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A SECTION OF UPPER SONORAN FLORA IN NORTHERN OREGON.

MORTON E. PECK.

From July 4 to July 16, 1915, the writer was stationed at Umatilla, Oregon, as special field agent of the United States Biological Survey. A part of the work assigned was the gathering of data in regard to the general character of the vegetation and the listing of the species identified. Most of the facts here given were embodied in a somewhat briefer form in the official report.

Umatilla is a small town on the south bank of the Columbia river, in Umatilla county, 110 miles from the eastern boundary of the state, and 205 miles from the Pacific coast. The elevation above sea level is less than 200 feet, and is therefore quite negligible as a climatic factor, while the Cascade mountains to the westward cut off most of the moisture from the Pacific. These conditions render the climate extremely dry and hot during the summer; moreover in June, July and August strong hot winds blow almost daily up the Columbia, greatly intensifying the general aridity. The annual precipitation is about 8.70 inches. Except along the streams, the vegetation, as might be expected, consists of only such plants as can endure rather severe xerophytic conditions.

The Umatilla river, a considerable stream, empties into the Columbia near the town. Much of the water is now being taken out by an extensive government irrigation project. Besides the Columbia and Umatilla rivers, there is very little water in the section studied except several small ponds to be mentioned presently.

Along the immediate shore of the Columbia there are in places small muddy pools and bayous, but for the most part the ground a few yards back from the margin is quite dry. There is also a little damp land along the Umatilla, which occasionally expands into small swampy strips. In many places along the banks of the latter stream there is abundant seepage.

For a distance of one-fourth to more than one-half of a mile back from the Columbia, the ground rises only from four or five to fifteen or twenty feet above the water. The soil is here loose and shifting, largely of water and wind formation. Beyond this strip of lowland the country rises rather abruptly two hundred or three hundred feet higher. This is about the mean elevation of the territory as far to the southward as our observations extended. There are higher points here and there and numerous depressions, but on the whole the country is not particularly rough.

Two or three miles southeast of the town is the end of a long lava ridge, extending for some miles to the southwestward. In many places it appears double, as if it had been upheaved and split. It rises from one hundred to two hundred feet above the general level of the country. On the eastern side of this ridge is a depression containing a chain of apparently perennial pools or ponds, none covering an area of more than an acre at the date of our visit. They are fed by small springs, and are all rather strongly alkaline.

On the west side of the Umatilla there is a considerable strip of land of about the same elevation as that lying along the Columbia. This has mostly a gradual rise to the westward.

On the whole, the area covered by these observations presents no great variety of soil conditions aside from water supply. The low strip along the Columbia and Umatilla rivers is very sandy, much of the sand being loose and shifting. It has doubtless been brought up largely from the sandy margin of the Columbia by the strong winds that blow almost constantly up stream. These winds sweep with great force across the angle formed by the confluence of the two streams on the west side of the Umatilla, and here there are many low shifting dunes. Along the lava ridge the ground is, of course, strewn with fragments of this material; otherwise throughout most of the elevated area the soil is made up mainly of water-worn gravel, fine sand, and volcanic dust. In some places the vegetation indicates the presence of a certain amount of alkali, but this is not abundant except in the above mentioned depression where the ponds are located.

Aside from water supply, probably the most important factor in determining the character of the vegetation in any of the

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areas we have described is the exposure to winds. Nearly all the taller plants in the less protected situations are bent very perceptibly to the eastward, the prevailing winds being from the west; this is notably true of trees and shrubs that have been planted in the town.

We will now consider briefly the various associations of plants that are found in these several situations. These forms that occur very sparingly in any locality, or are much more characteristic of one of the other associations are omitted from the list for that locality.

