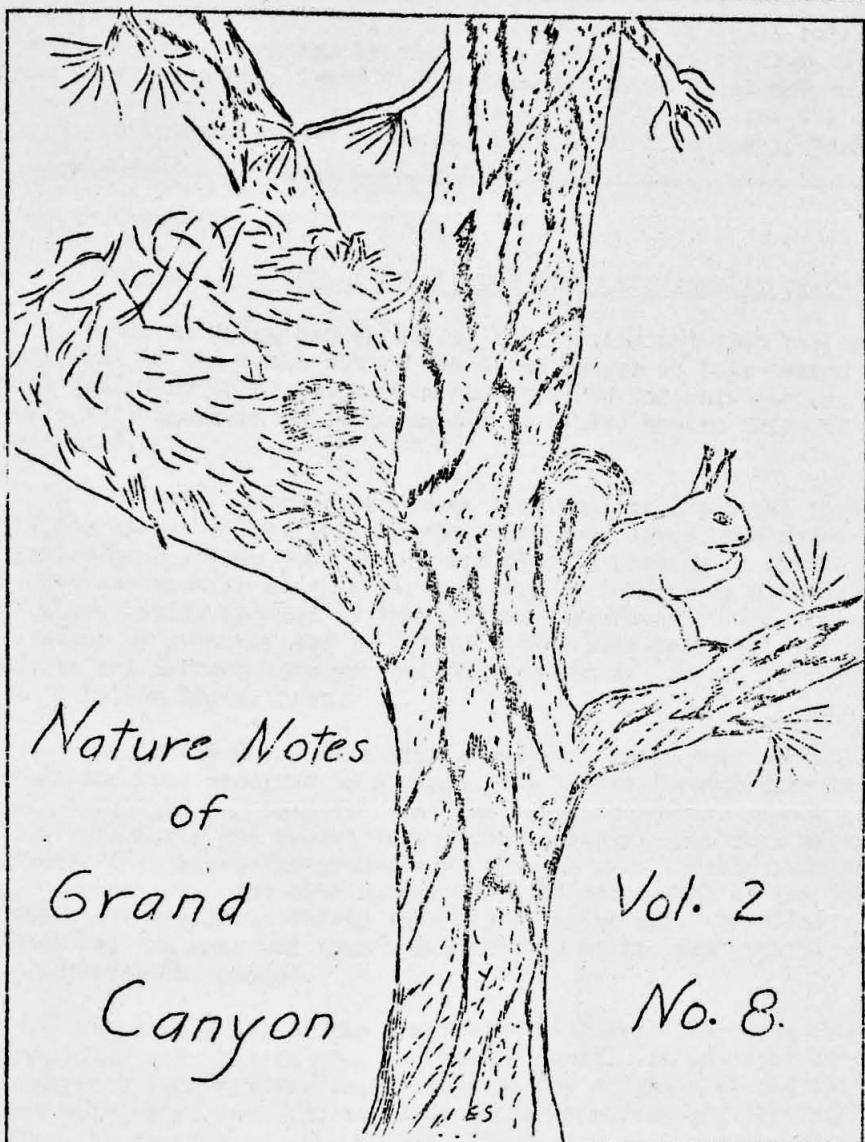




*Nature Notes  
of  
Grand  
Canyon*

*Vol. 2  
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U. S. DEPARTMENT OF THE INTERIOR  
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GRAND CANYON NATIONAL PARK

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GRAND CANYON NATURE NOTES

NO. 8.  
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This bulletin is issued monthly for the purpose of giving information to those interested in the natural history and scientific features of the Grand Canyon National Park. Additional copies of these bulletins may be obtained free of charge by those who can make use of them, by addressing the Superintendent, Grand Canyon National Park, Grand Canyon, Arizona.  
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M. R. Tillotson, Superintendent. By - G. E. Sturdevant, Park Naturalist.

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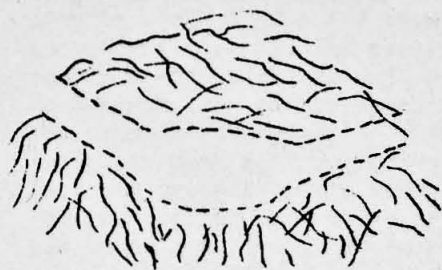
NESTING AND FOOD HABITS OF THE ABERT SQUIRREL AT GRAND CANYON.

After studying and examining the nesting and food habits of the Abert squirrel on the south rim of the Grand Canyon at this season of the year, the following interesting data was obtained for this region. The information is based on the examination of twelve nests, three of which were occupied.

