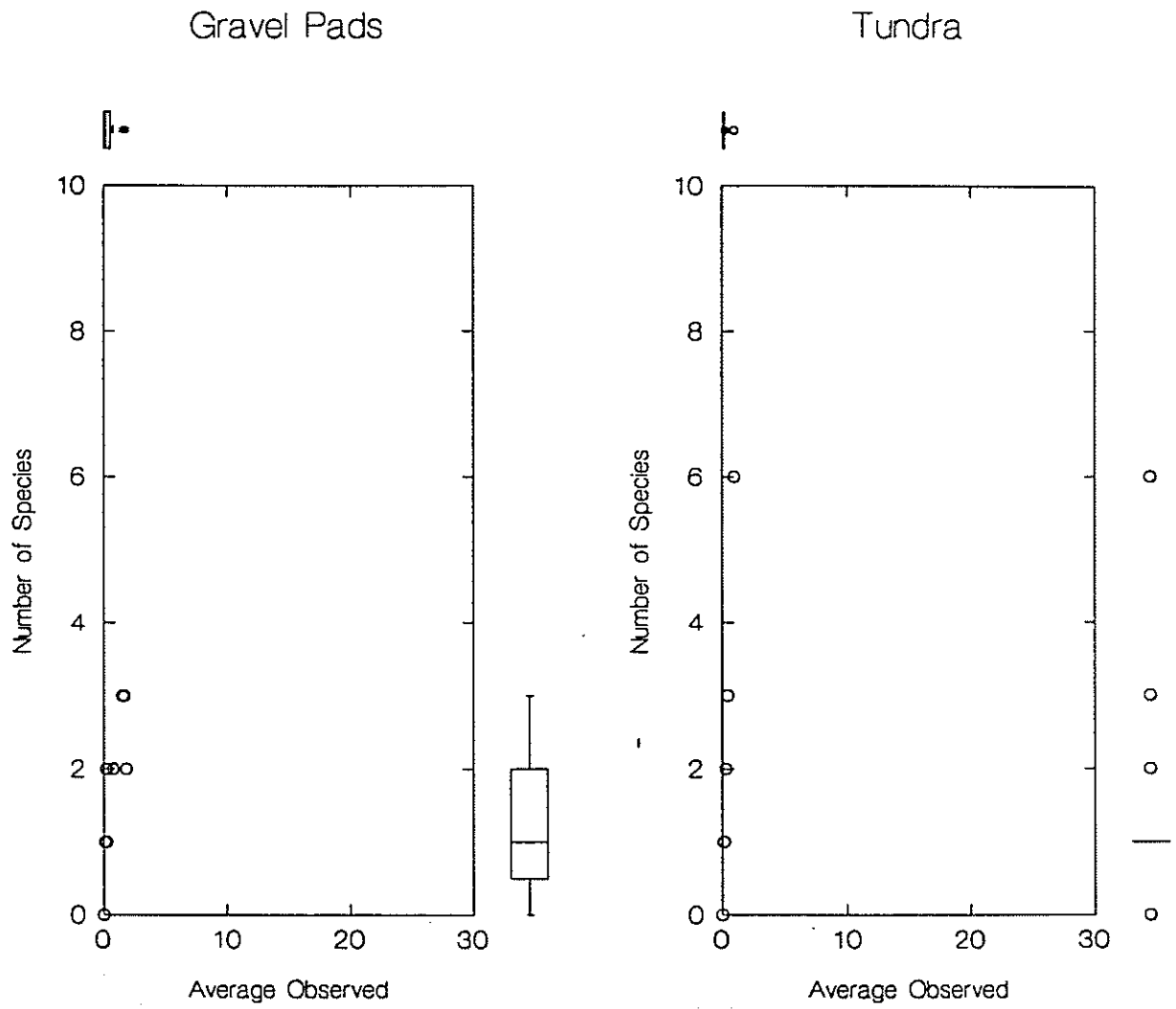
from mid-July to mid-August
excluding observations on impoundments



