Hopi Use and Occupancy of the Indian Reservation Defined by the Act of June 14, 1934: A Sociocultural Perspective on the Use of Natural Resources by the Hopi Indians

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I. INTRODUCTION

Hopi use and possession of the 1934 Reservation area spans a broad time frame, dating back at least several hundred years, continuing through 1934 to the present day. This report details the nature and extent of a variety of Hopi land uses in and around the year 1934.

Today Hopis are excluded, on a practical basis, from many areas within the 1934 Reservation which they previously used for religious and subsistence needs. Exclusions of the Hopi and restrictions on their use of the 1934 area lands did not occur all at once, but through time. Turning back the clock to accurately determine what areas Hopis used in the year 1934 presents obvious problems. Part of the difficulty is that, over 50 years later, many Hopis who were using these lands in 1934 are now deceased, and their first-hand information has been lost; in addition, even those remaining alive have some difficulty remembering exactly what they were doing so long ago. Thus, much corroboration of evidence is needed to piece these land use events together and ensure the reliability of the information obtained.

In describing the various ways in which Hopis used the 1934 area in 1934, this report makes extensive use of information gained

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from anthropological interviews and field trips conducted with members of the Hopi Tribe.[1/] Topics discussed in the interviews included the use of the 1934 lands not only for livestock grazing and agriculture, but for the collection of subsistence and cultural items that were and are essential to Hopi culture for maintenance of their way of life as they have known and practiced it for hundreds of years. These uses will be described below. Briefly, Hopis collected the following items from the 1934 lands: materials for arts and crafts, medicines, fuelwoods, stone for building, and plants for food. In addition, Hopis made extensive use of the lands in question for religious purposes and for hunting.

The focus in this report is on Hopi, rather than Anglo-American, concepts of land use. Therefore, roughly equal degrees of importance are assigned for the various uses that are outlined in the following pages.[2/] Indeed, given the scarcity of natural surface resources in the 1934 area, a much larger land area per capita is essential to sustain and preserve the Hopi culture and way of life than might be the case in other regions. For example, sufficient supplies of fuelwood, grazing lands, farm lands, and other resources must be preserved for allocation when needed. Such needs often arose in the past when local shortages of fuelwood occurred,

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1/ See Methods and Techniques section, Appendix 1, for further elaboration.

2/ In contrast to Anglo concepts of land use, in which farming, ranching, and forestry products are of greatest importance because of market demand, Hopis place great importance on the subsistence and religious qualities of land.

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or when crops failed due to varying moisture conditions, requiring shifts in the location of gathering sites or farm plots. The lands of the Hopi were generally adequate to meet these needs until inroads by members of the Navajo Tribe created further competition for those scarce resources, and for the areas that contained them.

Certain rules established by Hopi culture dictated when and how scarce resources could be collected, how range could be used for grazing, and how agricultural lands could be set aside for growing crops. The simple fact of being Hopi did not, in and of itself, permit the indiscriminate use of resources. All Hopis had to follow prescribed cultural practices for using the land. For example, areas were set aside for exclusive use by specific societies and clans, and all other Hopis respected such use rights.3/ Those areas not specifically set aside under prescribed ownership rights were open to any Hopi who had need, but the land was to be used in ways reflecting Hopi cultural values of conservancy and respect. Ernest Beaglehole, who worked and wrote extensively among the Hopi in the 1930s, describes land stewardship in the following way:

> As to land tenure, it may be noted first that the village remains a passive agent in land control. Stock is grazed and hunting takes place over all land adjacent to the villages irrespective of village boundaries. The village council comes into the picture as a land owning unit only on the occasion of dispute regarding boundary alignments. The effective controlling agent is therefore the clan group. Clan lands vary in size from a few hundred square yards to a square mile, and today, because of the operation of such factors as clan merging

3/ Refer to maps 20a, b, and c, Appendix 4, for presentation of these clan and society holdings.

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> and reshuffling, there is little correspondence between the area of clan land and the number of clan members. Clan lands are distributed over a number of sites in various parts of the washes surrounding the mesas.
>
> . . . There is reserved enough clan waste land to enable a household freely to shift its cultivable areas elsewhere should the originally allotted household sections be denuded by flood or sand-covered by wind [Beaglehole 1937:15].

Since Beaglehole was a contemporary observer of Hopi cultural practices in the 1930s, his observations provide an unbiased and especially significant account of Hopi land stewardship and ownership in this time period.

Part of the Hopi concept of ownership of land consisted in the ability to visit areas known to contain specific food plants and craft materials, to visit areas of religious significance, and to pass through their lands, from point to point, unmolested and uncontested by other groups of people. For example, Hopis from Third Mesa routinely collected cattails and reeds for the Soyal ceremony from Reservoir Canyon, near Moenkopi, 45 miles away,[4/] because this was one of the most reliable places from which reeds could be obtained, and because the area held religious significance (Nagata 1970:100). They also obtained water, used in the Shalako (also spelled Salako) ceremony, from Shalako spring and Patuipa pool, in Reservoir Canyon. Anthropologist Shuichi Nagata states: "Third Mesa Hopi also went to Moenave for cottonwood fruit, Pikyaingkolu (Wildcat Peak) for firewood and timber, Pikino

4/ The Moenkopi area was part of the Third Mesa "outland," and thus was controlled by the Oraibi Kikmongwi, or headman.

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in Reservoir Canyon for rocks, and Oako on Coal Mine Mesa for coal" (Nagata 1970:100).

Apart from the need for access to places where materials -- wild plants, minerals, fuelwood, etc. -- are not otherwise available, Nagata states that the collection of ceremonial foodstuffs unobtainable in the outside market functioned to maintain tribal identity. Denial of the ability to obtain such items is, in Nagata's view, a threat to the very existence of Hopi tribal survival (Nagata 1970:219).

The sections below begin with a very brief description of the division of labor (gathering activities, herding, etc.,) among the Hopi and its relation to land use, along with a description of the seasonal activities which were taking place in the 1930s. Subsequent sections are arbitrarily organized for convenience by specific types of land use. Hopis themselves, however, do not make the distinctions between religious and secular uses of land reflected in this report. There is no separation of religious practice from any other aspect of daily Hopi life. All actions, including the collection of daily subsistence needs, are a part of the religious cycle, and the practice of Hopi religion, conversely, is an aspect of subsistence in the Hopi way of thinking.

Hopi people consistently stated in interviews that land, which is held in religious trust,[5/] must be respected. When a

5/ See Eggan expert witness report (Jan. 1986).

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Hopi takes something from the land, whether a wild plant or a crop of corn, a prayer offering is left and thanks are given.

To conclude the introductory section, it is my opinion that the areas described in the following discussion, and outlined in tables and maps included in the appendices, were used by the Hopi circa 1934 for the various purposes described in this report.

III. USE OF WILD PLANTS BY THE HOPI IN THE 1934 AREA

Introduction

A substantial body of literature currently exists, thanks to several botanists and anthropologists who worked among the Hopi before and during the 1930s, which describes the types and uses of the plant environment of the Hopi. Drawing from these primary and secondary sources and from interviews conducted with 138 Hopis for this report, this section describes the various locations and uses of the flora in the Hopi sustaining area before, during, and after the 1930s.

The information presented below confirms that in and around 1934, Hopis had a wide knowledge of how plants should be used and where these plants were located, and that they made very extensive use of the 1934 Reservation area to collect these plants. Beaglehole states:

> If the physicial and geographical environment of the Hopi is such that only by virtue of skill, experience and patience can he gain basic subsistence through agriculture, the natural resources of his environment as regards its flora are nevertheless rich enough to provide him with material help in his struggle to live. Apart from a variety of indigenous cultivated plants, materially increased by those of Spanish introduction, the Hopi . . . is familiar with the existence and use of many of the one hundred and fifty indigenous wild plants in his environment. A large portion of this number is used as edible food plants in search of which the Hopi extends his environment by long journeys in all directions. Every berry patch in the vicinity of each village is known and regularly visited. Many plants are used in early spring when other food may run low. Others probably provide sweet substance and formerly took the place of sugar in his diet [Beaglehole 1937:50].

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Florence Ellis reports that the Hopi used sunflower petals, yellow pollen, the dried flowers of Bigelovia graveolens, pine, oak, holly grape, mountain mahogany, tobacco, beebalm, and Douglas fir from as far away as the San Francisco Peaks, and as far as 30 to 40 miles north of the Hopi villages. Yellow pine, used for kiva ladders and for large roof timbers, came from the San Francisco Peaks (Ellis, Docket 196: Ex. E 500, p. 141,161,165; Whiting 1939:49).

Stephen states that sivwa pi (Bigelovia graveolens) was used in ceremonies, for wind breaks, as construction material, as medicine, as fuel for heating, as weaving loom material, and as a stirring stick. The berries, called si vwipsi, are were used as a red coloring (Stephen 1969:879,1295,233). Elsewhere, in interviews for this report, Hopis described making a "Hopi tea" from the berries.

Mohu, also spelled moho (Yucca angustifolia), was used to make foaming suds for ritual hairwashing, as part of the Hopi wedding ceremony. Yucca roots were pounded and put in boiling water to make the suds (Voth 1900:241). A reed mat, woven from sand grass (songo 'tala) was used to hold the wedding costume of the bride after the wedding ceremony (Voth 1900:244-245). Kennard states:

> "The Hopis make extensive use of the wild plants in their habitat. The roots of yucca (soapweed) are used in hair washing, which is an essential part of every ceremony-- naming, initiations, girl's puberty grinding, marriage. The leaves are split and sewed around a core in making coiled basketry and in making sifting baskets and trays. The Hopi brush, which is an essential tool in every house,

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> is made from the culms of purple hair grass [Kennard 1979:557].