The species occurring along the immediate margin of the Columbia, or at least within the direct influence of the copious water supply are as follows:

Marsilia vestita	Veronica peregrina
Juncus bufonius	Verbena hastata
Salix amygdaloides	Iva axillaris
Salix exigua	Euthamia occidentalis
Polygonum emersum	Coreopsis atkinsoniana
Roripa columbiæ	Gaillardia aristata
Roripa curvisiliqua	Helenium autumnale grandiflorum
Roripa obtusa	Artemisia dracunculoides

The Marsilia is extremely abundant. The willows form low thickets in places, which are nowhere very extensive. *Roripa columbiæ* is a peculiar species, of very limited distribution, apparently mainly confined to the banks of the Columbia in eastern Washington and Oregon; it is not common here. The Coreopsis, Gaillardia, Helenium, and Artemisia are especially plentiful. Several introduced plants, especially the Russian thistle and *Atriplex hastata* are common here, but are more characteristic of the next higher association. This list is a very short one, in spite of the abundance of moisture. This is due largely to the fact that the land here is nearly all below high water mark, and the late floods prevent many species from securing a foothold.

Between the moist margin of the river and the more elevated country, lies the low sandy tract above mentioned. The soil here is dry but not excessively so, and supports a fairly distinct association of plants, though several of the species are equally characteristic of the higher section. Here we find:

<i>Oryzopsis hymenoides</i>	<i>Elymus condensatus</i>
<i>Sporobolus cryptandrus</i>	<i>Juncus balticus</i>
<i>Salsola kali</i> tragus	<i>Grindella nana</i>
<i>Atriplex hastata</i>	<i>Chrysothamnus viscidiflorus</i>
<i>Lepidium medium</i>	<i>Artemisia canadensis</i>
<i>Gaura parviflora</i>	<i>Artemisia ludoviciana</i>
<i>Anogra pallida</i>	<i>Artemisia tridentata</i>
<i>Verbena bracteosa</i>	

The *Oryzopsis* is remarkably abundant. The Russian thistle here attains its maximum size. The *Chrysothamnus* is extremely abundant and is quite generally distributed, while the sagebrush, though covering a more limited area, grows in places very rank. That such species as *Juncus balticus* and *Gaura parviflora* should appear in the same association as sagebrush seems a little strange. The anomaly is perhaps owing to the combination of sandy soil, hot, dry winds, and close proximity to the river. The plants of this section suffer more, it would seem, from the direct effects of the wind, than any others of the region. Species with delicate foliage cannot survive here, and low forms are likely to be buried by the drifting sand.

The vegetation of the slope leading up to the higher land is scant and mostly short, this being also much exposed to the wind. Sagebrush is here almost wanting; there is an abundance of very dwarf *Chrysothamnus viscidiflorus*, *Achillea millefolium lanulosa*, *Amsinckia intermedia*, and *Bromus tectorum*, while large areas are whitened over with *Plantago purshii*. Where there is an abundance of fine loose sand piled into low dunes by the wind, there may be found here and there large patches of *Cleome lutea* and *Psoralea lanceolata scabra*, and a scattered growth of a peculiar dune grass, *Elymus flavescens*.

The elevated section, by far the most extensive in area, did not yield a very long list of species. While the total of individual plants is sufficiently large, nearly all of them are so dwarfed as to form but a scant mantle of vegetation. Over tracts many acres in extent one may scarcely find a plant of any sort rising to a height of more than two feet. Another peculiarity of the species of this region is their "mosaic" mode of growth. One will come abruptly upon a certain form distributed in immense abundance over a considerable area of land, but when this is crossed, the species leaves off as abruptly, and perhaps another takes its place in equal profusion. Usually no particular reason for this phenomenon can be assigned. At the time of our visit the spring vegetation of ephemeral an-

At the time of our visit the spring vegetation of ephemeral annuals and weak perennials had disappeared. This, however, must have been very scant, or it would have left more traces. I was told by residents that early spring flowers were here almost wanting. The following belong in this association:

<i>Festuca octoflora</i>	<i>Lupinus ornatus</i>
<i>Bromus tectorum</i>	<i>Erodium cicutarium</i>
<i>Agropyron subvillosum</i>	<i>Linum lewisii</i>
<i>Sitanion</i> sp.	<i>Euphorbia glyptosperma</i>
<i>Comandra pallida</i>	<i>Piscaria setigera</i>
<i>Rumex venosus</i>	<i>Sphaeralcea munroana</i>
<i>Polygonum majus</i>	<i>Mentzella laevicaulis</i>
<i>Eriogonum niveum</i>	<i>Mentzella albicaulis</i>
<i>Eriogonum baileyi</i>	<i>Opuntia polyacantha</i>
<i>Salsola kali</i>	<i>Epilobium paniculatum</i>
<i>Abronia mellifera</i>	<i>Pteryxia terebenthina</i>
<i>Sisymbrium altissimum</i>	<i>Gilia inconspicua</i>
<i>Kunzia tridentata</i>	<i>Coldenia nuttallii</i>
<i>Piptocalyx circumscissus</i>	<i>Chrysothamnus viscidiflorus</i>
<i>Solanum triflorum</i>	<i>Chrysothamnus nauseosus</i>
<i>Nicotiana attenuata</i>	<i>Erigeron hispidissimus</i>
<i>Plantago purshii</i>	<i>Balsamorhiza sagittata</i>
<i>Ptiloria paniculata</i>	<i>Achillea millefolium lanulosa</i>
<i>Gaertneria acanthicarpa</i>	<i>Artemisia tridentata</i>

This list is remarkable not only for its brevity, but also for the scant representation or total absence of a number of great genera that dominate most of the other arid sections of eastern Oregon. Among these may be mentioned *Eriogonum*, *Arabis*, *Astragalus*, *Cogswellia*, *Gilia*, and *Erigeron*.

The only association that remains to be considered is that of the damp ground along the Umatilla river. We might at first thought expect to find here the same species that occur along the Columbia, but in fact we meet with not only very different forms, but a far greater variety. These are mostly Transition species which, while having plenty of moisture, are protected by their situation from the floods and winds to which those growing along the Columbia are exposed. The margins of the Umatilla, then, may be looked upon as forming a very narrow strip of Transition territory extending down to the lowest level of the Upper Sonoran that is to be found anywhere in the state. Many of the species are poorly represented, as might be expected from the smallness of the area. Even with these omitted, however, the

list is very long in proportion to those of other associations. It is as follows:

<i>Typha latifolia</i>	<i>Solanum dulcamare</i>
<i>Potamogeton lonchitis</i>	<i>Solanum nigrum</i>
<i>Potamogeton pusillus</i>	<i>Urtica holosericeus</i>
<i>Allisma plantago-aquatica</i>	<i>Rumex mexicana</i>
<i>Paspallium distichum</i>	<i>Rumex crispus</i>
<i>Panicum crus-galli</i>	<i>Polygonum aviculare</i>
<i>Phleum pratense</i>	<i>Chenopodium botrys</i>
<i>Polygogon monspeliensis</i>	<i>Alsine media</i>
<i>Sporobolus asperifolius</i>	<i>Clematis ligusticifolia</i>
<i>Agrostis alba</i>	<i>Ranunculus sceleratus</i>
<i>Agrostis exarata</i>	<i>Ranunculus cymbalaria</i>
<i>Deschampsia calycina</i>	<i>Ribes aureum</i>
<i>Deschampsia elongata</i>	<i>Roripa nasturtium</i>
<i>Poa annua</i>	<i>Rosa pisocarpa</i>
<i>Poa pratensis</i>	<i>Potentilla rivalis</i>
<i>Poa compressa</i>	<i>Cratægus brevispina</i>
<i>Distichlis spicata</i>	<i>Thermopsis montana</i>
<i>Hordeum murinum</i>	<i>Mellilotus albus</i>
<i>Hordeum jubatum</i>	<i>Trifolium pratense</i>
<i>Elymus condensatus</i>	<i>Trifolium repens</i>
<i>Cyperus inflexus</i>	<i>Trifolium hybridum</i>
<i>Scirpus americanus</i>	<i>Trifolium sp.</i>
<i>Eleocharis palustris</i>	<i>Medicago lupulina</i>
<i>Eleocharis acicularis</i>	<i>Hosakia americana</i>
<i>Carex prægracilis</i>	<i>Rhus glabra occidentalis</i>
<i>Carex athrostachya</i>	<i>Rhus toxicodendron</i>
<i>Lemna minor</i>	<i>Malva rotundifolia</i>
<i>Juncus balticus</i>	<i>Hypericum scouleri</i>
<i>Juncus bufonius</i>	<i>Epilobium adenocaulon</i>
<i>Juncus tenuis</i>	<i>Berula erecta</i>
<i>Vagnera stellata</i>	<i>Centaurion exaltatum</i>
<i>Salix sp.</i>	<i>Lycopus lucidus</i>
<i>Populus trichocarpa</i>	<i>Plantago major</i>
<i>Alnus rhombifolia</i>	<i>Gallium aperiæ</i>
<i>Mentha canadensis</i>	<i>Symphoricarpos racemosus</i>
<i>Verbascum thapsus</i>	<i>Agoseris heterophylla</i>
<i>Pentstemon richardsonii</i>	<i>Taraxacum taraxacum</i>
<i>Veronica peregrina</i>	<i>Iva axillaris</i>
<i>Veronica americana</i>	<i>Xanthium speciosum</i>
<i>Mimulus pilosus</i>	<i>Solidago serotina</i>
<i>Mimulus langsdorffii</i>	<i>Euthamia occidentalis</i>
<i>Mimulus floribundus</i>	<i>Bidens cernua</i>
<i>Verbena hastata</i>	<i>Gnaphallium palustre</i>

The irrigation of a considerable tract has brought about the establishment of a number of introduced species, which are mainly confined to cultivated ground and irrigation ditches.

In concluding this brief account of the distribution of the flora in the neighborhood of Umatilla, it may be said that there are few other sections of moderate elevation in the state where the vegetation is so poor in species and so scant in quantity, and that this poverty doubtless is due to the low annual precipitation, high summer temperature, strong winds, and loose, light character of the soil. Omitting the vegetation of the river banks and cultivated ground, the flora is pronouncedly Upper Sonoran. Perhaps no better example of the zone is to be found in Oregon.

The following is a complete list of the species identified, with brief notes as to abundance, distribution, etc.

Typha latifolia L. Plentiful along the Umatilla.

Potamogeton lonchites Tuck. Rather common in the Umatilla and in irrigating ditches.

Potamogeton pusillus L. Extremely abundant in the Umatilla and in irrigating ditches. In the latter it grows in such quantities as to completely choke them up, and must frequently be cleaned out.

Alisma plantago-aquatica L. Common in mud along the Umatilla.

Paspalum distichum L. Plentiful in places on the banks of the Umatilla where there is abundant seepage.

Panicum crus-galli L. Common in damp, especially cultivated ground.

Panicum barbipulvinatum Nash. Very common along irrigating ditches.

Oryzopsis hymenoides (R. and S.) Rick. This remarkable grass is one of the most abundant of the family in this locality. It grows in large, dense tufts that apparently persist for many years. It is most plentifully distributed on the dry sandy strip bordering the immediate banks of the Columbia, but is also scattered over the high arid section.

Phleum pratense L. Frequent in moist ground.

Polypogon monspeliensis (L.) Desf. Very abundant in wet places along the Umatilla.