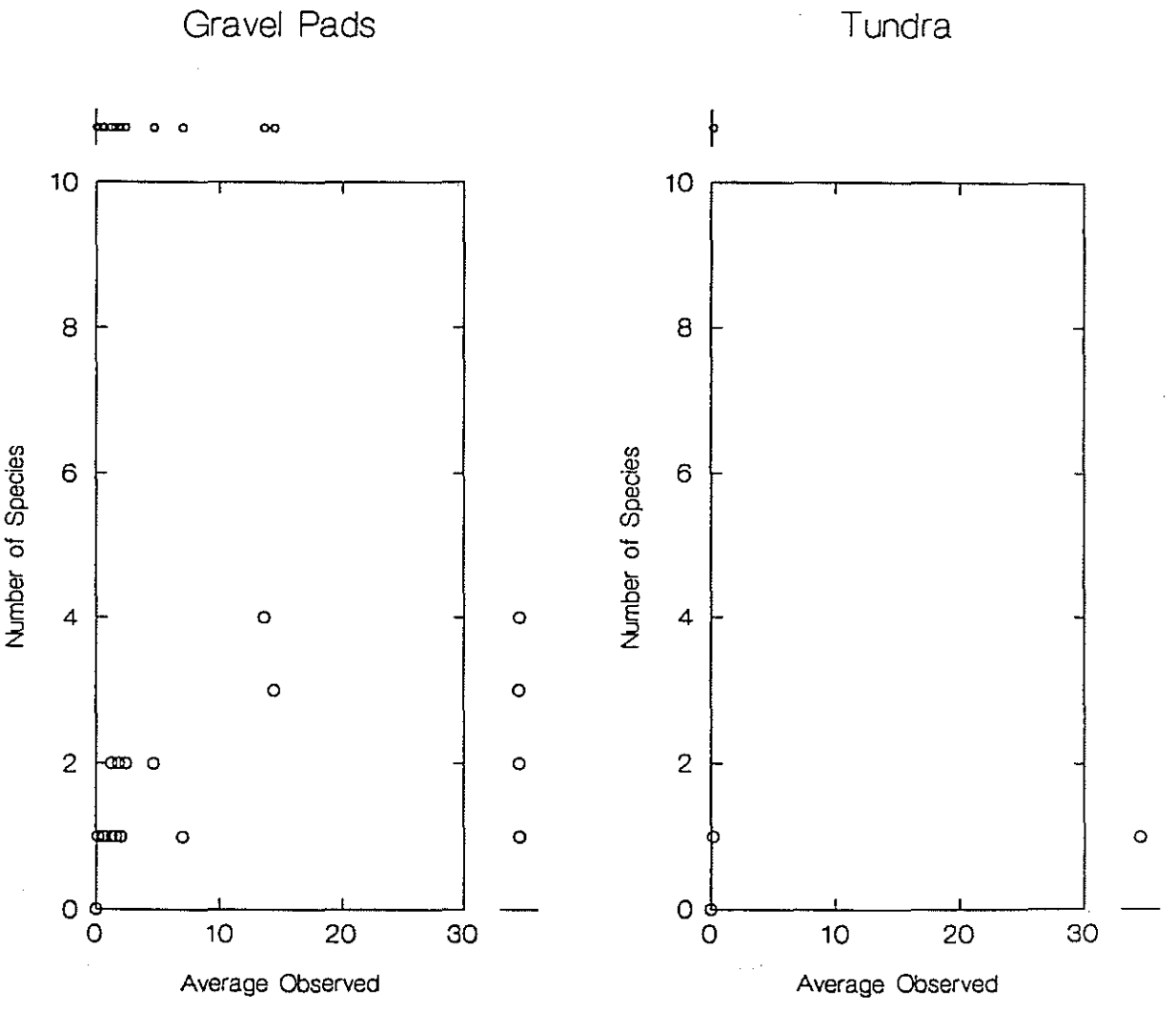
Bird Use of Gravel Pads



Bird Use of Foothill Gravel Pad Sites

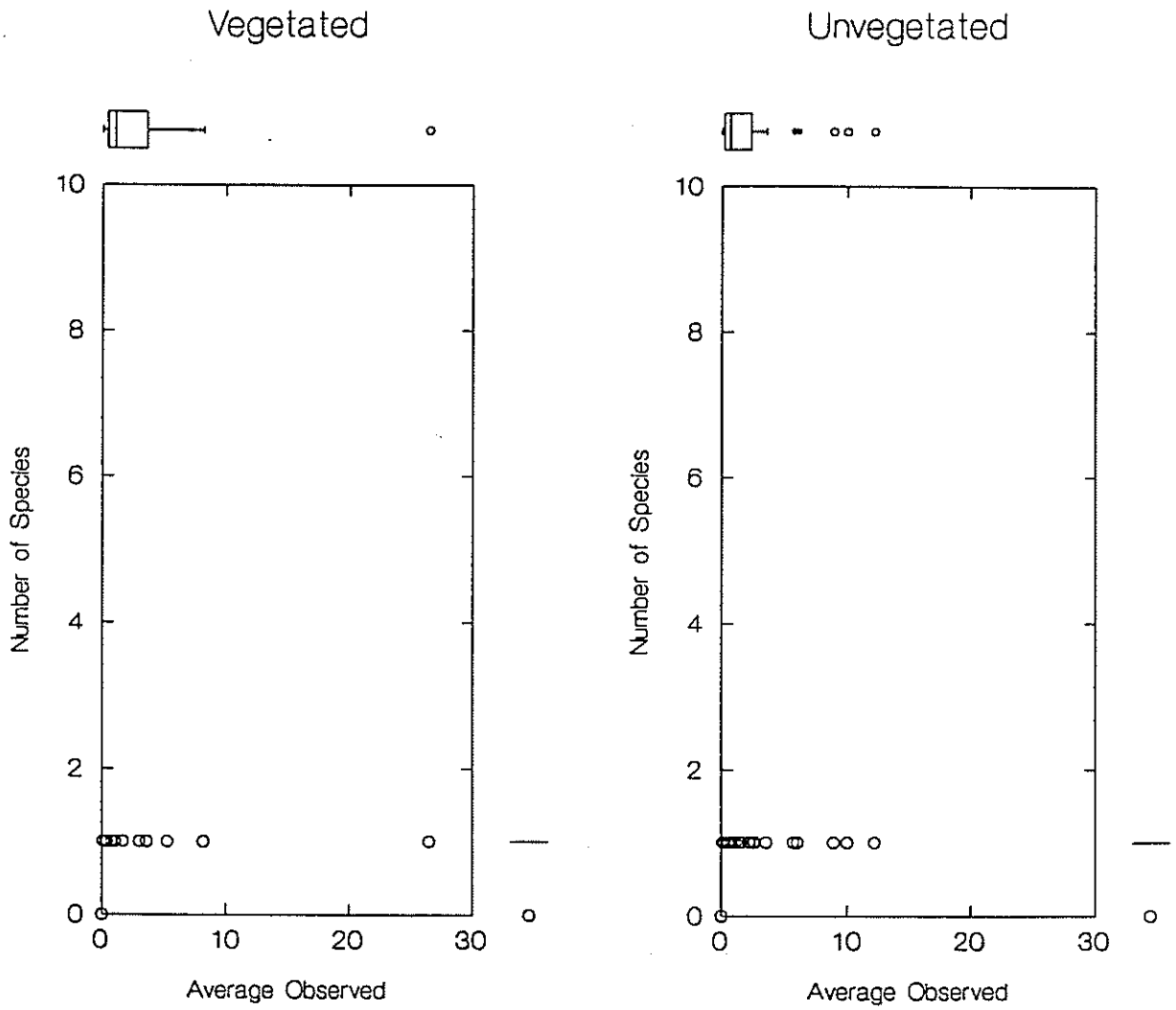


Waterfowl Use of Coastal Gravel Pad Sites

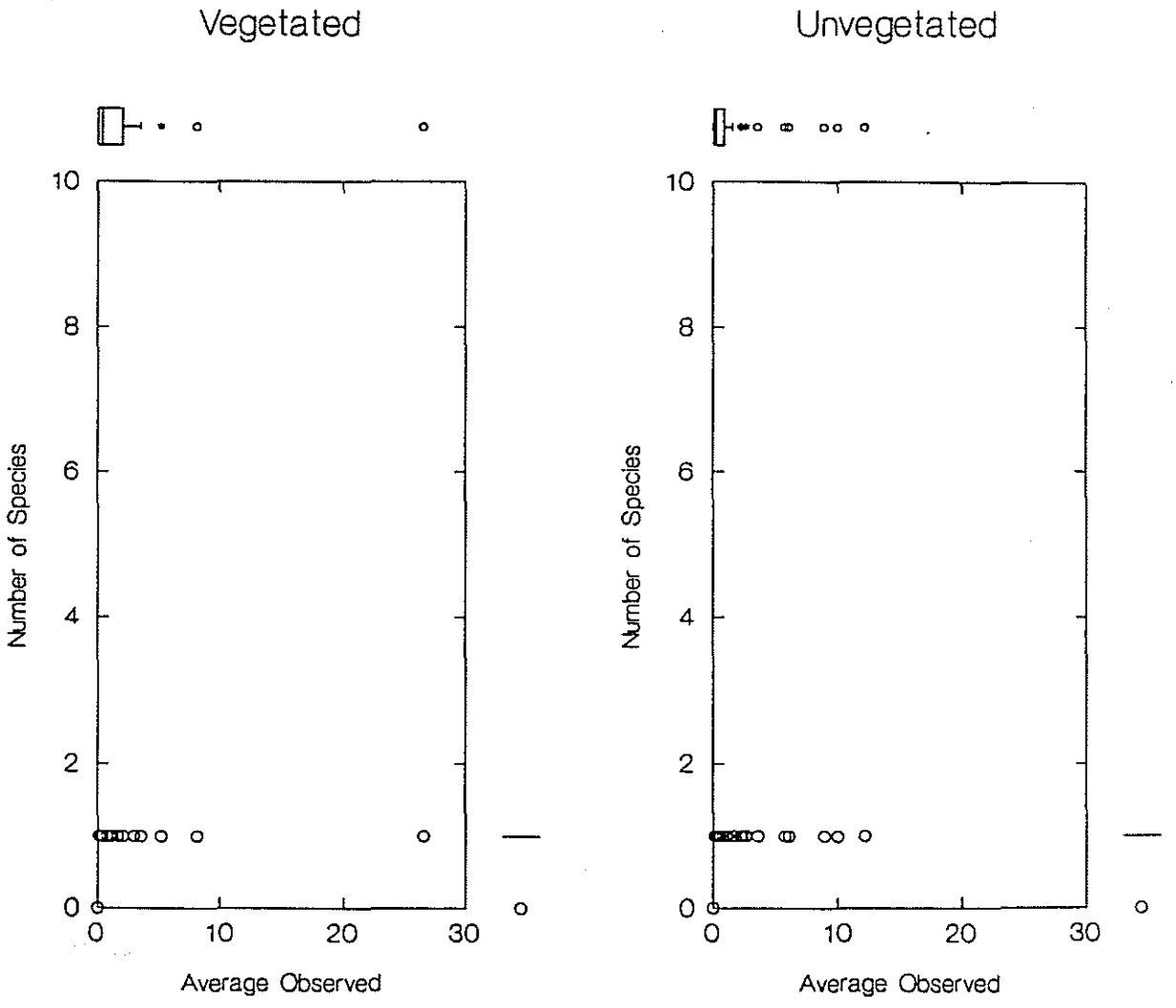


Lapland Longspur Use of Gravel Pads

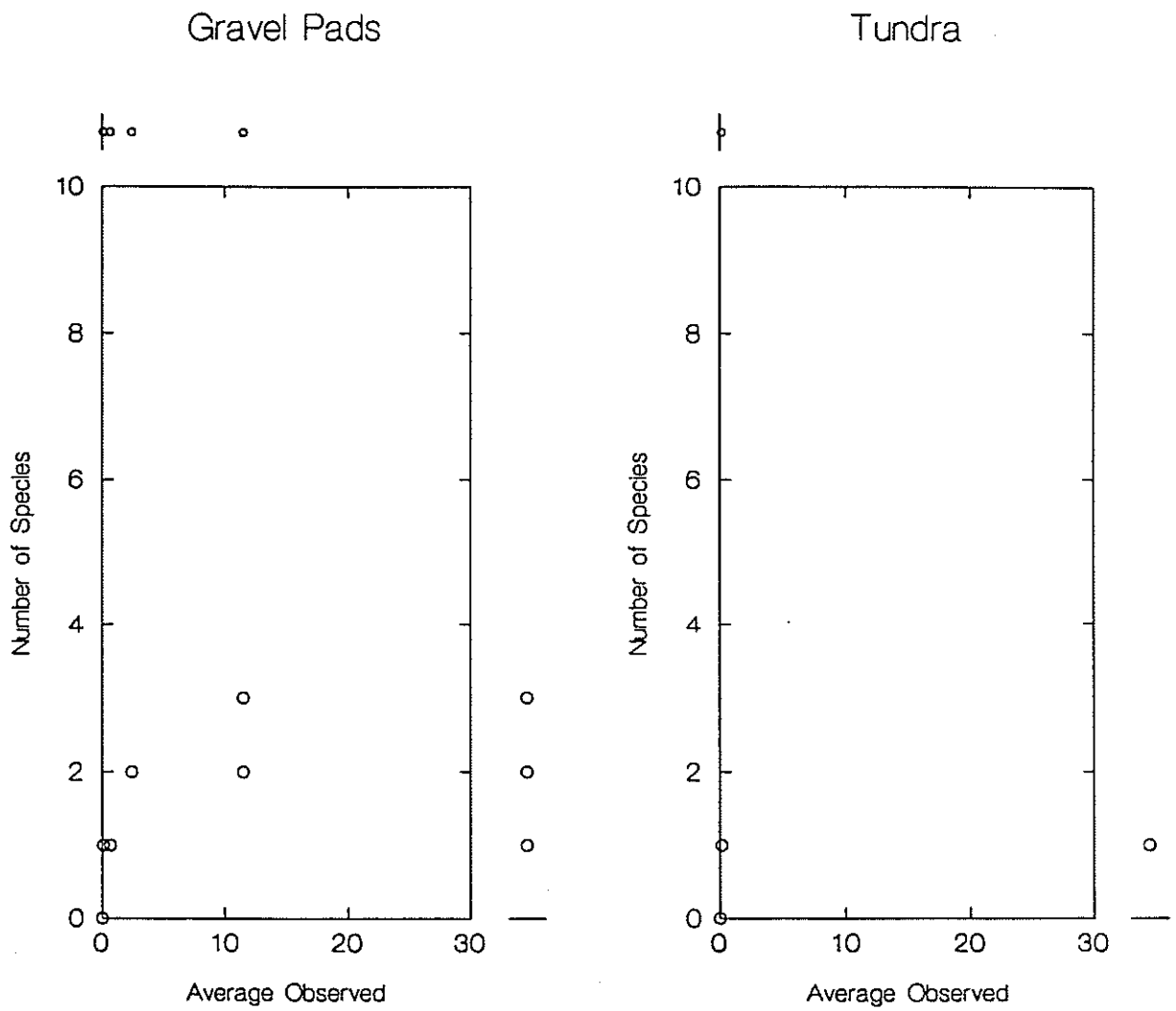
from mid-July to mid-August
excluding observations on impoundments



