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THE USE OF HANFORD WASTE PONDS BY WATERFOWL AND OTHER BIRDS

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by

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THE USE OF HANFORD WASTE PONDS BY WATERFOWL AND OTHER BIRDS

ABSTRACT

A survey and census of birds observed at the Hanford waste water ponds during an annual cycle is described and evaluated with respect to radioactive waste management. Migration and behavior of waterfowl were given special attention because the Columbia Basin area is an important waterfowl breeding and wintering area. Physical features of the 200 Area waste ponds are described and evaluated with respect to the use and suitability for waterfowl and other birds. Seasonal distributions indicate that all birds observed in the Hanford environs can be classified according to five basic status groups. These are, in decreasing order of numbers of species, (1) migrants, (2) winter residents, (3) summer residents, (4) permanent residents, and (5) accidentals. Summer residents, winter residents, and permanent residents are of greatest importance to waste management because a large portion of their time is spent on and about the ponds. General life history information is described for 106 species of birds observed during the study period and indicates the relative importance of each species with respect to the radioactivity in the ponds.

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THE USE OF HANFORD WASTE PONDS BY WATERFOWL AND OTHER BIRDS

INTRODUCTION

The Columbia Basin region has steadily increased in importance as a wintering and production area for waterfowl due to an increase in suitable habitat brought on by irrigation and hydroelectric development (1). Twelve major species are known to breed in eastern Washington, and many others overwinter or migrate through the region. Waste water ponds in the 200 Areas of the Hanford Reservation also are attractive to birds. Most of the ponds are essentially permanent features of the environment and will receive coolant water as long as plant operation or waste solidification operations continue.

The Columbia River has been a significant source of radionuclides, but following reactor closure the waste ponds remain as the single most important source of radioactivity availability to wildlife in the Hanford environs. Waterfowl and other birds have always been important to the management of Hanford waste ponds. The first significant recorded event occurred in 1952 following an unplanned release of fission products (2). At the time it was noted that approximately 1500 ducks and geese were using the ponds. The ability of local waterfowl to concentrate radionuclides from waste water also has been demonstrated (3,4) and illustrates the constant need for waste area surveillance.

Management practices take into account the likelihood of the waste ponds contributing to waterfowl production and the possibility of spreading small amounts of radioactivity from the Hanford Reservation, but there is need for current data on waterfowl use of the ponds. Information as to the kinds of birds which temporarily use or take up residence at the ponds has not been previously reported. Hanson (2) thought Coots were probable residents but that Mallard ducks and geese, at least, moved from pond to pond depending on the degree of human intrusion and disturbance during fall and spring migration periods. The interaction of waterfowl between waste ponds and the Columbia River is largely unknown, but waterfowl

dispersion from the Hanford Project was studied in 1961 (5). It was estimated that 200,000 waterfowl annually utilize the Columbia River and vicinity near the Hanford Reservation.

The objective of this study is to examine waterfowl use of the 200 Area ponds through several annual cycles. During the course of the study other birds are being observed. Information gained will aid the formulation of ecologically sound long-term waste management practices and surveillance programs. This paper reports results from the first year of observation.

STUDY AREA

The study area consists of the four main low-level liquid waste ponds located in the 200 Areas of the Hanford Reservation. Waste water (primarily condenser coolant water) routinely discharged to the ponds contains less than 50 pCi/ml radioactivity. The ponds are usually referred to as Gable Mountain (216-A-25), "B" (216-B-3), "U" (216-U-10) and Redox (216-5-16).

Gable Mountain pond (200E Area) is the largest of the four ponds and covers about 71 acres to an average depth of 5 ft. The edge is heavily vegetated with peachleaf and sandbar willows, wild millet, horsetail, sedges, and other terrestrial plants. There is very little open shoreline. Emergent aquatic vegetation near the shoreline is mostly cattail and several species of bulrush. Pondweed is an abundant aquatic plant particularly in shallows. Insects and other invertebrate animals are also abundant. Deer frequently are observed near the shore or on one of the several islands. This pond is located in a remote area and not often subjected to human intrusion or disturbance. It has never been treated with herbicides.

"B" pond (200E Area) is the second largest and covers approximately 46 acres to an average depth of 10 ft. The shoreline was shortened in 1971 and sprayed with herbicides. Construction activity in 1972 was a source of disturbance much of the time, and the inlet ditch and shoreline were again treated with herbicide. Most of the terrestrial vegetation consists of tumbleweed, but only a very small portion of the shoreline is vegetated. There are a few willows at one end. Emergent vegetation is mostly composed

of bulrush which forms several small patches. Insects are noticeably abundant. The pond is less than 2 miles from Gable Mountain pond and about one-half mile from buildings and routine human activity. Wildlife (deer, coyote, etc.) are occasionally seen in the area.

"U" pond (200W Area) is the only pond studied which lies within a fenced exclusion area. The pond covers about 22 acres to an average depth of 4 ft and is highly vegetated. There are large (20 to 30 ft tall) cottonwoods and willows and a dense willow underbrush in many places. There is no open shoreline. The most prominent shoreline vegetation is cattail although bulrushes and sedges also are present. Floating duckweed and submerged pondweed are prevalent. The advanced stage of plant succession at this pond provides cover and food for a variety of animal life. Aquatic snails, dragonflies, and damselflies are particularly abundant invertebrate animals. Muskrats are common. Deer and coyotes are seen occasionally, and the fence probably restricts their use of the pond. The pond was undisturbed until recently when a large construction project was started nearby, and the vegetation was treated with herbicide.[1] Previously the only possible source of herbicide in the pond was a small amount of residue which may have come from the spraying of inlet ditches.

Redox pond (200W Area) is within 2 miles of "U" pond but lies outside of the 200W Area perimeter fence. Its use was temporarily discontinued in June, 1972, when the water source was diverted. All major vegetation was removed and the pond bottom allowed to dry and then covered with 6 in. of soil. Prior to these changes the pond covered about 17 acres to an average depth of 2 ft. The pond edge was vegetated with willow and smartweed with some bare shoreline. Sedges were also abundant. Emergent aquatic plants were a few bulrushes, but cattails were noticeably absent. Pondweed was abundant. Insects and other invertebrate animals also were abundant. There were signs of deer although animals were infrequently observed. Coyotes were frequently seen in the area. This pond is in a remote location and seldom disturbed by man.

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[1] The vegetation at "U" pond was sprayed with herbicides in the latter part of July, 1972. Krovar (50% Hivar-S and 50% Karmex) was applied at the rate of 20 lb/100 gal water/acre.

METHODS OF OBSERVATION

Weekly observations at "B", "U", Redox, and Gable Mountain ponds were begun in September, 1971, and continue. During the latter part of the first year of study, Honey Hill pond also was observed because of its size (12 acres, average depth, 10 ft) and close proximity to Gable Mountain pond. Waterfowl were of greatest interest, but other kinds of birds and wildlife were noted at all ponds. Data of this type are usually an index and may underestimate the true situation unless each observation is made over a long time period. The technique used here called for an observer with binoculars to scan each pond from several angles and record counts or estimates of the numbers of each species present. Identifications are accurate within the limitations of visibility; however, estimates of abundance may be low at certain periods, e.g., during nesting when individuals may be hidden from view. A set period of observation was scheduled each week and followed as closely as possible. It was occasionally obvious that man-induced disturbances from construction resulted in low counts of waterfowl. Local construction activity was very influential at "B" pond for example.

RESULTS

Waterfowl

Waterfowl are frequently grouped as geese, puddle ducks, diving ducks, Mergansers, and Coots. Puddle ducks are the Mallard, Gadwall, Pintail, Teals, Baldpate (Widgeon), and Shoveler. They dabble and tip as they feed mostly on vegetation in shallow water. Diving ducks are the Redhead, Ring-Necked, Canvasback, Scaups, Goldeneyes, Bufflehead, and Oldsquaw. These ducks dive underwater when they feed on vegetation and varied forms of animal life. Mergansers are much like the diving ducks in habit but differ in general appearance. Coots belong to a separate taxonomic group and generally associate with Mergansers, ducks, and geese. These waterfowl are legally hunted game, but geese and puddle ducks are generally preferred by sportsmen because of their superior table qualities.

Figure 1 shows the total number of waterfowl observed at all ponds for each censusing period. Fall is the period of greatest waterfowl use, but

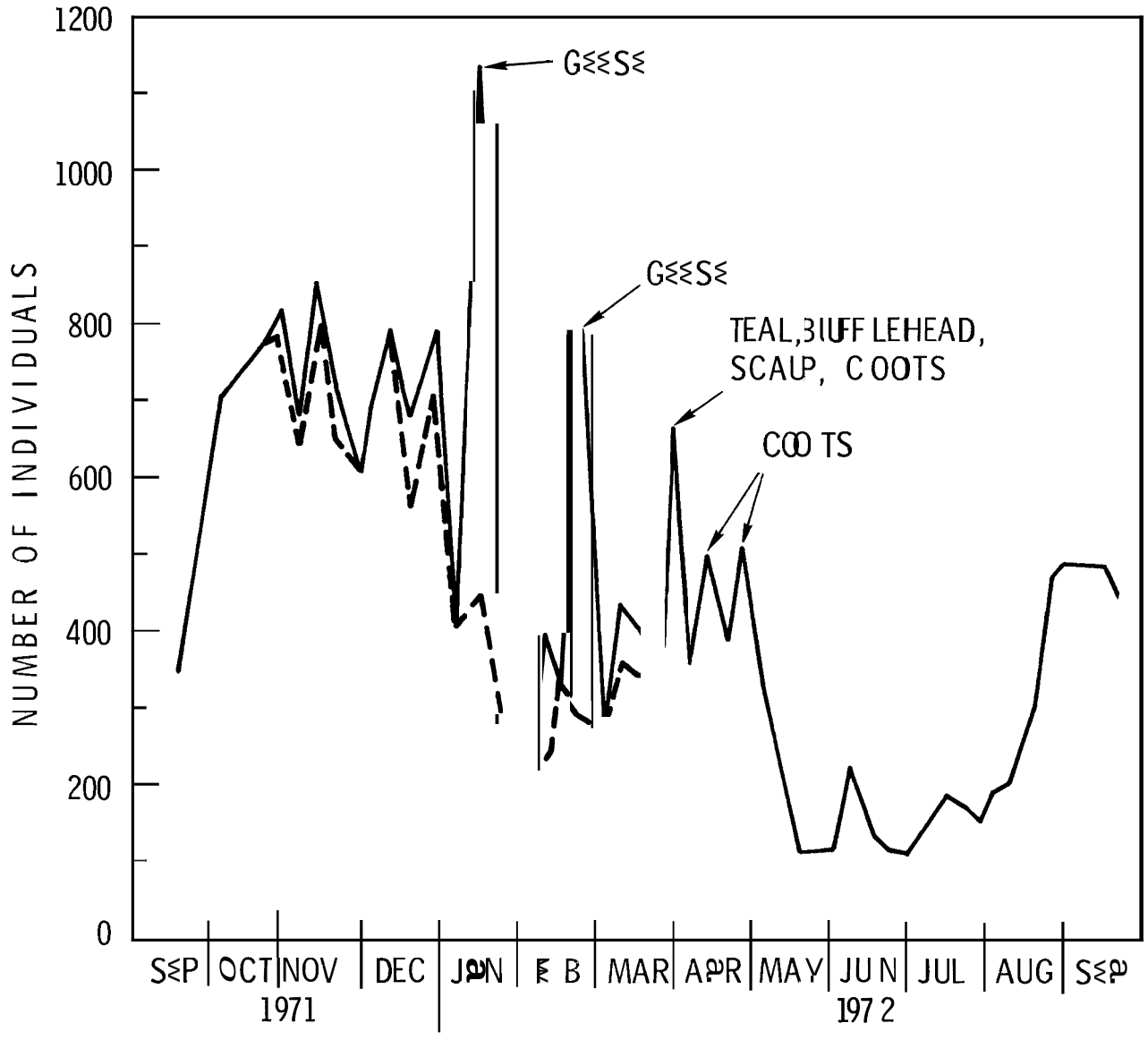


FIGURE 1. Total Abundance of All Waterfowl. The dashed line represents abundance excluding geese.

because different species migrate and move through the area at different times of the year, it is difficult to pick out definite fall or spring migrations. For example peaks in mid-January and mid-February are due to large numbers of geese; whereas the peak at the end of March is due to relatively large numbers of Teals, Bufflehead, Scaup, and Coot. When the numbers of geese observed during December through March are subtracted, a curve results which depicts the combined migration patterns of puddle ducks, diving ducks, Coots, and Mergansers. The fall migration period is October through December. The spring migration period is mid-February through mid-May. The reduced number of birds returning north in the spring partly reflects losses from hunting pressures and natural causes. The low numbers of birds observed from mid-May through mid-August are the result of two factors. First, the springtime northward migration had passed and fall migration had not begun. Second, most of the waterfowl remaining on the ponds were nesting and perhaps only half the population was visible at any one time. Gable Mountain was the pond most active with brood pairs although young were observed at "B" and "U" ponds as well.

