

## A SURVEY OF THE BIRDS OF DEATH VALLEY

By ROLAND H. WAUER

In 1893, A. K. Fisher, a member of the Death Valley Expedition under Dr. C. Hart Merriam, reported 69 species of birds in the below-sea-level region of Death Valley, California. Not until 1917, however, did Dr. Joseph Grinnell and Joseph Dixon continue the study of the avifauna of Death Valley.

Grinnell used the sea level contour as the boundary of his study area and in 1923 published a list of 120 species. He wrote that an analysis of his list (1923:45) "shows a constituency by seasonal categories which is much different from that usually obtaining in local lists: the proportion of breeding species to casual visitants, transients and winter visitants is exceedingly small." He pointed out that 25 of the 120 species were casual visitors or vagrants, 45 were regular transients, 31 were winter visitors, and 9 were summer visitors. Of these only one, the Bullock Oriole (*Icterus bullockii*) was known to breed in the below-sea-level area.

Grinnell listed 12 permanent residents which were considered to breed in the study area. He said (1923:46), "The following four are dependent on the existence of the Ranch [Furnace Creek Ranch]: Killdeer, Desert Quail (introduced), Western Meadowlark, and English Sparrow (non-native). There are left but eight species which are native in, and doubtless breed 'at large' in, the restricted area in question, namely: Prairie Falcon, Burrowing Owl, Road-runner, Say Phoebe, Western Raven, California Linnnet, LeConte Thrasher, and Rock Wren."

Sumner (1923) added the Golden Eagle (*Aquila chrysaetos*) to the list of birds found in the below-sea-level area of Death Valley. Five more species were added in 1934 by Grinnell, and Gilman accounted for an additional 17 species in 1935. Thus a total of 143 species of birds were known to have been present one or more times in the below-sea-level portion of Death Valley. Later Gilman (*in* Putnam, 1947) listed a total of 179 species in the area below sea level.

In all of the reports mentioned, with the exception of Fisher (1893), the sea-level contour was used as a natural boundary line. I am using the same contour as the boundary of the 550 square miles involved in the study area.

## DESCRIPTION OF THE AREA

Death Valley is a long trough between two mountain ranges which extend north and south. The Armagosa Range rises steeply along the east side of Death Valley to a height of 7000 feet. Sparse vegetation occurs along the steep slopes, and few fresh water springs can be found along the 75-mile front of the Armagosa Range. Only Triangle, Neveres, Texas, Travertine and Willow Springs lie five miles or less from the below-sea-level contour. Small salt water seeps occur at several locations along the edge of the salt flats.

The Panamint Range borders the western side of Death Valley and rises over 11,000 feet. This range of mountains embraces four life zones. A line of springs at the 4000-foot level produces luxuriant growths in a few narrow canyons. Above the springs is a forest of piñon pine (*Pinus monophylla*) and juniper (*Juniperus californica*). Limber pine (*Pinus flexilis*) is found above 9500 feet, and bristlecone pine (*Pinus aristata*) grows on the high slopes of Telescope Peak.

The study area itself is, for the most part, a chemical desert—a huge "pan of salt," not fit to sustain life. Except for birds flying over this region, the area is uninhabited. A thin line of phreatophytes (deeply rooted plants) exists at the base of the alluvial fans which extend over the salt pan in the below-sea-level region of the valley. Furnace

Creek Ranch, 900 acres of greenery, lies in the center of Death Valley. Exotic trees, grasslands, irrigation ditches and ponds make up this oasis.

#### CLIMATE

The highest temperatures in the world have been recorded in Death Valley. The table below presents a summary of the average and extreme temperatures (in Fahrenheit) at Greenland Ranch (Furnace Creek Ranch) since 1910.

|             | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Yearly average |
|-------------|------|------|------|------|-----|------|------|------|-------|------|------|------|----------------|
| Av. maximum | 66   | 72   | 81   | 90   | 99  | 109  | 116  | 114  | 106   | 91   | 76   | 66   | 90             |
| Av. minimum | 38   | 44   | 51   | 60   | 69  | 78   | 87   | 84   | 73    | 59   | 46   | 39   | 61             |
| Average     | 52   | 58   | 66   | 75   | 84  | 94   | 102  | 99   | 89    | 75   | 61   | 52   | 76             |
| Highest     | 58   | 92   | 100  | 109  | 120 | 124  | 134  | 127  | 121   | 110  | 93   | 86   | 134            |
| Lowest      | 15   | 21   | 30   | 35   | 42  | 49   | 62   | 65   | 41    | 32   | 24   | 19   | 15             |

The average annual precipitation, since 1910, is 2.3 inches. The total precipitation during 1959 was 1.86 inches; 0.57 inch of rain was recorded during January and February. In that year no rain fell until September when 0.52 inch was recorded. October and November were rainless, and 0.77 inch was recorded during December.

#### HABITATS

The study area is an elongated concave playa. Vegetation exists along the edge of the salt flats where water can be obtained at the terminus of the alluvial fans.

The phreatophyte zone consists of a narrow band of vegetation along the western side. Plant identifications are based on Munz (1959). Iodine bush (*Allenrolfea occidentalis*) grows in isolated bunches closest to the salt pan. A line of saltgrass (*Distichlis stricta*), arrowweed (*Pluchea sericea*), and sacatone grass (*Sporobolus airoides*) form



Fig. 1. The Park Service Visitor Center is situated in the center of Death Valley. Nearby is the Furnace Creek Ranch area in which may be found the date orchard, grasslands and ponds. This area is utilized by many birds in the below-sea-level region of Death Valley National Monument.

a ground cover about the dominant plant of the phreatophyte zone, honey mesquite (*Prosopis juliflora*). Cattle spinach (*Atriplex polycarpa*) is found in the vicinity of the Eagle Borax Works where it intermingles with sacatone grass and extends into the desert holly (*Atriplex hymenelytra*) of the zerophyte zone at the base of the gravel fans. Creosote bush (*Larrea tridentata*) persists on the upper fans which dip into the study area.

Except at Furnace Creek Ranch, almost no fresh water is found in the below-sea-level region of Death Valley. A small pool of stagnate water at Tule Spring and annual pools of water at the Eagle Borax Works are all that is available on the west side of the valley.