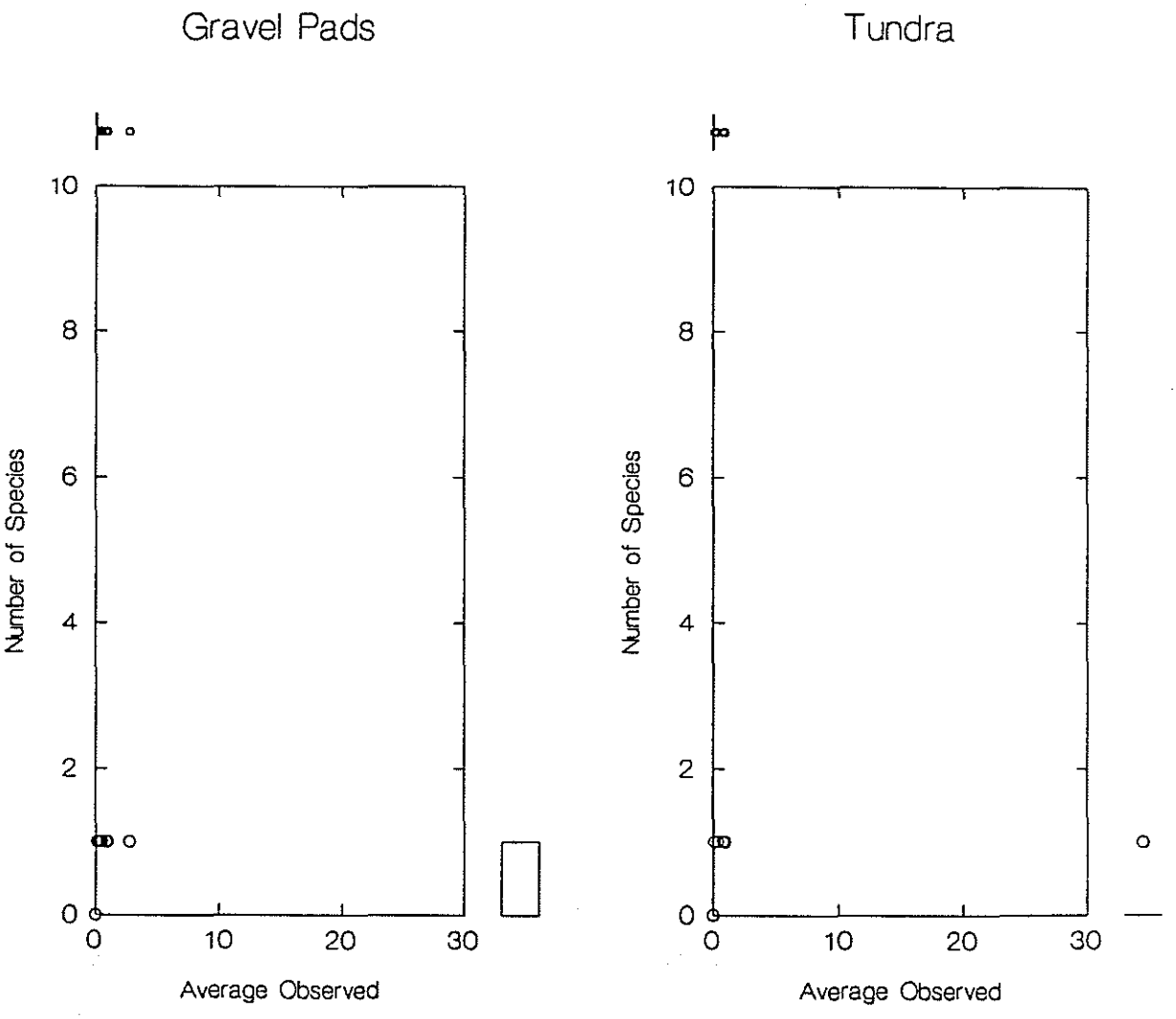
Lapland Longspur Use of Gravel Pads
excluding observations on impoundments



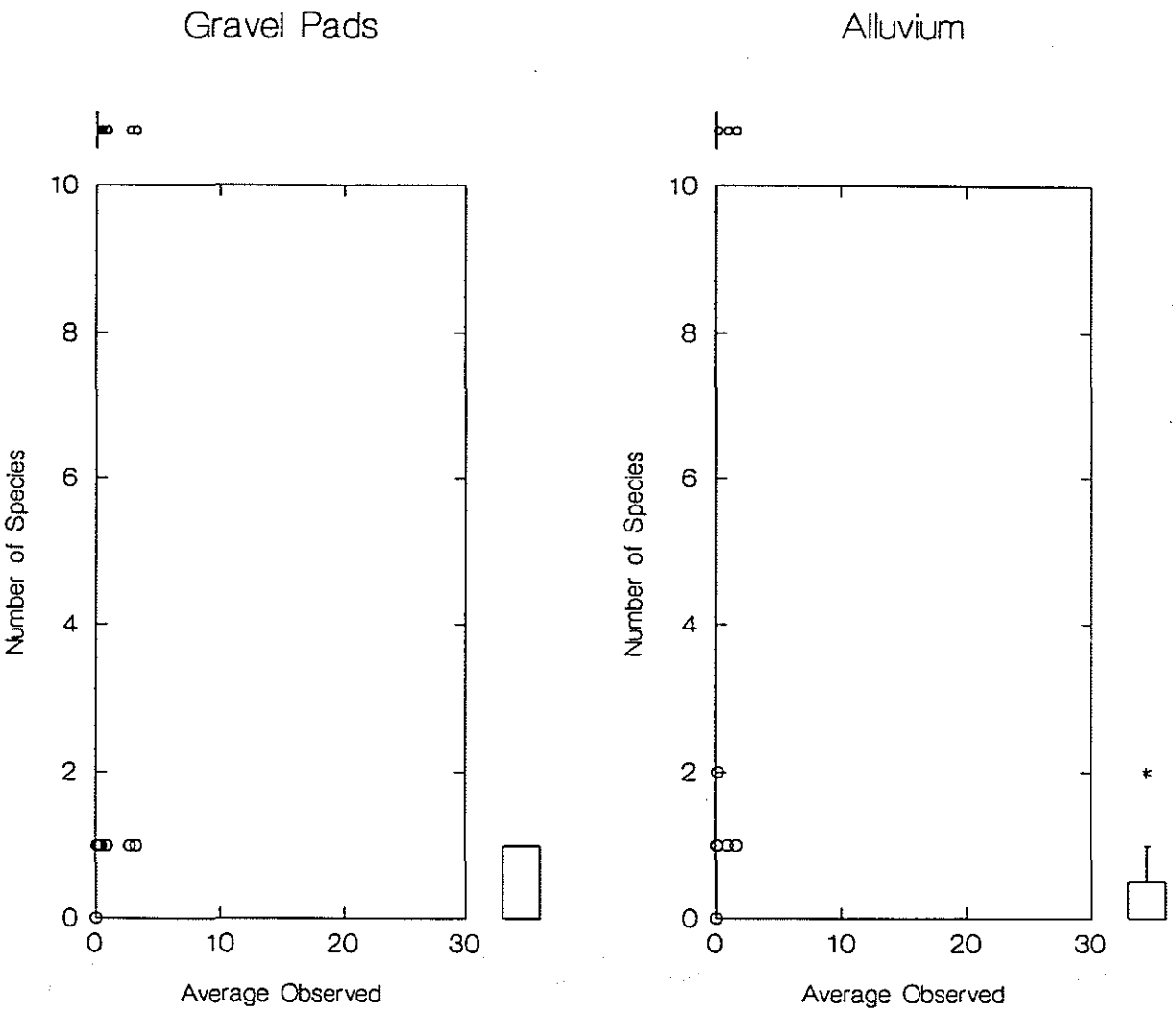
Waterfowl Use of Coastal Gravel Pad Sites
excluding observations on impoundments