The distribution of waterfowl from pond to pond is quite different as shown in Figures 2a through 2d. The data are plotted for each pond as percent abundance of all birds observed. A striking feature is the predominant use of Gable Mountain pond. More than 30 percent of all waterfowl observed at any one time were at Gable Mountain pond. "B", "U", and Redox ponds were frozen over in late January and no waterfowl were observed using them. Periodic complete or partial freezing during winter months undoubtedly made the ponds unattractive to waterfowl, but Gable Mountain pond was never completely frozen over. The mirror image distributions between Gable Mountain and "B" ponds is in part a response to the availability of open water and in part due to influxes of geese which seemed to prefer Gable Mountain pond. Periodic construction activity carried on at "B" pond also may have been influential in causing the birds to oscillate betweeen ponds. Fluctuations at all ponds during other periods are probably due to (1) influx and eflux of migrating birds, *(2)* nesting behavior of brood pairs, and (3) the behavior and habits of young birds. It is not yet possible to determine from

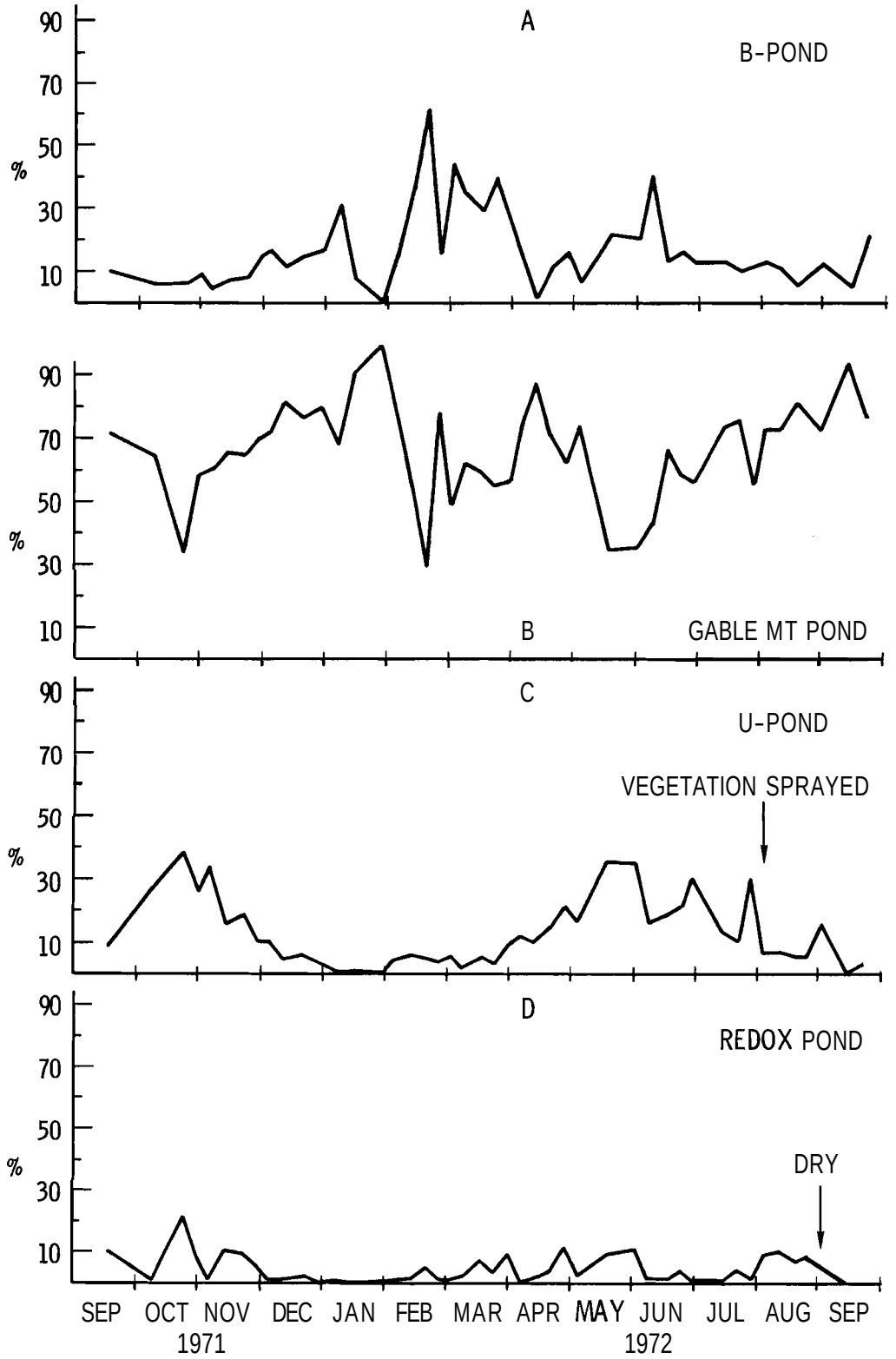


FIGURE 2. Percent Abundance of all Gamebirds

the data whether or not spraying the vegetation at "U" pond had a material effect on waterfowl usage. Certainly the drying out of Redox pond had a profound effect.

Weekly abundance of the niajor waterfowl species observed during the study period at all ponds are plotted as histograms in Figures 3 through 7. Figures are arranged as puddle ducks, diving ducks, Mergansers, Coots, and Canada geese and show how the population of each group changed over the course of an annual cycle.

All puddle ducks show similar patterns in their use of the waste ponds. Baldpate and Mallard apparently lacked a strong spring migration pulse which is evident for other species. Mallard also was the only puddle duck observed using the waste ponds during every month of the year. Baldpate and Mallard occurred in greatest abundance on a weekly basis, but far more Mallard ducks used the waste ponds during the study period than any other species of duck.

The Ring-Necked duck was the most abundant diving duck; however, the Ruddy duck was the only diving duck observed during every month of the year. Bimodal peaks in weekly abundance, indicative of fall and spring migration patterns, are evident for Goldeneye, Bufflehead, and Scaup.

The prominent feature in the abundance of Mergansers and Coots is the large number and short duration of Mergansers and the large and rather constant numbers of Coots. The low nunibers of Coots observed during May and June is most likely associated with nesting and the cryptic behavior of brood pairs. Canada geese were observed in large numbers on several occasions but apparently used the waste ponds only during October through May.

Other birds

Varying numbers of other birds also are attracted to the ponds. Grebes (small, duck-1ike, diving birds) were rather abundant at "B", Gable Mountain and Honey Hill ponds, but observed only on two occasions at "U" pond. More than 70 Pied-billed Grebes were noted on several occasions at Gable Mountain pond in the early fall of 1972. They are in the 200 Areas mostly from August through December, and several nested at Gable Mountain pond.

