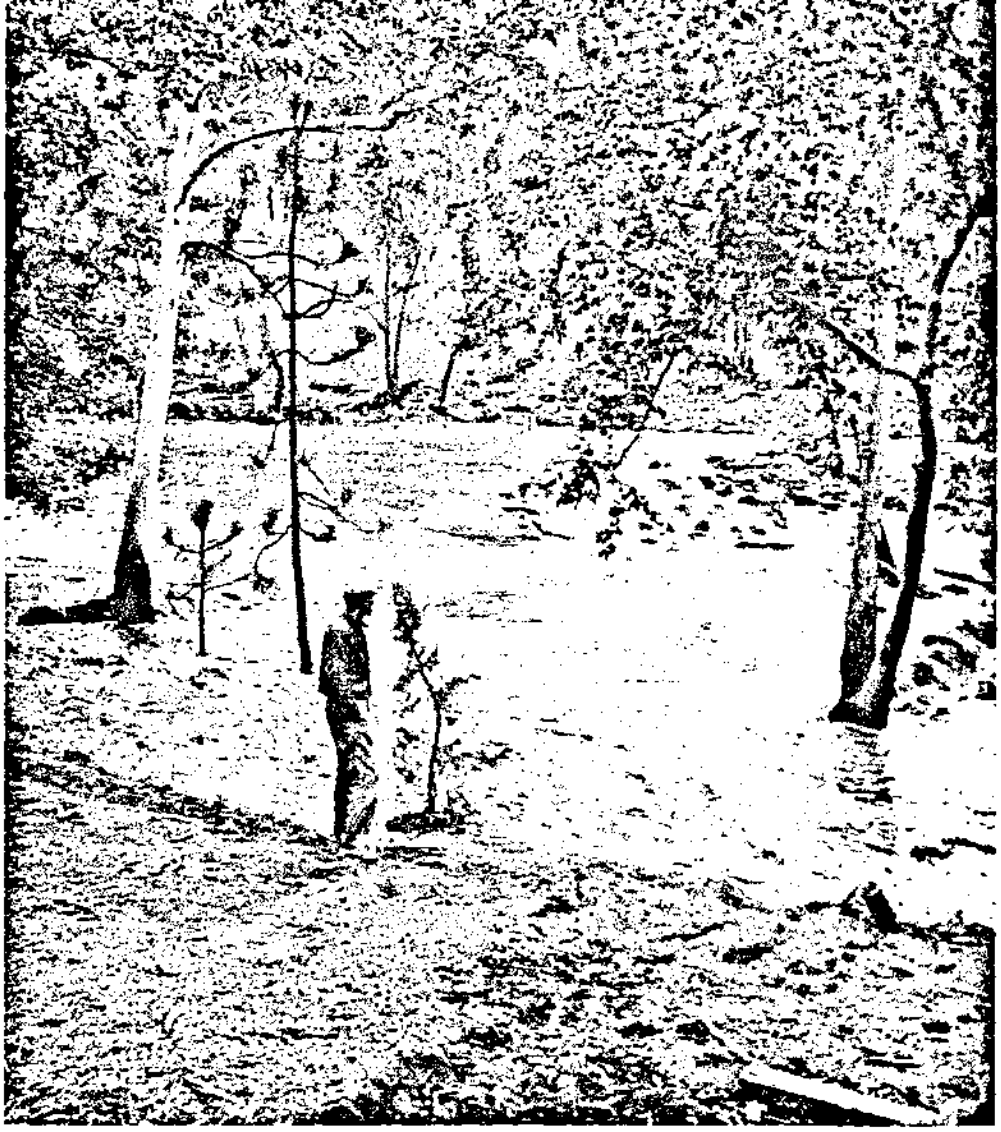
In the wilderness days before lumbering and grazing, floods like this were unknown to the Río Gavilán. (Photograph by the author)



Adíos, Gavilán

A. STARKER LEOPOLD

WHEN FIRST I KNEW THE Río Gavilán it was a tumbling mountain stream whose stable channel showed no gravel beds and whose trout knew not the choking silt of floodwater. From the virgin pinelands of the Sierra Madre a thousand crystal springs fed its current. If freshets followed the summer rains, they left no scars. Presumably lightning cracked along the rims as it does now, and thundershowers drenched the hills each summer afternoon. But the ungrazed mat of grama grass held back both soil and water, and from this sponge the springs were fed throughout the year. For in 1937 the watershed of the Gavilán was a wilderness, unmarred by ax or cow. Like a few other mountain regions of Mexico, it had been spared for a later generation to exploit. The river knew well the flashing draft of lightning fires in the grass but not the consuming roar of a slash fire. Each dusk brought out the deer to nibble ceanothus along its banks, but the cows had yet to munch its golden grama. It had heard the light ax of the passing hunter bite the limbs of dead junipers but not the crash of falling pines.