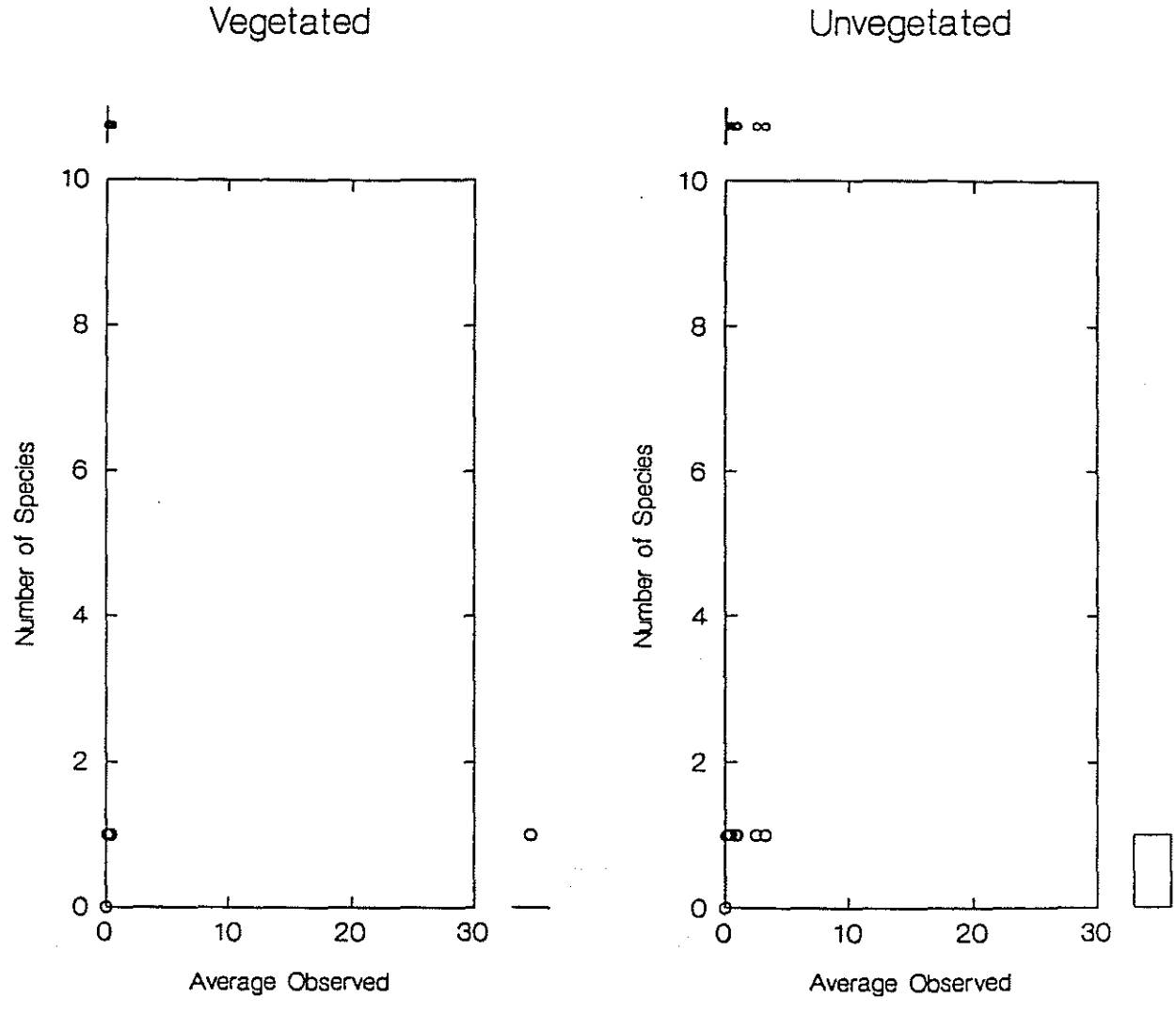
Mammal Use of Coastal Gravel Sites



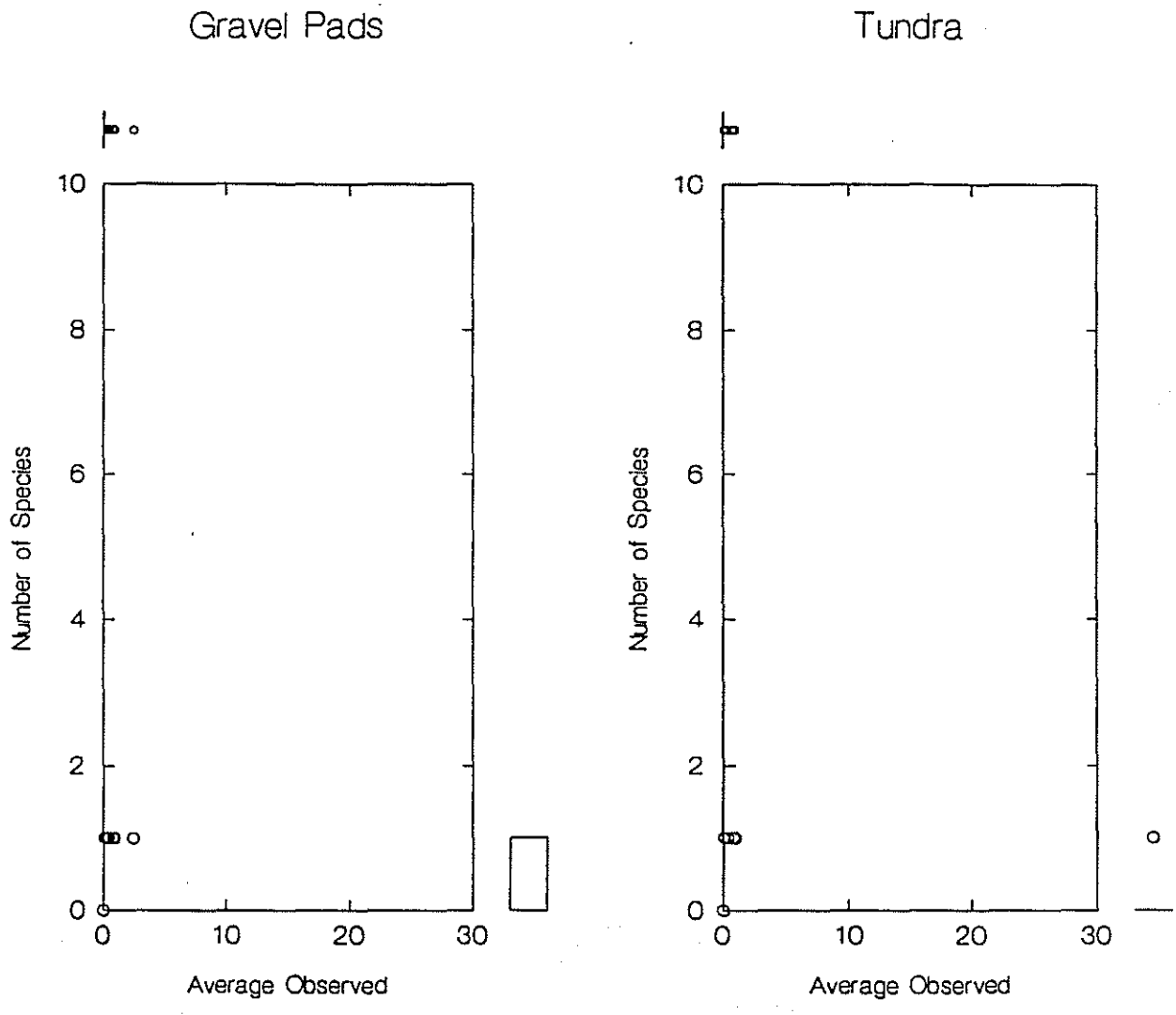
Mammal Use of Gravel Pads and Alluvium



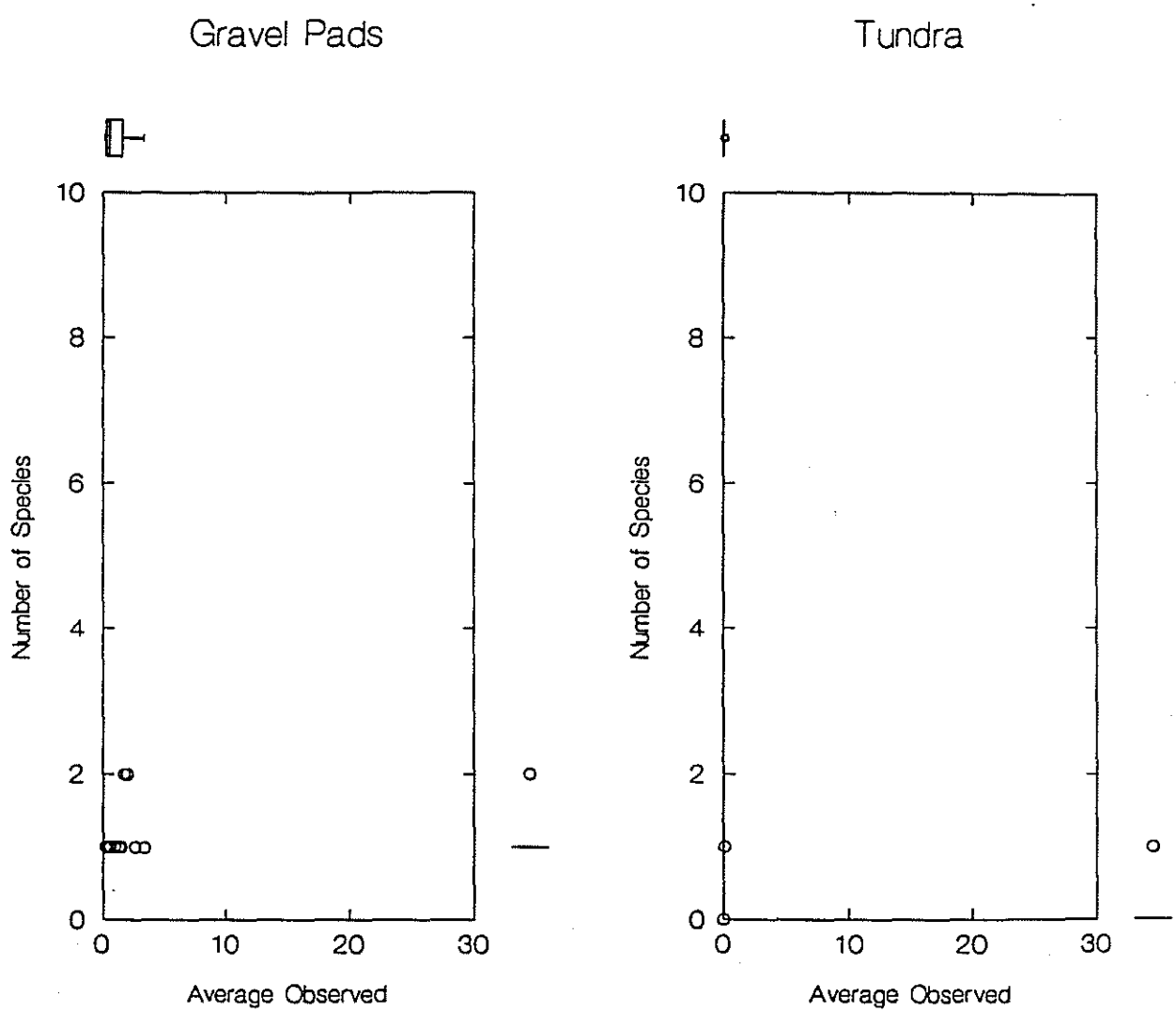