A handful of the purple hair grass was tied with a piece of string near the butt end. The lower end served as a hair brush, while the upper was used to sweep the meal from the grinding stones, as well as to sweep the adobe floors of houses.

Cottonwood, which grew along washes and near springs, particularly along the Little Colorado River, was the basis of the woodworking industry. This included the manufacture of drums, feather boxes, other small objects, kachina dolls, masks, animal figurines, prayer offerings, altar frames and slats, lightning sticks, and house beams, which are discussed elsewhere. Expeditions were still made to collect large supplies of cottonwood roots from near Winslow in the 1930s (Ellis Docket 196: Ex. E 500, p. 166-67; Colton 1959:9-11).

For purposes of the present report, the ethnobotanical work of Alfred Whiting is perhaps the most important documentary source to draw upon, since he conducted his fieldwork in 1935, 1936, and 1937, and completing an exhaustive study of Hopi ethnobotany in 1939. Whiting, in turn, drew upon the earlier work of Walter Hough as a basis of his larger and more accurate research (Whiting 1939; Hough 1897).

Appendix 2 is a condensed version of Whiting's plant use data, excerpted by this author to reflect the most important plants used by Hopis in the 1930s in the 1934 Reservation area. Whiting and others have reported that the Hopi collected about 100 different locally available wild plant species (Whiting 1939:48-50; Hough

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1897:43-44; Kennard 1979:557). Michael Stanislawski has confirmed that the Hopi and Hopi-Tewa presently use at least 100 local plant species, as well as an additional 100 species which are collected or otherwise obtained within a radius of 200 miles of the Hopi villages. These plants are broken into the following categories: 65 for medicine, 37 for ceremonial purposes, 47 for construction or decoration, and 54 for food supplies (Stanislawski 1979:593). While Stanislawski does not make the distinction, many of the plants in these groupings undoubtedly have multiple uses (Whiting 1939).

Although Whiting, Stanislawski, and other researchers have documented the types and uses of plants important to the Hopi, there is less empirical information describing the actual locations from which plants were gathered. Therefore, an important step in this research was to interview Hopis who were alive in the 1930s, and who had actually gathered plants at that time, to determine those locations.

It is my opinion that wild plants still played a very important role in the Hopi culture and diet in 1934. A description of these plants, and the areas from which they were collected, is presented below. Even with the substantial cultural changes experienced since 1934, Hopis still have a wide knowledge of the names, locations, and uses of locally and remotely available plants, and still incorporate wild plants -- albeit not as extensively as in the past -- into their everyday life for religious (cedar and pine boughs, paints for religious articles, etc.), subsistence (wild

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vegetables, fuelwood, pinyon nuts, etc.), and commercial (materials for baskets, arts and crafts, etc.) purposes.

Of all the uses of plants listed above, in terms of subsistence, none could have been of more importance than those collected for food. In a recent article, John Martin listed important wild plant foods for the Indians of the Grand Canyon region, stating:

> As is evident, most of these crops are seasonally complimentary and are located at different elevations and locations. If a group of people had access to a range which included sufficient variation in elevation and, hence, flora, their food supply should have been well assured for all but the late winter months . . . [Martin 1985:144].

Certainly, Hopis depended heavily on "seasonally complimentary" plants scattered about the 1934 Reservation for their food sources in the 1930s, and much of the importance of the 1934 lands to the Hopi lies in the difference in elevation from Black Mesa on the northeast to the Little Colorado and Colorado River drainage systems (see Figures 2, 3, and 4, Hack 1942a:4,6,8).

Tables 1 through 11 in Appendix 3 list the names of the Hopis who were interviewed about the use of wild plants, and the locations of those collection areas. Maps 1 through 11, Appendix 4, visually illustrate the plant collection areas used by Hopis in and around 1934.

Of the 138 Hopi people interviewed, 109, or almost 80%, expressed specific knowledge about collection of wild plants and their uses from the 1934 Reservation lands, and this information has been grouped into the following areas of use: hunting sticks, pine pitch, bows and arrows, medicines and herbs, woods for looms,

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greens, cottonwood roots, religious use, arts, crafts, utilitarian goods, fuelwoods, woods for construction, and pinyon nuts.

While information about areas outside the 1934 Boundary is not included on the accompanying maps,[6/] Hopis reported that the gathering of many of these materials extended into southern Utah and the Grand Canyon and Flagstaff areas in 1934.

The following section describes the locations and types of wild plants named by Hopi informants and by Whiting as useful for food sources during the 1930s. In some instances, Hopis gave either specific Hopi or English names for these plants. At other times such plants were simply described as "greens." The names and uses of plants described by Hopis parallel quite closely the names and uses related by Whiting in his "Ethnobotany of the Hopi" (1939).[7/] Unless otherwise indicated, the uses identified were made by Hopis in and around 1934.

Gathering of Wild Edible Plants

Seeds, Greens, Berries, Fruits and Herbs

Several edible plants collected in the 1934 Reservation provided "important means of sustenance" for the Hopis in the 1930s (Whiting 1939:18). These include, among others, Indian

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6/ Although not plotted on maps, gathering areas outside the 1934 area are noted in the body of the report and in the accompanying Tables.

7/ See Appendices 2 and 3.

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millet, alkali sacaton, dropseed, and giant dropseed, which Whiting describes as "staple foods" (Whiting 1939:65-66).

Indian millet, also known as Indian rice grass (le'hu) is common in the desert, and has an excellent food value. Alkali sacaton (nu' nu) is also abundant. Giant dropseed (kwa' kwi) is used as a grain (Whiting 1934:65-66).

Whiting breaks other plants down by use, including those for seasoning, beverages, between-meal snacks, and foods relied upon when crops fail. Seasonings included tansy mustard, tomatilla, wild potato, wild onions, cactus fruits, mint, beebalm, and purslane. Beverages are sumac, mistletoe, and two varieties of Hopi tea. Between-meal snacks (the Hopi equivalent of chewing gum) were obtained from the fruits of milkweed, cottonwood, cattail, and the roots of the Mariposa lily. Under the listing of foods which were relied upon during poor harvests are: dried greens, the fruits of tomatilla, two varieties of cactus, juniper berries, wild currant, wild rose, and blazing star. Spring greens which are listed by Whiting include pigweed, wormwood, saltbush, lamb's quarters, beeweed, beebalm, tansy mustard, spiderwort, homi' ma, and honya' vako (Whiting 1939:18-21).

Several species of saltbush (unga' toki, or ki' tsvi) occur at low elevations in the Hopi region. The leaves of this plant are cooked as greens (Whiting 1939:73). Many members of the Amaranth family were also used as greens, including a plant the Hopi call wi' wa, coxcomb (ko' mo), and pigweed (pi'siowu). Wi' wa was cooked as a green and eaten with meat. The coxcomb was

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sometimes raised in small gardens, and was used as a dye to color piki bread. Pigweed was one of the earliest greens picked in the spring. Frequently the seeds of this plant were also eaten. Harold Colton, in a report submitted to the Indian Claims Commission, describes pigweed in the following manner: "In wet areas this may be a common plant. It is collected wherever found, and trips are made to the lower elevations to get this plant in the early spring. It is collected along the Colorado River, in Upper Polacca, Oraibi, Denebito, Lower Oraibi, and in the White Cone area" (Colton 1974:1). It is evident from Colton's remarks that Hopis traveled long distances -- for example, to the Colorado River, outside the 1934 area -- to acquire this green. As spring and summer advanced, the plant could be found at progressively higher altitudes, and thus was found inside the 1934 boundary as the growing season progressed.

Kwi' vi is also used as a green in the spring. It is simply boiled and eaten. Colton noted that the earliest collection spots for kwi' vi were in the lower elevations around Holbrook and Winslow, but, as with pigweed, the plant could be collected at higher altitudes as the weather warmed, placing collection areas inside the 1934 area (Colton 1974:42).

Rocky Mountain beeweed (tu' mi) was also boiled and used as a green, and was frequently sought as a food supplement. Tu' mi was gathered from the Flagstaff, Shonto, and Kayenta areas, along the highway between Moenkopi and Flagstaff, and at Cow Springs.[8/]

8/ Just inside the 1882 boundary, in the Coal Mine Mesa vicinity.

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Sumac, or squaw bush (su' vi), is a common shrub that is found, among other places, in the Moenkopi area. This shrub produces berries (suvip' si) which were made into a kind of "lemonade," or so-called "Hopi tea."

Nanakopsi, commonly known as Beebalm, is a mint, and was an important herb used for cooking, as was tu' i' tsma, a member of the sunflower family. Nanakopsi came from a variety of places: the Flagstaff and Inscription House areas; north of Coal Mine Mesa; Moenkopi Wash; Moenave; Pasture Canyon; Poseolelena; and Shonto. Si' ta, and hohoi' si, two other herbs of the sunflower family, were important to the Hopi for teas and dyes, and were used in the same manner (Colton 1974:21-A; Whiting 1939:98).

The narrow-leafed yucca, called pite before cooking, and qua-ni after cooking, provided a fruit that is edible just before harvest time. Hopis used the fruit from this plant as a food supplement, and juice from the fruit was used in ceremonies (Stephen 1969:417,457,1287).

An assortment of greens was collected by the Hopi along the highway between Winslow and Moenkopi, in the Shonto area, and in the sand hills east of Moenkopi. Other greens, such as tu' i' tsma, mohu, nanakopsi, and tu' mi were gathered wherever they happened to be growing in the local Moenkopi area in the 1930s.[9/] Meha came from the fields around Moenkopi village and Kerley Valley. Kerley Valley was also the source for kwi' vi, nepni,

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9/ See Table 1 of Appendix 3.