The Eagle Borax Works is situated in about the center of the line of mesquite on the west side of Death Valley. Except for the mesquite, introduced tamarisk (*Tamarix*) is dominant and grows in heavy thickets and long tall rows about the site of the early-day borax operation. In the winter months, November through May, open water is generally available to the many waterbirds that winter in the area or stop to feed or rest during their spring migration. From June through October a four-foot well provides the only water available. The soil remains damp throughout the summer allowing the growth of a heavy ground cover of sedge (*Carex* sp.) and yerbamansa (*Anemopsis californica*). A hot tropical "jungle" is the result.

Along the eastern edge of the salt pan, mountains rise abruptly allowing a minimum of vegetation below sea level. Iodine bush and sacatone grass is most common at Coyote Well and Badwater; mesquite persists at Coyote Well and on the alluvial fan at the mouth of Furnace Creek Wash.

Salt Creek, at the northern end of the study area, flows south along the base of Tucki Mountain. A thick layer of algae covers the slow-flowing creek during the summer months, but from November to June large open pools and waterways persist and the banks are thickly covered with iodine bush and saltbushes. The flow finally sinks into the sand of the alkali flat where "checker-board" bunches of mesquite grow in an area of several square miles.

Greenland Ranch (now known as Furnace Creek Ranch), -179 feet elevation, has been altered from the native mesquite thickets to a luxuriant oasis. Migrants, winter and summer visitants, transients and vagrants tend to "fill" the lawns and ponds at Furnace Creek Ranch throughout the year. There is little doubt that the distribution of the avifauna of Death Valley has been greatly influenced by the unnatural conditions caused by man's intervention. Since the 1870's, irrigated fields and orchards, ditches and ponds, grasslands and fence rows have formed a refuge for literally thousands of birds.

Seven distinct habitats can be recognized at Furnace Creek Ranch.

**Grasslands.** This is the largest area and includes a nine-hole golf course and more than 175 acres of pasture land. Water is ditched onto the golf course during the summer months and 30 to 40 head of cattle graze there.

**Ditches and waterways.** Tules (*Scirpus* sp.), introduced Bermuda grass (*Cynodon dactylon*), and a rush (*Juncus cooperi*) grow in or about the waterways, often times forming heavy mats along the banks. The red-spotted toad (*Bufo punctatus*) is common in the area. Even goldfish find their way into the ditches from the Furnace Creek Inn where they are planted annually.

**Open ponds.** These are found at the terminus of several ditches. The largest and deepest pond is nowhere over six feet deep. It is circular in shape, being about 100 feet across. The overflow from this enters a large pond, 350 feet long and 20 to 75 feet across.

The latter pond is shallow, being only from 3 to 10 inches deep, and has a heavy growth of tules and cattail (*Typha angustifolia*) along the edge and in the shallower end. Three smaller ponds lie to the southwest, but these are filled only occasionally, depending upon the irrigation.

*Date orchard* (*Phoenix* sp.). This orchard forms the second largest habitat at Furnace Creek Ranch. Since the 1930's, the trees have produced dates which ripen in September and are picked in October and November.

*Tamarisk rows*. Tamarisks grow in and around the ranch proper. The species does exceptionally well with only the slightest irrigation. The trees grow in long tall rows and in shorter dense thickets.

*Mesquite thickets* and *alkali flats*. These two form the only natural habitats. Several hundred acres of mesquite surround the ranch, and mesquite is also found occasionally where fields or grasslands have not been established on the ranch lands. Neglected fields often give way to alkali flats which intermingle in and around the Furnace Creek Ranch.

Grinnell (1923:47) pointed out that the various bird species associated themselves with conditions at Furnace Creek Ranch that were most like their natural breeding associations. They tended to "find themselves' associationally as nearly as existing conditions will permit. Associational choice is exercised just so far as is possible."

#### SYSTEMATIC LIST

The following is a complete list of species of the avifauna known in the below-sea-level region of Death Valley National Monument. Nomenclature is based on the fifth edition of the A.O.U. Check-list. Included here are 232 species. An asterisk designates those species observed in the course of this study.

- |  |   |
|--|---|
| * <i>Gavia immer</i> . Common Loon                 | <i>Aix sponsa</i> . Wood Duck                     |
| <i>Gavia arctica</i> . Arctic Loon                 | * <i>Aythya americana</i> . Redhead               |
| * <i>Podiceps caspicus</i> . Eared Grebe           | * <i>Aythya collaris</i> . Ring-necked Duck       |
| * <i>Aechmophorus occidentalis</i> . Western Grebe | <i>Aythya valisineria</i> . Canvasback            |
| * <i>Podilymbus podiceps</i> . Pied-billed Grebe   | * <i>Aythya marila</i> . Greater Scaup            |
| * <i>Pelecanus erythrorhynchos</i> . White Pelican | * <i>Aythya affinis</i> . Lesser Scaup            |
| * <i>Phalacrocorax auritus</i> .                   | * <i>Bucephala clangula</i> . Common Goldeneye    |
| Double-crested Cormorant                           | * <i>Bucephala albeola</i> . Bufflehead           |
| * <i>Ardea herodias</i> . Great Blue Heron         | * <i>Oxyura jamaicensis</i> . Ruddy Duck          |
| * <i>Butorides virescens</i> . Green Heron         | * <i>Lophodytes cucullatus</i> . Hooded Merganser |
| * <i>Casmerodius albus</i> . Common Egret          | * <i>Mergus merganser</i> . Common Merganser      |
| * <i>Leucophoyx thula</i> . Snowy Egret            | * <i>Mergus serrator</i> . Red-breasted Merganser |
| * <i>Nycticorax nycticorax</i> .                   | * <i>Cathartes aura</i> . Turkey Vulture          |
| Black-crowned Night Heron                          | * <i>Accipiter striatus</i> . Sharp-shinned Hawk  |
| <i>Ixobrychus exilis</i> . Least Bittern           | * <i>Accipiter cooperii</i> . Cooper Hawk         |
| * <i>Botaurus lentiginosus</i> . American Bittern  | * <i>Buteo jamaicensis</i> . Red-tailed Hawk      |
| <i>Mycteria americana</i> . Wood Ibis              | * <i>Buteo swainsoni</i> . Swainson Hawk          |
| * <i>Plegadis chihi</i> . White-faced Ibis         | <i>Buteo albonotatus</i> . Zone-tailed Hawk       |
| * <i>Olor columbianus</i> . Whistling Swan         | * <i>Buteo regalis</i> . Ferruginous Hawk         |
| * <i>Branta canadensis</i> . Canada Goose          | * <i>Aquila chrysaetos</i> . Golden Eagle         |
| <i>Anser albifrons</i> . White-fronted Goose       | * <i>Circus cyaneus</i> . Marsh Hawk              |
| * <i>Chen hyperborea</i> . Snow Goose              | <i>Pandion haliaetus</i> . Osprey                 |
| * <i>Anas platyrhynchos</i> . Mallard              | * <i>Falco mexicanus</i> . Prairie Falcon         |
| * <i>Anas strepera</i> . Gadwall                   | * <i>Falco peregrinus</i> . Peregrine Falcon      |
| * <i>Anas acuta</i> . Pintail                      | * <i>Falco columbarius</i> . Pigeon Hawk          |
| * <i>Anas carolinensis</i> . Green-winged Teal     | * <i>Falco sparverius</i> . Sparrow Hawk          |
| * <i>Anas discors</i> . Blue-winged Teal           | * <i>Lophortyx gambelii</i> . Gambel Quail        |
| * <i>Anas cyanoptera</i> . Cinnamon Teal           | * <i>Rallus limicola</i> . Virginia Rail          |
| * <i>Mareca penelope</i> . European Widgeon        | * <i>Porzana carolina</i> . Sora                  |
| * <i>Mareca americana</i> . American Widgeon       | * <i>Gallinula chloropus</i> . Common Gallinule   |
| * <i>Spatula clypeata</i> . Shoveler               | * <i>Fulica americana</i> . American Coot         |