Mammal Use of Gravel Pads
excluding observations on impoundments



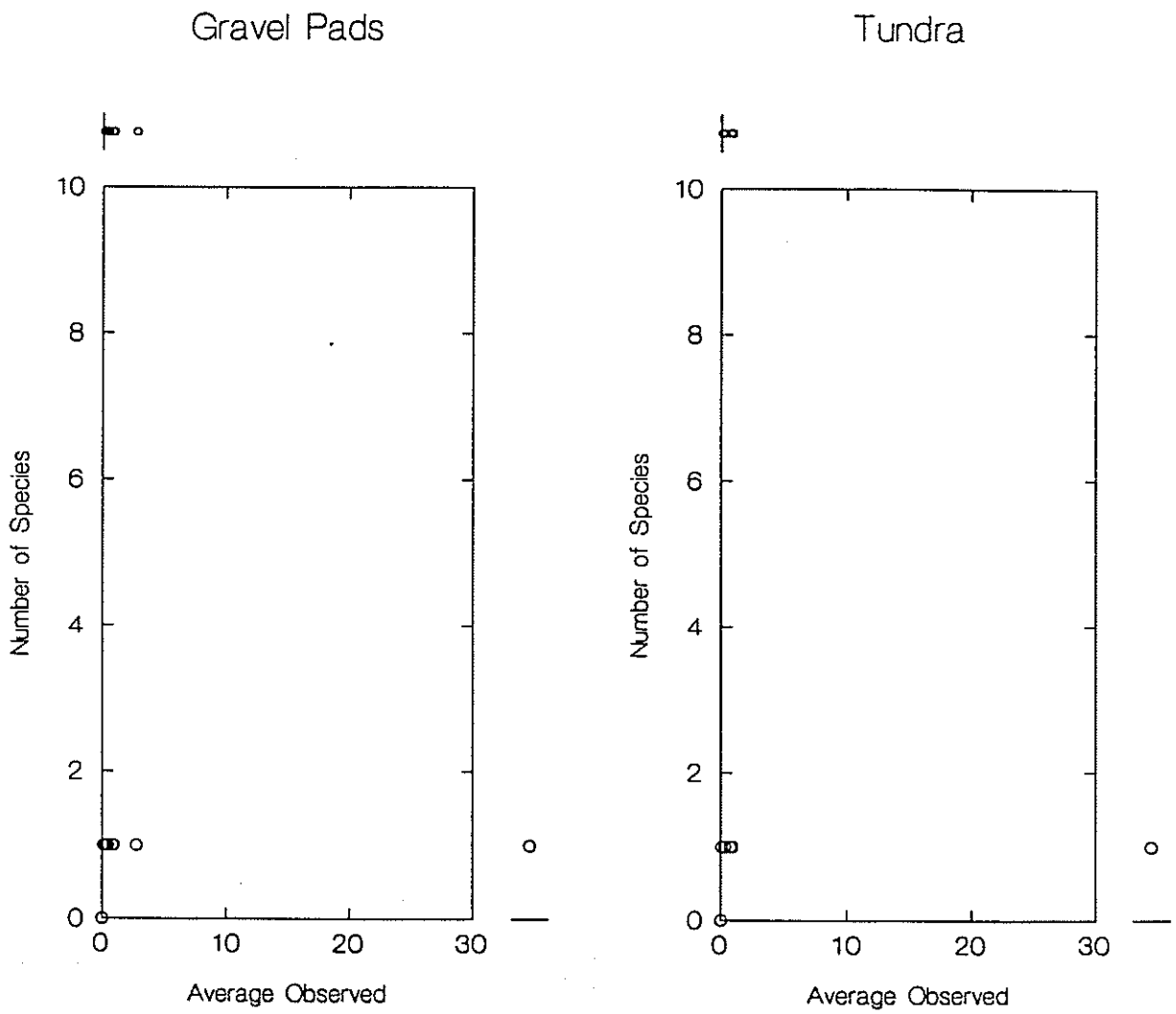
Mammal Use of Coastal Gravel Pad Sites
excluding observations on impoundments



