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FROM THE

UNITED STATES NATIONAL HERBARIUM

VOLUME 19

FLORA OF NEW MEXICO

By E. O. WOOTON and PAUL C. STANDLEY

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PREFACE.

The present volume of the Contributions is devoted to a flora of New Mexico, by Mr. E. O. Wooton, of the United States Department of Agriculture, and Mr. Paul C. Standley, assistant curator, United States National Herbarium. Mr. Wooton was connected with the New Mexico College of Agriculture for twenty years, during which time he made extensive botanical collections in nearly all the counties of the State. Mr. Standley spent three years in botanical work at the same institution and has since revisited the State for the purpose of further studying its flora. This volume, therefore, is based very largely upon the collections made by the two authors, although all other available collections from New Mexico have been studied.

Only the flowering plants and vascular cryptogams of New Mexico are contained in the present work. Keys are given for the determination of the species as well as of the larger groups, so that the volume may be used as a field manual. At the same time the citations will enable those who have access to libraries to consult readily the original descriptions of the species.

The number of species treated is approximately 3,000. Notwithstanding the large amount of field work already accomplished, many remote districts in New Mexico are still imperfectly known botanically, so that eventually this number will doubtless be increased by several hundred species. The treatise in its present form, however, will be found to contain most of the plants growing spontaneously in those parts of the State thus far settled or frequently visited.

This is the fourth volume of the Contributions to be devoted to a State flora, the others being the Botany of Western Texas (volume 2), the Plant Life of Alabama (volume 6), and the Flora of Washington (volume 11).

FREDERICK V. COVILLE,
Curator of the United States National Herbarium.

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FLORA OF NEW MEXICO.

By E. O. WOOTON and PAUL C. STANDLEY.

INTRODUCTION.

This flora of New Mexico is a list of all the species of phanerogams and vascular cryptogams at present known to occur within the State, with keys to the families, genera, and species. Although we have examined all the herbarium material easily accessible and have endeavored to verify all published data, we know that the list is far from complete. Even in the most carefully explored areas of the eastern United States, species which have been overlooked are still coming to light and more careful study of more copious material is increasing the number of recognized species. Much more are additional species to be looked for within the 122,000 square miles embraced in the area of New Mexico, many large portions of which have never been visited by any botanist, while even the most familiar regions have not been thoroughly examined. Thus it is certain that as collectors extend their fields of exploration our present list of 2,975 species will be increased to far above 3,000. It is along the borders of the State that the greater number of additions will be found, especially in the southeastern and southwestern corners and in the high mountains along the Colorado line, but isolated mountain ranges in the interior probably hide endemic species still unknown.

Various short accounts of New Mexico and Arizona plants were published by the earlier botanists of the United States.¹ These, however, are too incomplete and disconnected to be of much use for identification purposes. Two or three more general works are available for use in New Mexico, but none is complete for any part of the State. The Botany of Western Texas, by Dr. J. M. Coulter,² contains descriptions of a majority of the plants of southeastern New Mexico, but the volume is not provided with keys to the species and the nomen-

¹ See, Paul C. Standley. A bibliography of New Mexican botany. *Contr. U. S. Nat. Herb.* 13: 229-246. 1910.

² *Contr. U. S. Nat. Herb.* 2. 1891-94.

clature is now antiquated. Dr. P. A. Rydberg's *Flora of Colorado*¹ is very satisfactory for use in the extreme northern part of the State. Even here, however, many plants will be found which have not been reported from Colorado and hence are not contained in that work, many of our Southwestern species seeming to reach the northern limit of their range just below the Colorado line. The new edition of Coulter's *Rocky Mountain Flora*, as revised by Prof. Aven Nelson, can be used in a limited way in northern New Mexico, but it will be found to describe only a fraction of our plants.

The material upon which this flora is based is chiefly that in the United States National Herbarium, in the herbarium of the New Mexico College of Agriculture and Mechanic Arts at Mesilla Park, and in the private herbarium of E. O. Wooton, lately acquired by the National Herbarium. In the National Herbarium are found sets of nearly all the larger New Mexican collections, both early and recent, such as those of Fendler, Bigelow, Wright, the first Mexican Boundary Survey, Heller, Wooton, Earle, Metcalfe, and Standley. These include duplicate types of most species that have been described from the State. Of particular value are the large collections made by Dr. E. A. Mearns in connection with the Mexican Boundary Survey of 1892 and 1893, and by members of the Biological Survey of the United States Department of Agriculture in connection with their studies of the fauna of New Mexico. There are also several smaller collections in the same herbarium of which no duplicates exist.