Sporobolus depauperatus (Torr.) Scrib. Common on gravelly bars along the Columbia. A very depressed and dwarf

- Sporobolus cryptandrus* (Torr.) Gray. Common in dry sandy places near the Columbia and Umatilla.
- Sporobolus asperifolius* (Nees and Mey.) Thurb. Found in abundance in a moist, slightly alkaline depression along the Umatilla.
- Agrostis alba* L. Common along the Umatilla and in irrigated ground.
- Agrostis exarata* Trin. Occasional on the margin of the Umatilla.
- Deschampsia calycina* Presl. Abundant along the Umatilla.
- Deschampsia elongata* (Hock.) Munro. Frequent along the Umatilla.
- Eragrostis hypnoides* (Gam.) B. S. P. Infrequent along the Umatilla.
- Poa annua* L. Common in damp places.
- Poa compressa* L. Common; with the preceding.
- Poa campestris* L. Common, with the preceding.
- Distichlis spicata* (L.) Greene. Found plentifully in several moist, more or less alkaline places.
- Festuca octoflora* Walt. This is one of the very abundant species over the dry elevated sections. It is very short lived and dwarfed.
- Festuca megalura* Nutt. Found sparingly in sandy ground near the Columbia.
- Festuca elatior* L. Found occasionally near the Umatilla and along irrigating ditches.
- Bromus* sp. An apparently native perennial in damp ground; scarce.
- Bromus tectorum* L. The most plentiful grass, distributed in enormous abundance over almost the entire area studied, without regard to soil or moisture conditions.
- Agropyron smithii mollis* (Scrib. and Sm.) Jones. In dry ground; scarce.
- Agropyron subvillosum* (Hook.) Piper. In dry ground; infrequent.

- Hordeum murinum* L. Frequent on moist banks of the Umatilla.
- Hordeum jubatum* L. Frequent along the Umatilla.
- Hordeum nodosum* L. Scarce, in moist ground near the Umatilla.
- Elymus condensatus* Presl. Frequent in small patches in moist places along the Umatilla, but seldom covering more than a very limited area.
- Elymus* sp., possibly *arenarius*. Infrequent, in loose sand.
- Elymus flavescens* Scribn. and Sm. A curious grass, the downy yellow spikes very conspicuous; growing rather scantily on drifting sand.
- Sitanion* sp. Frequent in very dry ground. A form remarkable for its dense, soft pubescence.
- Cyperus inflexus* Muhl. Common in wet places along the Umatilla.
- Cyperus esculentus* L. In moist ground; scarce.
- Scirpus occidentalis* (Wats.) Chase. Scarce, along the Umatilla.
- Scirpus americanus* Pers. Very abundant on wet margins of the Umatilla.
- Hemicarpha micrantha* (Vahl.) Britt. One specimen, in wet ground along the Umatilla.
- Eleocharis palustris* (L.) R. and S. Very abundant along the margins of the Umatilla.
- Eleocharis obtusa* Schult. One specimen, near the Umatilla.
- Eleocharis acicularis* (G.) R. and S. Common along the Umatilla.
- Carex douglasii* Boott. A few plants in slightly moist ground near the Columbia.
- Carex praegracilis* Boott. Found plentifully in one place among cat tails along the Umatilla.
- Carex athrostachya* Oln. Frequent along the Umatilla.
- Lemna minor* L. Very common along the Umatilla.
- Juncus balticus* Willd. Plentiful in slightly moist ground along the Columbia and less so near the Umatilla.