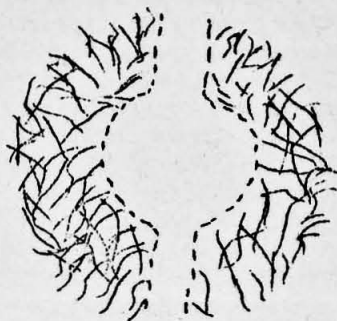
A thickly-branched evergreen tree appears essential in the selection of the home. Of the twelve nests examined, seven were found in western yellow pine (*Pinus ponderosa*), and five in pinon pine (*Pinus edulis*). These two species along with Utah juniper (*Juniperus utahensis*) constitute the prevailing species of this region. Failure to find nests in Utah juniper is probably due to the fact that this species has a more exposed crown and affords less protection from above. In no case was a nest found in a hollow log or tree.

All of the nests were from twenty to eighty feet above the ground. When the nest occurred in a pinon pine it was located near the top where the tree forked. When the nest was found in western yellow pine the distance above the ground varied considerably. One nest appeared only twenty feet above the ground near the end of a thickly-branched limb. In another case the home occurred on the first limb at its junction with the trunk and about thirty feet above the ground. In still a third instance the nest was found near the top of the pine approximately eighty feet above the ground.

In pattern all of the nests were similar. They were found to be generally circular in plan and always domed. In one nest occupied by squirrels snow was two inches deep on top of the nest and although it was melting at the time the nest appeared remarkably dry inside. Aside from the foundation, the outside dimensions of the nest are nine to twelve inches in diameter and seven to eight inches deep. Two tunnels, two and one-half to three inches in diameter, serve as entrances that lead into a circular chamber three inches deep and about five inches in diameter. -----  
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Cross-section



Floor Plan

Short twigs eight to twelve inches in length, many of which have the needles still on them, serve as the foundation for the home. These are placed in a protected crotch. The depth of twigs appears to vary with the angle at which the tree branches. Where the tree branches at a wide angle but few twigs are necessary for a foundation. In one instance where the tree branched at a rather sharp angle fully five inches of cut twigs were required before the proper diameter to the nest could be attained. The squirrel evidently does not go far for the twigs as the species of tree in which the nest is located determines the kind of twigs. One exception to this rule was noted where the nest was confined to a pinon pine. In this instance a single twig of Utah juniper was found among the pinon twigs. The nest proper in all cases is composed essentially of juniper bark. Coarse bark appears on the outside of the nest while finely chewed and shredded bark lines the interior. A few cut twigs were found on top of the nest in some instances.

One nest in the old camping ground was interesting in that it shows how the squirrel has availed himself of good nesting material. Although the nest was mostly composed of Utah juniper bark, slight diversion from this material was noted. Several pieces of twine were interwoven with the bark and exposed on the outside. As the nest had been abandoned I took the liberty to examine it piece by piece. In addition to the twine, two pieces of cloth, a feather of a jay, and a lock of long auburn hair appeared foreign to the general make-up of nests. It was easy to account for the presence of the first three articles but where the squirrel obtained the very fine, long tress of auburn hair is more difficult to understand.

The Abert squirrel does not wait for any particular season to make necessary repairs to his home. He has been seen stripping off long shreds of juniper bark at all seasons of the year. Only a few days ago, numerous tracks were followed to a Utah juniper. Shreds of bark on the snow and freshly exposed surfaces on the tree trunk clearly showed that the squirrel had been busy repairing his abode since a snow storm that occurred a few days previously.

Whether or not the Abert squirrel stores food for winter has been a point of contention. As far as can be determined this species does not store food in any quantity. No food was found in any of the nests and by following their tracks on the fresh snow none led to caches. He has been seen to cache a piece of bread in a tree crotch and to bury nuts and cones one at a time. Several squirrels were observed eating pinon nuts where the snow had melted around the base of trees. A single squirrel was found in a pinon tree gathering nuts from the ripened cones, eating the nuts in the tree and dropping the thin shells on the fresh snow. In other instances some members were seen eating the seed of western yellow pine that had dropped on the snow. Again one squirrel was observed clipping off and feeding upon cones of western yellow pine that had just started and which take two years to mature. In many places under western yellow pines one can find numerous twigs that have been cut off and dropped to the ground - probably to be used for food in case of necessity. In fact one twig six inches in length was found on the snow stripped of its bark. One squirrel was observed eating the inner bark on western yellow pine limb that was about six inches in diameter. The exposed surface on the limb described a rough rectangle with dimensions of about two by five inches. One squirrel was eating what appeared to be a small branch. It was twirled around in his front paws as though he were stripping the bark from it. After watching him for some time I was curious to see if such was the case. As I went closer the squirrel ran up a tree and cached the article that had aroused my curiosity on a branch. After the squirrel had departed to another tree I climbed the tree to the branch and discovered that the object in question was a small dried bone. Although the squirrel had not eaten any of the bone, there were numerous slight impressions where the teeth had gnawed on it.