The herbarium of the Agricultural College contains probably the largest assemblage of New Mexican plants that has hitherto been gathered. Here are found not only sets of the more recent generally distributed collections, but several thousand plants collected by the present writers of which few duplicates were obtained. Local collectors in different parts of the State have forwarded collections from time to time, some of which are of great interest.

The Wooton herbarium contains duplicates of many of Mr. Wooton's collections deposited in the herbarium of the Agricultural College, besides many specimens not to be found elsewhere. It also includes sets of the plants collected by Dr. C. L. Herrick and Miss A. I. Mulford.

The New Mexican ranges given for the listed species are based upon the specimens in these herbaria. We have also examined New Mexican material of certain groups in the herbarium of the New York Botanical Garden, besides collections lent by Prof. T. D. A. Cockerell, now of Boulder, Colorado, and Miss Charlotte C. Ellis, formerly of Placitas, New Mexico.

The work of preparing the manuscript of the flora was carried on chiefly at the National Herbarium during the years 1910, 1911, and

¹ Colo. Agr. Exp. Sta. Bull. 100. 1906.

1912, although some preliminary work had been done previously at the New Mexico Agricultural College. Descriptions of most of the new species discovered in the course of the work have been published in a recent part of the Contributions from the United States National Herbarium.¹ Accounts of the Cactaceae and of the grasses and grass-like plants have appeared as bulletins of the New Mexico Agricultural Experiment Station.²

It is our intention to publish in the near future, in the Contributions from the United States National Herbarium, an account of the phytogeography of the State. This will include a discussion of the life zones and of the factors which influence them. There will also be a history of botanical exploration in New Mexico, and a discussion of other matters of botanical interest.

Under each species in the present volume we have cited the place of publication, to facilitate reference to the original description. No attempt has been made to give complete synonymy, the intention being rather to enter only names having some more or less direct bearing upon New Mexican botany. In citing data regarding habitat and zonal distribution, only conditions inside the State have been considered. In other States some of the plants often occur in habitats different from those we have indicated, although in all probability zonal distribution is practically constant for the same plant in whatever region it may grow.³ The generic diagnoses have been drawn with only the New Mexican species in mind.

In the preparation of the flora we have received the assistance of many persons, of whose aid we wish to express our appreciation. We are especially indebted to the following for help in various ways: Dr. E. L. Greene, Dr. N. L. Britton, Dr. P. A. Rydberg, Dr. B. L. Robinson, Prof. M. L. Fernald, Dr. J. H. Barnhart, Dr. Ezra Brainerd, Mr. George V. Nash, Dr. J. K. Small, Mr. K. K. Mackenzie, Prof. T. D. A. Cockerell, Mr. Vernon Bailey, Mr. E. A. Goldman, and Mr. C. R. Ball, as well as several of our botanical associates in Washington. Many residents of New Mexico have assisted by collecting specimens and furnishing data concerning the distribution and uses of plants. Our sincerest thanks are extended to numerous citizens of the State who have always afforded all the assistance in their power to collecting expeditions, which would have been impossible or unfruitful without their labors so freely expended in our behalf.

¹ Contr. U. S. Nat. Herb. 16: 109-196. 1913.

² Cacti in New Mexico. By E. O. Wooton. Bull. 78. 1911. The grasses and grass-like plants of New Mexico. By E. O. Wooton and Paul C. Standley. Bull. 81. 1912.

³ For an account of life zones in New Mexico see, Bailey, Vernon. Life zones and crop zones of New Mexico. North American Fauna (U. S. Dept. Agr. Bur. Biol. Surv.) 85. 1913.

SYSTEMATIC TREATMENT OF THE VASCULAR PLANTS.

SYNOPSIS OF THE LARGER GROUPS, WITH KEYS.

Subkingdom PTERIDOPHYTA.

Plants without flowers or seeds, producing spores, each of which, on germination, develops into a flat or irregular prothallium. The prothallia bear the reproductive organs (antheridia and archegonia). As a result of the fertilization of an egg in the archegonium by a sperm produced in the antheridia a fern or an allied plant is developed.

KEY TO THE ORDERS.