- \**Charadrius alexandrinus*. Snowy Plover  
 \**Charadrius vociferus*. Killdeer  
 \**Eupoda montana*. Mountain Plover  
   *Squatarola squatarola*. Black-bellied Plover  
 \**Capella gallinago*. Common Snipe  
 \**Numenius americanus*. Long-billed Curlew  
 \**Numenius phaeopus*. Whimbrel  
 \**Actitis macularia*. Spotted Sandpiper  
 \**Tringa solitaria*. Solitary Sandpiper  
 \**Catoptrophorus semipalmatus*. Willet  
 \**Totanus melanoleucus*. Greater Yellowlegs  
 \**Totanus flavipes*. Lesser Yellowlegs  
 \**Erolia melanotos*. Pectoral Sandpiper  
 \**Erolia minutilla*. Least Sandpiper  
 \**Limnodromus* sp. Dowitcher  
 \**Ereunetes mauri*. Western Sandpiper  
   *Tryngites subruficollis*. Buff-breasted Sandpiper  
 \**Limosa fedoa*. Marbled Godwit  
 \**Recurvirostra americana*. American Avocet  
 \**Himantopus mexicanus*. Black-necked Stilt  
 \**Phalaropus fulicarius*. Red Phalarope  
 \**Steganopus tricolor*. Wilson Phalarope  
 \**Lobipes lobatus*. Northern Phalarope  
 \**Larus californicus*. California Gull  
 \**Larus delawarensis*. Ring-billed Gull  
 \**Larus philadelphia*. Bonaparte Gull  
 \**Chlidonias niger*. Black Tern  
 \**Zenaidura asiatica*. White-winged Dove  
 \**Zenaidura macroura*. Mourning Dove  
 \**Columbigallina passerina*. Ground Dove  
 \**Geococcyx californianus*. Roadrunner  
 \**Otus asio*. Screech Owl  
 \**Bubo virginianus*. Great Horned Owl  
 \**Speotyto cunicularia*. Burrowing Owl  
 \**Asio flammeus*. Short-eared Owl  
 \**Phalaenoptilus nuttallii*. Poor-will  
   *Chordeiles minor*. Common Nighthawk  
 \**Chordeiles acutipennis*. Lesser Nighthawk  
 \**Chaetura vauxi*. Vaux Swift  
 \**Aeronautes saxatalis*. White-throated Swift  
   *Archilochus alexandri*.  
   Black-chinned Hummingbird  
 \**Calypte costae*. Costa Hummingbird  
   *Selasphorus rufus*. Rufous Hummingbird  
 \**Megaceryle alcyon*. Belted Kingfisher  
 \**Colaptes auratus*. Yellow-shafted Flicker  
 \**Colaptes cafer*. Red-shafted Flicker  
 \**Asyndesmus lewis*. Lewis Woodpecker  
 \**Sphyrapicus varius*. Yellow-bellied Sapsucker  
 \**Sphyrapicus thyroideus*. Williamson Sapsucker  
 \**Dendrocopos villosus*. Hairy Woodpecker  
 \**Tyrannus tyrannus*. Eastern Kingbird  
 \**Tyrannus verticalis*. Western Kingbird  
 \**Tyrannus vociferans*. Cassin Kingbird  
 \**Sayornis nigricans*. Black Phoebe  
 \**Sayornis saya*. Say Phoebe  
 \**Empidonax traillii*. Traill Flycatcher  
 \**Empidonax hammondi*. Hammond Flycatcher  
 \**Empidonax oberholseri*. Dusky Flycatcher  
 \**Empidonax wrightii*. Gray Flycatcher  
 \**Empidonax difficilis*. Western Flycatcher  
 \**Contopus sordidulus*. Western Wood Pewee  
 \**Nuttallornis borealis*. Olive-sided Flycatcher  
 \**Pyrocephalus rubinus*. Vermilion Flycatcher  
 \**Eremophila alpestris*. Horned Lark  
 \**Tachycineta thalassina*. Violet-green Swallow  
 \**Iridoprocne bicolor*. Tree Swallow  
 \**Riparia riparia*. Bank Swallow  
 \**Stelgidopteryx ruficollis*. Rough-winged Swallow  
 \**Hirundo rustica*. Barn Swallow  
 \**Petrochelidon pyrrhonota*. Cliff Swallow  
 \**Progne subis*. Purple Martin  
 \**Aphelocoma coerulescens*. Scrub Jay  
   *Pica pica*. Black-billed Magpie  
 \**Corvus corax*. Common Raven  
 \**Corvus brachyrhynchos*. Common Crow  
   *Nucifraga columbiana*. Clark Nutcracker  
 \**Auriparus flaviceps*. Verdin  
   *Psaltriparus minimus*. Common Bushtit  
 \**Sitta carolinensis*. White-breasted Nuthatch  
 \**Sitta canadensis*. Red-breasted Nuthatch  
 \**Certhia familiaris*. Brown Creeper  
 \**Troglodytes aedon*. House Wren  
 \**Troglodytes troglodytes*. Winter Wren  
 \**Thryomanes bewickii*. Bewick Wren  
 \**Telmatodytes palustris*. Long-billed Marsh Wren  
 \**Salpinctes obsoletus*. Rock Wren  
 \**Mimus polyglottos*. Mockingbird  
 \**Toxostoma rufum*. Brown Thrasher  
 \**Toxostoma lecontei*. LeConte Thrasher  
   *Toxostoma dorsale*. Crissal Thrasher  
   *Oreoscoptes montanus*. Sage Thrasher  
 \**Turdus migratorius*. Robin  
 \**Ixoreus naevius*. Varied Thrush  
 \**Hylocichla guttata*. Hermit Thrush  
 \**Hylocichla ustulata*. Swainson Thrush  
 \**Sialia mexicana*. Western Bluebird  
 \**Sialia currucoides*. Mountain Bluebird  
 \**Myadestes townsendi*. Townsend Solitaire  
 \**Poliophtila caerulea*. Blue-gray Gnatcatcher  
 \**Poliophtila melanura*. Black-tailed Gnatcatcher  
 \**Regulus satrapa*. Golden-crowned Kinglet  
 \**Regulus calendula*. Ruby-crowned Kinglet  
 \**Anthus spinoletta*. Water Pipit  
 \**Bombycilla cedrorum*. Cedar Waxwing  
 \**Phainopepla nitens*. Phainopepla  
 \**Lanius ludovicianus*. Loggerhead Shrike  
 \**Sturnus vulgaris*. Starling  
 \**Vireo bellii*. Bell Vireo  
 \**Vireo solitarius*. Solitary Vireo  
 \**Vireo gilvus*. Warbling Vireo  
 \**Mniotilta varia*. Black-and-white Warbler  
 \**Vermivora celata*. Orange-crowned Warbler  
 \**Vermivora ruficapilla*. Nashville Warbler  
 \**Vermivora luciae*. Lucy Warbler  
 \**Dendroica petechia*. Yellow Warbler  
 \**Dendroica magnolia*. Magnolia Warbler  
 \**Dendroica coronata*. Myrtle Warbler  
 \**Dendroica auduboni*. Audubon Warbler  
 \**Dendroica nigrescens*.  
   Black-throated Gray Warbler  
 \**Dendroica townsendi*. Townsend Warbler