The above observations will acquaint one with the nesting and food habits of the Abert squirrel on the south rim of Grand Canyon at this season of the year. Other observations are necessary to definitely ascertain whether one or two litters are brought forth in a single year, and the length of tenancy of the home.

#### SPECIES OF PRODUCTUS OF THE KAIBAB LIMESTONE AT GRAND CANYON

Productus is not as bad as it sounds. It merely refers to an extinct group of shell fish that lived and thrived and were world-wide in their distribution when the Kaibab limestone, the top-most formation in the walls of Grand Canyon, was being deposited beneath the sea. Many park visitors do not see evidence of the existence of a sea in this formation which is now some seven thousand feet above the present of marine waters. Yet such is the case notwithstanding as is manifested by the occurrence of a vast array of fossil shell fish which, as they died, dropped to the bottom and helped build up this limestone deposit.

The genus Productus comes from the Latin word "productus" meaning "produced" which characterizes the prolongation of the beak of one valve of the shell (ventral) beyond that of the other valve (dorsal). Paleontologists, (scientists who trace in a most interesting manner how forms lived and died millions of years ago, some leaving descendants slightly different, some giving rise to new forms, while others died without leaving descendants), agree that the great genus Productus was derived from

# Showing Position of Productus on Time Scale

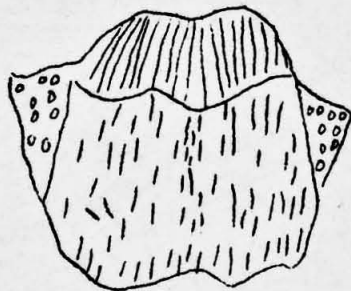
| Era         | Period                                                    | Age of:-                                                                                    |
|-------------|-----------------------------------------------------------|---------------------------------------------------------------------------------------------|
| Psychozoic  | Recent                                                    | Man                                                                                         |
| Cenozoic    | Pleistocene<br>Pliocene<br>Miocene<br>Oligocene<br>Eocene | Mammals                                                                                     |
| Mesozoic    | Cretaceous<br>Jurassic<br>Triassic                        | Reptiles  |
| Paleozoic   | Carboniferous                                             | Permian                                                                                     |
|             |                                                           | Pennsylvanian                                                                               |
|             |                                                           | Mississippian                                                                               |
|             |                                                           | Devonian                                                                                    |
|             |                                                           | Silurian                                                                                    |
| Proterozoic | Keeweenawan<br>Animikean<br>Huronian                      | Higher (shelled)<br>Invertebrates                                                           |
|             |                                                           | Primitive<br>Marine<br>Invertebrates                                                        |
|             |                                                           | Fossils unknown                                                                             |

the *Productella* which lived millions of years previously in what is known as Devonian time. From the *Productella* developed several new forms, agreeing in some respect with their ancestors but forming such distinct groups of their own that they were necessarily described as new species. The *Productus* became world-wide in distribution in Mississippian, Pennsylvanian, and Permian times which three periods taken collectively form the Carboniferous or the time of the great coal deposits of the world. As the *Productus* penetrated practically all seas at this time, some paleontologists refer to these ancient seas as *Productus* seas.

Many species of *Productus* were in the seas during Permian time or the time when the Kaibab limestone was being deposited in the sea in the vicinity of Grand Canyon. The remains of five species of *Productus* in the Kaibab limestone indicate that as many forms had taken up their abode in marine waters at this locality. Of these species by far the most numerous is *Productus ivesi*. This species was first collected and described by Dr. Newberry who served as geologist with Lieut. Ives' Colorado River Expedition in 1858. About two hundred feet down the Yaki Point section of the Kaibab trail one may see where more than one foot of the solid stratified rock in the walls of the Canyon is composed almost entirely of the remains of *Productus ivesi*. Other species of *Productus* occurring in the Kaibab limestone are: *Productus occidentalis*, *Productus* aff. *P. irginiae*, *Productus subhorridus* var. *rugatulus*, and *Productus* sp. All of the various species of *Productus* are characterized by one shell (ventral) being convex while the other (dorsal) is always concave.