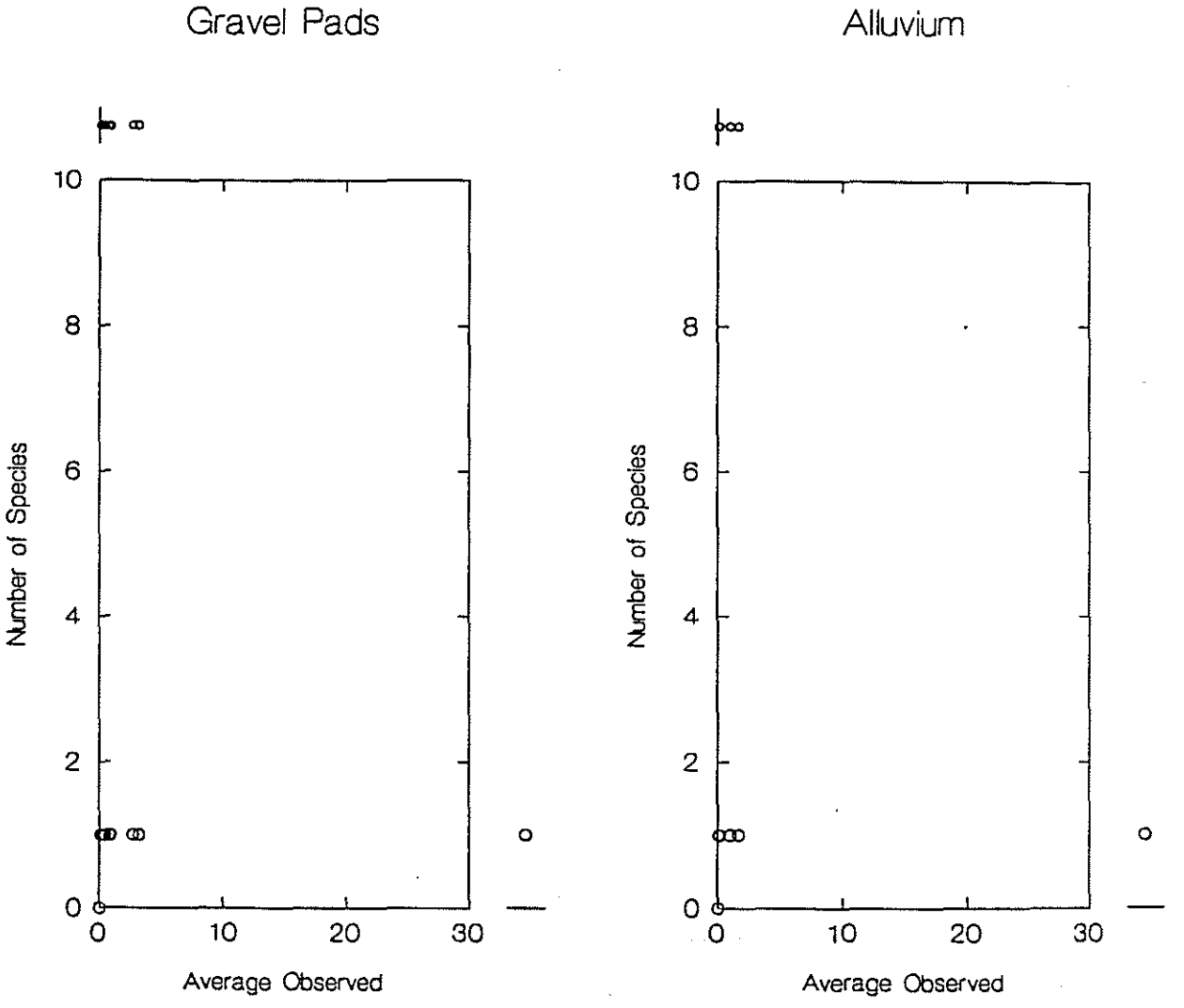
Mammal Use of Foothill Gravel Pad Sites



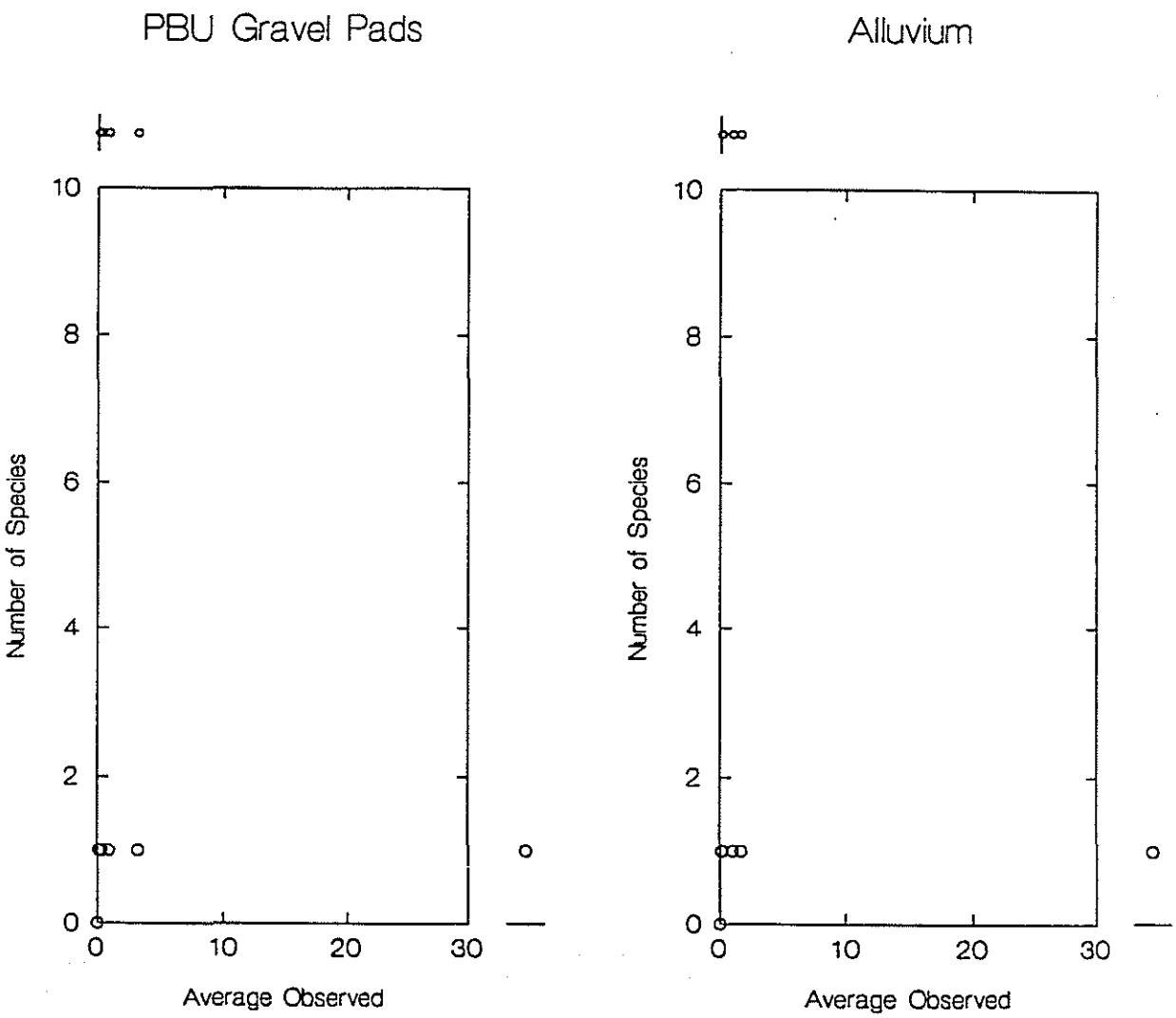
Caribou Use of Coastal Gravel Pad Sites



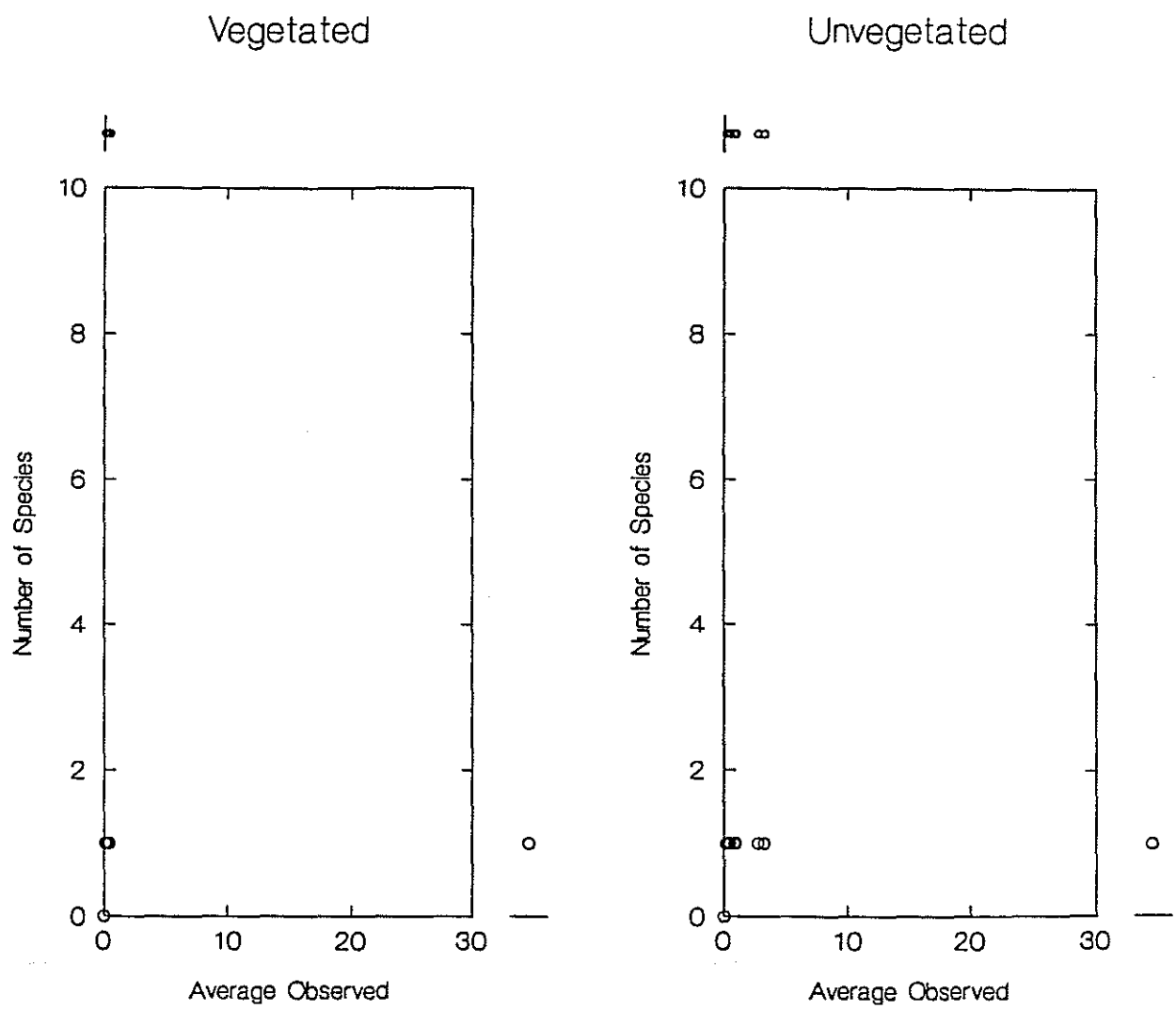
Caribou Use of Gravel Pads and Alluvium



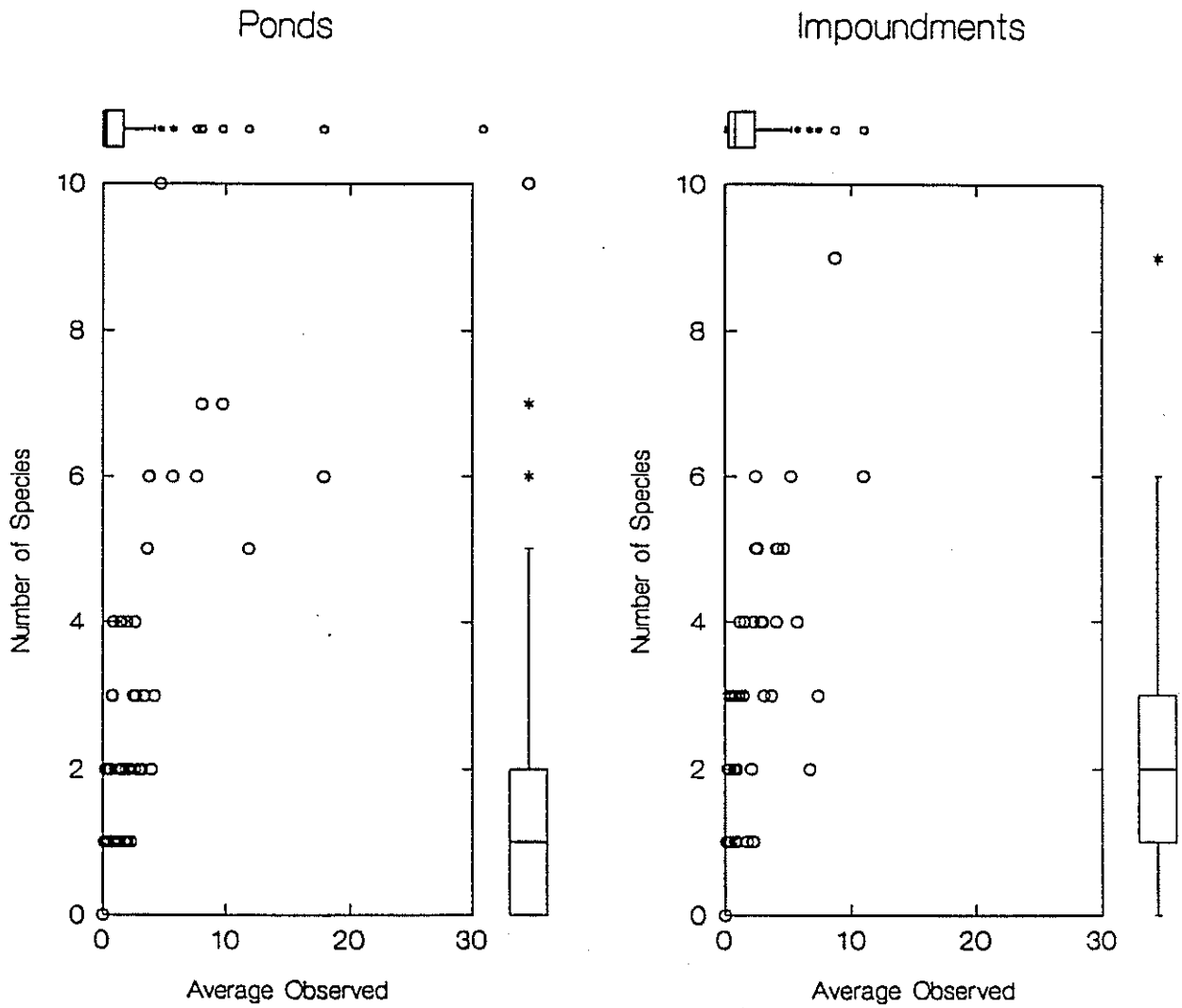
Caribou Use of PBOC Gravel Pads and Alluvium