- \**Dendroica occidentalis*. Hermit Warbler  
 \**Dendroica palmarum*. Palm Warbler  
 \**Seiurus noveboracensis*. Northern Waterthrush  
 \**Oporornis tolmiei*. MacGillivray Warbler  
 \**Geothlypis trichas*. Yellowthroat  
 \**Icteria virens*. Yellow-breasted Chat  
 \**Wilsonia pusilla*. Wilson Warbler  
 \**Setophaga ruticilla*. American Redstart  
 \**Passer domesticus*. House Sparrow  
 \**Sturnella neglecta*. Western Meadowlark  
 \**Xanthocephalus xanthocephalus*.  
     Yellow-headed Blackbird  
 \**Agelaius phoeniceus*. Redwinged Blackbird  
 \**Agelaius tricolor*. Tricolored Blackbird  
 \**Icterus cucullatus*. Hooded Oriole  
 \**Icterus parisorum*. Scott Oriole  
 \**Icterus bullockii*. Bullock Oriole  
 \**Euphagus cyanocephalus*. Brewer Blackbird  
 \**Molothrus ater*. Brown-headed Cowbird  
 \**Piranga ludoviciana*. Western Tanager  
 \**Pheucticus melanocephalus*.  
     Black-headed Grosbeak  
 \**Gairaca caerulea*. Blue Grosbeak  
 \**Passerina amoena*. Lazuli Bunting  
 \**Spiza americana*. Dickcissel  
 \**Carpodacus purpureus*. Purple Finch  
 \**Carpodacus mexicanus*. House Finch  
 \**Spinus pinus*. Pine Siskin  
 \**Spinus tristis*. American Goldfinch  
 \**Spinus psaltria*. Lesser Goldfinch  
 \**Spinus lawrencei*. Lawrence Goldfinch  
     *Loxia curvirostra*. Red Crossbill  
 \**Chlorura chlorura*. Green-tailed Towhee  
 \**Pipilo erythrophthalmus*. Rufous-sided Towhee  
 \**Passerculus sandwichensis*. Savannah Sparrow  
 \**Poocetes gramineus*. Vesper Sparrow  
 \**Chondestes grammacus*. Lark Sparrow  
 \**Amphispiza bilineata*. Black-throated Sparrow  
 \**Amphispiza belli*. Sage Sparrow  
 \**Junco hyemalis*. Slate-colored Junco  
 \**Junco oreganus*. Oregon Junco  
 \**Spizella arborea*. Tree Sparrow  
 \**Spizella passerina*. Chipping Sparrow  
 \**Spizella breweri*. Brewer Sparrow  
 \**Zonotrichia querula*. Harris Sparrow  
 \**Zonotrichia leucophrys*. White-crowned Sparrow  
 \**Zonotrichia atricapilla*.  
     Golden-crowned Sparrow  
 \**Zonotrichia albicollis*. White-throated Sparrow  
 \**Passerella iliaca*. Fox Sparrow  
 \**Melospiza lincolni*. Lincoln Sparrow  
 \**Melospiza melodia*. Song Sparrow  
 \**Calcarius lapponicus*. Lapland Longspur  
 \**Calcarius ornatus*. Chestnut-collared Longspur

## SEASONAL CHANGES IN THE AVIFAUNA

Of the 232 species of birds known from the below-sea-level region of Death Valley, 15 have been recorded throughout the year. These include Pied-billed Grebe, Mallard, Red-tailed Hawk, Prairie Falcon, Gambel Quail, American Coot, Killdeer, Roadrunner, Great Horned Owl, Burrowing Owl, Say Phoebe, Common Raven, Mockingbird, House Sparrow, and House Finch. Two of the 15 species are exotic, having been introduced. The Gambel Quail was probably planted by Texas Bennett at "Greenland Ranch" in the 1870's (Grinnell, 1923), and the House Sparrow was first noticed in Death Valley about 1914 (Grinnell, 1919).