*Productella of Devonian*



*Productus ivesi*

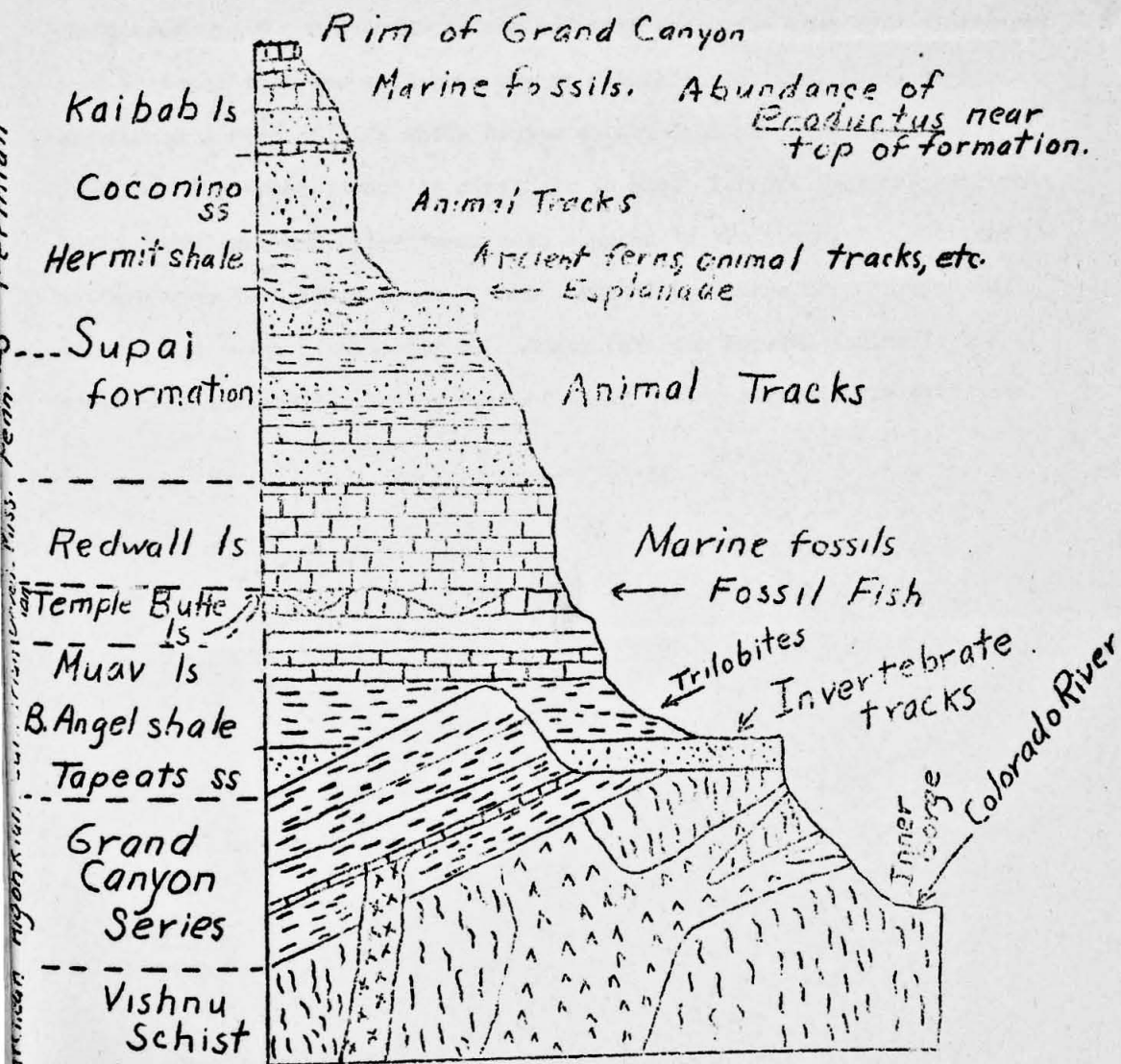


*P. subhorridus*  
var. *rugatulus*



*P. occidentalis*

# Diagrammatic Profile of Grand Canyon (After Noble)



Although the *Productus* was rare in Devonian time, the genus became exceedingly prolific during the Carboniferous which would tend to show that conditions must have been ideal for such forms of life. Before the close of the Permian the genus *Productus* became extinct all over the world. The discovery of a *Productus* in the rocks is therefore generally considered good evidence that the sediments are of Carboniferous age. Many wonder why should a form of life which became so abundant and widespread become extinct. The exact reason is difficult to say. Perhaps they had outlived their usefulness and other forms more adapted to the changing conditions at this time took their place. Some suggest that other forms preyed on them to the point of extinction. At any rate the Permian sediments the world over contain the last record of their losing struggle for existence.

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