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nanakopsi, tu' mi, wild onions, wuyavoko, wild spinach, si' wi, and do-do-na (wild carrots).

A large assortment of greens was collected throughout the Moenkopi area, including tui' tsma, nanakopsi, tu' mi, wild asparagus, meha, wild spinach, woo-ya-vaus, homima, mo-ong-dash-have (bush mint), spearmint, Hopi tea, kwi' vi, and is' ho. Moenkopi area fields provided a variety of wild greens besides the planted crops, as did Moenkopi Wash. Greens from the Wash included si' ta, wild spinach, wild asparagus, nanakopsi, and wild onions.

Pasture Canyon provided a wide variety of plant foods. Among others, these plants were nepni, nanakopsi, tu' mi, wild onions, kwi' vi, meha, wild spinach, wild asparagus, homima, and is' ho (a vegetable similar to wild spinach). Other areas visited regularly for wild greens were: Moenave; Inscription House; the Flagstaff area; and along the roads and trails in the 1934 area.

Si' ta came from the Bakalo, and is' ho from near the present area of the checking station on Highway 89, north of Gray Mountain. Is' ho was gathered from the Cameron area, and the present Goldtooth area at Masiskya. Kwi' vi came from Pasture Canyon.

The most frequently mentioned area from which greens were obtained was the Flagstaff/San Francisco Peaks region, which is just outside the 1934 area, southwest of the Hopi Mesas.10/

10/ See Map 22, Appendix 4, for Trails and Roads.

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Following in order of importance were: the Moenkopi area; the Shonto area; the Moenave area; Cameron; Kayenta; Pasture Canyon; and finally, Kerley Valley. These areas were most frequently noted as important gathering sites because of the wide diversity of plant life available or because of proximity to villages and trails frequented by Hopis. However, as stated above, some plants grow only at certain locations due to elevation and rainfall, and since Hopis knew the 1934 lands so well, these other sites were also important.

Pinyon Nut Collection

Pinyon nuts (tuve' e, or tu' va) were also an important adjunct to other food sources for Hopis in the 1930s. The nuts were picked in the fall or early winter of each year during good weather, and subsequently roasted so they would remain fresh through the winter (Nequatewa 1943:24).

Several persons interviewed for the 1934 litigation reported that their families made annual trips to gather pinyon nuts in the locations presented in Table 2 of Appendix 3. They traveled each year to the best pinyon nut gathering locations and stayed for several days, while the whole family participated in gathering the nuts. Since pinyon nut production is cyclical, different locations were visited each year to assure good harvests.

Areas used by the Hopi to harvest pinyon nuts before, during, and after 1934 include: Navajo Mountain, near the Utah/Arizona border; Inscription House; the Flagstaff area; the Grand

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Canyon area; Steamboat Canyon; Gray Mountain; and the Black Mesa area, northeast of Cow Springs, inside the 1934 boundary. Other locations for pinyon nut collection included: the forested areas along the old road from Keam's Canyon to New Mexico, near Steamboat Springs; the Kaibab National Forest; the Kaibito area; Preston Mesa; and Shonto. The Grand Canyon region, which is just outside the 1934 area to the west, was the most frequently mentioned site by informants for collection in the 1930s, with Gray Mountain the next most important site.

Plants Used for Arts and Crafts

Reeds, Yucca, Grasses and Other Basketmaking Materials

As has been previously stated, Hopis made extensive use of plants for purposes other than food, including uses for art and craft products. Some of these plants have been used for hundreds of years, but by the 1930s a few tourist items had begun to play an increasingly important economic role as a result of the growing tourist trade. Concerning this trend, Whiting states:

> Next to pottery, baskets were perhaps the most useful containers that the Hopi had in the old days, and in modern times the sale of baskets and pottery is an important element in Hopi economy. As an element in practically every Hopi basket, yucca plays an important role in this tourist supported industry. . . . The local supply of yucca has been much depleted in the face of this demand, and it is now necessary to go a considerable distance to obtain it [Whiting 1939:26].

Whiting's statement indicates that those Hopi women who made baskets had used up the locally available yucca in the process of

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manufacturing for the tourist trade and were of necessity having to travel further to obtain their materials in the 1934 time period. In the case of women living in the villages situated on the mesas, this included gathering yucca along the improved roads and other routes of travel in the 1934 area,11/ as they traveled back and forth to the Mesas, Moenkopi, Winslow, Flagstaff and other border towns.

Beaglehole also noticed that Hopis were increasingly collecting plant materials for commercial manufacture for the tourist trade. He states:

> The utilization of the plant environment for arts and crafts may also be mentioned to indicate the variety of ways its products enter into economic processes. . . . Such dyes made from gathered wild, or semi-cultivated, plants are also used in basket-making, pottery decoration, and food coloring [Beaglehole 1937:50].

According to Kennard (1979), the production of crafts had become a supplementary income source in every household, and women's craft products had become specialized by the beginning of the twentieth century. Pottery was the most important tourist craft at First Mesa, coiled basketry at Second Mesa, and wicker basketry on Third Mesa (Kennard 1979:561). Pottery does not appear to have been manufactured in any significant quantity at Moenkopi, but several kinds of baskets were being made by Moenkopi women.

11/ See Map 22, Appendix 4.

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Stephen states that shu hu (also spelled su hu),[12] a tall grass, was used for the interior of a coiled basket made on Second Mesa. The inner grass was wrapped with strips of mo hu (also spelled moho) to make the coil for the basket. He also relates that samo a, a broad leaf yucca, was being used to make a whip (Stephen 1969:282,1251,1287,1291).

Reeds, yucca and grasses were selected and gathered in the 1930s for a variety of baskets besides those made for the tourist trade. The Hopi used a reed-like grass (so- gno- wu, or so- gno- sivu[13]) to construct a wedding garment container, called so-gno-sivu (actually more of a suitcase), in which the garments of the female were placed after marriage. Yucca (moho) was used in several types of baskets, including flour sifters. Rabbit brush (sivapi) was incorporated as a material in several types of baskets. Hopi women regularly gathered sivapi[14] along Reservoir (Pasture) Canyon in 1934 (Deposition of Roger Honahni, vol. 4:484, Feb. 26, 1979). Nagata states that cattails and reeds abound in Reservoir Canyon, and Hopi from Third Mesa collected them (Nagata 1970:100). He comments:

12/ Different spellings reflect both differences in linguistic training on the part of the investigators, and dialect differences between mesas. No attempt is made, however, to give, in every instance, Hopi, common and scientific names for every plant discussed.

13/ Whiting spells it songo'tala, which means "full bloom."

14/ Dup-heni is the finished product of sivapi after it has been scraped and dried.

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> Even after the separation of Moenkopi from Oraibi by a reservation boundary, the Hopi from Third Mesa continued to visit Shalako spring and Patuipa pool in Reservoir Canyon for the water used in the Shalako ceremonies and for reed and cattails for the Soyal ceremony in Oraibi [Nagata 1970:100].

Another type of reed (si' wi), was used in the manufacture of a plaque-style basket. Other materials used by Hopi women included suuvi, a variety of grasses and twigs, galleta grass (so' ho), blue gramma, sumac, and Parryella filifolia (si' wi) (Whiting 1939:26).

Hopis reported that basketmaking materials were gathered from the following areas: Wa-wa-la; Maria Mesa; the Old Hopi Bridge area; the Moenkopi area; Coal Mine Canyon to Moenkopi Wash; Pasture Canyon; the present site of the fairgrounds near Reservoir Canyon; the Moenkopi Plateau; and the Windy Tank area. Other sites included the Bakalo; Castle Rocks; Preston Mesa, along the sand dunes; White Mesa; the sand hills east of Tuba City; Ironwood Springs; the Suhuva road; Yuvukpu; Tsingava; along the old air-strip west of Tuba City; Moenave; the present location of Tuba City; the Rare Metals area; Kerley Valley, including the area around the Kerley Trading Post; and Willow Springs.

Farther away, basketmaking materials came from Shonto; along the Little Colorado River; the Cameron area, and north of Cameron; the Canyon Diablo area; Bayud-mo; the Red Lake (south) and Leupp areas; the sandy areas on Ward Terrace, near the Hume-tewa ranch; along Hamblin Wash; below the Gap; Apaat-ho; Grand Falls; and from Hukyatwi.

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As previously mentioned, Hopis also gathered basket materials as they traveled along improved roads, such as the old road on the way to Cameron and Flagstaff from Moenkopi, and between Moenkopi and Oraibi. Hopis also report gathering basket materials from the Ganado area, on the east side of the 1934 boundary, and from Ironwood Springs (O top' sap- va) in the vicinity of Moenkopi. These materials were also collected in the Flagstaff and Holbrook areas by Hopis living inside the 1882 area.

The area most used for collection of basketmaking materials as reported by informants was Pasture Canyon, followed by the local Moenkopi area, and then the Moenave and Tuba City areas. The Flagstaff region was also an important source for these materials, with the Rare Metals area, Ward Terrace, Cameron, and Kerley Valley also often reported as sources. Table 3 of Appendix 3 presents this gathering information, and Map 3 is a visual presentation.

Plants for Making Paints

No evidence was derived through the interview process that clay was collected for making pottery in the 1934 area, but such collection should not be ruled out. Potters appear to have been living primarily on First Mesa during the 1930s, and probably secured their clay primarily inside the 1882 boundary. Plant materials for making paints for pottery, however, did come from the 1934 area. These materials included Rocky Mountain beeweed

HP2400

(tu' mi), which, in addition to its use as food, was incorporated in the preparation of pottery paint.