My father took me there to hunt deer, and although I was too young perhaps to appreciate fully the "symphony of the wilderness" as he called it,* I still was conscious of an untrammeled beauty in the country. From the village of Casas Grandes, Chihuahua, we had come by truck over a tenuous and even dangerous road to the hamlet of Pacheco, well up the east slope of the Sierra Madre. From there we crossed the continental divide by pack train and dropped down to the Río Gavilán on the west slope, leaving the last traces of civilization on the east side. In a month of hunting we killed enough deer and turkeys to keep the Dutch oven

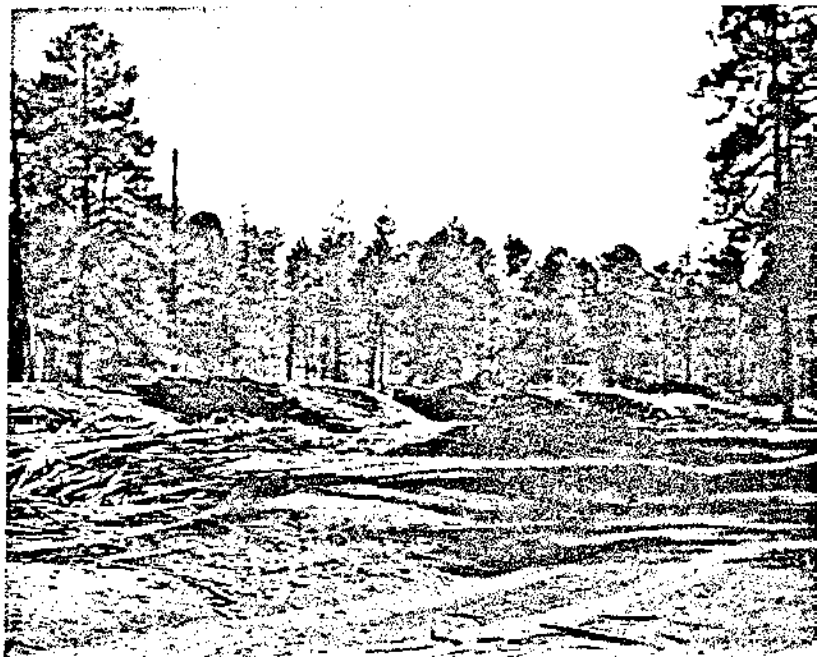
* "Song of the Gavilán" by Aldo Leopold (*Journal of Wildlife Management*, 4: 329-332, 1940).

filled, and we reveled as always in our escape from schools, telephones, bank accounts, and the other trivia of everyday existence. We had, of course, escaped before to countless other camps; but there was a "flavor" about the Gavilán that I for one had not known elsewhere. This was *wilderness,* as distinct from the *back forty.* Each saddle in a pine ridge or pass through the rimrock was in my boyish imagination a new route to be explored for the first time by a white man. I even wondered if a few of Geronimo's Apaches might remain in some hidden barranca—a thought that made my scalp tingle one early morning when a mysterious column of smoke rose from the canyon below me and then was snuffed out as suddenly as it had appeared. It developed later that our packer had set fire to a "witch's broom" in a low pine bough, but that feeling of wild elementalism I shall not soon forget. Such adventures of the mind can occur only in the proper setting.

The wilderness of the Gavilán lived on in memory and fireside yarn, and a decade passed before the opportunity came for a second visit. Then in the summer of 1948 I returned to help make a collection of the vertebrate animals of the region for the Museum of Vertebrate Zoölogy, of the University of California. My companions were Alden Miller and Ward Russell of the Museum, and Robert McCabe of the University of Wisconsin. In addition to collecting specimens we hoped to initiate some long-term studies of the native fauna under virgin conditions. Of particular interest would be an investigation of the balance between deer and their natural predators — wolves and mountain lions. Such a problem could not be solved in one summer, and I hopefully visualized years of intermittent work in the Gavilán basin.

Early in July we crossed the border at Antelope Wells, New Mexico—a cluster of ranch buildings set in the middle of a great plain. The corresponding group of shacks across the international boundary is called Berrendo, which of course means Antelope. It was gratifying to learn that there still are several bands of antelope on this plain. In our high-wheeled truck we negotiated the hundred miles of sandy track to Casas Grandes, and after stocking up with last minute provisions we turned west toward the mountains and Pacheco.