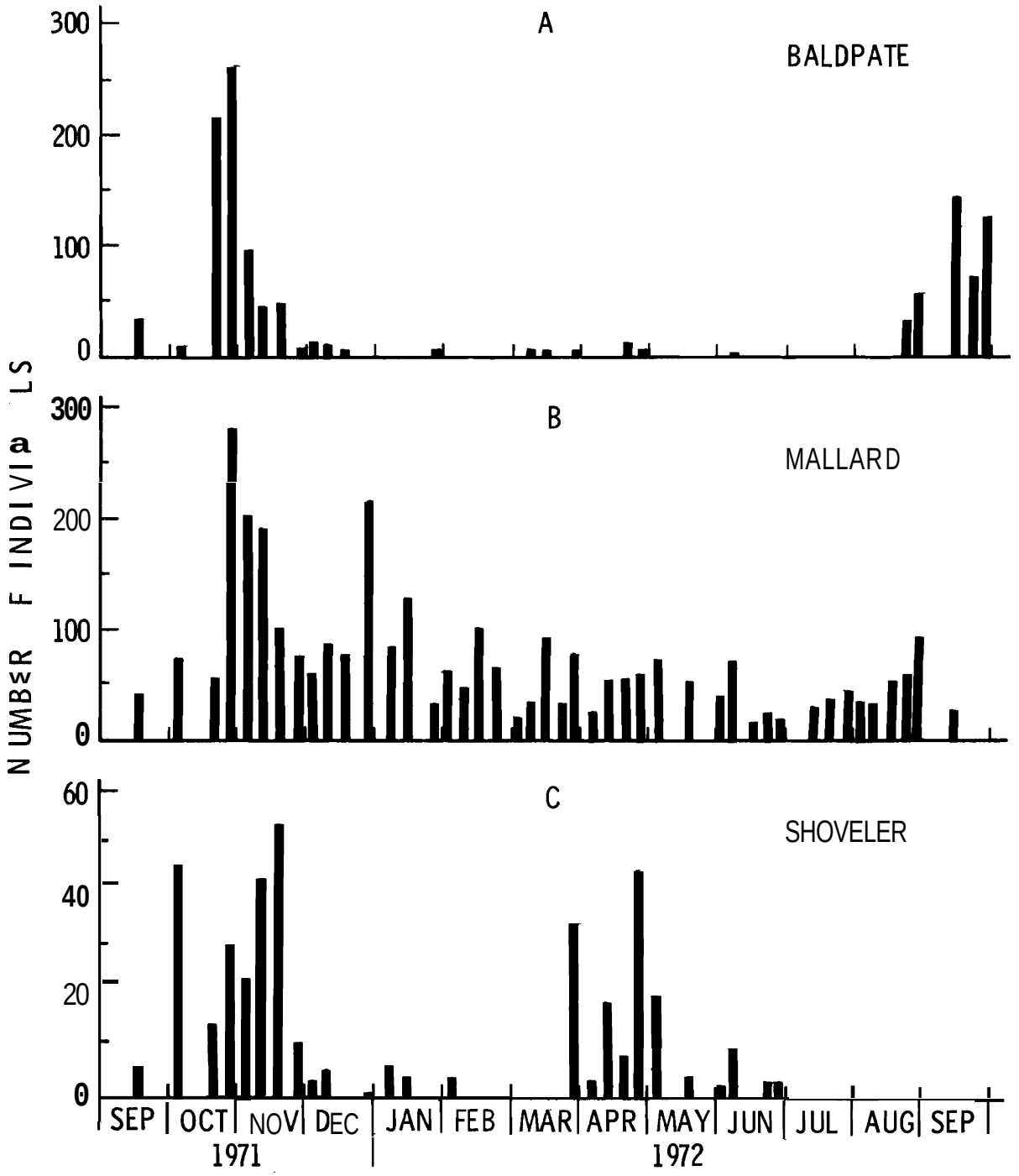


FIGURE 3. Weekly Abundance of Puddle Ducks

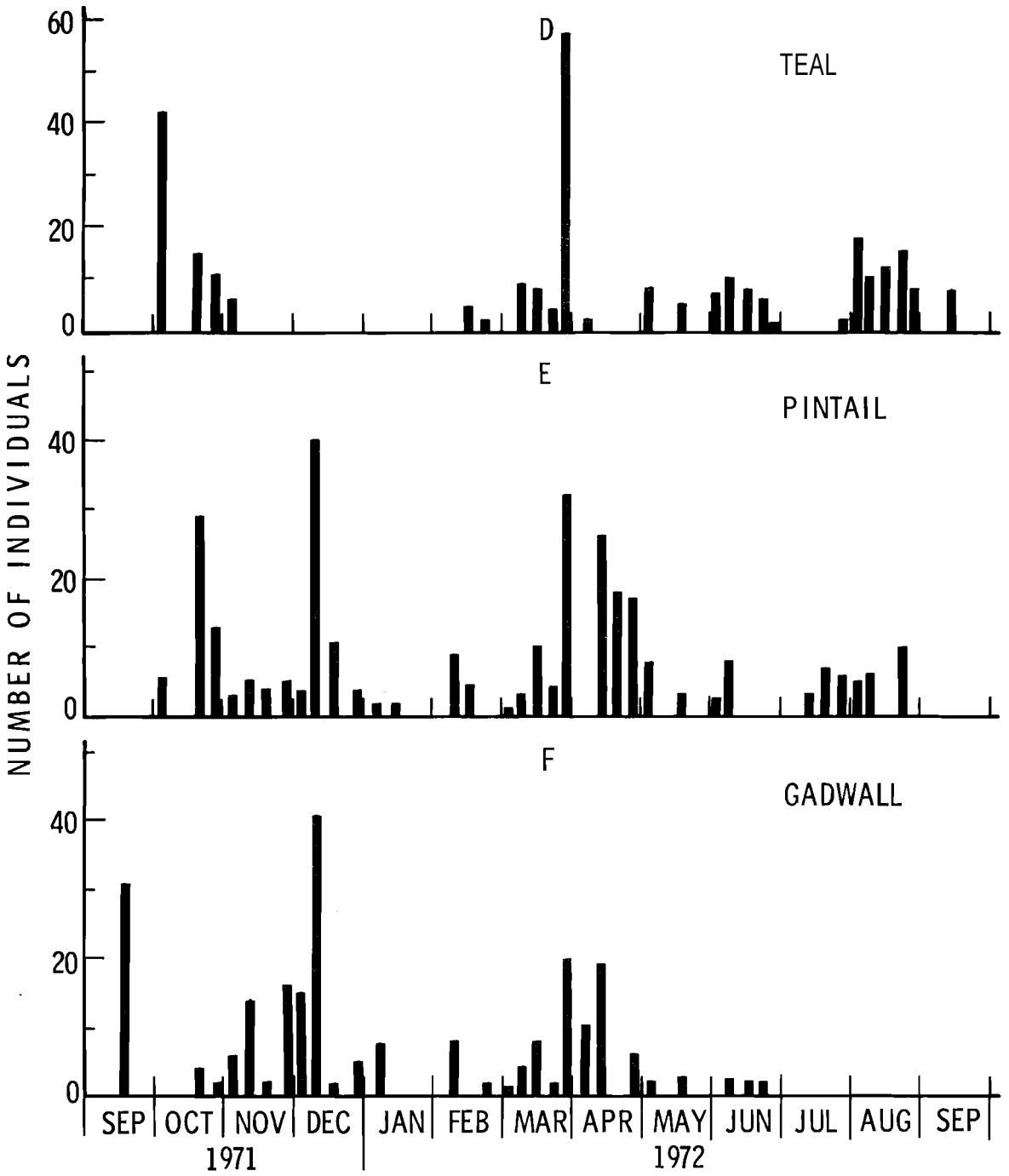


FIGURE 3. (Contd)

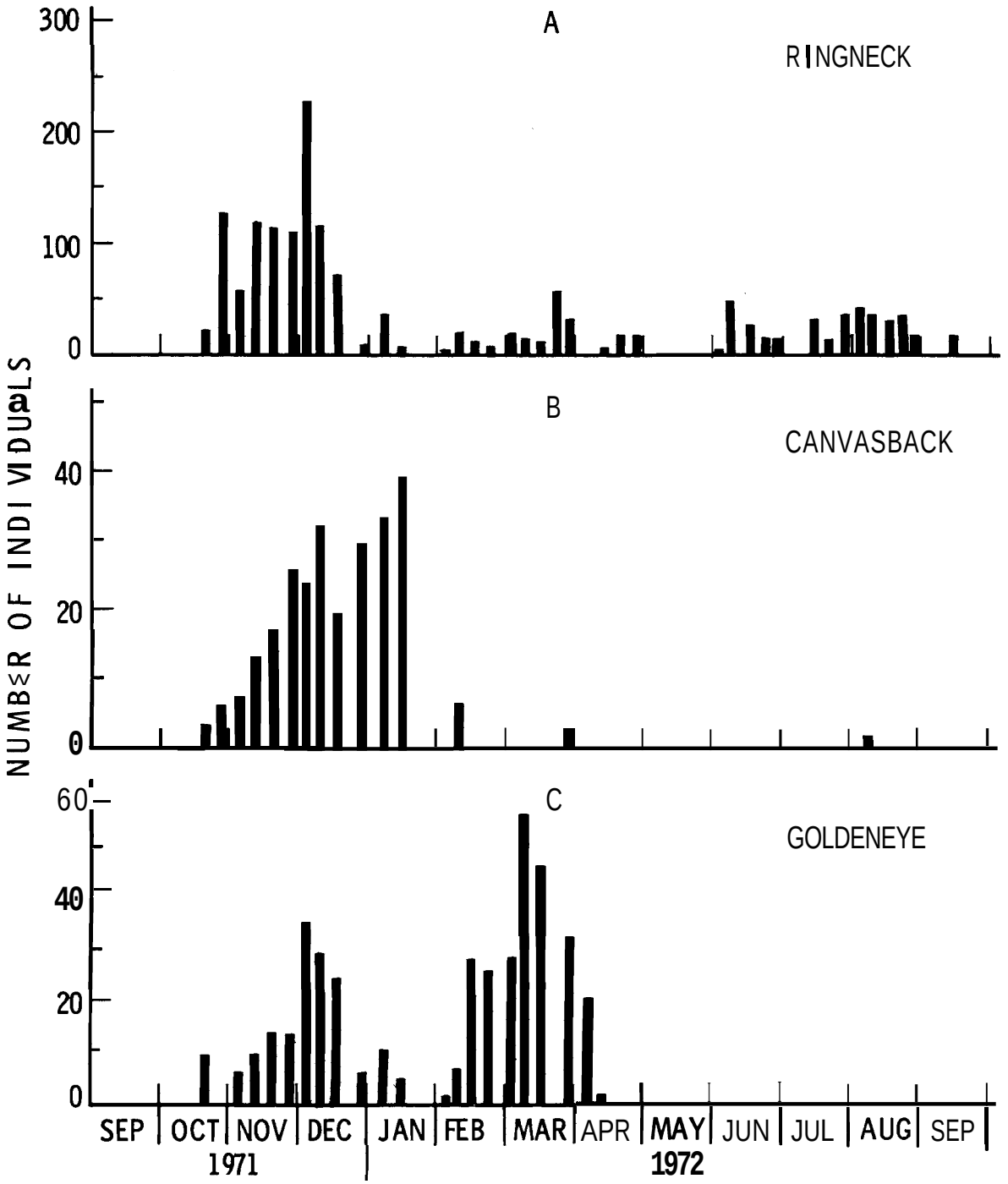
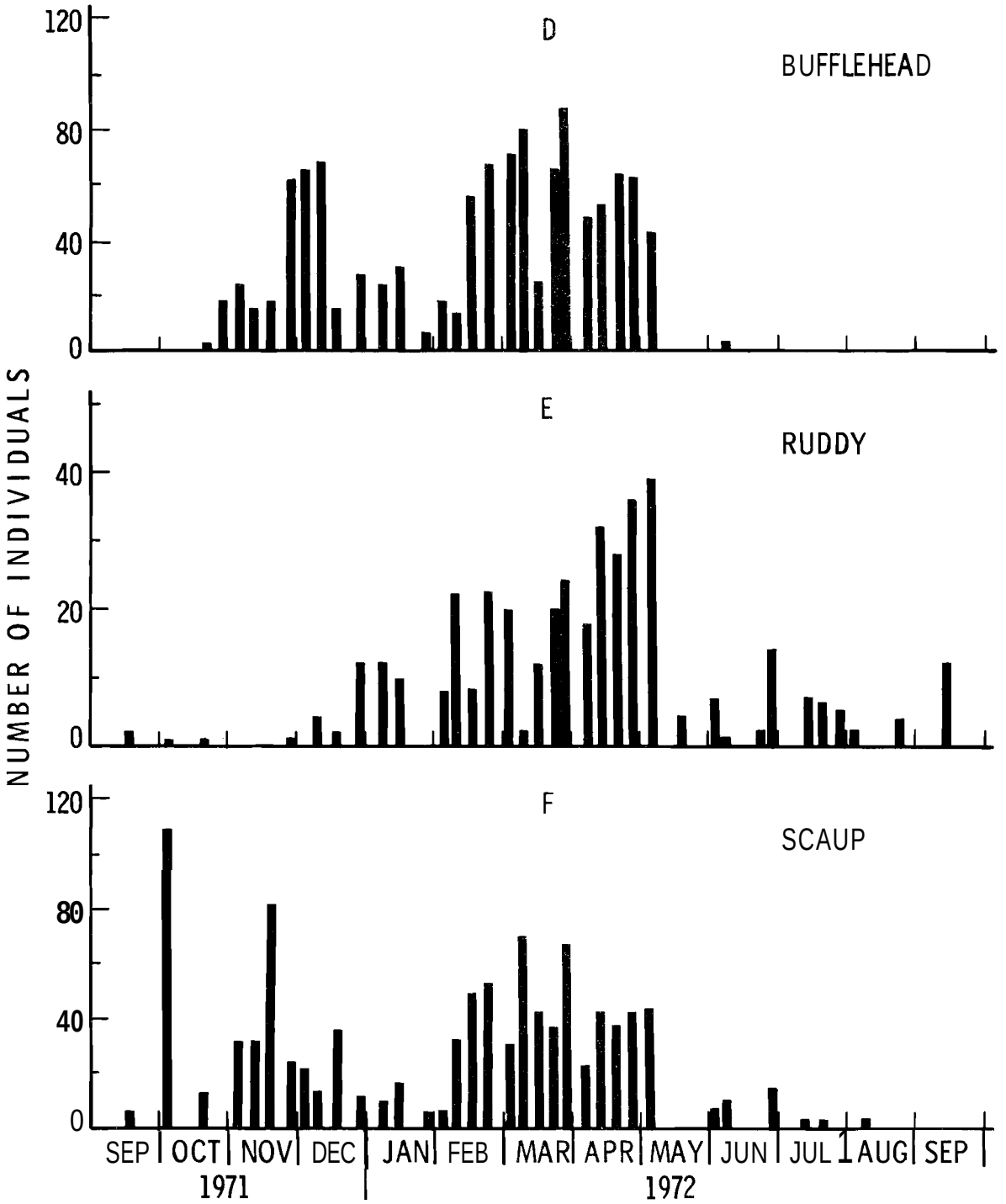