Pottery paint also usually contained tansy mustard. Ellis reports that a black pigment for pottery was made from tansy mustard, or from the narrow leaf yucca (Ellis Docket 196: Ex. E 500, p. 139; Stephen 1969:1190,1204). The paint was applied with a yucca brush (Whiting 1939:26). The yucca came from a number of areas (See Table 3, Appendix 3).

Sumac, (su' vi, or suuvi) was important as a preparation for body paint. Si' ta and hohoi' si were also used for dyes. Other objects which were colored by vegetable dyes include wool, bows and arrows, and ceremonial paraphernalia.

Plants Used for Utilitarian Materials

Daily utilitarian needs such as soap and utensils were also met through collection of plants in the sustaining area of the Hopi. Soap came from yucca roots; greasewood provided stirring rods, pegs, and tools. The baby's cradle board was padded with the soft bark of the cliff rose, and paints were applied with yucca brushes. Brooms, brushes, and strainers were manufactured from certain plants including yucca and purple hair grass (Whiting 1939:25-26,50-51). The 1934 land was an important source for these materials.

Pine Pitch and Pine Gum

Several species of pine found in the 1934 area are very important to the Hopi for a number of reasons. Besides the use of pine as a fuelwood, pine boughs are used for religious purposes (described below in the section on religious use of plants). The pinyon nut is used as a food source, and pine trees provide other materials for the Hopi, including pine pitch and gum.

Uses of pine pitch and gum include: waterproofing; as a sort of glue for various repairs; as a preparation for some dyes; as a medicine; as chewing gum; and to make a ball (stone race ball) used in a Hopi social event. Pinyon gum was also reported by Whiting to have been thrown on fires during the ritual purification of family members after a funeral (Whiting 1939:3,26).

Pine pitch was regularly obtained from a variety of areas in the 1930s, including Flagstaff, Gray Mountain, Kayenta, and Black Mesa in the 1930s. It was also obtained from Wildcat Peak, Kaibito, the Grand Canyon,[15/] and the Betatakin area. The information on pine pitch and pine gum is incorporated into Table 3.[16/]

Cottonwood Products

As described above, cottonwood roots play a role as a material for arts and crafts, and the wood is important for other

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15/ Outside the 1934 area.

16/ See also Map 8, Appendix 4.

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uses. Cottonwood trees grow in abundance in areas of good, permanent moisture. They are normally found along washes and near springs. Hopis have transplanted these trees in countless areas to provide shade and wood. The cottonwood has proven useful as fuelwood, but is not as efficient as other, harder, woods. As described elsewhere, the trunks of the cottonwood are used for beams in the construction of houses, and the "berries" are chewed as gum. Parts of the cottonwood are also used in the construction of prayer sticks, kachina dolls, and gaming cups, as well as boxes which hold ceremonial paraphernalia (Whiting 1939).

Cottonwood trees often lose branches in storms, and frequently an entire tree will fall and wash downstream during spring runoff. Several Moenkopi Hopis related that they had participated in pulling cottonwood branches and roots from streams and rivers with the use of ropes, during the spring highwater season (Beaglehole 1937:56; Ellis Docket 196: Ex. E 500, p. 166-67; Colton 1959:9-11). The roots of the tree, after soaking in water, are considered to be of superior quality for carving. The roots are throughly dried, yielding a soft, light wood that is highly suitable for the knife.

Areas from which the Hopi gathered cottonwood before, during, and after 1934 include: Lee's Ferry; Moenkopi Wash; the Little Colorado River, near Winslow and toward Leupp, and including Grand Falls; the Colorado River, including an area near Grand Canyon; the Gap area; the Cameron area; the Black Falls area;

Vermillion Cliffs; Kayenta area; Cow Tracks; and the Coal Mine Wash area.[17/]

Areas outside the 1934 boundary from which the Hopi obtained cottonwood are: Clear Creek (between Winslow and Holbrook); the Winslow area; the Flagstaff area; and Camp Verde. Blue Canyon[18/] was also a popular place for gathering cottonwood by Moenkopi residents.

Moenkopi Wash was the source most often reported by Hopis as a gathering area for cottonwood. This was followed by the Lee's Ferry area, Grand Falls, the drainage of the Little Colorado River, and Cameron.

Medicines

A large variety of plants were gathered primarily for their medicinal qualities. Often, these plants grow only in remote places, and were gathered only by medicine men.[19/] Locations where medicinal plants grow, and from which they were collected, include: the area around the present Rodeo grounds on Coal Mine Mesa; the Moenkopi area; Moenkopi Plateau; Maria Mesa; Wildcat Peak; west, east, and south of Moenkopi village; above Pasture Canyon; and the Rare Metals area, all near Moenkopi.

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17/ See Table 4, Appendix 3, and Map 4, Appendix 4.

18/ Inside the 1882 boundary.

19/ Whiting (1939) lists a variety of medicinal plants and their uses.

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More distant areas include Lee's Ferry, Marble Canyon, Navajo Mountain, the Grand Canyon, Inscription House, the Shadow Mountain area, the Leupp area, Seba Delkai, Tees-Toh, the Ganado area, the Steamboat area, and the Hopi Buttes.[20]

Areas outside the 1934 boundary, but still inside Arizona, where medicines were gathered in the 1930s were the Flagstaff area, Williams, west of Page, Chevelon, Camp Verde, Payson, Chevelon Mountain, Woodruff, north of Phoenix, Sedona, White River, and Mesa.

Locations inside the 1882 boundary where Moenkopi Hopis traveled to gather medicines include Blue Canyon, Pinyon, and Red Lake (north).

Religious Uses of Plants

The Hopi also used a variety of plants in religious ceremonies. These include, but are not restricted to, white fir (he' kwpa), Douglas fir (sala' vi), juniper (ho' tcki), pine (tuve' e and luqu), and cedar boughs (ngo-ma-pi) -- all of which are usually refered to as evergreens -- and Hopi tobacco.[21]

Juniper, cedar, fir, and pine figure prominently in costumes for dances. Small evergreen trees were displayed in the plaza during both ceremonial and social dances. These trees were and are thought to be life-giving, to have healing and regenerative

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20/ See Table 5, Appendix 3, and Map 5, Appendix 4.

21/ Some of these plants are also used as medicines, but for purposes of this discussion they will be separated.

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powers, and are associated with rain. Special trips each year from various villages were made to the collection areas described below by specially designated society or clan members -- depending on the dance to be performed -- to gather the evergreen boughs.

Hopi tobacco, which was smoked to induce rain to come, is said by Whiting to have been mixed with the "young leaves of spruce, pine, and aspen" (Whiting 1939:39-40; Stephen 1936:599). Whiting continues: "Like most other North American Indian tribes, the Hopi often mixed other herbs with their tobacco. A mixture of tobacco with the dried leaves and flowers of Onosmodium thurberi is thought to be more efficacious in bringing rain than is tobacco alone" (Whiting 1939:40).

Areas in the western and northern 1934 area from which these and other plants for religious use were gathered are as follows: the Gap; Cow Springs;[22/] Pasture Canyon; Moenave; Preston Mesa; Maria Mesa; Moenkopi Springs; Moenkopi area; Masauu; and west of the Tuba City junction, on Highway 89. Table 6, Appendix 3, presents this information.

Areas farther away from Moenkopi in which religious-use plants were gathered are: Black Mesa, the Burnt Corn area, east of Low Mountain, Grand Canyon, Shonto, south of Steamboat, the west ridge of Ganado Mesa, on Snake Flats, Hu-kyatwi, Inscription House, White Mesa, south of Wildcat Peak, Kaibito, Navajo Mountain,

22/ Just inside the 1882 Reservation boundary.

HP2406

the Hopi Buttes, Ganado, Gray Mountain, Maria Mesa, Cameron, Black Mesa, Leupp, Kayenta, and Page.

Plants of religious significance were also collected by Moenkopi Hopis inside the 1882 boundary at Kisiwu, Red Lake (north), Rocky Ridge, Pinyon, Howell Mesa, and Cliff Springs.

Locations outside the 1934 area were: the San Francisco Peaks, including the Fort Valley Road, and the present-day ski areas along the slopes of the San Francisco Peaks; Bill Williams Mountain; Payson; Kaibab Mountain; Jacob Lake; north of Kaibab; the Navajo College area; Chevelon Canyon; Heber, Arizona; the Winslow area; Oak Creek Canyon; and Deep Wells.

The Flagstaff/San Francisco Peaks area was most often mentioned as a source of plants for religious use, followed by Maria Mesa and Inscription House. Travel to these areas was by the routes outlined on Map 22, Appendix 4.

Saltbush, rabbit brush, sumac, and greasewood are all plants which had multiple uses, but took on a special religious significance when they were used as fuelwoods in the kiva (Whiting 1939:22).

An important point concerning Hopi use of the 1934 area for fuelwood concerns the sacred use of wood ash, derived from burning firewood inside the kiva. Several authors, in discussing this point, state that fuel obtained a ritualistic significance in the form of ash, and was saved (Hack 1942b:11-12; Brew 1979:517).

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Wood for Looms

The construction of the loom used by Hopi men has changed little with time. Whiting states:

> The beams are made of any convenient piece of wood. The battens are carved from oak or mountain mahogany. More especially desired for this purpose is peachwood. Combs are carved from the wood of mountain mahogany and lease rods are cut from some convenient reed patch or clump of greasewood [Whiting 1939:27-28].