At once it was evident that a great change had come to the Sierra Madre. The narrow, rocky road of eleven years back was graded and ditched, and around almost every bend we met a lumber truck groaning down the grade under a staggering load of pine planks. From one of the drivers we learned that the lumber was transferred to railroad cars in Casas Grandes for shipment to the hungry markets of the United States. American "progress" had arrived with a vengeance. One of the mills was at Pacheco; a dozen others were operating in the high country around García and Chuhuichupa — the headwaters of our Gavilán. Up to this time, however, the loggers had not reached the particular area where we hoped to camp, but they were working in that direction from three sides. We knew then that instead of initiating an era of renewed acquaintance with the wilderness, we had come to witness its passing. Elsewhere in Mexico I had learned that sawmills and logging roads are followed inevitably by settlers and livestock. Once logged, a wilderness becomes merely a forest and



ABOVE: *We packed into the Gavilán from Pacheco with seven animals. Floyd Johnson, our packer and guide, brought in additional supplies as needed, taking a load of specimens back to Pacheco on each trip.*

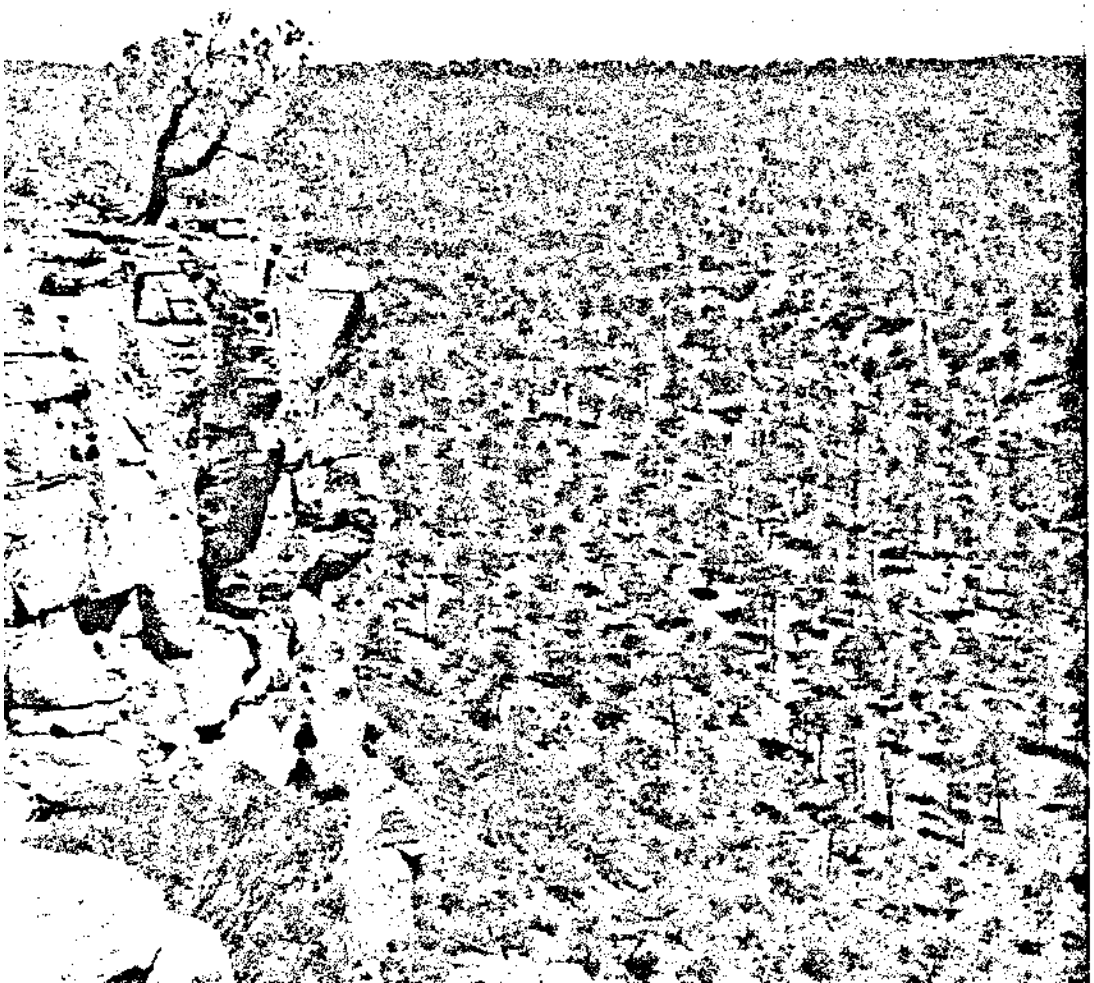
BELOW: *Debris left by a transient lumber mill near García in the headwaters of the Gavilán. (Photographs by Robert McCabe)*

it may not remain a forest for long, so great is the "land hunger" of agricultural Mexico.

Our pack train unloaded on the bank of the Gavilán exactly where we had camped a decade earlier. Tall pines still stood on the narrow bottomland, and Mexican jays streamed through the lower branches as noisily as ever. The river bluffs were studded with crusty old junipers and oaks just as I remembered them. But the river itself was not the same. What had been a narrow channel winding between grassy banks was now a wide, scoured trough of cobblestones left by summer floods. The banks were undercut and piles of debris marked the high water levels of recent years. Sand bars in sheltered coves of the channel were mixed with coarse pine sawdust from the mills upstream. Apparently the logging in the headwaters, followed by hot slash fires, had destroyed in part the "watershed sponge," and the Gavilán was experiencing flash floods—the inevitable result of watershed abuse. We came to know these floods too well during the summer. It was fortunate indeed that we happened to select a knoll for our camp. Even there we came near being drowned out on one or two occasions.