Winter visitants begin to appear in the study area during the last two weeks of September. Species commonly found in the area throughout the winter season (September through April) include Green-winged Teal, American Widgeon, Ruddy Duck, Cooper Hawk, Common Snipe, Red-shafted Flicker, Yellow-bellied Sapsucker, Bewick Wren, Long-billed Marsh Wren, Robin, Ruby-crowned Kinglet, Water Pipit, Starling, Audubon Warbler, Western Meadowlark, Brewer Blackbird, Oregon Junco, White-crowned Sparrow, and Song Sparrow. The Lewis Woodpecker and Mountain Bluebird are sporadic in occurrence; they are common some winters and absent others.

During the first two weeks of March the majority of winter visitants move out of the study area and the first spring migrants begin to appear. Waterbirds are especially noticeable as they begin to "invade" the ponds and moist fields of Furnace Creek Ranch. Among these are the Eared Grebe, Common Egret, Snowy Egret, Cinnamon Teal, Green-winged Teal, Bufflehead, Sora, Killdeer, Common Snipe, Spotted Sandpiper, American Avocet, and Black-necked Stilt. Marsh Hawks and Sparrow Hawks become common, as well as large flocks of Mourning Doves and swallows.

The first wave of warblers reaches the study area about mid-April. Literally hun-

dreds of Yellow Warblers, MacGillivray Warblers, Yellowthroats, and Wilson Warblers can be found in the area from the mesquite thickets to the Furnace Creek Ranch golf course. Flocks of Redwinged Blackbirds, Brown-headed Cowbirds, Western Tanagers, Savannah Sparrows, and Lincoln Sparrows appear with the first wave of warblers. Like sand flowing in an "hourglass," migrants pour into the only area in the valley where adequate food and water can be found.



Fig. 2. Charadriiforms are common in the valley in the spring and fall months when great flocks of migrants appear. Available water is eagerly used whether it is in large open ponds or narrow ditches. The avocets and phalaropes shown here have found a drainage pond from the Cow Creek irrigation.

The spring migrants arrive in March and April and reach their peak in mid-May, but only a few species remain to nest in the below-sea-level region of Death Valley. Those that have been found nesting in the study area but are not permanent residents include the Verdin, Yellow-breasted Chat, Redwinged Blackbird, Bullock Oriole, and Blue Grosbeak. All but the Redwinged Blackbird prefer the native mesquite for nesting sites. Those permanent residents that are known to nest in the study area include the Mallard, Gambel Quail, Killdeer, Roadrunner, Great Horned Owl, Burrowing Owl, LeConte Thrasher, Say Phoebe, House Sparrow, and House Finch. Fifteen species have been found nesting in the below-sea-level region of Death Valley.

In June fewer individuals frequent the study area than at any other time of the year. The following is a monthly tabulation, based on 215 field trips, of avian species recorded in the below-sea-level region of Death Valley.

| Mean                  | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Yearly average |
|-----------------------|------|------|------|------|-----|------|------|------|-------|------|------|------|----------------|
| Number of species     | 24   | 25   | 29   | 40   | 45  | 35   | 38   | 39   | 43    | 34   | 26   | 26   | 34             |
| Number of individuals | 348  | 271  | 329  | 333  | 402 | 143  | 359  | 555  | 496   | 285  | 271  | 323  | 341            |

By the end of May the northward movement subsides, but it is only a matter of a few weeks before the southward trend begins. The mean number of individuals recorded for June is 42 per cent less than the average number of individuals found in the area over a twelve-month span. And in July the count jumps to 5 per cent above the annual mean.

This increase in July is accounted for by the great number of summer visitants that descend into the valley from their nesting grounds in the surrounding area. Regardless of the extremes in temperatures and aridity, the below-sea-level region is well populated in July and August, at least in those portions of the valley where vegetation and fresh water can be found. At this time the average maximum temperatures are 116° and 114° F. A few of the species that arrive in July and stay on through the summer include

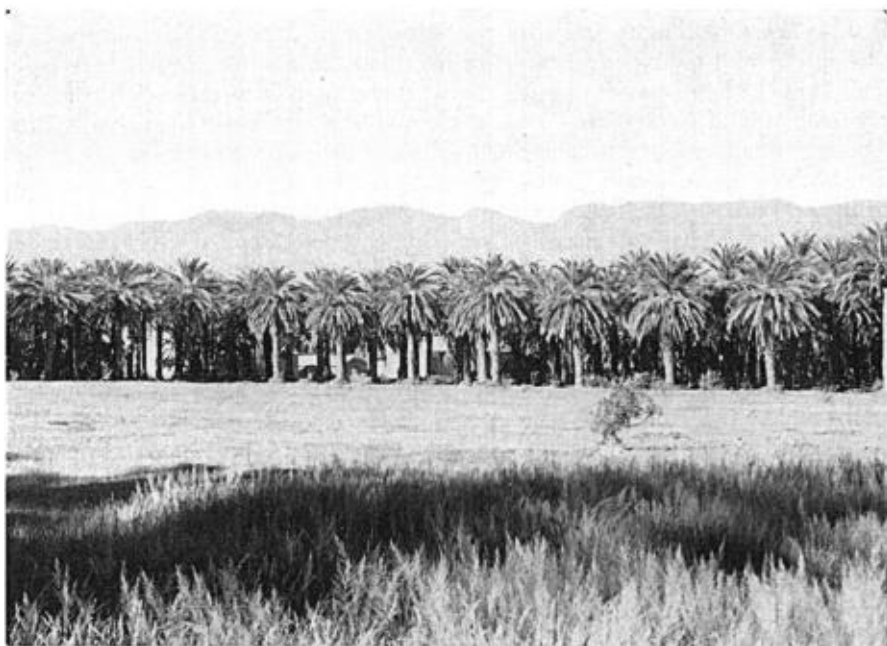


Fig. 3. A large portion of Furnace Creek Ranch consists of a date orchard. Since the 1870's, these ranchlands have served as a source of food and water for the avifauna of Death Valley. In this area the second highest official temperature in the world, 134° F., was recorded.

the Pintail, Blue-winged Teal, Turkey Vulture, Killdeer, Spotted Sandpiper, Least Sandpiper, Western Sandpiper, Black-necked Stilt, Wilson Phalarope, Mourning Dove, Lesser Nighthawk, Western Kingbird, Ash-throated Flycatcher, Black Phoebe, Tree Swallow, Mockingbird, Warbling Vireo, Orange-crowned Warbler, Yellow-headed Blackbird, Brown-headed Cowbird, and Chipping Sparrow.