While the art of weaving is presently practiced less extensively than in the past, many Hopi are still well aware of where they and others acquired the necessary materials for building and using a loom in the 1930s.23/

Ironwood was an especially useful wood for battens because of its strength. It was gathered from the Inscription Rocks area, and from as far away as the San Francisco Peaks, outside the 1934 area. Other woods, especially hardwoods, came from Shonto and Navajo Mountain. Among the important collection areas for the gathering of materials for looms were: the Flagstaff area (due to the abundance of hardwoods in the region); an area 25 miles west of Flagstaff, near Prescott; a canyon east of Inscription House; the Hopi Buttes; Greasewood Lake; and the Moenkopi Wash area.

23/ Kennard states: "Hopi men do the weaving, and the bulk of their work is in ceremonial garments of cotton and wool. Sashes, kilts, wedding robes, belts, and garters are the most commonly produced forms of the weaver's art. They also make the woolen black dress, which is part of a woman's traditional costume, and knit black or blue leggings, which are worn in dances. Some men also weave a striped woolen blanket" (Kennard 1979:561).

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This information is presented in Table 7, Appendix 3, and Map 7, Appendix 4.

Hunting Sticks

The hunting stick was made by Hopis primarily from oak or greasewood. It was widely used for rabbit hunting in the 1930s despite the availability of small game rifles by that time.

Hopis report that materials for hunting sticks were gathered from the Flagstaff area (oak and greasewood); Maria Mesa; Blue Canyon (inside 1882 boundary); Oak Creek Canyon (outside the 1934 boundary); Tepkoli (Greasewood Lake); Shonto; Navajo Mountain (oak); around Moenkopi, including Moenkopi Wash; Inscription House; and Grand Canyon (oak).24/

Bows and Arrows

Hopis have in the past used bows and arrows as weapons in hunting and for self-defense. By the 1930s, however, their use was primarily ceremonial. The materials used in the construction of the bow and arrows -- distributed, for example, to young boys at the yearly bean dances in February -- were carefully constructed from among materials gathered in limited areas, and then meticulously hand-painted.

Oak and shadblow were, in the 1930s, and continue to be, the most used materials for the bow, with Holly grape, Apache

24/ See Table 9, Appendix 3, and Map 8, Appendix 4.

HP2409

plume, shadblow, rabbit bush, greasewood, and owl's eye used for the arrow shaft.

Areas from which these materials came include: Lee's Ferry; Pasture Canyon; Maria Mesa; Moenkopi Wash; Shonto; the Gap area; Cameron; Inscription House; Yuvukpu; below Moenave; Navajo Mountain; Tuvikstala; south of Black Mountain; Chevelon Mountain; west of Leupp; Kerley Valley; Marble Canyon; Naptsewtaka; Howell Mesa;[25] Oak Creek, Sedona, Prescott Canyon, and Flagstaff areas;[26] and other areas.[27]

Fuelwoods

While Hopis were heavily dependent on fuelwood for heating, cooking, and other activities in the 1930s, the physical environment of the 1882 and 1934 lands is notable for a general lack of woodlands, and thus a scarcity of locally available fuelwood. Along the Hopi Mesas, where the major Hopi population resides, and in the Moenkopi vicinity, nearby stocks had been used up well before 1934. This created a need to haul wood from great distances, particularly for those Hopis who lived inside the 1882 Reservation, but who had to go into the 1934 area for fuelwood.

By the 1920s, Hopis in all the villages were having to solve their daily fuelwood needs by traveling farther and farther

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25/ Inside the 1882 boundary.

26/ Outside the 1934 boundary.

27/ See Table 9, Appendix 3, and Map 9, Appendix 4.

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for supplies. First they utilized wagons and teams of horses, and later, trucks, for hauling the wood. Beaglehole has described the timber and firewood problem in the following manner:

> The supply of timber and firewood close to the Hopi villages is so very scant as to be almost valueless economically; to secure wood for craft activities and for cooking, expeditions are made at frequent intervals to the Black Mesa forests a day or more distant to the north. An individual makes the expedition alone or else two friends take a wagon and supplies and gather timber together for their households. As the wood closer to the villages is being rapidly used up such expeditions have to go further to the north each year to secure adequate supplies. The principal timbers used are cottonwood, pinon, juniper, mountain oak and mountain mahogany [Beaglehole 1937:56].

Ellis concurred, stating that the lack of timber and firewood surrounding the mesas meant long journeys north to Black Mesa to procure wood, while Colton reported that Moenkopi Hopis were getting their wood from north of Tuba City (Ellis Docket 196: Ex. E 500, p. 167; Colton 1939:7).

Due to budget and personnel constraints, there was probably little understanding on the part of the staff of the various Indian agencies as to the severity of the fuelwood problem on the Reservations in the 1920s and early 1930s. It was not until 1936-37 that the Soil Conservation Service (SCS) began to consistently measure and evaluate woodlands, and to publish the quantitative results of their field studies. The SCS found that woodland areas had actually been decreasing in size since the early 1900s -- the result of increased human use. Speaking about conditions in the vicinity of Moenkopi, forester D.G. Anderson commented:

> Woodland products available in the area are only in limited quantities and are only in restricted localities. This is due to several factors. In the first place, woodland areas have been limited and the present population has, through severe over use, removed practically all available dead material and are at present removing live material [Anderson 1938:69].

An SCS survey conducted in 1936 reported only 5.1% of Land Management Unit 3 (established in 1936, and including the Moenkopi region) as woodland, thus illustrating the small amount of available fuelwood in the immediate area of Moenkopi (Monson 1936-37:5). E.R. Fryer indicated that those areas surrounding and immediately adjacent to the Hopi population centers, in what became Land Management Units 3, 5, and 6, were among the most deficient of all the units in the production of dry fuel cords (Fryer 1941:70,73).

Anderson was of the opinion that it was the "location and character of woodland stands" in Unit 3 which presented the greatest problems. He continues:

> For the most part, the stands are located on rather easily eroded soils and through misuse much of the duff and litter has been washed away, creating adverse conditions in regard to seed bed. From an ecological standpoint, the woodland stands are located on submarginal land. A shallow, spotty soil cover, a low rainfall and high water runoff present a poor ecological habitat for woodland stands . . . . Misuse through poor cutting and grazing practices, together with a low rainfall have resulted in a lack of reproduction and regeneration of woodland stands [Anderson 1938:69-70].

Not only were the daily fuel needs of the human population putting pressure on a shrinking supply of fuelwood, but erosion and livestock were preventing regeneration of new woods. Anderson's

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observations were no doubt applicable to other units in the region as well.

By 1937 the fuelwood situation had become so bad that the SCS was restricting access for wood collection in the most depleted areas, and had initiated a permit system in some areas, particularly in Unit 3. Elsewhere, in describing wood gathering practices, Anderson reports: "The present [1930s] practice is for truck drivers, especially Hopi, to go to various outlying stands to obtain fuel and posts. This has resulted in severe depletion of woodland resources and a great deal of controversy by the Navajos" (Anderson 1938:690). Thus, there is documentation that the Hopi and Navajo were coming into conflict over use rights to stands of wood by at least the mid-1930s, if not before.[28/] Both groups were well aware not only of where the best collection areas were, but of which kinds of trees and which parts of the trees were most efficient for fuelwood consumption. Proposals were made to set aside specific areas for the use of Hopis for fuelwood cutting to relieve the critical situation.[29/]

Several informants described wood-gathering trips of two or three days duration, in which uncles, aunts, brothers, and sisters traveled to and from wood-cutting regions and camped in the vicinity of the area from which wood was being gathered. Several trips

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28/ Letter from B. Wetherill to H.E. Holman, Jan. 26, 1939.

29/ Letter from Herion to Holman, April 20, 1937; leter from Holman to McGinnies, April 26, 1937; letter from Ray Walker to A.G. Hutton, May 15, 1937.

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for each family were necessary each season so that the entire extended family had a sufficient supply of wood for the winter. Most of these expeditions were informal, but occasionally they became more formally organized, particularly before important religious ceremonies such as the wuwuchim and powamu.[30]

Cyrus Tungovia, testifying in Healing v. Jones (Pl. Ex. No. 360), stated that because of the difficulty of finding wood inside District 6, he and other Hopis got their wood from, among other places, Steamboat Springs. Robert Sakiestewa, in the same case (Pl. Ex. No. 348) related how he traveled from Moenkopi to White Mesa and to Gray Mountain for firewood.

Gale Monson suggests that by 1936-37, Unit 3 was "well supplied with Indian wagon roads permit[ting] almost entire coverage by automobile" (Monson 1936:6). Inferences can be made from other reports that suitable passage for trucks into woodland areas was also available in the remainder of the districts in the 1934 area. Research on roads and trails conducted on behalf of the Hopi for this litigation confirms this conclusion for the period around 1934.[31]

In addition to the more conventional fuelwoods, Hopis used brush, and on occasion, flotsam from nearby washes to supplement

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30/ During certain religious ceremonies large amounts of wood are gathered to heat the kivas sufficiently to force the ritual sprouting of beans, requiring a greater store of fuel. Some of this wood is given to the women in exchange for food services provided during the ceremonies, thus increasing the demand for fuel even more (Beaglehole 1937:57).

31/ See Map 19, Appendix 4.

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their firewood supplies. They used crop residue, such as corn cobs, as well.