In addition to the loggers, there had been another invasion that contributed to erosion and runoff: livestock had arrived. In 1937 there was no stock in the Gavilán basin, but in 1948 we found hundreds of cattle and nearly as many horses. Recently, some large bands of sheep had summered in the area. A tumbled down herders' shelter stood a hundred yards from our tent. The original bunch-grass sod (largely *Bouteloua hirsuta*) of the river bottomlands and of the more accessible mesas already had been slicked off by concentrated grazing, and in its place grew spindly annual weeds, some native but many of Mediterranean origin.

Such were the changes that were overtaking the Gavilán. We found, happily, that many of the steep side-canyons had been little altered, and by selecting our hunting grounds we could spend our days in pockets of untouched wilderness. Only the whine of distant sawmills and intermittent road blasting, audible on still mornings, kept reminding us that this was to be the last summer of solitude. For the moment we still could see something of the natural balance in the native vertebrate populations. After a few days of exploratory hunting we settled down to study the wildlife as it had existed here for past eons, at the same time levying our tribute upon the land—specimens for our collections. It is my object here to recount something of what we learned on our daily morning hunts.



The Gavilán basin is a broken country of rocks and canyons. The area encompassed in this photograph was the favored range of several mountain lions. (Photograph by the author)

LEFT: *Some of the mesa tops retained their virgin cloaks of golden grama.*

BELOW: *Mountain mahogany, heavily browsed by deer. This venerable bush had been chewed on for years —witness the maimed branches within four feet of the ground. It grew on a canyon side where there were many deer and no livestock. (Photograph by the author)*

The most evident of the larger game forms was the white-tailed deer. We saw from three or four to a dozen each day, and tender venison filled the Dutch oven most nights. The local race or subspecies of white-tail is almost the smallest deer in North America; only the diminutive brocket of the tropics is smaller. A large Gavilán buck will weigh 80 pounds, and most of them tip the balance between 60 and 70. Does rarely exceed 50 pounds. In mid-day we found them bedded along the rimrocks or in the heads of brushy draws. A flash of the white flag disappearing down a precipitous slope was usually the only indication that a deer had been jumped. But in the early morning they might be encountered feeding in the open, and it was then that we could obtain our specimens and, incidentally, our camp meat.

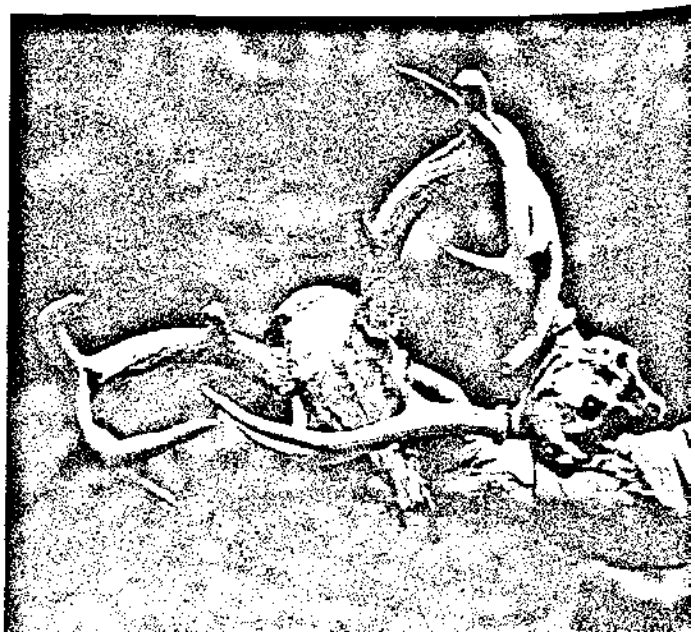
The bread-and-butter of the deer diet seemed to be a prickly, knee-high bush called by the Mormon ranchers of Pacheco "Johnny-jump-up" (*Ceanothus huichagorare*). Related species are among the best deer foods in California, and the Chihuahuan representative was no exception. Despite frequent lightning fires (or perhaps because of them?) the Johnny-jump-up was thick on moist slopes, and heavy deer use did not make a dent in the supply. Seasonally acorns are sought by the deer, and they never seemed to miss a chance to nip the tender sprouts of mountain mahogany (*Cercocarpus breviflorus*). In fact the mahogany shrubs were uniformly "high skirted" (see cut) despite the abundance of other foods. In the parlance of U. S. deer managers this would put mahogany in the class of an "ice cream plant"—one so favored by deer that it is commonly overbrowsed regardless of the balance between deer and the total available forage. Under present conditions it would be virtually impossible for the mahogany to reproduce, since seedlings would be eaten as fast as they appeared. How did the existing stands get started? Was this evidence of past "lows" in the deer population? It was a matter of some interest to discover this situation on virgin deer range, since we have come to think of overbrowsing by deer as a *modern* problem following predator control and over-zealous legal protection.