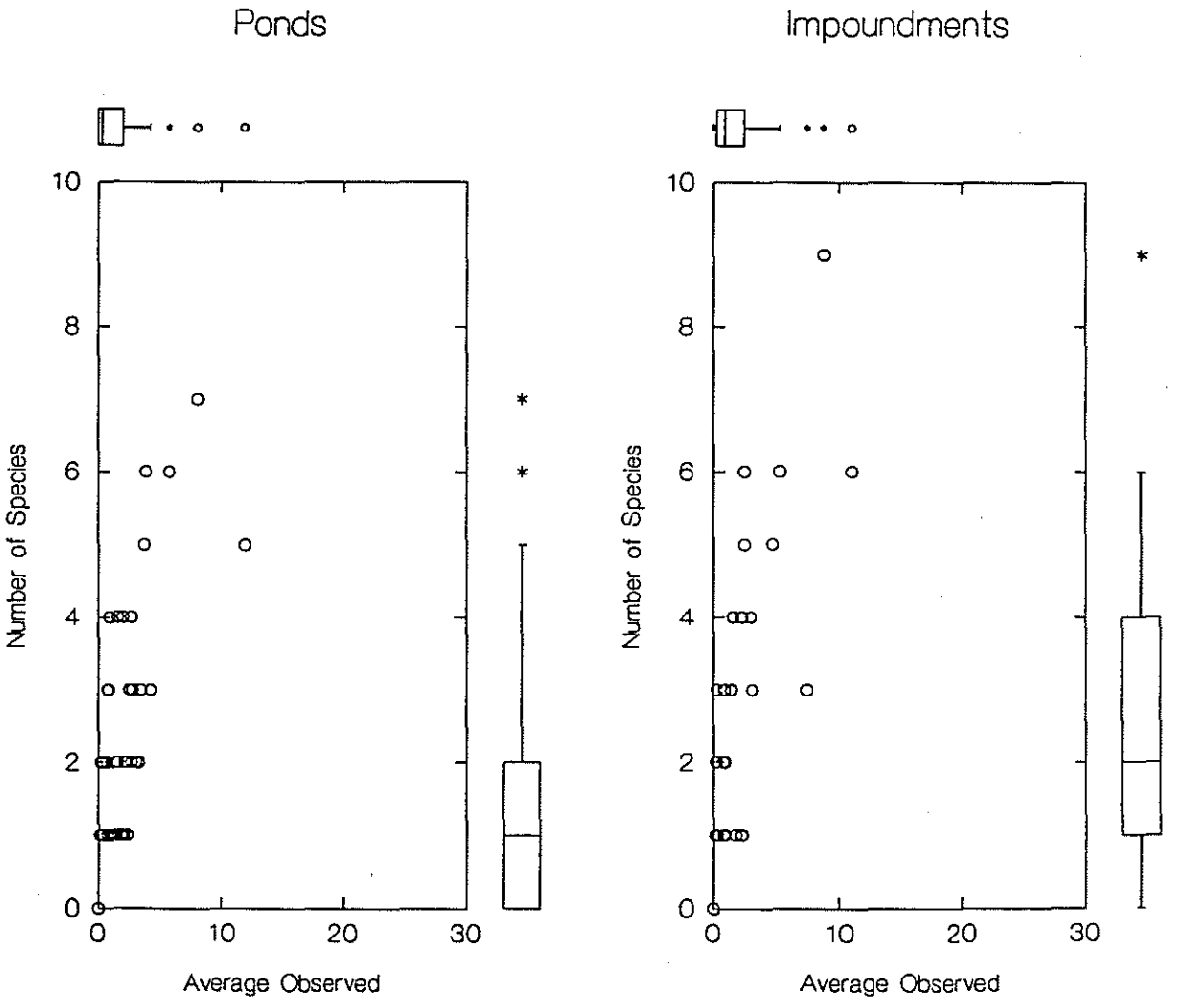
Caribou Use of Gravel Pads



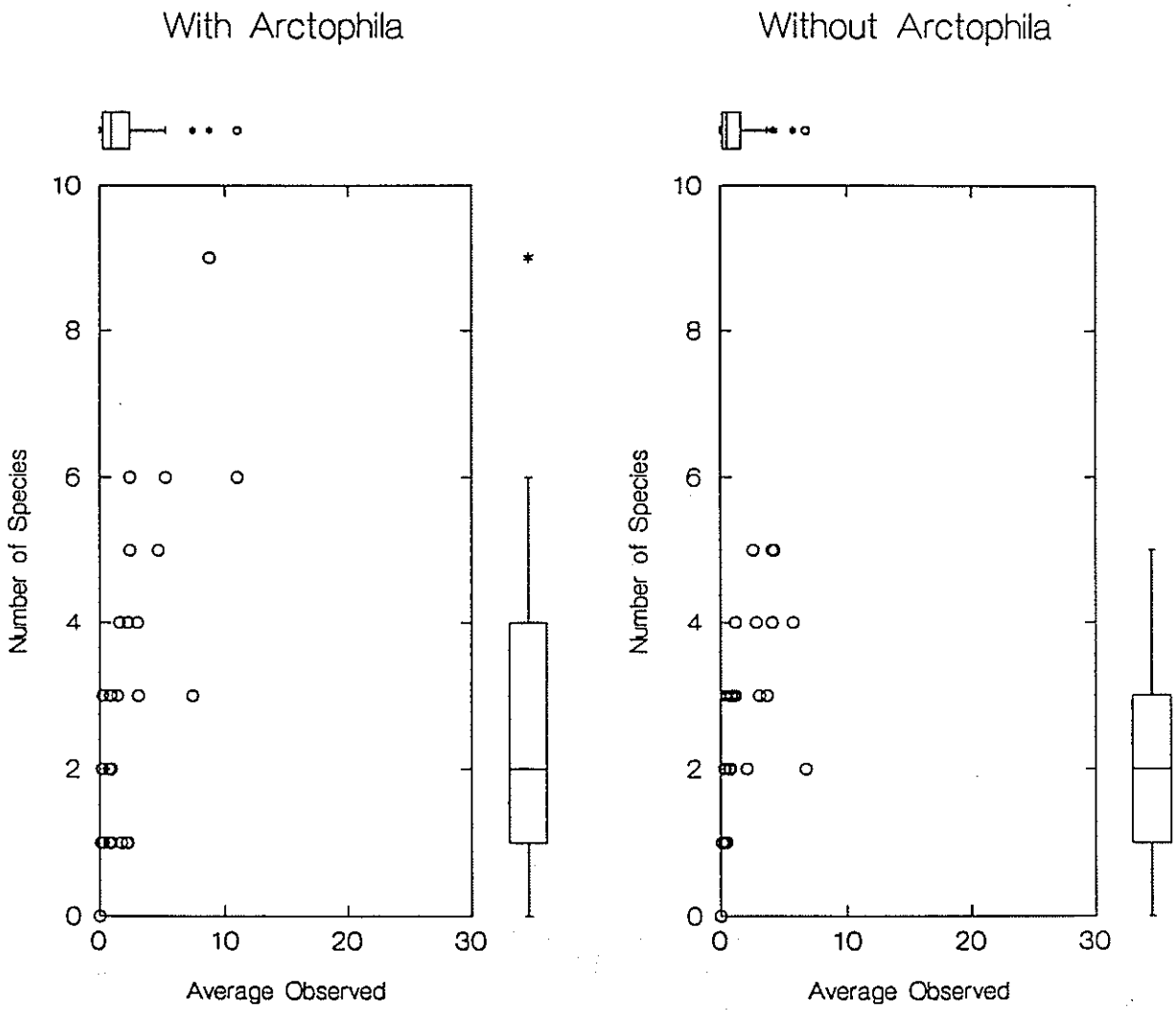
Bird Use of Ponds and Impoundments



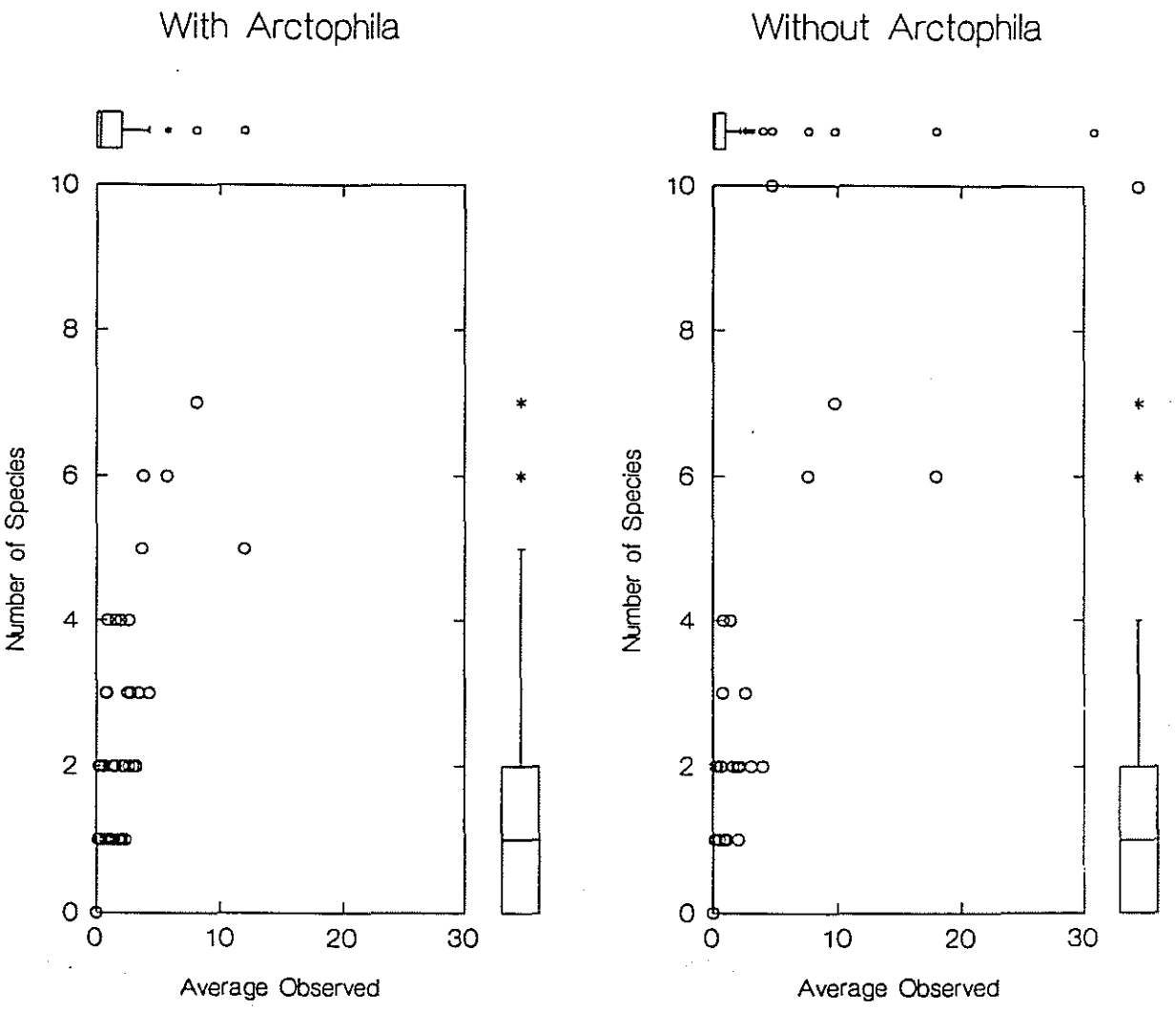
Bird Use of Ponds and Impoundments
(with Arctophila)