Based upon the interview data gathered for this case, there are several areas from which the Hopi obtained fuelwood before, during, and after 1934. These woodland regions are summarized below. The interview data conform quite closely with studies made by SCS personnel. The areas were: the fields around Moenkopi; the Kerley Trading Post area; Moenkopi Wash; areas north of Tuba City; Siptuyka; Willow Springs; Yuvukpu; Cedar Ridge; the Gap area; Copper Mine area; Bodaway; Page, Arizona; Preston Mesa (Hu-nap-tuka); Wildcat Peak; White Mesa; Maria Mesa; Inscription House; Shonto; Kayenta; Kaibito; Navajo Mountain; Black Mesa; Black Mountain; Gray Mountain, to the Watch Tower area of the Grand Canyon; Kaibito Plateau; Rough Rocks to Steamboat Springs; Ganado; and east of Low Mountain. See Table 10, Appendix 3, and Map 10, Appendix 4, for a summary of these locations.

Farther away, outside the 1934 area, Hopis went to: Jacob Lake; Kanab, Kaibito Plateau, and the San Francisco Peaks. Such trips necessarily took them across the 1934 area. Inside the 1882 area, Moenkopi Hopis went to Cow Springs, Rat [Gopher] Springs, Red Lake (north), Rocky Ridge, east of Maria Mesa, north of Tonalea, Blue Canyon, Star Mountain, and Bi-tso-mo (Nipple Butte).

The most frequently used areas for fuelwood gathering, according to the responses of Hopis at Moenkopi, were as follows: Wildcat Peak; Gray Mountain; the Gap area; White Mesa; Preston Mesa and Kaibito areas; and the Grand Canyon Area. Following were

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Shonto and an area north of Tuba City towards Preston Mesa, Wildcat Peak and Maria Mesa.

Wood for Construction

Construction woods for houses, corrals, and kivas must be of a larger diameter and of a greater length than fuelwood. Wood used for construction was also much scarcer in 1934, since there were few stands of large, tall trees within the 1934 boundary.

By the 1930s, with the introduction of trucks, Hopis were driving as far as Flagstaff to purchase sawcut, dimensional wood for building materials. Several Hopis reported that they had purchased lumber from a saw mill located in the vicinity of the Sacred Mountain Trading Post, between Cameron and Flagstaff, in the northern San Francisco Peaks area (Puhu' tukya' ovi).

They also continued to harvest wood with axes. Long beams or poles were used as vigas, in conjunction with sandstone and limestone, in the construction of the pueblo-style housing traditionally built by the Hopi. They were also used as livestock corral material, in the roofs of kivas, and for kiva ladders. Dimensional lumber was used in the construction of frame houses and shacks at outlying ranch and agricultural areas, and for storage sheds.

Hopis report that in the 1930s they were gathering wood for construction from as far north as Tuko' navi (Navajo Mountain); west in the Marble Canyon region; northeast along the tall stands of timber on Black Mesa; and throughout the San Francisco Peaks.

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Closer stands of timber which were exploited by the Hopi included those in the Kaibito area, at Preston Mesa, and at Wildcat Peak.

Cottonwood logs were gathered for construction use from along the Moenkopi Wash, from all along the Little Colorado River from Winslow to Cameron, and from all the way to Lee's Ferry, in the northwest part of the 1934 area.

Materials for kiva construction were gathered on the Moenkopi Plateau. Additionally, Hopi made trips into the 1882 area and to Blue Canyon to collect construction woods. See Table 11, Appendix 3, and Map 11, Appendix 4, for a presentation of this information.

Summary

The information presented above, based on primary and secondary sources, demonstrates that Hopis were making extensive use of the 1934 area for plant gathering. These plants were important to the Hopi as supplements to their subsistence, for arts and crafts, fuelwoods, construction woods, and for social and religious purposes.

As a final summary for this section, it is helpful to examine Tables 12 and 13, Appendix 3, which are rankings tables, to ascertain the degree of importance of the plants discussed and their locations.

Table 12 ranks uses of plants by the number of locations in which the Hopi stated that these gathering activities took place. Greens, for instance, were gathered from 57 separate locations,

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and art, craft and utilitarian plants were gathered from 53 different locations. Gathering for religious use took place in 46 locations, followed by the collection of fuelwood at 42 sites.

Conversely, Table 13 lists these activities by the overall number of informant responses to questions concerning the major types of gathering conducted by the Hopi in the 1930s. For example, 88 informants contributed information concerning the gathering of fuelwood, indicating that this type of gathering was a very important aspect of use in the 1934 area. Next in importance was the gathering of greens, followed by religious gathering, and then art, craft and utilitarian use.

Examined in this manner, plant gathering for greens, arts and crafts, religious use and fuelwood were the four most important types of plant gathering which took place in the 1930s.

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VI. HUNTING OF ANIMALS FOR CEREMONIAL AND ECONOMIC USE

Less has been written about the role of hunting in Hopi culture than about agriculture and religion. Nevertheless, hunting was important to the Hopi and took place throughout much of the 1934 boundary area before, during, and after 1934.

Hopis hunted a number of animals within their sustaining area to increase and supplement their basically vegetarian diet. Hunting was particularly important during times of drought and crop failure, and was accompanied by a wide array of ritual to assure success and to ensure that the animals hunted would be replenished. Hunting was also done on ceremonial occasions and as a part of male initiation (Beaglehole 1936).

As with other aspects of Hopi culture, hunting was based on a seasonal cycle, following prescribed patterns in conjunction with other tasks such as farming, wood gathering, and so on. There is disagreement in the literature concerning the economic importance of hunting to the Hopi. Kennard (1979) suggests that hunting has not played an important economic role among the Hopi since the sixteenth century, when livestock were introduced. He states: "The area is not rich in large game, although deer and antelope were reported to have grazed in the area between the Hopi Buttes and the Little Colorado River. They [deer and antelope] were formerly hunted by men in pairs, and it was regarded more as a sport than a subsistence quest" (Kennard 1979:557). D.G. Anderson, a Soil Conservation range examiner, agrees that game animals

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were not abundant in the Hopi area, given the harshness of the terrain and lack of water, but he does list deer, antelope, and mountain sheep as being present in small numbers, along with migratory birds, game birds, coyote, bobcats and foxes (Anderson 1938:31-34).

Antelope were still being hunted at least as late as the beginning of the twentieth century as far south as the Little Colorado River, but probably began to disappear from the region as increasing livestock herds depleted their natural grazing area, and perhaps as the result of overhunting in an unprotected and unregulated game area (Anderson 1938:31; Beaglehole 1936:8).

Certainly, the Hopi report that large game hunting has continued (see Table 17, Appendix 3), but not as close to the Hopi villages as was once reported by early explorers (Beaglehole 1936:3). It is impossible to state how important game was before white contact, and it is equally impossible to state with any authority whether game hunting became less important with the introduction of domesticated animals. Sufficient data to support either conclusion are lacking.

Concerning smaller animals, Stanislawski lists "rabbits, mice, rats, prairie dogs, and other rodents, as well as coyotes, turtles, small birds, lizards, and snakes" as fair game for the Hopi hunter (Stanislawski 1979:593). He states: "Animals were important both for food and for raw materials, and in 1974 was still a critical resource in times of poor harvests and for ceremonial purposes" (Stanislawski 1979:593). Table 17 of Appendix 3

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lists some of the animals Hopis still hunted in the 1930s, including rabbits, deer, coyotes (for the sale of their pelts to traders), quail, prairie dogs, squirrels, and fish, while Table 16 lists foxes and bobcats, which were trapped, and whose pelts were used for ceremonial dances. Both tables also list the locations in which the animals were hunted and the names of the Hopis who gave the information.

Another animal which Hopis collected even beyond the 1934 boundary line on the south was turtles. Beaglehole writes in "Hopi Hunting and Hunting Ritual" that turtles had not been collected "for many years" (Beaglehole 1936:22) as he was collecting information in 1935-36, but Stanislawski states: "Turtles are also collected, and their shells used in dance ceremonies as leg rattles" (Stanislawski 1979:593), suggesting that collection of turtles is still practiced to some extent. Hopi interviewees themselves did not contribute information concerning the gathering of turtles, but Ellis relates that turtles were used as rattles during ceremonial dances, and as gifts to small boys. Citing Beaglehole, she states: "The turtles are obtained from a tributary of the Little Colorado River near Winslow, now dammed to form a water supply for that city. Prayer sticks are placed on a shrine in a narrow rock crevice with prayers for rain and for success of the turtle hunt" (Beaglehole 1936:22; Ellis, Docket 196: Ex. E 500, p. 154). She further cites Fewkes as stating that Hopis gathered turtles at Homolovi, a former Hopi occupation site near Winslow (Fewkes, 1896:525; Ellis, Docket 196: Ex. E 500, p. 154).

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To understand the importance of hunting among the Hopi before, during, and after 1934, one must once again understand that culture and religion are synonymous as a way of life, and affect daily activities. Whiting reports, for example, that "the Hopi hunter always prepares pahos [i.e., prayer feathers] for the particular kind of game animal which he is going out to hunt. In the evening before the hunt he places these pahos where the animal people may come and get their prayer offerings" (Whiting 1939:6; see Beaglehole 1936). Beaglehole describes the ritual preparations for the hunt, and states that after the game had been brought home and the meat removed, the bones were cleaned and each bone marked along its length with a streak of red ochre, including the eye sockets, jaws, and nose of the skull. He continues:

> Before sunrise on the following morning, the bones sprinkled with meal were placed on a shrine Didi' ska close to the village with prayers for the increase of animals; the skull with the antlers also, if the latter were to be put to no practical use, was placed on the shrine ma kna vo' dzi bi with similar prayers" [Beaglehole 1936:8].