A curious adaptation of the deer to local climatic conditions was reflected in the lateness of fawning. Fawns are born here in August, which is after the summer rains have initiated growth of new vegetation. Farther north in the United States white-tail fawns are dropped in June—the period of spring greenery following winter snows and preceding summer droughts. June in Chihuahua, however, is dry—not at all propitious for rearing young deer, or, apparently, young of some other vertebrates. A parallel retardation in the reproductive cycle was observed among the peccaries, wild turkeys, Mearns quail, and some of the smaller birds such as sulphur-bellied flycatchers.

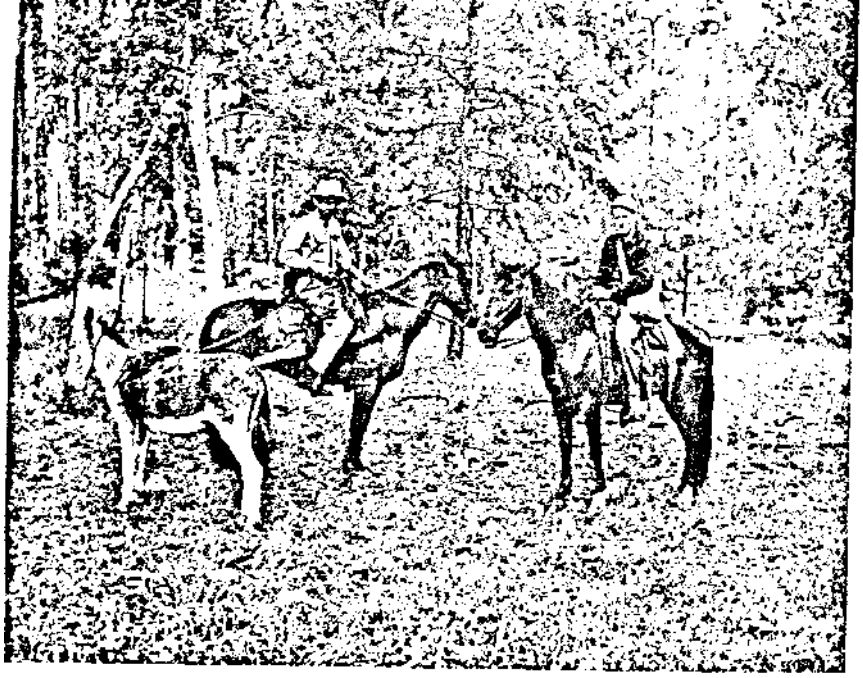
Unpressed and a little soiled, but healthy and happy. Left to right: Bob McCabe, the author, Ward Russell, and Alden Miller. (Photograph courtesy of Robert McCabe)

Despite unchecked predation by wolves and mountain lions, the white-tails were abundant. It is a common belief of hunters in the United States that unless the large predators are controlled, a deer population will dwindle to nothingness. Yet a relatively large population of both wolves and lions preyed heavily on the deer without diminishing their numbers unduly. Until the recent arrival of livestock the predators probably lived almost exclusively upon deer. Here was concrete evidence of the much talked of natural balance between predator and prey. We regretted deeply our inability to determine the numerical proportion between the two—that is, the number of lions and wolves supported year in and year out by a given number of deer. The unusual opportunity is now lost, for already the cattlemen are poisoning wolves and the logging camps will dispel all semblance of natural conditions. It was our impression, however, that the deer furnished sustenance for an astonishingly large predator population.

Peccary or jabelí were fairly common in certain localities as judged by tracks and other sign, but they were rarely seen. In manzanita thickets and along the rims of rugged canyons we found fresh rootings and dung almost daily, but as the end of the summer drew near we had encountered the animals only twice and had got but one specimen. I turned my full attention to jabelí hunting, and by elimination decided that the animals must be bedded in daytime on the brushiest and most precipitous slopes since these were the only areas we had not hunted. After several days of scrambling over uninviting terrain I finally located a group of five, bedded down in a thicket of oaks. They consisted of an old sow, two yearlings, and two suckling pigs that could not have been over two weeks old. Four of these made their way into our collection. The sow weighed 52 pounds which was fully as heavy as a large doe. The yearlings presumably were the sow's progeny of 1947 and the piglets constituted the 1948 litter—rather a low reproductive rate when compared to domestic pigs! From rootings and sign we had deduced that jabelí were feeding to a large extent on acorns and manzanita berries, but in addition the stomachs of two of these animals contained large quantities of *green grass*. This should not have been a sur-



The bucks of the Gavilán, as elsewhere, sometimes lock horns in battle and die miserably. Two bleached skulls, picked up by Floyd Johnson on the trail from Pacheco. (Photograph by Robert McCabe)



LEFT: *On our way to tend the wolf traps in the high country. (Photograph by Robert McCabe)*
BELOW: *The big "lobo"—one of our prized specimens. (Author's photograph)*

prise perhaps, since barnyard pigs are known to thrive on greens, but somehow I had not thought of jabelí as grazing animals. We learned nothing of predation on the pigs, but probably they contribute in a small way to the diet of the larger predators.