FIGURE 4. Weekly Abundance of Diving Ducks



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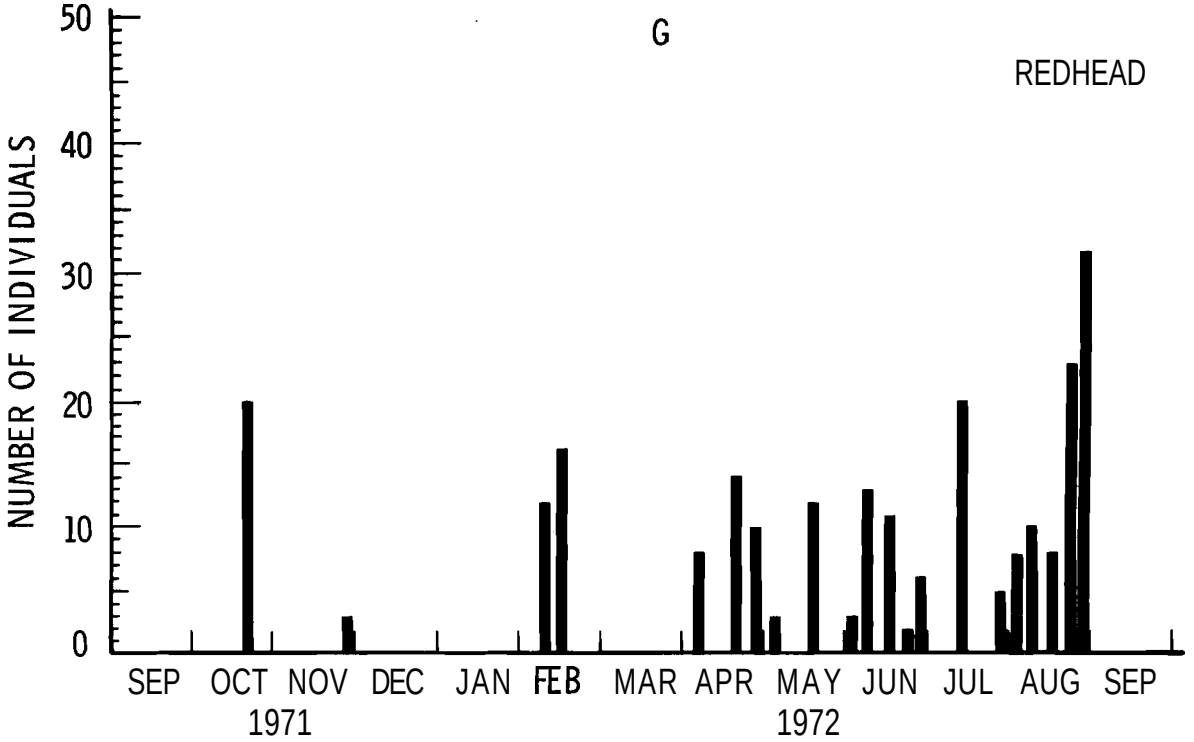

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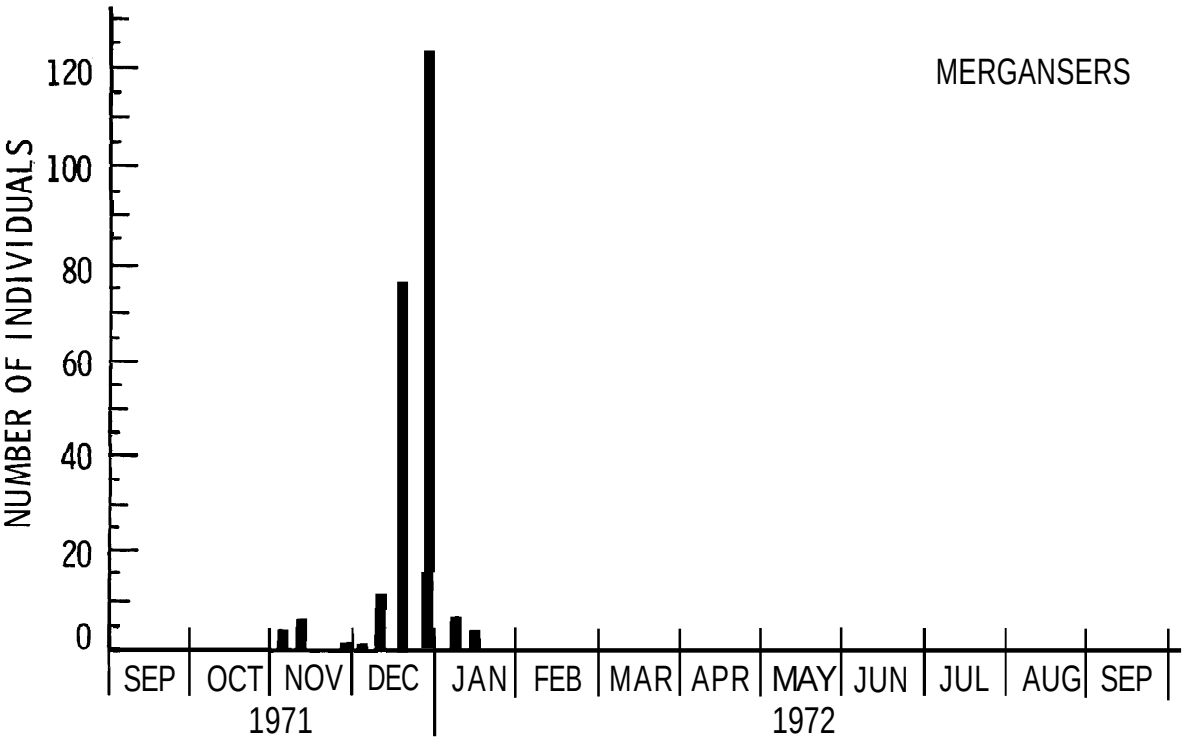

FIGURE 5. Weekly Abundance of Mergansers

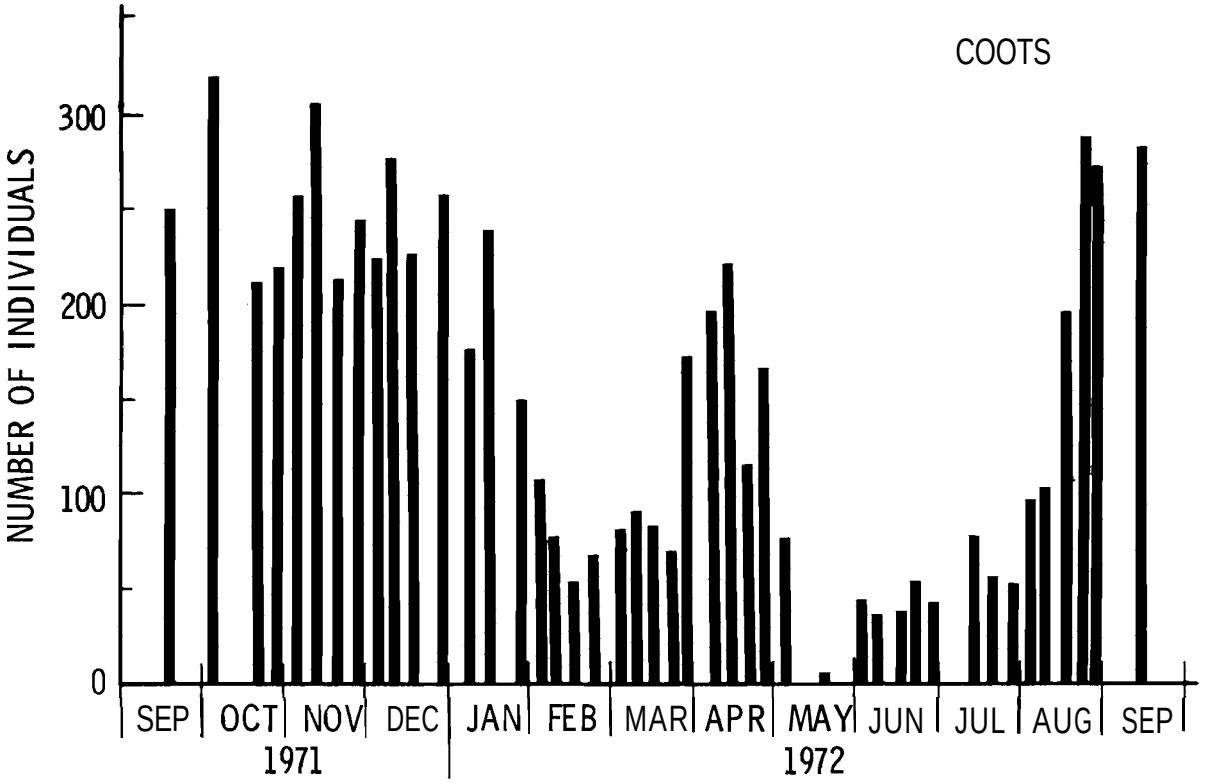

FIGURE 6. Weekly Abundance of Coots

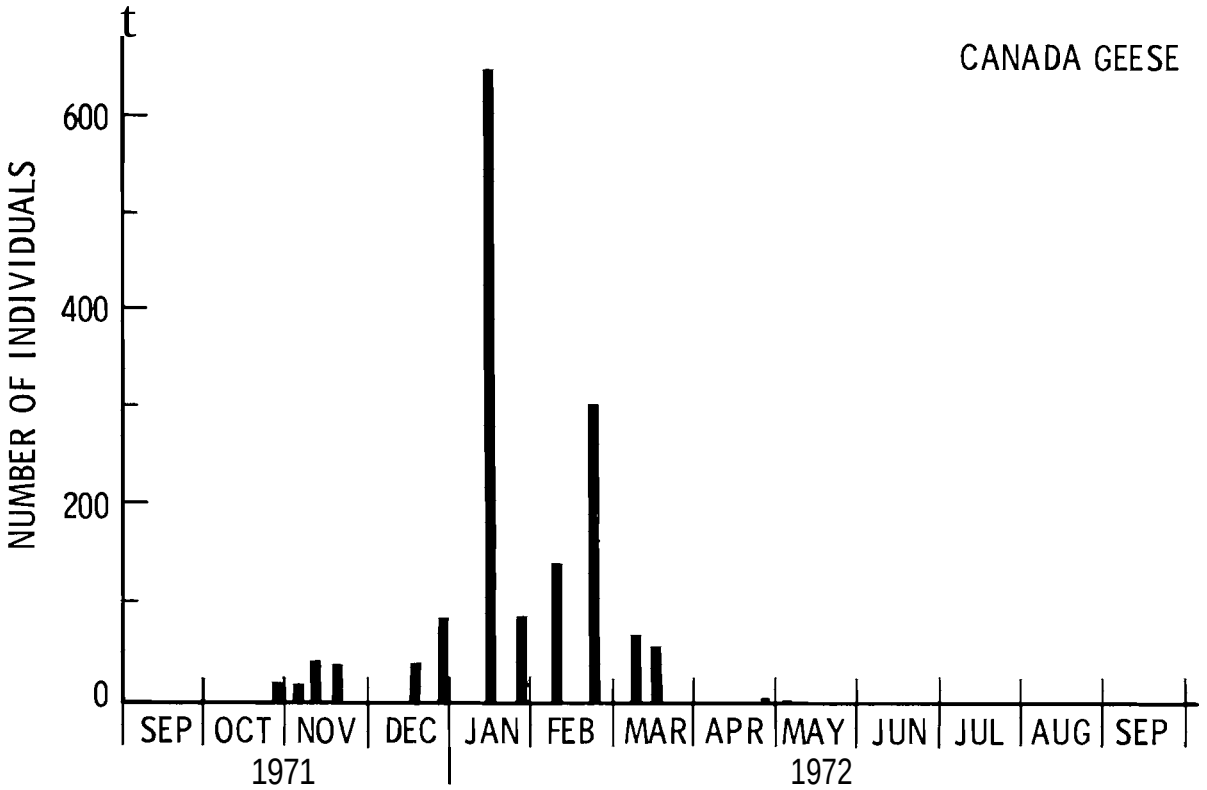

FIGURE 7. Weekly Abundance of Canada Geese

Blackbirds, particularly Red-winged and Yellow-headed Blackbirds, were common at all ponds from April through June. As many as 80 blackbirds were observed at the height of their season. They nested and reared their young in the cattails, bulrushes, and willows especially at Gable Mountain pond. Swallows are nother migratory bird occasionally occuring in large numbers (about 100), but they were not observed between late September and early April. The largest groups were seen at "B" and Gable Mountain ponds.

The killdeer is a shorebird present at all ponds (predominantly "B" and Gable Mountain) in small numbers. They occurred in the area from February through September. Nests are constructed on the ground surface in stony areas. Gulls were observed mostly in March through September and on one occasion were seen feeding on goldfish at Gable Mountain pond. The Great Blue Heron is another fish-eating bird frequently seen at Gable Mountain or "B" ponds and occasionally elsewhere. Rarely were more than one or two birds seen. There is a large heron rookery on the Columbia River near the townsite of White Bluffs, but it is not known whether the herons observed were from that rookery.

