Fire Suppression, Faunal Changes and Condor Diets

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UNDENIABLY the sight of uncontrolled fire is terrifying. Doubtless it is frighteningly impersonal, ruthless and remorseless. And yet most animals have learned how to survive its potential for death, and many plant associations are admirably adapted for rapid recovery from its ravages.

Viewing this ancient and potent force of nature operating in forests and brush, man has been in the habit of seeing only its terrifying and damaging aspects. Nonetheless, throughout much of the world and especially in many otherwise bland climates, these recurrent episodes have enabled surface cleansing flames to hasten what would otherwise be an extremely slow recycling of the elements.

Without fire immense quantities of biologically needed elements would remain uselessly bound up in the dry and decay-resistant debris of forest litter. In the climate that prevails in most of southern California, without recurrent fires there would have been an almost endless accumulation of organic matter, a smothering surface blanket and a miserly hoarding of needed soil nutrients. And such an accumulation of dry litter would present a nightmare threat in the form of an ultimate devastating and uncontrollable and inescapable fire.

Our present perception of the role of fire in its balanced entirety probably resembles that of the first human being to experiment with

it. This early man must have watched a lightning-kindled ember with superstitious fear and trepidation. Doubtless as his captive flame entered and consumed kindling and firewood he must have regarded the phenomenon with deep foreboding concerning its power to destroy as well as to warm and protect, and the bystanding spectators must have cringed as they watched this first controlled flare-up of the flames. On a vastly larger scale for good or evil we now contemplate the forces still concealed within the atom's heart!

From this small beginning in the use and abuse of fire have come the reasons for these Tall Timbers conferences which even now encounter reluctant fears of positive use of fire and lack of information in its use within our habitat. And we are slowly gaining new and important understanding of its role as it was before the advent of modern man, its role when it was uncontained and undirected.

As a result of inadequate information and contending viewpoints, and the resultant corollary of fear, there have been many needless plant and animal casualties. Most of these have been the direct consequence of mankind's thoughtless and uninformed bias and his often unseemly haste in tampering with this natural phenomenon.

On the basis of these and other observations, it was suggested as long ago as 1958 (Cowles) that the extensive suppression of fire in much of the southern California chaparral areas might have caused serious stresses in the lives of its native fauna possibly including a food deficiency for the California condor. The complex interrelationships involved in formulating this working hypothesis included numerous and at first glance, apparently unrelated factors including even demographic changes.

QUANTITATIVE APPRAISAL OF POTENTIAL FOODS

In a treatise wholly devoted to an analysis of the reasons for a numerical decline in the condor population (Miller, McMillan and McMillan) strong exception was taken to Cowles' proposal regarding a possible decline in necessary condor food due to suppression of fire. However, these authors presented indubitable evidence proving that at least quantitatively there is an ample and continuous supply of food at least in and around the areas bordering the present condor refuge.

One of the serious omissions from both the Cowles and the Miller, McMillan and McMillan reports was an analysis of some other aspects of condor requirements. It was noted by Miller *et al.* that when rabbits and other small animals were available, the birds evinced a definite preference for rabbits, and neglect (which might have been avoidance) of food from large domesticated animals. Additionally, poisoned ground squirrels constitute a hazard even though dead sheep, etc. proffer more than an adequate food supply. Even from the relatively meagre evidence, it is impossible not to ask the question as to whether or not all of our present knowledge of condor foods might not be based on witnessing what they are forced to eat rather than on what they originally preferred and what they actually may need.

TRANSPORT OF NESTLING FOOD

Another possibly serious omission results from the fact that almost nothing was said concerning the transport of food from the ground at the feeding to the nesting sites. It was noted, however, that on flat ground in still air a gorged bird failed to achieve flight and was forced to spend the night in a tree. This strongly hints of the problem faced by birds attempting to take off from the plains, and possibly the foothills below the point of strong thermal breezes, while heavily burdened with food for their nestlings. The contrast between this feat and the normal problems of landings and laden take-offs from the now brush covered mountain slopes may indicate yet another facet of suppression of fire.