- Leaves broad, entire or dissected; ferns or fernlike plants.
 Spores of 1 kind, borne in sporangia; plants not aquatic...1. **FILICALES** (p. 18).
 Spores of 2 kinds, borne in sporocarps; aquatics.....2. **SALVINIALES** (p. 27).
 Leaves narrow, scalelike or awllike; mosslike or rushlike plants.
 Sporangia in a terminal cone; stems hollow.....3. **EQUISETALES** (p. 28).
 Sporangia in the axils of small or leaflike bracts; stems solid.
 4. **LYCOPODIALES** (p. 29).

Subkingdom SPERMATOPHYTA.

Plants with flowers which produce seeds. Microspores (pollen grains) borne in the microsporangia (anther sacs) develop each into a tubular prothallium; a macrospore (embryo sac) develops a minute prothallium and, together with the macrosporangium (ovule) in which it is contained, ripens into a seed.

KEY TO THE CLASSES.

- Ovules and seeds borne on the face of a bract or scale; stigmas wanting.
 1. **GYMNOSPERMAE** (p. 30).
 Ovules and seeds borne in a closed cavity; stigmas present.
 2. **ANGIOSPERMAE** (p. 39).

Class 1. GYMNASPERMAE.

KEY TO THE ORDERS.

- Staminate and pistillate flowers both in aments; perianth none; trees or shrubs with needle-like or scalelike leaves5. **PINALES** (p. 30).
 Staminate flowers in aments; pistillate flowers single or in pairs; perianth present; shrubs with jointed stems, the leaves reduced to sheathing scales.
 6. **GNETALES** (p. 38).

Class 2. ANGIOSPERMAE.

KEY TO THE SUBCLASSES.

- Cotyledon 1; stems endogenous; leaves parallel-veined.
 1. **MONOCOTYLEDONES** (p. 39).
 Cotyledons normally 2; stems exogenous; leaves not parallel-veined, or rarely apparently so.....2. **DICOTYLEDONES** (p. 154).

Subclass 1. MONOCOTYLEDONES.

KEY TO THE ORDERS.

- Perianth when present rudimentary or degenerate, often composed of bristles or mere scales, not corolla-like, sometimes wanting.
 Flowers in the axils of dry or chaffy, usually imbricated, bracts (scales or glumes).
 10. **POALES** (p. 42).
 Flowers not in the axils of dry or chaffy bracts.
 Perianth of bristles or chaffy scales.....7. **PANDANALES** (p. 39).
 Perianth fleshy or herbaceous, or wanting.
 Fruit baccate; endosperm present; plants 1 cm. broad or less, consisting merely of a flat thallus with 1 or more roots, floating.
 11. **ABAALES** (p. 124).
 Fruit drupaceous; endosperm wanting; aquatics with well-developed stems.....8. **NAIADALES** (p. 39).
 Perianth of 2 distinct series, the inner usually corolla-like.
 Gynoecium of distinct carpels.....9. **ALISMALES** (p. 41).
 Gynoecium of united carpels.
 Endosperm mealy.....12. **XYRIDALES** (p. 125).
 Endosperm fleshy, horny, or cartilaginous.
 Ovary and fruit superior.....13. **LILIALES** (p. 127).
 Ovary and fruit wholly or half inferior.
 Endosperm present; flowers regular..14. **AMARYLLIDALES** (p. 145).
 Endosperm wanting; flowers irregular..15. **ORCHIDALES** (p. 148).

Subclass 2. DICOTYLEDONES.

KEY TO THE ORDERS.

- Corolla wanting.
 Calyx wanting.
 Herbs.
 Flowers monœcious or diœcious.....30. **EUPHORBIALES** (p. 392).
 Flowers mainly perfect.
 Flowers spicate; styles wanting.....16. **PIPERALES** (p. 154).
 Flowers axillary; styles present.
 (Callitrichaceae) 30. **EUPHORBIALES** (p. 392).
 Trees or shrubs.
 Fruit many-seeded; seeds each with a tuft of hairs.
 17. **SALICALES** (p. 154).
 Fruit 1-seeded; seeds without tufts of hairs42. **OLEALES** (p. 495).
 Calyx present, at least in the staminate or in the perfect flowers.
 Flowers, at least the staminate, in aments or ament-like spikes; fruit a nut or achene; trees or shrubs.
 Leaves simple; ovule pendulous and anatropous..19. **FAGALES** (p. 163).
 Leaves pinnate; ovule erect and orthotropous.
 18. **JUGLANDALES** (p. 161).
 Flowers, at least the staminate, not in aments; fruit various; herbs, trees, or shrubs.
 Ovary inferior.
 Flowers, at least the staminate, in involucre heads.
 (Ambrosiaceae) 50. **ASTERALES** (p. 618).