Table 1 is an alphabetical listing of all birds observed at the waste ponds. Appendix A presents the list in annotated form and in proper taxonomic order. Brief life histories and habits are included in the appendix.

DISCUSSION

Birds, especially migratory birds, are very mobile animals and thus present a constant potential for the inadvertent spread of radioactivity away from waste ponds. This preliminary study points up several factors important to the management of low-level waste. An obvious consideration is the actual amount of radioactivity any given bird might be carrying away from a storage pond. From the broadest sense this includes internal body burden as well as externally associated radioactivity. Internal sources are important to the individual animal and consumer animals. External sources are important from the standpoint of possible nuisance-level spread of radioactivity. Radioactive droppings also are important. A second feature is habitat attractiveness. If a pond for some reason is

TABLE 1. Birds Observed at the Waste Ponds During the Study Period September, 1971 to September, 1972

Comnon Name	Scientific Name
American Avocet	Recurvirostra americana
American Bittern	Botaurus lentiginosus
American Coot	Fulica americana
American Goldfinch	Spinus tristis
American Widgeon	Mareca americana
Ash-throated Flycatcher	Myiarchus cinerascens
Audubon's Warbler	Dendroica auduboni
Barn Swallow	Hirundo rustica
Barrows Goldeneye	Bucephala islandica
Belted Kingfisher	Megaceryle alcyon
Black-billed Magpie	Pica pica
Black-crowned Might Heron	Nycticorax nycticorax
Blue-winged Teal	Anas discors
Brewer's Blackbird	Euphagus cyanocephalus
Brown-headed Cowbird	Molothrus ater
Bufflehead	Bucephala albeola
Bullock's Oriole	Icterus bullockii
Burrowing Owl	Speotyto cunicularia
California Quail	Lophortyx californicus
Canada Goose	Branta canadensis
Canyon Wren	Catherpes mexicanus
Canvasback	Aythya valisneria
Cedar Waxwing	Bombycilla cedrorum
Chukar Partridge	Alectoris graeca
Cinnamon Teal	Anas cyanoptera
Cliff Swallow	Petrochelidon pyrrhonota
Common Crow	Corvs brachyrhynchos
Common Goldeneye	Bucephala clangula
Comnon Merganser	Mergus merganser
Common Nighthawk	Chordeiles minor
Common Raven	Corvus corax
Comnon Starling	Sturnus vulgaris
Downy Woodpecker	Dendrocopos pubescens
Eared Grebe	Podiceps caspicus
Eastern Kingbird	Tyrannus tyrannus
Gadwall	Anas strepera
Golden Eagle	Aquila chrysaetos
Golden-crowned Kinglet	Regulus satrapa
Golden-crowned Sparrow	Zonotrichia atricapilla
Great Blue Heron	Ardea herodias
Great Horned Owl	Bubo virginianus
Greater Yellowlegs	Totanus melanoleucus
Green-winged Teal	Anas carolinensis
Hermit Thrush	Hylocichla guttata
Hooded Merganser	Lophodytes cucullatus
Horned Grebe	Podiceps auritus
Horned Lark	Eremophila alpestris
Hutton's Vireo	Vireo huttoni
House Finch	Carpodacus mexicanus
House Sparrow	Passer domesticus
Lark Sparrow	Chondestes grammacus
Lesser Scaup	Aythya affinis
Lesser Yellowlegs	Totanus flavipes

TABLE 1. (Contd)

Common Name	Scientific Name
Loggerhead Shrike	Lanius ludovicianus
Long-billed Curlew	Numenius americanus
Long-billed Dowitcher	Limnodromus griseus
Long-billed Marsh Wren	Telmatodytes palustris
Mallard	Anas platyrhynchos
Marsh Hawk	Circus cyaneus
Mockingbird	Mimus polyglottos
Mourning Dove	Zenaidura macroura
Myrtle Warbler	Dendroica coronata
Nashville Warbler	Vermivora ruficapilla
Northern Killdeer Plover	Charadrius vociferus
Northern Phalarope	Lobipes lobatus
Oldsquaw	Clangula hyemalis
Oregon Junco	Junco oreganus
Pied-billed Grebe	Podilymbus podiceps
Pintail	Anas acuta
Red-backed Dunlin	Erolia alpina
Red-breasted Nuthatch	Sitta canadensis
Red-eyed Vireo	Vireo olivaceus
Red-shafted Flicker	Colaptes cafer
Red-tailed Hawk	Buteo jamaicensis
Redhead Duck	Aythya americana
Red-winged Blackbird	Agelaius phoeniceus
Ring-billed Gull	Larus delawarensis
Ring-necked Duck	Aythya collaris
Ring-necked Pheasant	Phasianus colchicus
Ruby-crowned Kinglet	Regulus calendula
Ruddy Duck	Oxyura jamaicensis
Rufous-sided Towhee	Pipilo erythrophthalmus
Sage Sparrow	Amphispiza belli
Sage Thrasher	Oreoscoptes montanus
Says Phoebe	Sayornis saya
Shoveler	Spatula clypeata
Sparrow Hawk	Falco sparverius
Spotted Sandpiper	Actitis macularia
Swainson's Hawk	Buteo swainsoni
Townsend's Warbler	Dendroica townsendi
Warbling Vireo	Vireo gilvus
Water Pipet	Anthus spinoletta
Western Grebe	Aechmophorus occidentalis
Western Kingbird	Tyrannus verticalis
Western Meadowlark	Sturnella neglecta
Western Robin	Turdus migratorius
Western Sandpiper	Ereunetes mauri
Western Tanager	Prianga ludoviciana
White-crowned Sparrow	Zonotrichia leucophrys
Whistling Swan	Olor columbianus
Wilson Comnon Snipe	Capella gallinago
Wilson Phalarope	Steganopus tricolor
Wilson's Warbler	Wilsonia pusilla
Winter Wren	Troglodytes troglodytes
Yellow-headed Blackbird	Xanthocephalus xanthocephalus
Yellow Warbler	Dendroica petechia

attractive to birds, then the number of birds coming into contact with radioactivity probably would be increased. A third major feature is related to the birds themselves, i.e., their behavior. Behavioral considerations include the amount of time a bird might spend in the area and at what time of year. In some cases behavior may strongly emphasize or de-emphasize the importance of a bird. Mergansers and herons are voracious fish eaters; swallows build nests of mud; killdeer and sandpipers nest on the bare ground surfaces. If radioactive fish, mud, or ground surfaces are available, these birds would be important to waste management. An additional consideration for waterfowl is the likelihood of a bird associating with the waste ponds and then being consumed by a hunter. A comparison of the relative abundance of individual species using the waste ponds with published reports on the harvest of the same species by hunters provides some insight.

Body burdens

Data on body burdens of waterfowl collected from waste ponds have been published intermittently since 1955. Routine sampling of waterfowl in the 200 Areas has been in effect since about 1960. (See "Biology Annual Reports" and the "Evaluation of Radiological Conditions" series.[2]) Most data collected prior to 1964 are in terms of "activity densities" (total beta activity/g) and are difficult to interpret from the standpoint of long-range trends. The transient nature of the birds and the uncertainty of their length of stay at the pond from which they were collected makes ecological interpretation of radiological survey data very difficult. From a hazards viewpoint, it can be said that no birds which could have been a health hazard if used for human consumption have been collected from a waste pond. It is known from food web studies, however, that the concentration of radionuclides such as ^{137}Cs may be many times greater in consumer organisms like waterfowl than in their environment (6).

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[2] Hanford Biology Research Annual Reports for 1955 (HW-41500), 1959 (HW-65500), and 1960 (HW-69500).
Evaluation of Radiological Conditions in the Vicinity of Hanford 1960 (HW-68435), 1961 (HW-71999), 1962 (HW-76526), 1963 (HW-80991), 1964 (BNWL-90), 1965 (BNWL-316), 1967 (BNWL-983), 1968 (BNWL-1314), 1969 (BNWL-1505), 1970 (BNWL-1669).

Long range surveillance plans should include a sampling program to collect repeatedly the same kind of bird from the same pond. Mallards or Coots would be good choices because some of them may be permanent residents on the pond. The Mallard is a vegetarian and the Coot is an omnivore.

Habitat attractiveness

The suitability of an area as a habitat for waterfowl primarily depends on its physical features and food supply. Moreover, each species of waterfowl has its own set of habitat requirements. These requirements generally overlap so that a number of different birds use a single habitat at the same time or in quick succession. However, it is not uncommon for a particular species to have a special requirement which limits its occurrence to those habitats capable of fulfilling the special requirement. An example of the former situation is the Coot whose distribution in the Columbia Basin is nearly synonymous with the occurrence of surface water and whose presence is generally with other waterfowl. The Merganser is an example of the latter situation, for its occurrence at Hanford waste ponds was virtually limited to fall migration and apparently coincided with a time when food (goldfish) was plentiful. By the same token, when a single habitat offers a variety of factors, a large number of many different kinds of waterfowl can be expected to utilize the area. Thus, maintaining the ponds in a manner which makes them an unsuitable habitat is a practical means of reducing waterfowl abundance.

The 200 Area ponds presently offer a variety of different habitats. These differences can be used in part to explain the diversity of birds at each pond. "U" pond for example is the most successionally advanced pond in the study area. The variety of trees and other plants serve as feeding and nesting sites for a large number of different birds. Warblers, fly-catchers, sparrows, blackbirds, thrushes and finches all were sighted more frequently at "U" pond than at any other pond. The abundance of plants and insects in the pond coupled with the shelter afforded by the rich plant growth, made this an attractive pond for many puddle ducks and a few diving ducks. Resident Great Horned Owls also were noted. Redox pond lacked large trees and emergent aquatic plants. This type of habitat is attractive

to shorebirds, a group which prefers open, unvegetated shores for food gathering and loafing. Waterfowl were usually sighted at Redox pond with puddle ducks being the most dominant. Shallowness and small size were the main features which made this pond unattractive to diving ducks. "B" pond is relatively free of vegetation except for a few scattered bunches of bulrush and some submergent aquatic plants. Few passerine species were observed, but many waterfowl and shorebirds were seen in the area. The large size and greater average depth of "B" pond were attractive to diving ducks. Gable Mountain pond is unlike any of the other ponds because of its large size, remoteness, and abundance of plant life providing food and shelter. These features make this pond very attractive to all species of waterfowl and a variety of passerine birds, particularly swallows and blackbirds.

Behavioral traits

Birds observed during this study can be placed into one or more of the five following status groups which reflect the amount of time spent in the area.

1. Migrants are birds which pass through the area and stay temporarily while en route between their summer breeding grounds in the north and winter habitats in the south. Eighty-five percent of the species sighted fall into this category. Their importance varies according to their length of stay, food habits, and habitat preference. It was observed that most migrants are typically in the area for only a few days, probably no longer than a week or two.

2. Winter residents stay on or around the waste ponds during winter months instead of continuing their southward migration. Freezing temperatures and ice formation on the waste ponds sometimes force waterfowl to more suitable feeding areas, but other birds remain. Most winter resident waterfowl, especially diving ducks and Coots, tend to stay in one location. Mallards may leave the ponds daily to feed in nearby grain fields, and it is during these feeding flights that many are hunted. Seventeen species are regarded as winter residents.

3. Summer residents stay in the area during summer months instead of continuing their northward migration to breeding grounds. These birds nest and rear young during their residence and are important for these reasons. Summer residents spend more of their time in a single location than any other temporary resident. The duration of stay for nesting waterfowl depends on the species, but probably averages 5 months. Some species of passerine birds stay for shorter periods of 1.5 to 2 months.

4. Permanent residents retain a permanent residence in the area. They may move considerable distances within a geographical area, but complete their life cycle without migrating to other areas. Owls, some hawks, crows, magpies and ravens belong to this category. The Columbia Basin is unique in that it has its own resident Canada goose population in addition to migrating geese. The importance of permanent residents depends on their permanence in one location. Some individual Mallards and Coots may be permanent residents at Gable Mountain pond. Twenty species are regarded as permanent residents to this region.