Fresh wolf tracks were seen almost daily, and the deep howls floated down the canyons many an evening. Actually encountering a wolf was a rare stroke of luck. Yet we glimpsed them four times, and two of our encounters yielded shots—both of them successful I am happy to add. One specimen was an adult male, as handsome and powerful an animal as I ever hope to see. The deep muzzle, heavy head and foreparts, and astonishingly long legs were his most striking characters. A forepaw spanned the palm of my hand and overlapped about half an inch—over four inches in length. The stomach of this animal contained a newly born fawn—head, hooves and all, but we were puzzled to find *one extra ear!* It was quickly ascertained that the supernumerary ear was that of an adult, probably the mother of the fawn. In her efforts to defend her young she apparently leaped in too close and had her ear bobbed off as a mark of her valiance.

The other wolf was a young animal about the size of a coyote and probably a year old. Its stomach told a story too, but of a different sort. Present were only chewed shreds of desiccated deer hide, stripped from some old carcass of yesteryear. Young wolves, recently alienated from their parents because of the arrival of a new litter of pups, may have some lean days while they learn to forage for themselves.

Our efforts to trap wolves were, in retrospect, rather ludicrous. For many weeks we tended half a dozen steel traps, painstakingly buried in trails, near baits and beside scent posts; not once did a wolf spring one. They stole our baits, however, and used the trails as before. But they seemed to know the exact location of every trap at all times. The wolves of the wilderness are not naïve!

One interesting sidelight on predator relationships was the *total absence of coyotes* in the wild areas occupied by wolves. Close to Pacheco and around the scattered ranches far downstream from our camp there are many coyotes, but their tracks cease a few miles from the settlements. Wolves presumably keep them out of the back country.

I never really expected to see a mountain lion. The big, mysterious cats are almost entirely noc-

turnal in habit, and it is rare indeed that one is observed on the move in daylight hours. One foggy morning I slipped quietly over a low rise in the pine forest and two hundred yards ahead on a rocky slope were *three lions* stalking majestically between the boulders. One animal led, and the other two followed forty yards behind. There was little visible difference in size, but I presumed that the leader was a lioness and the others were her grown young of 1947. They were through hunting apparently, for they loafed along, pausing now and then to preen their coats. When the leader stopped the other two held up likewise and kept their distance. I finally shot (without scoring a kill) and sent them all bounding over the boulders. At the time I was bitterly disappointed not to have taken a specimen, but in looking back on the incident I know that the important achievement was to have seen them at all.

On another occasion McCabe and I were hunting turkeys on a steep canyon face near camp when there commenced on the far side of the canyon a powerful roaring, reminiscent of an African lion but of higher pitch and shorter duration. This stirring serenade continued off and on for nearly half an hour. McCabe, who was below me on the slope, could see that the author of the disturbance was a large mountain lion (he guessed a male) parading along the rocky ledges and roaring occasionally as he walked. The observation is of considerable interest, since there has been a long-standing controversy among naturalists as to whether mountain lions roar at all (McCabe is publishing a full description of what he saw). There are some who have hunted lions for years and killed dozens or even hundreds without hearing one give any vocal expression other than a snarl or hiss. For dilettante lion hunters we had

A pair of wild turkeys for the Museum of Vertebrate Zoölogy collection. Breast meat in the Dutch oven for hungry hunters! (Photograph by Robert McCabe)

our share of luck in making good observations of the animals.

We had other brushes with lions without actually seeing them. A trap was set at a lion scent post and two nights later it made a catch, but the big cat tore out the anchor of the trap (a buried post) and made off with the whole outfit. Another day a turkey gobbler mysteriously flushed from a patch of thick oaks above me and flew directly over my head and out across the canyon. I killed the turkey, but I was so puzzled as to why it should have flown that I returned to the oak thicket to investigate. A fresh lion track came from near my original location and passed directly by the point from which the gobbler had emerged. Bent grass blades in the tracks of the lion were still straightening up in short jerks. The lion must have jumped *very* close to me (yet I heard or saw nothing); evidently he did me the good turn of stampeding the gobbler.