Fall departures begin anytime after the nesting cycle has been completed. Yellow-breasted Chats cannot be found in the study area after the third week of July. Blue Grosbeaks can be found daily through July, but they are gone by early August. Say Phoebes tend to move out of the study area after nesting, but they return by the end of August. One or two phoebes can always be found in the area, but before and immediately after nesting the species is abundant. I have noticed this trend of departure in 1959 and again in 1960.

During the first week of August southward migrants begin to reach Death Valley. These individuals may pass quickly over the study area or, more often, stay to feed and rest for from a few hours to many days. Common fall migrants include the Great Blue Heron, Snowy Egret, Black-crowned Night Heron, Pintail, Sparrow Hawk, Mourning Dove, Barn Swallow, Orange-crowned Warbler, MacGillivray Warbler, Yellowthroat



Redwinged Blackbird, Brown-headed Cowbird, Savannah Sparrow, Chipping Sparrow, Brewer Sparrow, White-crowned Sparrow, and Lincoln Sparrow.

Less common fall migrants, yet part of the overall "picture," are the White Pelican, American Bittern, White-faced Ibis, Marsh Hawk, Sora, Solitary Sandpiper, Red Phalarope, Traill Flycatcher, Western Flycatcher, Nashville Warbler, Wilson Warbler, and Lazuli Bunting.

#### DISCUSSION

It is not too surprising to find birds below sea level in Death Valley, but the abundance of species and individuals is noteworthy. That birds would winter there is to be expected, but the large masses of birds that visit the study area throughout the year is remarkable. Although only a few nest, great numbers of anseriforms, charadriiforms and passerines can be found even during the hottest days of the summer.

The native flora of Death Valley is very different from that of the artificial oasis found in the Furnace Creek Ranch area. The indigenous mesquite, saltbushes, iodine bush, and arrowweed habitats support a very thin bird population. The great abundance of birds in the study area is due then to the grasslands, orchards, and waterways of Furnace Creek Ranch. There is no way of knowing what the avifauna consisted of before the ranch became a factor. No doubt the few desert species and the spring and fall migrants made up the bulk of the avifauna of Death Valley. Today, however, many species of waterfowl, large numbers of raptorial birds that find their prey easy "pickings" about the moist ranchlands, and other species are permanent residents.

Of special interest are the regular summer visitants. In June, daily temperatures reach 115° F. or higher, and this high temperature tends to "drive" the last of the



Fig. 4. A heavy growth of tamarisk (*Tamarix*) is found along the edges of ponds. This pond, situated west of the Furnace Creek Ranch golfcourse, is 350 feet long and 20 to 75 feet wide. In the background are the Panamint Mountains which form the western boundary of Death Valley.

migrants from the area. But by early July, the summer visitants appear en masse. Although daily maximum temperatures are around 120°F., the avifauna is abundant where there is the slightest moisture and food. A typical field trip at this time of the year discloses the following: July 11, 1959, Furnace Creek Ranch, 5:45 to 8:15 a.m., calm and 118°F. at 8:00 a.m. Great Blue Heron, 2; Black-crowned Night Heron, 4; Mallard, 12; Cinnamon Teal, 8; Redhead, 4; Ruddy Duck, 2; Turkey Vulture, 6; Cooper Hawk, 1; Red-tailed Hawk, 1; Ferruginous Hawk, 1; Prairie Falcon, 1; Gambel Quail, 8; American Coot, 10; Killdeer, 23; Spotted Sandpiper, 2; Least Sandpiper, 18; Solitary Sandpiper, 1; American Avocet, 4; Wilson Phalarope, 1; Mourning Dove, 55; Roadrunner, 2; Great Horned Owl, 1; Short-eared Owl, 1; Western Kingbird, 2; Ash-throated Flycatcher, 4; Black Phoebe, 2; Say Phoebe, 3; Horned Lark, 5; Bank Swallow, 5; Rough-winged Swallow, 12; Barn Swallow, 65; Cliff Swallow, 8; Common Raven, 22; Mockingbird, 5; Phainopepla, 1; Warbling Vireo, 2; Yellow-breasted Chat, 4; House Sparrow, 12; Yellow-headed Blackbird, 26; Redwinged Blackbird, 125 (3 flocks); Hooded Oriole, 5; Bullock Oriole, 9; Brown-headed Cowbird, 95; Blue Grosbeak, 2; House Finch, 18; Savannah Sparrow, 8. Total, 45 species and 608 individuals.

Thirty-four per cent of the total species have been recorded in the study area from July 1 to August 15. Official summer air temperatures have been recorded as high as 134°F. and ground temperatures over 180°F. The mesquite thickets and the alkali flats are all but denuded of bird life in mid-summer. Only where there is a supply of available water do birds persist. The open ponds and flooded golf course at Furnace Creek Ranch offer refuge from the arid surroundings. Early mornings and late afternoons are busy times, but little activity takes place during midday.

Shade is at a minimum and swallows can be found, mouths agap, among the foliage of a tamarisk, or in small bunches on the moist ground. Yellow-headed Blackbirds and Brown-headed Cowbirds find shade beneath the cattle that stand about under the tamarisks. The dabbling of the Cinnamon Teal or the occasional call of a Western Kingbird or Black Phoebe is audible. Only the charadriiforms are found in the open, usually half



Fig. 5. Five hundred and fifty square miles of Death Valley National Monument lie below sea level. More than 60 per cent of this area is made up of barren salt flats.

submerged in water and moving only as their source of food necessitates. Mourning Doves and House Finches prefer the shelter of the date orchard or they may join the House Sparrows along the irrigated paddies beneath the trees. But when the sun sets there is a dash for food. A little exercise and then there is a need for rest once more. For even after the sun sets the temperatures drop very little. A twenty-four hour minimum temperature in July may well be from 100° to 110°F.

Death rate during the summer months is a great deal less than in September and October. Migrants arriving from cooler and higher regions are sometimes greatly affected by the high temperatures and aridity. Many Red-shafted Flickers are found dead each fall. Herons, warblers, and sparrows have a high death rate. During mid-summer, birds robin-size and smaller seldom decay when death occurs. They become dried carcasses within eight hours. I placed a dead Brown-headed Cowbird in the sun at 7:00 a.m. and by 6:00 p.m. it was mummified, dry enough to be stored out of a freezing unit. In late August, I found a Redwinged Blackbird attached to a shrub; its wings were open and it was mummified. Dehydration probably accounts for the greatest number of dead birds during the summer in the below-sea-level region of Death Valley.