5. Accidentals are birds rarely seen in the area. Occasionally strong winds and other weather conditions force migrating individuals far off course and out of their normal range. The mockingbird sighted at "U" pond is an example of a southern species not usually seen this far north.

Based on resident status, important waterfowl to consider in waste management are summer residents (brood pairs and young), winter residents, and permanent residents. Mallard, Pintail, Scaup, Redhead, Ruddy duck, and Coot were observed as nesting species on the waste ponds and may fit into any of the above three categories. Bufflehead, Goldeneyes, Ring-necked, and Gadwall are mostly winter residents. Individuals may spend much of their time around the waste ponds but there are migrants also, and it is not possible to differentiate between them. Moreover, the data considered here are for only one season and may not be completely representative.

Other species of summer, winter, or permanent resident birds also may be important. Owls, night hawks, swallows, killdeer, and sandpipers exhibit nesting or feeding behaviors conducive to the spread of radioactivity if a source is available.

Waterfowl harvest

Table 2 indicates relative abundance and lists peak percentages for all ducks observed at the waste ponds during the study period. Mallard and Ring-necked ducks were additionally important due to their abundance over extended periods. Baldpate also was an abundant duck but only during fall migration. Table 3 is taken from data collected by the Bureau of Sport Fisheries and Wildlife (7) and shows the percentage of ducks in the Pacific Flyway killed and retrieved by hunters. In addition, 11.6% of all ducks retrieved by hunters in the Pacific Flyway during 1971 were taken in the state of Washington. Scoters and Wood ducks are the only species listed for the Pacific Flyway which were not observed on the waste ponds. Sport Fisheries and Wildlife also has data which show that 4.7% and 3.5% of the total waterfowl kill for 1971 were Coots and geese, respectively. About 23% of either Coots or geese killed in the United States in 1971 were taken in the Pacific Flyway.

TABLE 2. Percentages of Ducks Observed at the 200 Area Ponds During the 1971 Hunting Season. Percentages were calculated from the peak number of birds sighted at a time during the hunting season.

Mallard	21.4%
Baldpate	20.0%
Ring-necked Duck	17.3%
American Merganser	9.4%
Scaup	6.2%
Bufflehead	5.0%
Shoveler	4.1%
Gadwall	3.1%
Pintail	3.0%
Canvasback	3.0%
Goldeneye	2.7%
Teal	2.3%
Redhead	1.5%
Ruddy Duck	0.9%

TABLE 3. Percentages of Pacific Flyway Ducks Retrieved During the 1971 Waterfowl Season and Arranged in Order of Importance in the Hunter's Bag

Mallard	31.7%
Pintail	25.0%
Green-winged Teal	12.2%
Baldpate	12.1%
Shoveler	6.1%
Gadwall	3.4%
Blue-winged and Cinnamon Teal	1.7%
Canvasback	1.4%
Redhead	1.3%
Scaup	1.3%
Ruddy Duck	1.1%
Bufflehead	0.8%
Wood Duck	0.8%
Ring-necked Duck	0.5%
Goldeneye	0.5%
Scoters	0.06%
Hooded Merganser	0.06%
Other Mergansers	0.016%
Other Ducks	0.007%
Oldsquaw	0.004%

SUMMARY AND CONCLUSIONS

Sixteen species of waterfowl and 90 species of other birds were observed to use the 200 Area waste ponds during the first year of study. The greatest abundance of birds occurred during fall and spring migration periods. Mallard ducks were the most abundant waterfowl, but large numbers of Coots and Ring-necked ducks also were noted. Mallard, Ruddy duck and Coot were present every sampling period. Mallard, Pintail, Scaup, Redhead, and Ruddy duck nested and reared young on the ponds. Geese were observed using the ponds only during October through May even though the Columbia Basin reportedly has a resident population. Other birds important because of their abundance, nesting, or feeding habits were the Great Horned Owl, swallows, killdeer, sandpipers, and nighthawks.

Published radiological survey data on waterfowl body burdens are difficult to interpret from a long range viewpoint, and it is not possible

to determine whether or not body burdens have changed over the years. Mallard and Coot should be sampled routinely and in sufficient numbers during migration seasons to offset the dilution effect of migrant birds in the population.

Habitat attractiveness is an outstanding feature of Gable Mountain and "U" ponds. Gable Mountain pond attracted the greatest number of waterfowl and "U" pond showed a great diversity of birds. The advanced degree of ecologic succession at these ponds is mostly responsible for their attractiveness although the large size and remoteness of Gable Mountain also were important contributing factors. Human disturbance, frozen water surface, and physical features such as small size and shallow depth were noted as unattractive to most waterfowl. Maintaining the ponds in an unattractive condition is a practical means of reducing bird use.

All birds observed belong to one or more status groups: migrants, winter residents, summer residents, permanent residents, or accidentals. Winter, summer and permanent residents are most important because of the extended time period an individual may be associated with a pond. The longer a bird associates with a pond the greater the possibility to accumulate a significant body burden.

The possibility of radioactive ducks or geese being consumed by hunters is briefly considered with respect to the observed abundance of waterfowl on the waste ponds and the Pacific Flyway waterfowl harvest. Mallard and Baldpate were abundant on the waste ponds and also were common ducks in the hunter's bag.

Future work will include continued observation of the waste ponds to further define the abundance of waterfowl and other birds. Additional studies will attempt to define what food items the various species are eating and the levels of radioactivity in the food. In addition, the degree of body burden accumulation will be studied by establishing a research colony of young ducks at one of the ponds in the springtime. The birds will be pinioned and released and then harvested periodically. Other

APPENDIX A

Annotated Check List of Birds Associated with the 200 Area Waste Ponds[3]

Podicipediformes - (Grebes)

Podicipedidae

Podiceps auritus - Horned Grebe

Uncommon spring and fall migrant and winter resident. Feed primarily on fish, aquatic insects, crustaceans, snails, and some vegetable matter.

Podiceps caspicus - Eared Grebe

Uncommon spring and fall migrant. Principal food items are water insects, small frogs, crustaceans, and various waterplants.

Aechmophorus occidentalis - Western Grebe

Rare spring, fall, and winter visitor. Only seen on Gable Mountain pond. Never more than one present on any occasion. Feed on fish and aquatic invertebrates.

Podilymbus podiceps - Pied-billed Grebe

Common spring, summer, fall, and winter resident. Known to nest on Gable Mountain pond. Foods consist of fish, frogs, tadpoles, aquatic invertebrates and some vegetable matter.

Ciconiiformes - (Herons)

Ardeidae

Ardea Herodias - Great Blue Heron

Permanent resident. A nesting colony is located in a stand of cottonwoods on a peninsula near White Bluffs. These large birds move about from pond to pond, feeding on fish, frogs, insects, and small mammals.

Nycticorax nycticorax - Black-crowned Night Heron

Common migrant and summer resident. A small breeding colony on Locke Island, probably accounts for most of the birds visiting the 200 Area ponds. The food of the Night Heron consists of fish, crayfish, lizards, mice, and insects.

Botaurus lentiginosus - American Bittern

Migrant and summer resident. Probably breeds in the area, but no nests have been found. Food consists of fish, frogs, snakes, lizards, crayfish, insects, and occasionally rodents.

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[3] Annotations are based on R. E. Fitzner's observations and information from the Bibliography listed at the end of the Appendix.

Anseriformes - (Goose-like birds)

Anatidae

Olor columbianus - Whistling Swan

Rare migrant. Only two of these large birds have been observed on the ponds. They stayed on Redox pond for a duration of two weeks before moving on. Feed on tubers and stems of aquatic plants.

Branta canadensis - Canada Goose

The Hanford stretch of the Columbia River is unique in that it has its own resident population of Canada geese. This flock of birds, which average 400 individuals tend to remain in the vicinity of the Hanford Reservation year around and move considerable distances in their foraging for food (5). Gable Mountain pond and "B" pond received some use as feeding and loafing areas for geese. Grassy areas around Gable Mountain pond serve as feeding areas for a few birds, particularly during late winter, when cheatgrass leaves are young and tender. Other foods consumed by the Canada goose include foliage of native and cultivated grasses, cultivated grains and seeds and foliage of other marsh and water plants. Animal matter is rarely consumed. It should be noted that large migrations occur through the Columbia River Basin during the winter months and more than 600 geese were observed at Gable Mountain pond at one time. All 200 Area ponds are potential resting and feeding areas, but none of the ponds seem to offer suitable habitat for year-round use.

Anas platyrhynchos - Mallard Duck

The duck of greatest importance to the Washington hunter is the Mallard. More of these ducks are shot and more of them nest within the State than any other species. The success of the Mallard stems from its ability to quickly invade any water habitat created by irrigation or impoundment. The food of this bird consists of 90% plant materials (pond weeds, clover, grass, weed seeds, and grains) and 10% animal matter (aquatic and terrestrial insects and invertebrates, and other animal matter). All 200 Area ponds serve as feeding, loafing, and nesting areas. At least 15 broods averaging 9 young per brood were noted for all 200 Area ponds. Gable Mountain accounted for at least 10 broods.

Anas strepera - Gadwall

The Gadwall is not an abundant duck on any of the 200 Area ponds but numbers are fairly high during fall and spring migrations. Gadwalls nest in a variety of habitats in eastern Washington, but no broods were noted on the study area. This is another duck which migrates late in the spring and early in the fall, much like the Teal. This habit, coupled with its small numbers, makes this a relatively unimportant game bird in this area. The food consumed is normally plant material, but animal matter may form a large part of its diet during the summer months.

Bucephala clangula - Common Goldeneye

Bucephala islandica - Barrows Goldeneye

These birds are discussed together because of their similar appearance and feeding habits. Small flocks of both species were seen on Gable Mountain and "B" ponds during the spring and fall migrations and during the winter. Nesting of either species is uncommon in eastern Washington. The foods of both ducks average 75% animal matter (insects, molluscs, crustaceans, fish) and 25% plant material.

Bucephala albeola - Bufflehead

This small duck is one of the most abundant diving duck species to visit the 200 Area ponds. It does not nest in the area; instead, it prefers the Canadian and Alaskan wetlands. It can be sighted in late spring and fall when migrating through the Columbia Basin. This is not an important game species due to the srong taste it acquires by feeding on approximately 80% animal matter and 20% plant materials.

Clangula hyemalis - Oldsquaw

Rare winter visitor on the Columbia and Yakima Rivers. Only one recorded at "B" pond in the winter of 1971. Foods are fish, invertebrates, and some marine plants.

Oxyura jamaicensis - Ruddy Duck

This small diving duck was never seen in numbers greater than 12. However one brood of five young were raised on "U" pond. Any species of waterfowl spending its immature life on any of the contaminated ponds is of interest because growing young ducks feed almost entirely on insect larvae and other animal matter. Adult Ruddy ducks feed on approximately 75% plant material which makes their flesh very tasteful. It also decoys well and as a result is often shot by hunters.

Lophodytes cucullatus - Hooded Merganser

Rare migrant. Generally found west of the Cascades. Only two have been sighted; both at "U" pond in the spring of 1972. Feed primarily on water insects and crustaceans.

Mergus merganser - Common Merganser

A large flock of these birds were observed on Gable Mountain pond last December. More than 100 were seen during one period, and on careful observation it was noted that they were feeding on resident goldfish. Thus, the Merganser is an important indicator species for radiological surveys to detect the movement of radionuclides from fish to waterfowl.

Falconiformes - (Hawk-like birds)

Accipitridae - (Hawks and Eagles)

Buteo jamaicensis - Red-tailed Hawk

Common migrant and permanent resident on the Hanford Reservation. Often seen near 200 Area ponds. Feed on small mammals, birds, reptiles, and amphibians.

Buteo swainsoni - Swainson's Hawk

Common migrant and summer resident on the Hanford Reservation. Often seen foraging near 200 Area ponds. Its foods consist of mammals, birds, reptiles, amphibians, and insects.

Aquila chrysaetos - Golden Eagle

Common winter and uncommon summer resident. Often seen soaring or perched near any of the 200 Area ponds. Feeds primarily on jack rabbits in the winter months. Ducks have also been known to fall prey to this powerful bird.