For reasons not at all understood, there were many more turkeys in the Gavilán area in 1948 than there had been in 1937. This suited me completely, for I confess to a strong personal bias for turkey hunting. Miller concentrated on small birds, McCabe on quail, Russell on wolves, and I

Annabelle, our pet coati. Meat scraps and powdered milk supplied her boundless energy, but she much preferred sugar or honey. (Photograph by Robert McCabe)

invested a large part of my time pursuing the big gobblers. On my first trip we had made a rough population estimate of ten birds to the square mile. This was in winter when all the young turkeys were grown. In the summer of 1948 there certainly were more than ten birds to the square mile counting only gobblers and unsuccessful hens that had given up nesting and formed into flocks. The breeding hens and their young were very secretive and we saw them but rarely. By autumn the new crop would perhaps double the observable summer population. The obvious fluctuation in turkey numbers was an unexplained but interesting point.

Our observations on the summer behavior and general natural history of the turkeys revealed nothing startling or new but tended rather to substantiate our meager knowledge of the birds. Preferred foods at this season were acorns, manzanita berries, and assorted greens. The sexes tended to segregate as is normal for the species, adult gobblers flocking independently of hens and young males. One flock of a dozen very handsome old males outwitted us through most of the summer, and it was only in the last week or so that we finally succeeded in bagging two of them. The breeding season is retarded as mentioned above, gobbling occurring mostly in May and early June according to Floyd Johnson, our packer. This throws the hatching period into July and August —only slightly earlier than the period of fawning in the deer.

In all we collected nine adult turkeys—a valuable series of skins for the museum, even though some of the birds were molting and in somewhat ragged plumage. Wild turkeys from Mexico are but poorly represented in most museums. The adult gobblers weighed from 15 to 17 pounds, the hens from 8 to 10 pounds. Needless to say, slabs of tender white breast meat were duly appreciated on the supper table.

The handsome little Mearns quail kept McCabe busy most of the time and intermittently occupied the attention of us all. So little is known of this quail that we made a special effort to gather life history data for some future report. Whereas turkeys had increased in the past decade, the Mearns quail had suffered a decrease of at least equal proportion. Johnson shed some light on this by telling of a very severe winter in 1944-45 which seemed to wipe out the quail throughout much of the high country. Heavy snow and temperatures down to 20 below were more than they could withstand. They were coming back, however, and we found enough to justify our attention.

Mearns quail are diggers. Most of their sustenance is scratched from the ground, and the best way to locate them is to watch for their scratchings. Elsewhere in Mexico I had found the birds eating a variety of small bulbs and fleshy roots, and here likewise they showed the same dietary preferences. A good many insect pupae are unearthed and consumed in these operations, but underground plant foods are the "staples." A few quail crops contained acorns and surface insects such as leaf-hoppers. The first newly hatched brood was seen on July 20, but most nests came off in August. The adults were expert at distracting attention while the chicks scattered and "froze" in the grass, and we spent many an hour on hands and knees attempting to find the young ones. One little hen hovered like a hummingbird before the face of my horse one morning while her chicks dispersed. The ruse was successful too, for in our enchantment with the behavior of the mother we failed to mark the hiding places of the young.

There were many other species of equal interest. Band-tailed pigeons raced low over the mesas in their regular flights to water and to distant feeding grounds. We found several of their flimsy nests in low oaks, each with a single egg or squab balanced precariously on a few twigs. Hog-nosed skunks, in their search for grubs, plowed up the riverbottoms every night and left more sign even than jabelí. We never saw them during the day and had to collect specimens at night with a jack-

One of the innumerable stone terraces built by ancient Indians who lived on the Gavilán. The stones were fitted into place without cementing, and many of the structures are quite intact today. (Photograph by the author)

light. In the same manner we hunted raccoons, owls, and poor-wills. Coatis, closely related to the raccoons, are more likely to be abroad in daylight and two adults were collected in the course of normal hunting operations. Likewise we acquired two juveniles as pets, and watching them was both entertaining and instructive. One became ill in the course of time and had to be dispatched, but the other returnd to Berkeley with us and is now nearly full grown.

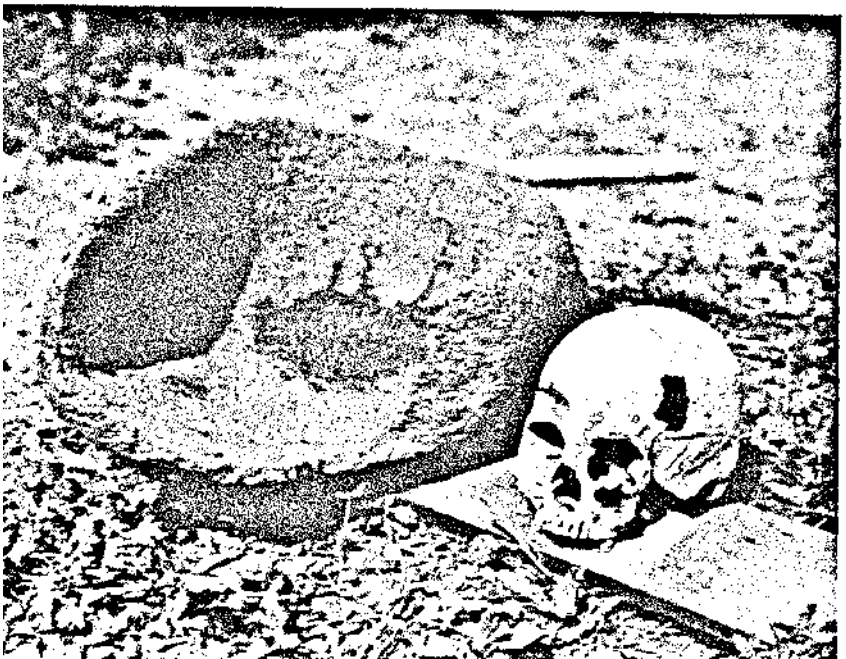
Thick-billed parrots frequented the high pine mesas, and their resonant cries penetrated even the deepest canyons. In flight these parrots are reminiscent of ducks as they circle high in the sky, then tumble down to their feeding grounds—the groves of cone-bearing yellow pines (*Pinus macrophylla*). Putting up parrot skins proved to be an ordeal, for the birds are most disorderly in their eating habits and pitch from the green cones covered their faces and breast feathers. Each skin had to be scrubbed in gasoline (completely "dry cleaned") before the cotton body was inserted.