These elaborate preparations indicate the interest and care the Hopi took in the process of hunting, the place of ritual in hunting, and the reverence in which Hopis held land and animals.

A distinction can be made, however, between hunting carried out to supplement the food supply and hunting for religious purposes. The former category, even while serving to place meat on the family table, is still imbued with social and ritual obligations; people do not often go out to hunt rabbits by themselves, but go in large groups, and they supply prayer offerings when

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animals are taken.[40/] Hunting activities which simply supply supplemental meat may be called economic hunting to separate them from hunting conducted for religious needs, e.g., the gathering of rabbits before the Soyal ceremony or collecting fox pelts as part of the ceremonial dress for dances. Beaglehole states:

> [T]hat rabbit hunting plays a not unimportant role in Hopi life is shown by two further facts: first, special hunts are regularly held in connection with the observance of calendrical ceremonies; second, initiation of youths on the rabbit hunting field is equivalent to full hunting initiation. An example of hunts connected with particular rituals are those associated with the annual wi' widzim ceremony held in November of each year. On the day that the crier chief announces this ceremony a rabbit hunt takes place [Beaglehole 1936:14].

What may best be described as economic -- or not specifically religious -- hunting consists of planned excursions several times throughout the year to acquire meat to supplement the agricultural and wild green diet. Animals hunted in this category consist primarily of rabbits and deer. Coyotes, which are not eaten, have been trapped and hunted more recently -- probably since the beginning of the century -- for sale or trade of the skins.

Religious hunting (Na-yung-ma-ma-ke) consists of the hunting of rabbits at certain designated times, particularly during religious ceremonies such as the Soyal. The process of hunting during these periods of religious activity is not always, of

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40/ An exception to this generality is individual hunting which takes place while traveling from village to village, or while herding.

HP2423

itself, a religious activity. Rather, with the exception of the Soyal hunt, which is a ritual hunt, it is the skins of the animals that are needed for the costumes of dancers during religious ceremonies, and the meat is used to prepare meals during these dances, giving this activity a religious connotation. Rabbit skins were also made into robes and blankets, which ~~may~~ did have ~~had~~ religious use, and which were certainly used for warmth in the winter.

As with many other activities of the Hopi, both economic and religious hunting activities are usually a social, and often a community affair, in that a large number of people are involved in the hunting process, there is a sponsor for the activity, and the hunt is organized according to certain rules.41/

There are other differences in how animals are hunted, as well. For example, deer hunting has usually always been carried out during the fall season, after harvest, and before large snowfalls. At this time, newborn deer are capable of surviving without their mothers, and the size of the deer is optimal for hunting. The hard work of harvest has been completed and it is time to put aside an assortment of food, both vegetable and animal, for the coming winter. Particularly with the advent of the automobile and truck, Hopi deer hunters could go farther and more often to prime deer hunting areas to assure a greater degree of success in the hunt.

& porcupine & gopher

41/ Fox, coyote and bobcat trapping do not fit into this category, since traps are used, and the hunter simply checks and maintains his traps periodically until an animal is caught.

HP2424

Rabbits, on the other hand, may be hunted individually throughout the late spring, summer, and fall whenever a Hopi encounters an animal while travelling to or from the fields and livestock range, or while on trips to other villages. Rabbits are also hunted when they begin to damage farm crops (Beaglehole 1936:11-12). The same description applies to prairie dogs, although they are not hunted as extensively as rabbits. Often, herders who are away from the village tending their livestock use rabbits to vary and enrich their diet.

As previously stated, rabbit hunting has more often been a social, rather than an individual, event. On these occasions, including the 1930s, a sponsor would let it be known through the town crier that a hunt was to be held on a prearranged day. Kennard describes it thus:

> The place of assembly, the direction in which they are going to hunt, the place-names along the route of the hunt, and the route of return are all included in the announcement. In the morning the men assemble with their throwing sticks. They form a surround a mile to a mile and one-half in area, and those at the rear close up the circle. When a rabbit is raised the hunters throw their sticks with a side arm motion at it. When a man hits and stuns one, he runs to it and kills it [Kennard 1979:557].

Often, 30 to 50 men and young boys attended these hunts, which lasted most of the day. Some Hopi report that as many as 15 rabbits per individual were collected. Portions of the rabbit meat were distributed to maternal aunts, and the remaining rabbit meat was used for food in the immediate household.

HP2425

Interviewees from First, Second, and Third Mesas gave no evidence that rabbit hunting took place on the north or east sides of the 1934 area in the 1930s. There is evidence that Hopi hunted rabbits while grazing livestock in the Hopi Buttes. Elsewhere, the west side of the 1934 lands was used extensively for both social and religious rabbit hunting. This includes lands north, west, east and south of the village of Moenkopi.

A typical hunt would start south, above Moenkopi Wash and continue to Coal Mine Mesa, thence to Middle Mesa, return north of Tuba City, and then back to Moenkopi. Tepkoli, or Greasewood Lake, near the present site of the Rare Metals area, was a favorite place for rabbit hunting. Social hunting for rabbits also took place in the Castle Rock area and toward Moenave. On an individual basis, probably among related menfolk, rabbit hunting took place in the Bakalo area; around Cameron; at Cedar Ridge, the Gap, and Lee's Ferry; in the Grand Canyon and Gray Mountain areas; along Hamblin Wash; in Kerley Valley; throughout the Moenkopi Plateau, and as far south as Leupp. Hunting extended outside the 1934 lands into the San Francisco Peaks area, but was most extensive between Leupp on the south and Lee's Ferry on the north. (See Tables 16 and 17, Appendix 3, and Maps 16 and 17, Appendix 4.)

Deer hunting occurred among family members and with male friends. Long distances were traveled, primarily outside the 1934 lands, as far as Utah, Colorado, and into the mountainous regions of Arizona. Inside the 1934 region deer were hunted at Cedar

HP2426

Ridge, the Gap, at Gray Mountain, Shadow Mountain, and possibly Navajo Mountain and Black Mesa.

Coyotes reportedly were trapped at Maria Mesa and at Masauu. As stated above, the pelts of the coyote were traded or sold for other goods, or were used in ceremonial costumes.

Quail were taken from Kerley Valley, Moenave and Moenkopi Wash in the 1930s.

Prairie dogs were hunted in the Moenkopi area, and around Winslow, while squirrels were taken from Balatuyka and from the Moenkopi Wash.

Hopis remember fishing during the 1930s at Lee's Ferry and in Pasture Canyon inside the 1934 boundary, and at Oak Creek, outside the area.

Foxes were trapped in a large variety of locations inside the 1934 lands. These include the Bakalo, Black Mesa, and Cameron. In addition, foxes came from Coal Mine Mesa and from the Copper Mine area. Closer to Moenkopi, foxes were trapped in Kerley Valley, Masauu, and Moenave, and throughout the local Moenkopi region. White Mesa was also a trapping site for foxes in the 1930s (See Table 16, Appendix 3, and Map 16 of Appendix 4).

Beaglehole (1936) also discusses the collection of eagles as a form of animal hunting, but in this report eagle gathering is described in a separate section.

HP2427

VII. COAL GATHERING IN THE 1930s

Coal has a long and important history for the Hopi. J.O. Brew asserts that the Hopi were the only known Pueblo Indians to use coal prehistorically. "They used it for cooking, for heating, for firing pottery, and for pigments. They used the flaky, resilient ash as a bed for the flagstones on their kiva floors" (Brew 1979:517). For unknown reasons, the Hopi appear to have stopped using coal for some time after Awatovi was deserted circa 1700, but by the early 1900s, and continuing through the 1930s, coal was being mined again at Coal Mine Canyon, by Moenkopi Hopis and hauled in wagons, and later, trucks, to heat the Tuba City Indian Agency buildings and school. Many Hopis also appear to have reinstituted the use of coal as a supplemental heating source in their homes (Nagata 1970:100).

As stated in the section on fuelwoods, the Hopi hold fuel and its residue as sacred, and a separate place was set aside in the kiva for coal ash (Brew 1979:517). It is unknown whether Moenkopi-area Hopis used coal for firing pottery, as was done in prehistoric times. Please see Table 18, Appendix 3, for a list of Hopis who discussed the gathering of coal.

HP2428

VIII. OTHER CONSTRUCTION MATERIALS USED IN THE 1930s

Hopi and other Pueblo Indian groups have long been admired for their architectural abilities, including the ability to use scarce local resources to build strong, durable housing. In most instances, sandstone or limestone from nearby quarries is used for construction, along with clay for mortaring the stone.

Concerning the use of these resources in the 1934 area, the villagers of Moenkopi and Oraibi appear to be the only Hopis who made use of stone quarries in the 1934 lands for construction in the 1930s. In Reservoir Canyon, alone, Hopis apparently had access to such resources until sometime in the 1950s. Nagata states: "[t]he Hopi were denied access to the rock quarry in Reservoir Canyon during the 1950s" (Nagata 1970:101). The closure to quarrying in Reservoir Canyon by the Western Navajo Agency does not appear to have affected other quarry sites, however.

Among the sources of stone used to build housing, kivas, sheds, bread ovens, piki houses and fences were: the Cameron area near the old highway; the Muski area (a butte on southeast edge of Moenkopi where Highway 264 runs); an area west of Moenkopi village; Tuvkistala (an area southwest of the intersection of highways 160 and 264, south of Tuba City); south of Tuba City; the area where the present Mormon church is situated between Moenkopi and Tuba City; above the village on the east; above Pasture Canyon, on the east; Flagstaff; and Winslow. (See Table 19, Appendix 3.)