Circus cyaneus - Marsh Hawk

Common migrant and summer resident. Probably nest near 200 Area ponds. Often seen foraging for food around all the ponds. Feeds on small mammals, birds, reptiles, amphibians, and insects.

Falconidae - (Falcons)

Falco sparverius - Sparrow Hawk

Common migrant and summer resident. Nest in hollow trees and cliffs and observed near all 200 Area ponds. Food items consist of mostly insects with a few small mammals and birds occasionally being eaten.

Galliformes - (Fowl-like birds)

Phasianidae - (Quails and Pheasants)

Lophortyx californicus - California Quail

Permanent resident on the Hanford Reservation. Probably nest and feed near all 200 Area ponds. Several have been seen at "U" pond and "B" pond. Feed primarily on seeds and other vegetable matter.

Alectoris graeca - Chukar Partridge

Introduced permanent resident. Seen on several occasions near "B" pond. Feed on seeds and vegetable matter.

Phasianus colchicus - Ring-necked Pheasant

Introduced permanent resident. Several have been seen near Redox and "U" ponds. Probably nest and feed around the ponds. Feed primarily on seeds but take some insects.

studies will simulate wintering populations of waterfowl which have different food habits. The degree of uptake by adult birds during winter months is expected to differ from that of the colony of young birds established in the springtime.

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Anas acuta - Pintail

The pintail is a highly prized duck because it possesses excellent table qualities and is one of the most handsome of our waterfowl. It is a relatively important nesting species in the Columbia plateau of eastern Washington, and large numbers can be seen on the 200 Area ponds during the spring and fall migrations. Like the Green-wing Teal, this bird migrates to the warm southern states early in the fall and returns to its northern nesting areas late in the spring. Some birds will stay in Washington during the winter months if open water and food are present. The 200 Area ponds are important stop-over areas for feeding and resting during migration. One nest was recorded at Redox pond, and a brood of seven young were successfully raised. The food habits of this duck consist of approximately 90% plant food and 10% animal.

Anas carolinensis - Green-winged Teal

Anas discors - Blue-winged Teal

Anas cyanoptera - Cinnamon Teal

Blue-winged, Cinnamon, and Green-winged Teal were seen on the 200 Area ponds, but only the Green-winged occurred in large enough numbers to warrant consideration. This small duck is an important gamebird due to its superior table qualities and is highly prized by sportsmen, It is common in the Columbia Basin during the early part of fall, but soon moves on to Texas and California, where it winters. In spring it migrates northward to nest. All three species of teal are common nesters in eastern Washington. The 200 Area ponds afford feeding, loafing, and nesting areas for this abundant migrant. No nests were recorded at any 200 Area ponds.

Mareca americana - Baldpate (American Widgeon)

This is a very abundant migrant duck in spring and fall. Large numbers were noted on all 200 Area ponds where they feed probably 90% on vegetable matter and 10% animal matter. By December most of these birds have migrated to the southern Pacific Coasts where they remain until early spring when they move back northward to their breeding grounds. Nesting on the 200 Area ponds was not observed even though this bird is reported to nest commonly in eastern Washington.

Spatula clypeata - Shoveler

This bird is a common migrant throughout Washington. It breeds commonly on lakes and sloughs in eastern Washington. A few of these ducks can also be found wintering along the lower Columbia River. The shoveler is unique in that about one-third of its diet consists of animal matter. This is a higher percentage than is consumed by any of the other puddle ducks found in Washington. The food habits of this duck make it an important species to examine in any situation where contamination of bottom ooze (the chief

habitat of aquatic insects and other invertebrates) has occurred. Shovelers have been seen in large numbers on most of the 200 Area ponds, particularly during spring and fall migration. No nesting was observed on any of the 200 Area ponds.

Aythya americana - Redhead Duck

The Redhead is considered to be a common nesting species in eastern Washington. It can also be seen in large numbers during migration. Only a few small flocks were seen at any one time on any of the 200 Area ponds, but several nesting birds were recorded in 1972 at Honey Hill pond. The foods of this bird are composed of approximately 90% vegetable and 10% animal matter.

Aythya collaris - Ring-necked Duck

This is the most common diving duck to visit the 200 Area ponds. Flocks of over 100 individuals were seen on Gable Mountain pond at one time. The Ring-necked duck is much like the puddle ducks in that its foods consist of approximately 80% vegetable and 20% animal matter. These food habits make this duck a desirable table bird. The Ring-neck, like many waterfowl species in Washington, is generally considered to be a migrant. Its nesting is restricted to high mountain lakes of northeastern Washington. In spring it migrates to the Canadian prairie provinces and in the fall it migrates to the warm southern states and northern South America. Many also winter in the state wherever open water and food can be found.

Aythya valisneria - Canvasback

This is a rare breeder but a common migrant in Washington. It was seen in numbers of over one dozen on Gable Mountain pond. It is a well known duck by all hunters because of its fine table qualities. Its numbers have steadily decreased for several years however, and the bird was protected by federal law and illegal to hunt during the 1971-1972 hunting season. Its diet consists of approximately 80% vegetable matter and 20% animal.

Aythya affinis - Lesser Scaup

The Lesser Scaup is another diving duck fairly common on all 200 Area ponds, particularly Gable Mountain and "B". It prefers these ponds probably because of the security afforded by the large body of water. This species nests in eastern Washington, but only one brood of five was hatched at any of the 200 Area ponds and that was at "B" pond. The greatest concentrations of these birds occur in spring and in the fall during their migrations. It is not a particularly sought after bird by the hunter, but many are shot due to their ease in decoying. The food habit of this species is composed of approximately 60% plant and 40% animal matter.

Gruiformes - (Crane-like birds)

Rallidae - (Rails and Gallinules)

Fulica americana - American Coot

The Coot is a small duck-like bird which belongs to the Rallidae family. It is often confused with some duck species because frequently it is seen swimming and feeding with them. It is usually not considered a table delicacy although large numbers are killed annually by hunters. It was the most common waterfowl species observed at all 200 Area ponds. Coot was the most common breeding waterfowl species on all ponds. Gable Mountain produced at least 15 and possibly 30 broods. Each brood was composed of 4 to 8 young. As the young reached maturity, their numbers decreased due to predation and other limiting factors. The number of young to reach adulthood on Gable Mountain pond was probably 50 or 60. "B" pond produced approximately 20 young, and "U" pond produced only 2 broods which yielded less than 10 young reaching adulthood. These numbers reveal that the Coot is an important species to consider when viewing the total ecological scheme around the waste ponds. Not only does the Coot's continual presence make it important, but its habits of eating both plant and animal matter place it high in the food web. It should also be noted, that large numbers of Coots were seen feeding on goldfish.

Charadriiforms - (Shorebirds and Gulls)

Charadriidae - (Plovers)

Charadrius vociferus - Northern Killdeer Plover

Abundant migrant and summer resident on all 200 Area ponds. Nests were abundant around Gable Mountain and "B" ponds. Food items consist almost entirely of insects.

Scolopacidae - (Snipe and Sandpipers)

Capella gallinago - Wilson Common Snipe

Spring and fall migrant. Few sightings have been recorded, probably due to the cryptic coloration patterns of this small shorebird. Feeds mostly on insects.

Numenius americanus - Long-billed Curlew

Rare migrant and summer resident. Nests in open grassy areas on the Hanford Reservation. Often seen feeding around 200 Area ponds. Food items consist of mostly insects.

Actitis macularia - Spotted Sandpiper

Uncommon spring and fall migrant and possible summer resident. Several sightings at "U" and "B" ponds. Probably do not nest near any of the ponds. Foods consist of insects.

Totanus melanoleucus - Greater Yellowlegs

Common spring and fall migrant. No nesting records. Seen mostly on "B" and Redox ponds. Feed on insects and other invertebrates.

Totanus flavipes - Lesser Yellowlegs

Uncommon fall migrant. Only one recorded at Honey Hill pond. Feed mostly on insects.

Erolia alpina - Red-backed Dunlin

Sighted during spring migration on Redox and Honey Hill ponds. Feed on aquatic insects.

Limnodromus griseus - Long-billed Dowitcher

Uncommon spring and fall migrant. Seen only on Honey Hill pond. Feeds mostly on aquatic insects and other invertebrates.

Ereunetes mauri - Western Sandpiper

Common fall migrant. Seen in large numbers on Honey Hill and "B" ponds. Food items consist of insects and small invertebrates.

Recurvirostridae - (Avocets and Stilts)

Recurvirostra americana - American Avocet

Uncommon migrant. The only sighting occurred on Honey Hill and "B" ponds. These birds do nest in eastern Washington, but we have no records for any of the 200 Area ponds. Feed on insects.

Phalaropodidae - (Phalaropes)

Steganopus tricolor - Wilson Phalarope

Rare migrant. Sighted only Redox pond. Feed largely on insects.

Lobipes lobatus - Northern Phalarope

Common spring and fall migrant. Sighted mostly on Honey Hill, Redox, and "B" ponds. More common than the Wilson Phalarope. Feeds primarily on insects.

Laridae - (Gulls and Terns)

Larus delawarensis - Ring-billed Gull

Spring and fall migrant and permanent resident. Gull rookeries exist on several Columbia River islands within the Hanford Reservation. Ring-bills have been observed on all of the 200 Area ponds, where they probably rest and search for food items such as small fish, amphibians and insects. They are also known to feed on garbage and decaying animal matter.

Columbiformes - (Pidgeon-like birds)

Zenaidura macroura - Mourning Dove

Common migrant and summer resident in eastern Washington. This very popular game bird breeds commonly on the Hanford Reservation.

During fall migration, more than 100 doves were seen in a single visit to "U" pond. All 200 Area ponds were used as feeding, watering, and loafing sites. Food items consist mainly of weed seeds.

Strigiformes - (Owls)

Strigidae - (Typical Owls)

Bubo virginianus - Great Horned Owl

Permanent resident on the Hanford Reservation. One pair nested at "U" pond and successfully raised three young. Since these birds hunt at night, our observations are restricted to "U" pond where a thicket of trees serves as shelter for the birds during daylight hours. Foods preferred by this large owl include small mammals and birds. Several jack rabbits and one coot were found half eaten at the "U" pond nesting site.

Speotyto cunicularia - Burrowing Owl

Common migrant and summer resident on the Hanford Reservation. Several sightings and one nest were recorded near Redox pond. Insects and small mammals form the main diet of this small owl.

Caprimulgiformes - (Goatsucker-like birds)

Caprimulgidae - Goatsuckers

Chordeiles minor - Common Nighthawk

Common migrant and summer resident on the Hanford Reservation. Hundreds of these birds nest on building tops and on the ground in the 200 W Area. They fly about in the evening searching for insects. Since all the 200 Area ponds support large populations of midges, caddis flies, and mosquitoes, they served as prime feeding areas for the Nighthawk.

Coraciiformes - (Roller-like birds)

Alcedinidae - (Kingfishers)

Megaceryle alcyon - Belted Kingfisher

Migrant and permanent resident throughout the state. No breeding records for the 200 Area ponds, probably due to a lack of suitable nesting habitat (sandy cliffs). Few sightings were recorded, and these occurred at "U" pond. Kingfishers feed primarily on small fish and tadpoles.

Piciformes - (Woodpecker-like birds)

Picidae - (Woodpeckers)

Colaptes cafer - Red-shafted Flicker

Permanent resident on the Hanford Reservation. Probably nest in the trees around deserted farm sites, White Bluffs, and other similar areas. Flickers have only been observed at "U" pond. Foods eaten consist of insects, seeds, wild fruits and berries.

Dendrocopos pubescens - Downy Woodpecker

Permanent resident on the Hanford Reservation. Nest in trees like most other woodpeckers. Only two sightings at "U" pond, both during the spring. Foods consist of insects and other invertebrates.

Passeriformes - (perching birds)

Tyrannidae - (Tyrant Flycatchers)

Tyrannus tyrannus - Eastern Kingbird

Common migrant and summer resident on the Hanford Reservation. One nesting record at "U" pond and several sightings at all 200 Area ponds during the spring and summer months. Feed almost entirely on insects.