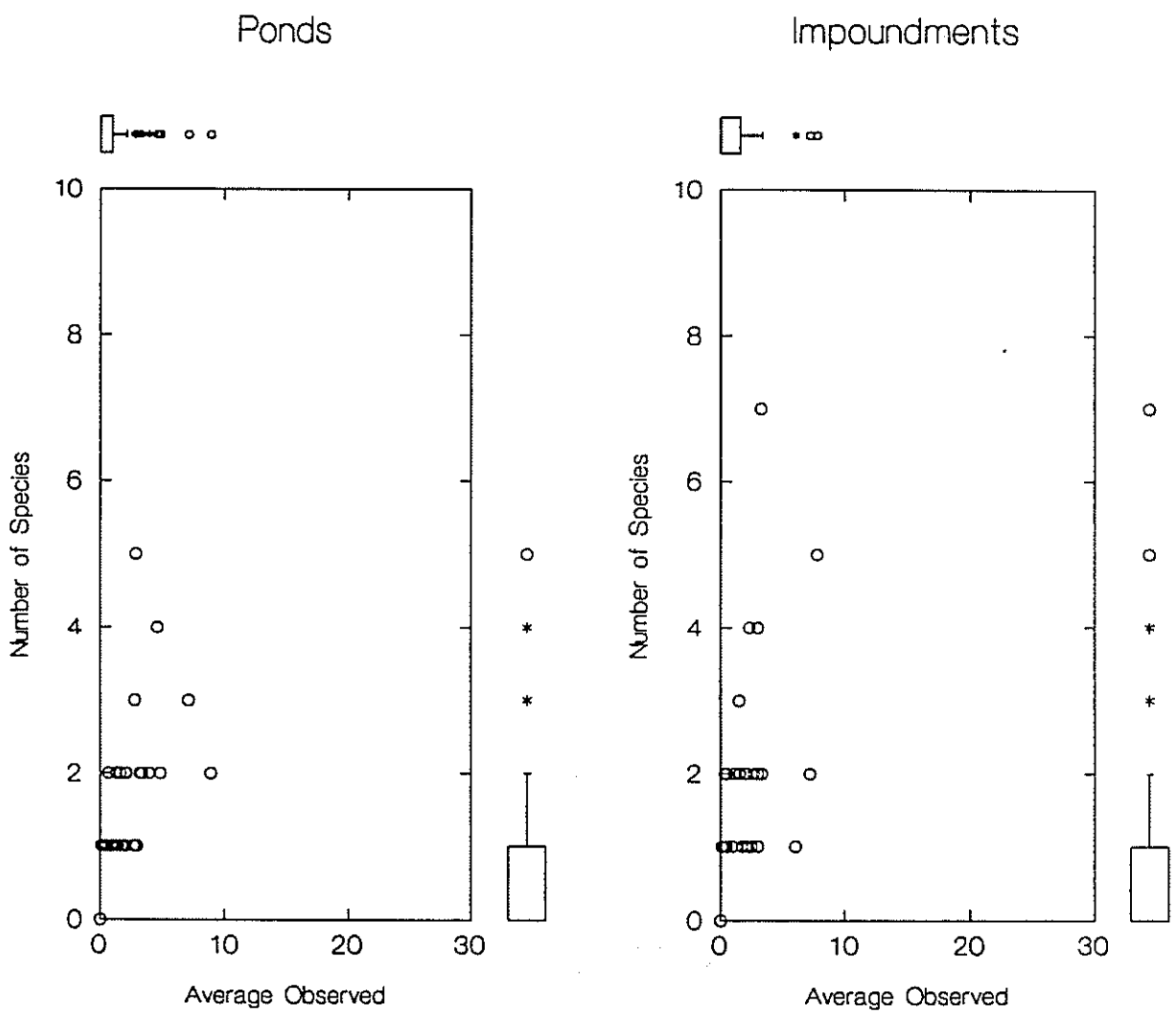
Bird Use of Impoundments



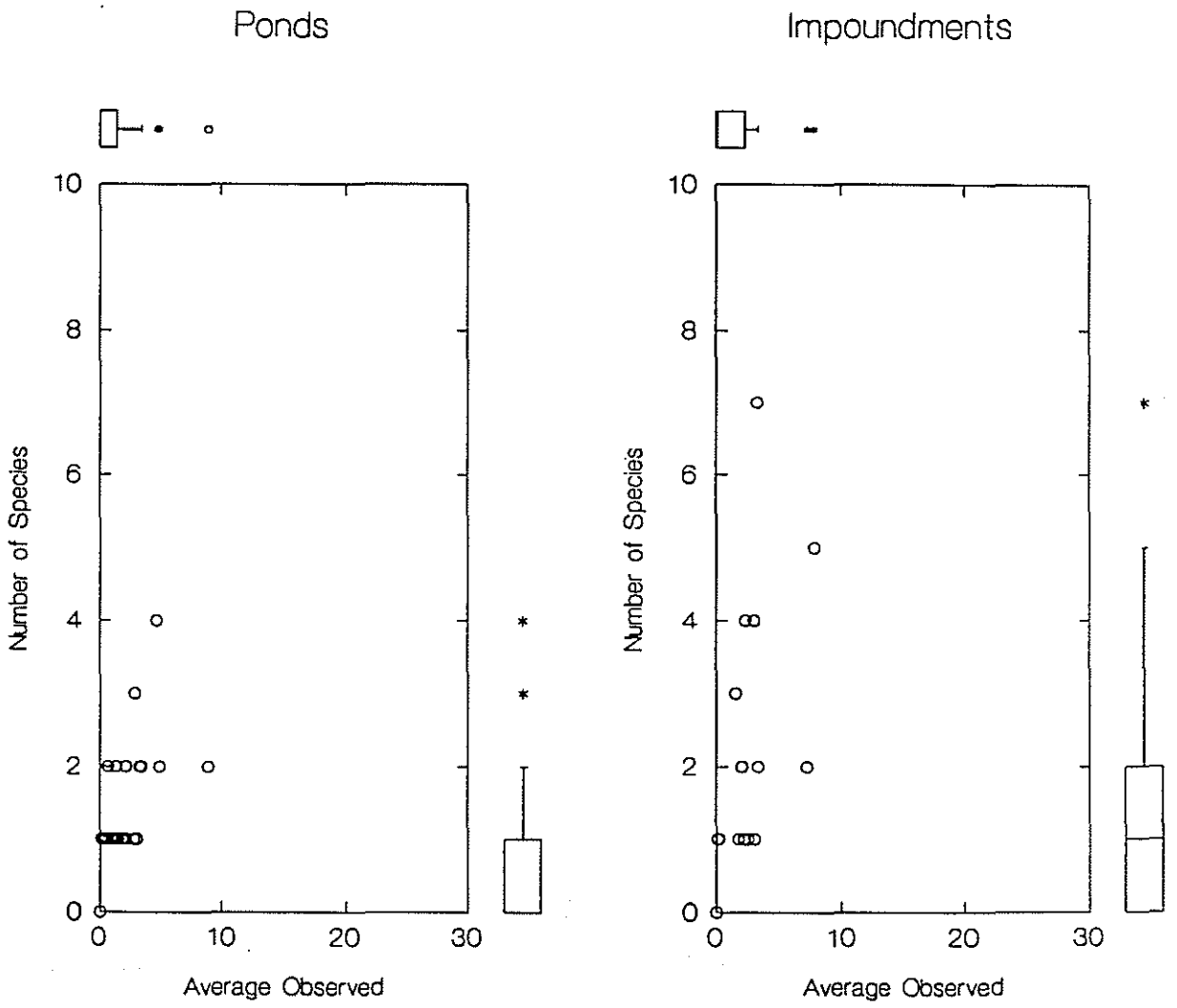
Bird Use of Ponds



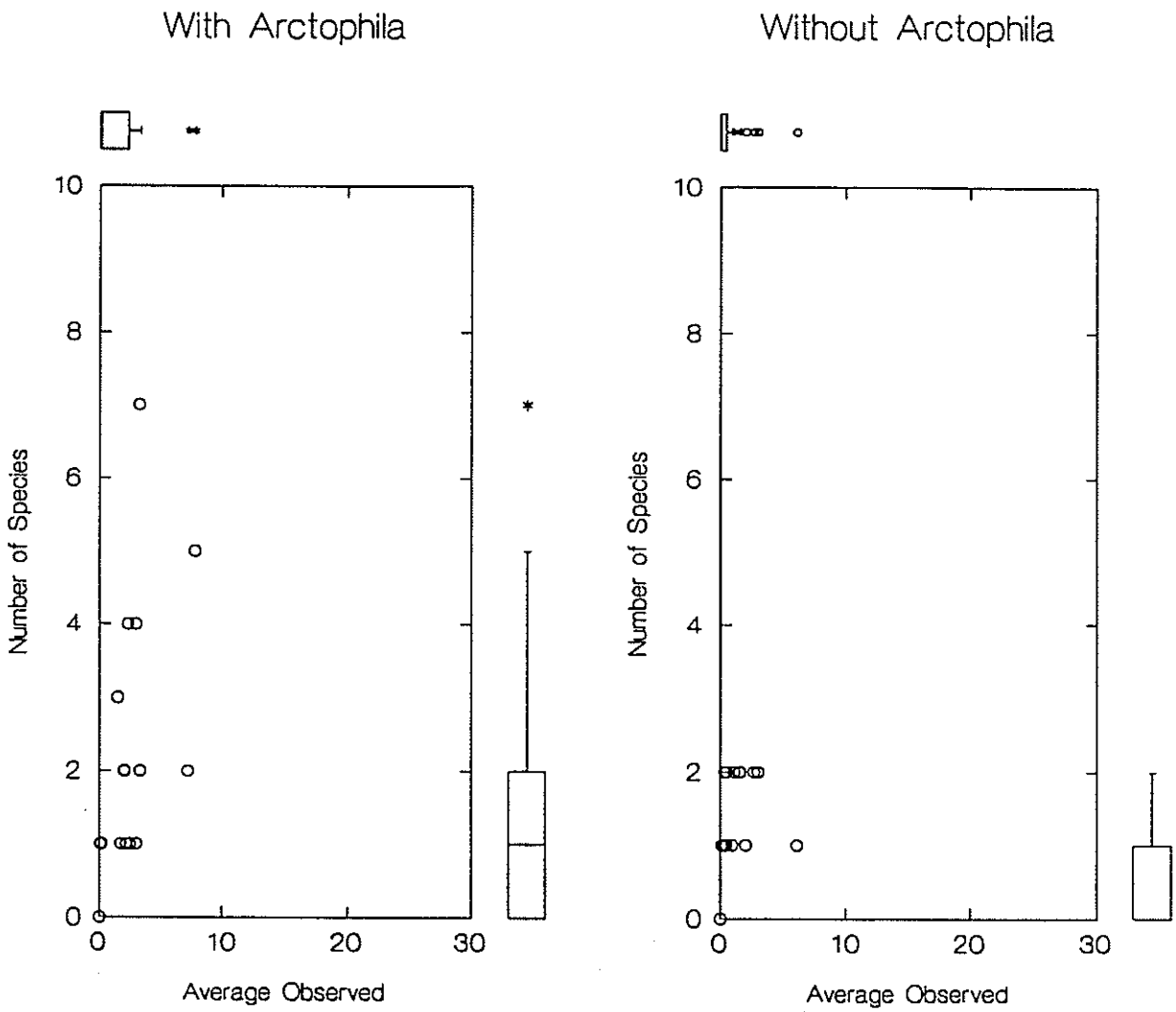
Waterfowl Use of Ponds and Impoundments



Waterfowl Use of Ponds and Impoundments
(with Arctophila)



Waterfowl Use of Impoundments



Waterfowl Use of Ponds