#### LIST OF SELECTED RECORDS

The following is a selected list of birds that either have not previously been reported from the study area of Death Valley or whose occurrence there needs further clarification. Racial identifications of specimens taken in the summer and fall of 1961 have been made by Ned K. Johnson.

*Gavia immer*. Common Loon. A single individual was first seen at Cow Creek by Goodwin and Alberts in April, 1941. Hartesveldt collected a specimen at Furnace Creek Ranch (hereafter FCR) on November 8, 1952 (DVNM no. 161). A single bird was observed on the flooded alkali flat west of FCR on November 8, 1958.

*Pelecanus erythrorhynchos*. White Pelican. A single individual was seen flying "over the valley" by Oakes and Cochran in September, 1944. On October 19, 1958, about 350 pelicans were observed over FCR at twilight. They circled and alighted on the ponds, but none was found the following morning at 6:00 a.m. A second flock was observed over FCR on September 12, 1960, in mid-morning, but they moved south along the Black Mountains.

*Branta canadensis*. Canada Goose. Previously reported. The race probably is *leucopareia* (Grinnell and Miller, 1944). Also, *B. c. minima* was found with *leucopareia* at FCR on February 10, 1960.

*Mareca penelope*. European Widgeon. A single male and four females were found on a pond at the FCR golf course on June 5, 1960.

*Aythya collaris*. Ring-necked Duck. Hartesveldt found a single bird at the Eagle Borax Works on March 7, 1953. From October 18 to 23, 1959, two pairs were seen daily on the pond at FCR.

*Lophodytes cucullatus*. Hooded Merganser. A single male was seen daily on the pond at FCR, from November 25 to December 6, 1959. A single male was again seen on the pond on June 12, 1960.

*Mergus serrator*. Red-breasted Merganser. A single dead male was collected at Cow Creek by Johnson in April, 1954 (DVNM no. 1966). A dead female was found at the Eagle Borax Works on June 20, 1959. The bird had been dead about two weeks. Two pairs were observed on the pond at FCR from October 22 to 24, 1959.

*Rallus limicola*. Virginia Rail. Although five records exist for the species above the sea level contour in Death Valley, there is but one record for the study area. A single bird was observed along an irrigation ditch at FCR on November 5, 1959.

*Charadrius alexandrinus*. Snowy Plover. A pair was observed feeding along the terminus of Salt Creek on March 20, 1960, by McAlpin.

*Squatarola squatarola*. Black-bellied Plover. Vessel observed a single individual at FCR in March, 1953.

*Numenius americanus*. Long-billed Curlew. Two or three individuals were seen daily on the FCR golf course from August 18 to September 24, 1960.

*Numerius phaeopus*. Whimbrel. A single bird was seen daily in the field at FCR from June 28 to August 9, 1960.

*Catoptrophorus semipalmatus*. Willet. A single bird was found on the FCR golf course on June 28, 1959, and again on April 25, 1960.

*Totanus flavipes*. Lesser Yellowlegs. A single individual was found on the FCR golf course on September 10, 1960.

*Erolia melanotos*. Pectoral Sandpiper. A single bird was observed on the FCR golf course on September 21, 1959, and on April 25, 1960.

*Limnodromus* sp. Dowitcher. Several observations were made at FCR of what was thought to be *Limnodromus scolopaceus*. Two were observed on March 29, 1958, and two were again seen September 3, 1959, in a wet pasture. Nine individuals were found March 20, 1960, along a shallow pond west of FCR golf course.

*Ereunetes mauri*. Western Sandpiper. The species is fairly common on the FCR golf course during the summer. A specimen was taken in 1959 (DVNM no. 3325).

*Zenaida asiatica*. White-winged Dove. A single bird was seen at FCR on May 21, 1960.

*Columbigallina passerina*. Ground Dove. A single bird was observed feeding beneath a row of tamarisk trees at FCR on November 27, 1958.

*Otus asio*. Screech Owl. Although there are several records for the species in the surrounding mountains of Death Valley, this is the only record for the study area. A dead bird was found at Cow Creek on November 13, 1959.

*Sphyrapicus varius*. Yellow-bellied Sapsucker. The species is a common winter visitant. The race usually found is *nuchalis* (DVNM no. 3330). There are also a few spring records of *S. varius daggetti*.

*Dendrocopos villosus*. Hairy Woodpecker. A single individual was observed on a dead mesquite at FCR on February 14, 1960. Although the species is resident about the nearby mountain springs, this is the first record for the study area.

*Tyrannus vociferans*. Cassin Kingbird. Ogston observed a single bird at FCR in 1939. A single individual was seen at the FCR golf course on September 12, 1960.

*Empidonax difficilis difficilis*. Western Flycatcher. Several individuals were collected at FCR during the summer and fall of 1960 (DVNM nos. 3334, 3337, 3338).

*Nuttallornis borealis*. Olive-sided Flycatcher. Several individuals were found at FCR in May, 1959. A single individual was observed at FCR on May 8, 1960.

*Eremophila alpestris*. Horned Lark. There are several records of this species at FCR from April through October. The race usually found is *utahensis*. Grinnell first identified specimens taken at FCR as *leucolaema* and later changed the identity to *utahensis*.

*Riparia riparia*. Bank Swallow. The species was fairly common during the summers of 1959 and 1960 at FCR.

*Progne subis*. Purple Martin. Vessel observed a single bird at FCR in March, 1954. An individual was seen flying over FCR golf course on April 20, 1960.

*Sitta canadensis*. Red-breasted Nuthatch. Although the species is common in the mountains surrounding Death Valley, this is the only record for the study area. A single individual was observed at Cow Creek on October 10, 1959.

*Certhia familiaris*. Brown Creeper. A single bird was observed feeding along the trunk of a tamarisk tree on the FCR golf course on October 31, 1958.

*Troglodytes troglodytes*. Winter Wren. A single bird was observed along an irrigation ditch near the cabins at FCR on November 15, 1959.

*Hylocichla guttata*. Hermit Thrush. The species is fairly common in the study area as a winter visitant and a migrant.