Tyrannus verticalis - Western Kingbird

Common migrant and summer resident on the Hanford Reservation. Several nestswere found near "U" pond and sightings were frequent at all 200 Area ponds during spring and summer. Insects are the main food source for this bird.

Myiarchus cinerascens - Ash-throated Flycatcher

Casual migrant and summer resident. Seen frequently at "U" and "B" ponds. No nesting records. Feeds on insects.

Sayornis saya - Say's Phoebe

Common migrant and summer resident. Seen at "U", Redox, and "B" ponds. One nest found in the 200W Area. Feeds on insects.

Alaudidae - (Larks)

Eremophila alpestris - Horned Lark

Comnon migrant and permanent resident. Large flocks can be seen around all 200 Area ponds during the winter months; their numbers thinning outduringthe other seasons. Foods consist of vegetable and insect matter.

Hirundinidae - (Swallows)

Hirundo rustica - Barn Swallow

Common migrant and sumner resident. Seen flying about all 200 Area ponds during the summer. One nest was found at Honey Hill pond. Other nests were observed on buildings in the 200W Area. Feeds entirely on insects.

Petrochelidon pyrrhonota - Cliff Swallow

Common migrant and summer resident. Very abundant around all 200 Area ponds during the summer and early fall. Thousands of this species nest on the cliffs along the Columbia River. Nests are made from mud collected along the river bank. Foods consist almost entirely of insects.

Corvidae - (Jays, Magpies, and Crows)

Pica pica - Black-billed Magpie

A common permanent resident and one of the most abundant passerine birds to be sighted around the 200 Area ponds. At least 10 active nests were located around "U" and Redox ponds. Other ponds served mostly as feeding and watering areas. Foods eaten by this bird include insects, young birds and eggs, carrion, and some plant material.

Corvus corax - Common Raven

Permanent resident on the Hanford Reservation. No nesting records for any of the 200 Area ponds, but sightings were frequent. Feeds on insects and carrion.

Corvus brachyrhynchos - Common Crow

Common permanent resident. Several nests were found around "U", Redox, and "B" ponds. Several crows could be seen on a visit to the ponds. Feeds on insects, eggs, young birds, grain, carrion, and almost anything else that is edible.

Sittidae - (Nuthatches)

Sitta canadensis - Red-breasted Nuthatch

Rare visitor. Only one sighting at "U" pond. Feeds on insects which live under the bark of trees.

Troglodytidae

Troglodytes troglodytes - Winter Wren

Uncommon visitor during fall and spring. Only one sighting at "U" pond. Feeds on insects.

Telmatodytes palustris - Long-billed Marsh Wren

Common migrant and summer resident. Few sightings, probably due to the secretive nature of this bird. Probably nests at "U" and Gable Mountain ponds as they offer the only suitable habitat. Feeds mostly on insects.

Catherpes mexicanus - Canyon Wren

Common permanent resident along cliffs bordering the Columbia River. Several sightings on the cliffs of Gable Mountain above Honey Hill pond. No nests were observed. Feeds mostly on insects.

Mimidae - (Mockingbirds and Thrashers)

Oreoscoptes montanus - Sage Thrasher

Summer resident on the Hanford Reservation. Only one sighting at "B" pond during June of 1972. Probably more abundant than sighting reveal as suitable habitat for nesting occurs near all ponds. Feeds on insects, seeds, and fruits.

Mimus polyglottos - Mockingbird

Accidental summer visitor in Washington. Only a few sightings of this rare visitor have ever been noted for the state. On June 17 and 22, a single bird was noted near "U" pond. It was believed to be the same bird each time, as it used one particular willow for its singing stand. The bird was not seen after June 22. It feeds on insects, seeds, and fruit.

Turdidae - (Thrushes)

Turdus migratorius - Western Robin

Spring and fall migrant on the Hanford Reservation. No nesting records for the area. The food of the robin includes berries, earthworms, and a variety of insects.

Hylocichla guttata - Hermit Thrush

Spring and fall migrant through the Hanford Reservation. Does not nest in the area. Feeds on berries, insects, and invertebrates.

Regulidae - (Kinglets)

Regulus satrapa - Golden-crowned Kinglet

Uncommon fall and spring migrant around the 200 Area ponds. Only a few sight records at "U" pond during the spring of 1972. The Golden-crowned Kinglet feeds mostly on insects.

Regulus calendula - Ruby-crowned Kinglet

Uncommon fall and spring migrant around the 200 Area ponds. Only a few sightings at "U" pond during the spring of 1972. The Ruby-crowned Kinglet feeds mostly on insects.

Motacillidae - (Wagtails)

Anthus spinoletta - Water Pipet

Spring and fall migrant on the Hanford Reservation. Only two sightings for the 200 Area ponds. Both sightings at Gable Mountain pond during the spring of 1972. Food items consist mostly of insects.

Bombycillidae - (Waxwings)

Bombycilla cedrorum - Cedar Waxwing

Spring and fall migrant on the Hanford Reservation. Very few sightings, probably due to a lack of sufficient foods around the 200 Area ponds. Feeds primarily on seeds and berries and often feeds on insects.

Laniidae - (Shrikes)

Lanius ludovicianus - Loggerhead Shrike

Common migrant and summer resident on the Hanford Reservation. Always a common sight around 200 Area ponds. Several pairs nested and reared young around "U" and Redox ponds. The Loggerhead Shrike feeds on insects and small vertebrates.

Sturnidae - (Starlings)

Sturnus vulgaris - Common Starling

Common permanent resident. Feeds and nests near the 200 Area ponds. Several nesting records for the buildings at 200W Area. Feeds on grains, weed seeds, insects, and a wide variety of other foods.

Vireonidae - (Vireas)

Vireo huttoni - Hutton's Vireo

Uncommon spring migrant. Only one spring sighting at "U" pond. Feeds mostly on insects.

Vireo olivaceus - Red-eyed Vireo

Uncommon spring migrant. Only one sighting at "U" pond in the spring of 1972. Feeds mostly on insects.

Vireo gilvus - Warbling Vireo

Uncommon migrant. Several sightings at "U" pond in the spring of 1972. Feeds principally on insects.

Parulidae - (Wood Warblers)

Vermivora ruficapilla - Nashville Warbler

Rare spring migrant. Only two birds were seen at "U" pond on April 27, 1972. This warbler usually migrates and summers in coniferous timber in the mountains of eastern and western Washington. Feeds mostly on insects.

Dendroica petechia - Yellow Warbler

Uncommon spring and fall migrant and probable summer resident in deciduous growths around ponds, streams, and rivers of the Hanford Reservation. Two individuals were sighted on May 4, 1972, at "U" pond. No nesting records. Feeds mostly on insects.

Dendroica coronata - Myrtle Warbler

Rare spring migrant in eastern Washington. Several sightings were made during the spring of 1972 around "U" pond. No nesting occurs in the Columbia Basin. The Myrtle Warbler feeds primarily on insects.

Denroica auduboni - Audubon's Warbler

Sightings and records in Washington indicate that this bird migrates and summers in mixed and coniferous woods west of the Cascade Crest. Apparently observations were lacking for eastern Washington for this was a very common spring migrant at "U" pond. Food items consist mostly of insects.

Dendroica townsendi - Townsend's Warbler

Common spring migrant on the Hanford Reservation. Several sightings at "U" pond during May of 1972. Nests in coniferous forest of the sub-alpine areas of Washington. Foods consist mostly of insects.

Wilsonia pusilla - Wilson's Warbler

Common spring migrant throughout eastern Washington. Nests in wooded areas from lowlands to sub-alpine areas. No nests recorded for the Hanford Reservation. Several sightings at "U" pond during the spring of 1972. Wilson's Warbler feeds primarily on insects.

Ploceidae - (Weaver Finches)

Passer domesticus - House Sparrow

This non-native bird is an uncommon permanent resident on the Hanford Reservation. It prefers more inhabited areas where food is easily found. No nesting records for the 200 Area ponds, but several sightings were made throughout the year.

Icteridae - (Blackbirds)

Sturnella neglecta - Western Meadowlark

Common migrant and summer resident; also irregular permanent resident on the Hanford Reservation. No nests were located near the 200 Area ponds, but many sightings were recorded for all months of the year. Feeds on insects, invertebrates, and seeds which it picks up while foraging about on the ground.

Xanthocephalus xanthocephalus - Yellow-headed Blackbird

Common spring migrant and summer resident on the Hanford Reservation. Nests were observed at all 200 Area ponds, with "U" and Gable Mountain ponds having approximately 5 and 20 nests respectively. Feeds mostly on insects and other invertebrates.

Agelaius phoeniceus - Red-winged Blackbird

Common migrant and summer resident on the Hanford Reservation. Nests in cattails and reeds of "U", "B", Redox, and Gable Mountain ponds. No less than 25 nesting females were recorded at Gable Mountain pond. "U" pond supported at least 5 females while "B" and Redox accounted for only two or three. Feeds primarily on insects, seeds and grain.

The Red-winged and Yellow-headed Blackbirds are two of the most common nesting birds to be found at the 200 Area ponds. They arrive in April and begin their nest constructing. By mid-May most nests are filled with young birds which will mature by early June and be ready to migrate south by early July.

Icterus bullockii - Bullock's Oriole

Common migrant and summer resident on the Hanford Reservation. At least one pair and possibly another nested at "U" pond. They construct a pendant nest which is placed high in the branches of a deciduous tree. This accounts for no nest being recorded at other 200 Area ponds besides "U". This bird feeds mostly on insects.

Euphagus cyanocephalus - Brewer's Blackbird

Common resident and migrant in eastern Washington. Occasional sightings at all 200 Area ponds were made. No nests were found. Insects, seeds, and grains are the most common food.

Molothrus ater - Brown-headed Cowbird

Uncommon migrant on the Hanford Reservation. A few scattered sightings at "U" pond during the spring of 1972. No nesting recorded. The cowbird feeds mostly on insects.

Thraupidae - (Tanagers)

Prianga ludoviciana - Western Tanager

Uncommon migrant on the Hanford Reservation. Several spring and early sightings at "U' pond. Does not nest in the area; instead it prefers deciduous and open coniferous timber of higher elevations. Feeds primarily on insects.

Fringillidea - (Grosbeaks, Finches, Buntings, and Sparrows)

Carpodacus mexicanus - House Finch

Common migrant and summer resident on the Hanford Reservation. Small flocks were often seen flying around "U" and "B" ponds. They were more often seen around buildings and roadways of the 200W Area. These finches nest in trees and shrubs around buildings of the 200 Areas. Feeds primarily on seeds.

Spinus tristis - American Goldfinch

Common migrant and summer resident on the Hanford Reservation. Often seen in large flocks during the spring and fall. No nesting was evidenced. Feeds on seeds.

Pipilo erythrophthalmus - Rufous-sided Towhee

Uncommon migrant on the Hanford Reservation. Only two sightings at "U" pond during the spring of 1972. Feeds on seeds and insects which are found by scratching about in the leaf litter.

Junco oreganus - Oregon Junco

Occurs as a spring and fall migrant and winter resident in wooded areas of the Hanford Reservation. Often seen around "U" pond and buildings of the 200 W Area. Feeds mostly on weed seeds.

Chondestes grammacus - Lark Sparrow

Common migrant and summer resident in the open sagebrush and bunchgrass areas of the Hanford Reservation. Flocks of over 20 individuals were often encountered at "U' pond during the later part of July. No nests were found around the 200 Area ponds. Feeds mostly on seeds.

Amphispiza belli - Sage Sparrow

Common migrant and summer resident on the Hanford Reservation. Strongly restricted to sagebrush habitat. Occasionally seen around "U" pond. Feeds on seeds and insects.

Zonotrichia leucophrys - White-crowned Sparrow

Common spring and fall migrant and winter resident around all 200 Area ponds. Often sighted more than 20 individuals at "U' pond. Feeds on seeds and insects.

Zonotrichia atricapilla - Golden-crowned Sparrow

Rare spring and fall migrant on the Hanford Reservation. Only a few sightings during the spring of 1972. Feeds primarily on seeds and insects.

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