HP2429

XII. SUMMARY

The above sections, compiled from primary, secondary and interview sources, present a representative picture of Hopi use of the 1934 area in the year 1934. This final section briefly attempts to place the various uses into working numbers of square miles or acres, based on the various use maps contained in Appendix 4.

Unfortunately, the majority of the extant primary sources -- particulary government correspondence and reports -- yield only tidbits of information concerning Hopi use of lands in the 1934 area apart from farming or ranching, and give little or no indication of the actual acreages of many types of Hopi uses, e.g., how many square miles or acres were involved in fuelwood collection, or the locations and boundaries used by Hopis for plant gathering, etc. The same may be said of secondary sources, thus necessitating the use of the interview format to, in essence, turn back the clock to the 1934 era to determine locations and parameters of use.

By the later 1930s, government workers were measuring, categorizing, and mapping such features in the 1934 landscape as woodland and shrub areas within the somewhat arbitrary divisions which became known as land management units. Possibly due to lack of personnel, and certainly due to lack of knowledge of culture and diversity among the Indian groups with which they were working, very few statements concerning the actual size and specific locations of lands used by either Hopis or Navajos for purposes

HP2430

other than farming and livestock grazing are found in even these post-1934 government documents. In addition, these government reports miss certain uses entirely, such as Hopi farming in the Coal Mine Mesa area and ranching on Ward Terrace. Thus, there was the need, for purposes of the 1934 case, to talk to those Hopi people who were making their living off the land in the time-frame of 1934.

The areas marked on the accompanying maps in Appendix 4 are conservative approximations of the extent of each use investigated. I believe each presents a reasonable estimate of use, given the topography of the land and the maps used.

The following, then, is a brief description of the use and approximate area of use by Hopis of the 1934 lands.

Map 1: Gathering of Greens

The gathering of greens was important in the 1930s in supplementing the Hopi diet. Table 12, "Ranking of Importance of Materials Gathered by Frequency of Informant Response by Location," indicates that more respondents listed locations of this type of use of the 1934 lands than any other type of gathering, with a total of 57 different locations reported as having been used for the purpose of gathering vegetable foodstuffs.

The physical area itself is very conservatively estimated to have been 250 square miles or 160,000 acres. This is certainly an underestimation of the actual area used by Hopis for gathering

HP2431

greens. This estimate attempted to take into account the use of then-existing roads and trails, along which Hopis reported gathering greens seasonally as they traveled to and from their daily destinations. Obviously, Hopis made extensive use of areas inside the 1882 boundary, which are not reflected in this estimation. Most of the greens gathering in the 1934 area was undertaken by Moenkopi-area Hopis, but Hopis living in the other villages on the Hopi mesas gathered in the 1934 area while traveling back and forth to Moenkopi and other locations. Hopis also went outside the 1882 area specifically to collect seasonal greens which were either scarce or which could not be found inside the 1882 boundary.

Map 2: Gathering of Pinyon Nuts

Hopis reported gathering pinyon nuts in several areas, including the Steamboat Canyon region, Gray Mountain, and areas north of the mesas such as Preston Mesa, Shonto, and the Inscription Rock area. These areas encompass approximately 134 square miles, or 85,760 acres of land in the 1934 area.

Map 3: Gathering of Reeds and Grasses

Areas used for the collection of reeds and grasses, used by Hopis for arts, crafts, and for other utilitarian purposes, covers a vast region of the 1934 lands primarily on the west side, making up 521 square miles, or 333,440 acres.

HP2432

Map 4: Gathering of Cottonwood Roots

Cottonwood trees grow only in certain areas along washes or in marshy spots in the 1934 area, but they are washed out during floods, and Hopis gathered them along the various drainages to use the trunks as firewood and the roots for carving kachina dolls. The areas reported to have been used to collect cottonwood comprise 102 square miles, or 65,280 acres.

Map 5: Gathering of Medicines and Herbs

Hopis made wide use of plants for medicinal purposes and for cooking. These plants often grew only in certain types of terrain and at particular elevations, and thus were spread over a wide expanse of the 1934 lands. Estimates for this type of gathering in the 1934 area are 563 squares miles, or 360,320 acres.

Map 7: Gathering of Woods for Looms

Woods used for the manufacture of looms for weaving tend to be exotic rather than common to the region, but can be found throughout certain elevations of the '34 lands. These woods, such as ironwood and oak, were available to Hopis on approximately 255 square miles, or 163,200 acres.

Map 8: Gathering of Hunting Sticks and Pine Pitch

One might think that the making of items such as hunting sticks, bows, arrows and other such seemingly esoteric items was insignificant to the Hopis, and that even if they were still

HP2433

making such crafts in any abundance in the 1930s, little attention would have been spent regarding what materials were used in their manufacture. Not so, as the Hopis interviewed for the 1934 case attested. For example, as Table 12 indicates, 18 respondents listed 11 locations for gathering oak and greasewood for making hunting sticks in the 1934 region alone. These locations comprise, conservatively, 59 square miles or 37,760 acres in the 1934 area which were used for the collection of such woods for hunting sticks. In addition, 40 square miles or 25,600 acres provided pine pitch.

Map 9: Gathering of Bows and Arrows

Oak, shadblow, holly grape, Apache plume, rabbit bush, greasewood and owl's eye were collected at many sites in the 1934 area for making bows and arrows, covering a total of at least 127 square miles, or 81,280 acres. As Map 9 indicates, these materials were especially widely gathered throughout the Moenkopi Wash region surrounding Moenkopi.

Map 10: Gathering of Fuelwood

The section on fuelwood, above, stressed the importance to the Hopi people of availability of firewood for cooking and heating, given the scarcity of woodlands generally. Fuelwood was gathered in the 1934 region by both Moenkopi Hopis and Hopis living at the other villages throughout widely scattered areas wherever proper woods for burning were available. Conservative estimates

HP2434

of land used for purposes of fuelwood collection are 694 square miles, or 444,160 acres.

Map 11: Gathering of Construction Woods

Construction wood, different in use from firewood, was much more scarce in the 1934 area, and was found in fewer and smaller collection areas. Nevertheless, woodlands used for this purpose are estimated to have made up a minimum of 143 square miles, or 91,520 acres.

Map 14a: Cattle Grazing

The single most widespread use of the 1934 lands by Hopis was for cattle grazing. The area, described in the livestock section above, comprised a minimum of 1647 square miles, or 1,054,080 acres in 1934. An additional 116 square miles, or 74,240 acres, had recently been used by Hopis for grazing, but at least some portions of this area may not have been used in the 1930s.

Map 14b: Sheep Grazing

Hopi sheep grazed on less acreage than cattle in the 1930s, due to differences in grazing techniques. By 1934, sheep were grazed mainly in the area surrounding Moenkopi village, on approximately 213 square miles, or 136,320 acres. An additional 160 square miles (marked in yellow on the map) were used for sheep grazing at an unknown time period, making up 102,400 acres.

HP2435

Some overlap occurred between cattle and sheep grazing with seasonal movements of livestock onto the same range. This took place in the immediate area surrounding Moenkopi, on about 199 square miles, or 127,360 acres of known range, and an additional 99 square miles, or 63,360 acres (marked in yellow) of range used for sheep herding at an unknown time period.

Map 16: Hunting: Ceremonial

Ceremonial hunting, as opposed to subsistence hunting, was done over a minimum of 219 square miles, or 140,160 acres of land in the 1934 area, and seems to have been primarily in the vicinity of Moenkopi, with some areas north, northeast, west, and southwest of Moenkopi.

Map 17: Hunting: Economic

Hunting for purposes of supplementing the basic vegetarian diet of Hopis during the 1930s was an important aspect of land use, as the following figures indicate. Rabbits were by far the most frequently and widely hunted game. Hopis related in interviews that they hunted over an expanse of land amounting to at least 2,345 square miles, or 1,500,800 acres.

As mentioned above in other sections, the 1934 area is sparce and arid, but nevertheless supported deer populations in some wooded spots. Land used for deer hunting in the 1930s in the 1934 area (marked in blue on map 17) took up 50 square miles, or 32,000 acres.

HP2436

Other types of game, including quail, prairie dogs, and squirrels, were all hunted in the immediate Moenkopi area. This area is part of the rabbit hunting area described above, but broken down into individual totals they are as follows: prairie dogs -- 4 square miles, or 2560 acres; squirrels -- 41 square miles, or 26,240 acres; and quail -- 7 square miles, or 4480 acres.

Maps 20a, b, c: Eagle Gathering and Other Religious Use

Map 20a, supplied by the Hopi Tribe, indicates approximately 1779 square miles, or 1,138,560 acres used for eagle gathering in the 1934 area. This compares quite closely with Map 20c, prepared by the author and based on some, but not all, of the evidence upon which map 20a is based. Map 20c, which is not exhaustive, still shows 1353 square miles, or 865,920 acres. Religious use, presented on Map 20b, indicates usage of 796 square miles, or 509,440 acres of land in the 1934 area.

Data used to compile Map 20b, derived from the interview form upon which this report is based, may reflect some eagle gathering material, i.e., persons interviewed may have listed eagle gathering as religious use, rather than separating the two related categories, so that the religious use table and map may, at least partially, reflect eagle gathering information. A comparison of the three maps, 20a-c, shows that the areas of land all correspond quite closely, with a good deal of overlap, but are broken into the three maps for purposes of presentation.

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Map 21: Gathering of Minerals: Sand, Clay, and Dyes

Lands used for gathering minerals, sand, clay, dyes, and so on, are presented in Map 21. A total of at least 168 square miles, or 107,520 acres was used by Hopis for these purposes.

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