ENFORCED ADJUSTMENT TO DIFFERENT FOODS

Probably of greatest importance to survival of this species, and a factor related to fire and not even mentioned in the report under discussion, is that of the nutritive adequacy of the admittedly very abundant supply of food in the form of large (but not preferred) animal carcasses.

The possible involvement of extensive fire suppression over the past few decades, together with other activities of man such as rodent (and lagomorph) control remain to be appraised. The ex-

treme changes in vegetation pursuant to fire control and the associated faunistic consequences simply cannot be dismissed cavalierly. The present and other reports inspired by the Tall Timber conferences supply abundant and unquestionable information on the vegetative changes induced by fire and on the relationship between vegetative cover and its fauna.

DIETARY CALCIUM AND EGG FORMATION

On the basis of known facts concerning at least the gross faunal changes associated with fire-altered vegetation, it would be difficult to prove that during the past 100 years there have been no major changes in the available varieties of condor foods.

To substantiate the statement that calcium is a major strengthening component of all egg shells, and that it is indispensable to the production of those that are adequately protected, requires no ostentatious padding with citations of the literature. Everyone who has raised domestic fowls, as well as all dieticians in zoological parks, know that when birds are deprived of this indispensable ingredient an ensuing clacium deficiency results in the formation of numbers of shell-less, membrane-covered eggs, or eggs with such fragile shells that the eggs rupture on contact with nesting material or a hard substratum. Clearly, if any substantial number of such defective eggs are included in the normal numerical complement, minimal mortality replacement needs will not be met. Because every known species of organism is endowed with the potentiality of an overwhelming reproductive capacity, and since in the simplest terms extinction is merely the result of an inability to cope with the effective death rate, any failure to produce an *adequate* number of young is tantamount to what we may be witnessing in the condor. There is no observational or experimental proof that the ovigerous condors actually lack adequate amounts of calcium but, as will be shown, there are ample reasons to suspect that they may.

CALCIUM AND THE GROWING YOUNG

It is equally well known that in captivity all of the large raptorial birds require dietary calcium not only during egg production but

also during the growth of the young and of their skeletal structures.*

Because of this dependence on calcium for eggs and bones in all birds, including (in a broad sense) the large vultures, it is imperative that we know whether or not the condors living under now altered conditions are obtaining requisite amounts for both their propagation and growth.

Clearly calcium cannot be insufflated with the air they breathe, nor obtained from their drinking water, nor can it be procured from the muscle and viscera of their prey. The normal source of dietary calcium comes from small digestible bones that are swallowed along with meat fragments, and more especially from numerous small animals that can be swallowed whole and either digested by the egg-producing birds or fed to the growing young. Condors, which for one reason or another may be forced to feed exclusively or very largely on the carcasses of horses, cattle or deer and other large herbivores (or rarely on the occasional dead predator upon large ungulates) would be unable to utilize such large bones. For adequate amounts of calcium the birds would need to include as a substantial part of their daily intake of food a fair proportion of much smaller creatures. Lacking the necessary observational or tabulated data, one must presume that the condors, at least during oviposition and while feeding the young, normally would include substantial numbers of dead cottontail rabbits, brush rabbits, and squirrels. Anything much smaller than these animals would be difficult to locate or find. Where the hill sides are not too steep nor the country too rugged, jack-rabbits would be common and available. Another very useful source of calcium in late spring and summer might be obtained from dead rattlesnakes, gopher snakes, and racers. All snakes are excellently corseted in a framework of numerous small bones while their body habitus are admirable for easy swallowing and transportation. There appear to have been no observations pertinent to this speculation.

On the basis of reasoning, it seems probable that the condors must have relied on these sources of food throughout much of their egg-laying and nestling-rearing season. Furthermore, if this was their diet during these vital months, is it not reasonable to suppose that

*I am indebted to Dr. J. M. Dolan Jr., Assoc. Curator of Birds, San Diego Zoological Garden, for verification of these dietary needs.

such a food supply was the usual one, whereas, what we assume to have been their chief diet, namely large dead animals, may have been merely a supplementary or occasional resource prior to the advent of the white man?

It could be that if we were successful in artificially feeding our few remaining condors largely on the carcasses of horses, cows, sheep, goats, or even on native deer, as in fact we are, we nonetheless migh expose these birds to serious malnutrition.