*Hylocichla ustulata*. Swainson Thrush. The species arrives each year by May 15 and is gone by May 25. During this time many individuals can be found throughout the study area.

*Regulus satrapa*. Golden-crowned Kinglet. A dead kinglet (DVNM no. 4133) was found at the base of the plate glass window of the National Park Service Visitor Center on November 7, 1961.

*Poliophtila melanura*. Black-tailed Gnatcatcher. A pair was observed catching insects from a mesquite thicket near FCR on April 17, 1960.

*Sturnus vulgaris*. Starling. The first record of the species in Death Valley was that of a single

bird at Cow Creek on December 31, 1950, recorded by L. D. Moore. Keller observed "a few" at Cow Creek in April of 1951. "Several at FCR" was recorded in the National Park Service files for the FCR area for March, 1954. One hundred and thirty-two individuals were estimated in a flock at FCR on November 4, 1957, and on November 22, 400 Starlings were counted at FCR. In the winters of 1958, 1959, and 1960, the species was abundant at both FCR and the Eagle Borax Works. The highest count was on December 23, 1958, when 506 individuals were counted at FCR. The species has not, as yet, spent an entire year in the valley, but two Starlings were found in June of 1960. None was found in July, but Starlings returned to the area in mid-August.

*Mniotilta varia*. Black-and-white Warbler. Vessel found the species at FCR in March of 1951. A single bird was observed throughout the day of May 7, 1960. It was feeding on insects in mesquite at Cow Creek.

*Vermivora ruficapilla*. Nashville Warbler. The species is a fairly common fall migrant.

*Vermivora luciae*. Lucy Warbler. A single male was observed singing from a mesquite thicket at the Eagle Borax Works on May 15, 1959. It was seen in good light with 9-power fieldglasses for several minutes before it flew into the cover of a nearby tamarisk.

*Dendroica magnolia*. Magnolia Warbler. A single individual was observed "flycatching" from a fence along a tamarisk row at FCR on August 23, 1960.

*Dendroica occidentalis*. Hermit Warbler. Several individuals were found along a tamarisk row at the FCR golf course on August 12, 1960. A single specimen was collected.

*Dendroica palmarum*. Palm Warbler. A single bird was found on the FCR golf course, feeding with a flock of Audubon Warblers on May 5, 1960. It was observed with field glasses in good light for several minutes. When I attempted to collect this specimen, the entire flock of birds flew away. The field characteristics and color of the Palm Warbler are unmistakable.

*Seiurus noveboracensis*. Northern Waterthrush. A total of four records exist, all between August 18 and 29. A single individual was walking along the margin of an irrigation drainage pond on August 21, 1960. A specimen (DVNM no. 4014) was collected as it searched for food along an irrigation ditch at Furnace Creek Ranch on August 18, 1961. A few days later, August 28, a dead bird was found at the Visitor Center, and the following day a single individual was seen, again at the Death Valley Visitor Center. Racial identity proved to be *notabilis*.

*Setophaga ruticilla*. American Redstart. A single male was found singing among the tamarisks at FCR on June 25, 1960, and a female was seen feeding on the golf course on August 23, 1960.

*Agelaius tricolor*. Tricolored Blackbird. An individual was observed at FCR in March of 1949. A single male was seen along the south pasture at FCR on March 13, 1960.

*Icterus parisorum*. Scott Oriole. A single male was observed in a mesquite thicket west of FCR on May 19, 1959.

*Molothrus ater*. Brown-headed Cowbird. Two racial identities are listed by Grinnell and Miller (1944) as *artemisiae* and *obscurus*.

*Spiza americana*. Dickcissel. The author collected a male (DVNM no. 4013) at Furnace Creek Ranch on September 22, 1961. It was first seen ten days before. It usually perched on a mesquite bordering a flooded pasture where several head of cattle grazed.

*Spinus lawrencei*. Lawrence Goldfinch. A pair was found drinking from an irrigation ditch near the date orchard at FCR on May 19, 1959.

*Chlorura chlorura*. Green-tailed Towhee. Although the species is a common summer visitant in the mountains surrounding Death Valley, this is the first record for the study area. A single individual was observed about the tamarisk rows at FCR on August 25, 1960.

*Pipilo erythrophthalmus*. Rufous-sided Towhee. This species is also common about the mountain springs. The only record for the study area is a dead bird found in the yard of the FCR Museum on November 16, 1957.

*Spizella arborea*. Tree Sparrow. A single female (DVNM no. 4012) of the race *ochracea* was collected at Furnace Creek Ranch on November 10. It was found on the ground along an irrigation ditch which was heavily overgrown with arrowweed.

*Zonotrichia atricapilla*. Golden-crowned Sparrow. A single individual was found with a flock of *Zonotrichia leucophrys* on the FCR golf course on December 19, 1959.

*Zonotrichia albicollis*. White-throated Sparrow. Welles and Toll observed a single bird at FCR on January 29, 1954. An individual was found at Cow Creek along an irrigation ditch on March 2, 1960.

*Passerella iliaca*. Fox Sparrow. Single birds were observed at FCR, about the tamarisk rows, on three dates: October 24, 1958, September 28, 1959, and September 12, 1960.

*Calcarius lapponicus*. Lapland Longspur. The author collected a male (DVNM no. 4017) from the lawn at Park Village in Death Valley, October 18. It represents the race *alascensis*.

*Calcarius ornatus*. Chestnut-collared Longspur. The author first observed a flock of eight birds on the lawn of the Death Valley Visitor Center on the morning of October 17. At 5 a.m. the following morning, October 18, five individuals were found on the Visitor Center lawn and a single specimen (DVNM no. 4016) was taken. Five more *ornatus* were discovered later, four miles north of the Visitor Center. An additional *ornatus* was seen near the village road which brought the day's total of longspurs to twelve.

#### SUMMARY

In the sixty-seven years from 1893 to 1961, 232 species of birds have been reported from the below-sea-level region of Death Valley. Fifteen species are here regarded as permanent in the study area and sixteen species are known to nest in the area. From November, 1957, through December, 1961, 214 species were observed in the region below sea level. Of the total of 232 species, listed here on good evidence, 7 per cent are permanent residents, 23 per cent are winter visitants, 20 per cent are summer visitants, 41 per cent are migrants, and 9 per cent are transients and vagrants. Fifty-one species are reported here for the first time for the below-sea-level region of Death Valley National Monument.

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