In the groves of tall oaks, particularly those draped with wild grape tangles, coppery-tailed trogons flashed their red breasts and irridescent green backs. Mexican crossbills, evening grosbeaks, acorn woodpeckers, and a galaxy of warblers and flycatchers all added their songs and colors to the sunny mornings, and promptly disappeared when the afternoon thunderheads gathered.

All told we collected over 900 specimens of vertebrates, including individuals of every species encountered except the mountain lion. A small plant collection was preserved too, the plants selected being in large part those that bore some important relationship to the bird and mammal populations. Of equal value and importance were our bulging notebooks—written records of what we had learned from day to day.

Although none of us had any background in archeology, we were interested in the abundant traces of an ancient Indian culture that had thrived here and then disappeared before the Spanish Conquest. In the head of almost every draw could be found stone terraces or check-dams, each one retaining a plot of level soil. The tiny fields, rarely 100 feet in length, presumably had been tilled by the Indians in crops of native beans, squash or maize. The rock masonry was skillfully laid, for some of the dams were completely intact, centuries after their abandonment. A staggering amount of hand labor went into their construction.

Near our camp were traces of an ancient city or ceremonial gathering place. A "council ring" of heavy stones, a masonry "fort," rocks inscribed with primitive hieroglyphics, and accumulated potsherds marked the spot as an important center of activity. Who were these people? Being agriculturalists, why did they choose so steep and rocky a country for their home? What made them leave? Carl Lumholtz, pioneer ethnologist of western Mexico, explored this region in the early years of the present century and apparently was much taken by the ruins of "Casas Grandes culture." But no one has since added to his initial descriptions of the culture. We wondered about the status of forests and game during the height of Indian occupation. Perhaps then the country was largely cleared. If the Indians were hunters, game would



ABOVE: *Stone "writings" of Casas Grandes culture. Floyd Johnson pointed out this rock to us within a quarter-mile of our camp on the Gavilán.*

BELOW: *Metate and skull of Casas Grandes culture, now in the possession of Floyd Johnson of Pacheco, Chihuahua. (Photographs by Robert McCabe)*

The Gavilán at low stage, showing cobblestones and debris left by recent floods. Elevation of the river at this point is 5,700 feet. (Photograph by Robert McCabe)

have been scarce. The present era of clearing and occupation, in that light, is not a *new* experience for the Gavilán—merely history repeating itself.

Summer waned and the hour of departure arrived. On August 25, when the last recalcitrant mule was packed, we turned our horses up the familiar trail to "top out" for the final time. What can we expect to find when next we return? Will there still be wolves to howl at dusk? Will young pines have filled the places of the fallen patriarchs? Will even higher floods scour the river course? I fear to hazard a guess. Certain it is, however, that the wilderness will be gone. Ubiquitous man has claimed even the Gavilán.

Though I lament the passing of the wilderness, I mean to pick no quarrel with civilization as a whole; automobiles, modern houses, and beefsteaks are as much appreciated by me as by anyone else. I question merely its universal spread. The Gavilán can offer little to the "good life." It will produce some beef and some lumber and then probably be left stripped and gutted to its basaltic core. Might it not have yielded more the way it was? Must there be a cow on *every* hill, a road in *every* valley?

In the United States we are making some progress toward preserving examples of primitive America. The National Park Service and the U. S. Forest Service have set aside some magnificent areas for preservation in the natural state. These and other remnants of unspoiled country are being stoutly defended by a little band of patriots, poor in purse but rich in spirit, who have joined to form a Wilderness Society. But in Mexico, the wilderness is still on its own.

I would like to think that there is another river filtering off hillsides of golden grama and winding under virgin pine. May my son some day explore its rimrocks and imagine there are still Apaches in its tributaries.