FIRE, FOOD ABUNDANCE AND ITS ACCESSABILITY

Where fire has been suppressed for even a few years, chaparral regrows into a tall, dense, and condor hampering or excluding type of vegetation. Additionally, such mature brush supplies very little food and few of the native animals can survive in it. Those that do, usually live along its edges or in areas of otherwise disturbed soils. Even the few animals that remain along the borders of dense chaparral are apt to die under its concealing cover thus making even the few morsels of food that might be present even scarcer and probably unattainable to any birds but the smaller agile species including ravens.

In the rare instances when one animal of the reduced population does die on some more accessible ridge, landings and take-offs become hampered by the quick regrowth of herbaceous or woody vegetation. An engorged bird, and especially one heavily laden with food for its nestlings would experience even greater difficulties at take-off. Even on fairly steep slopes these large birds usually must have room in which to take a few awkward hops preparatory to their launch into space and their steep downward swoop while gaining flight speed. When gorged with food for themselves or for their distant young it seems safe to presume that the "payload" may be very close to the permissible maximum or regulated to permit flight. On the level ground to which they are forced when deprived of their higher chaparral-clad mountain slopes, their take-off and ascent become even more laborious or even precarious. Apparently we are determined to handicap these vanishing birds by over protective inadvertent and unintentional means, total suppression of fires.

HUMAN POPULATION PRESSURE, WILDLANDS AND FIRE

As pointed out in an earlier paragraph, some apparently unrelated factors that are involved in the management of our environment cannot be omitted if we are to succeed in securing maximum benefits for this and succeeding generations. A simple example illustrates this point:—had we in the western United States, and particularly in California, continued to live at the same population density as that of approximately a century ago, and had outside markets for our produce remained about the same, we would, and we could afford to, practice the same classical negligence regarding forest and brush fires. And by continuing these customs, the wealth and beauty of this state as described by John Muir and others would have remained the same, and so would the standard of living in terms of food, shelter, and other natural resources.

The per capitum share in fertile soil, water, trout and salmon streams and rivers, lumber, wildlife and sunshine, would have remained unaltered under this system of non-management.

As we multiplied, the *per capitum* share of these natural resources diminished, to be replaced by an increasing resort to management and exploitation. The relationship between numbers of Californians, and of their national and world markets, and the necessity of management and for preservation of forests and waterways and expansion of farmed or built-over lands are inexorably interlinked, and recent predictions as to our numbers by middle of next century (A.D. 2020) range as high as 60,000,000.

Unless we are devout Marxists we must believe that somewhere in the course of this progressive change in the relation between natural resources and numbers, progress as we call it, our *per capitum* shares, will diminish. The resources are fixed in quantity but those who wish or must share, are not. The rising monetary value of our wildlands and their penetration and occupation by multiplying people will inexorably require maximum management for man, and a resulting minimum shares for wildlife and natural conditions. For some time now there have been no wildlife reserves or wilderness areas located on the richest bottom lands having the highest carrying capacity. Such concessions to nature and wildlife are confined to

the least productive soils. Even with the best management we could not even now restore the per capitum shares in land, forests, streams and rivers, beaches, and natural wealth including the freedom of the individual to do as he pleases, nor could we maintain nature in its original pristine, unfouled and unpolluted state; for pollution is a product related to numbers.

The relationship of these factors to the perpetuation of the condor, to the preservation of its habitat as it was when it was a flourishing species, to the re-establishment of frequently recurring lightning-set and uncontrolled fires over its former habitat, versus the population propelled compulsion to manage every resource in order to sustain this growing population, are combining to carry us more or less helplessly toward whatever fate lies ahead. Under the circumstances we may be able to slightly extend the life of some species, and delay the advent of deterioration in our individual share of unspoiled nature and its finite and renewing resources, but we cannot prevent a gradual and inexorable diminution of our environment.

I believe the logic in this brief summary of human ecological dilemma is unassailable, and it can be summed up by saying that we cannot practice effective conservation until we also practice human husbandry of numbers in the management of our affairs and of our resources.

LITERATURE CITED

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