- Juncus bufonius* L. Abundant in damp ground.
- Juncus tenuis* Willd. Common in damp ground.
- Juncus torreyi* Cov. Scarce, along the Umatilla.
- Juncus oxymeris* Eng. Scarce, near the Umatilla.
- Vagnera stellata* (L.) Morong. Plentiful in one place in a damp thicket on the bank of the Umatilla.
- Asparagus officinalis* L. Sparingly escaped along the Umatilla.
- Salix amygdaloides* Anders. Abundant in places along the Columbia, reaching a height of ten to twelve feet and forming close thickets. It also occurs plentifully along the Umatilla, becoming much larger.
- Salix exigua* Nutt. Frequent with the preceding along the Columbia.
- Salix* sp. An undetermined species past fruiting; common along the Umatilla and sometimes forming close thickets.
- Populus trichocarpa* T. and G. Frequent along the Umatilla, and probably more so formerly. Some of these trees grow about a swampy place close to the town and have attained a good size.
- Alnus rhombifolia* Nutt. Rather plentiful along the Umatilla.
- Celtis douglasii* Planch. One or two specimens were found on a high dry slope above the Umatilla.
- Urtica holosericeus* Nutt. Frequent along the Umatilla, the plants remarkably tall and robust.
- Comandra pallida* A. DC. Common and quite generally distributed in the high arid sections.
- Rumex venosus* Pursh. Very plentiful in places, especially in loose, dry sand.
- Rumex mexicanus* Meisn. Common in moist ground along the Umatilla.
- Rumex crispus* L. Very common in moist ground.
- Rumex persicarioides* L. Scarce, in wet places along the Umatilla.
- Polygonum aviculare* L. Common in moist ground.
- Polygonum majus* (Meisn.) Piper. Common and generally distributed through the arid section.

Polygonum emersum (Michx.) Britt. Frequent in water and mud along the Columbia and Umatilla.

Polygonum lepathifolium L. Common along irrigating ditches.

Polygonum persicaria L. Common with the preceding.

Polygonum hydropiper L. Common, with the two preceding.

Eriogonum niveum Dougl. Very abundant in many parts of the desert. Over considerable areas where the soil is exceptionally dry and sterile it is the dominant species. Its white color and bushy, almost leafless peduncles make it very conspicuous.

Eriogonum baileyi Wats. Moderately common in very dry ground.

Eriogonum compositum Dougl. Scarce, in dry ground. Only a few specimens found.

Eriogonum stellatum Benth. Only a few plants found, in rather dry ground.

Salsola kali tragus (L.) Moq. With the possible exception of *Bromus tectorum*, this is the most abundant and generally distributed plant of our territory. It thrives from the wet margin of the Columbia to the most arid and sterile hill-tops.

Atriplex hastata L. Abundant in nearly all slightly moist ground, especially along the Columbia.

Chenopodium album L. Common in all but very dry ground.

Chenopodium botrys L. Common along streams.

Abronia mellifera Dougl. Very common, especially in drifting sand.

Portulaca oleracea L. Found in abundance in a moist depression near the Columbia.

Silene menziesii Hook. In only one locality, on the bank of the Umatilla.

Alsine media L. Frequent along the Umatilla.

Tissa diandra bracteata (Robins.) Piper. Occurs rather sparingly on the margin of alkaline pools.

Clematis ligusticifolia Nutt. Frequent on the banks of the Umatilla.

- Batrachium aquatile* (L.) Wimm. A large flowered form was found in a pool along the Umatilla.
- Ranunculus sceleratus* L. Frequent along the Umatilla.
- Ranunculus Cymbalaria* Pursh. Abundant in wet places.
- Roripa nasturtium* (L.) Rusby. Common along the Umatilla.
- Roripa columbiae* Suks. Scarce; a few specimens found in mud along the Columbia.
- Roripa curvisiliqua* (Hook.) Bessey. Frequent in damp ground.
- Roripa obtusa* (Nutt.) Britt. Infrequent, in mud along the Columbia.
- Sisymbrium altissimum* L. Very abundant and generally distributed, being found nearly everywhere in the desert.
- Sisymbrium canesens* Nutt. Occasional along the Umatilla.
- Bursa bursa-pastoris* (L.) Weber. Common about houses.
- Lepidium medium* Greene. Abundant in slightly moist ground.
- Cleome lutea* Hook. One of the most conspicuous plants of the region. It grows in great abundance on drifting sand, attaining a height of five to six feet, with stems an inch in diameter.
- Ribes aureum* Pursh. Found in a few places along the Umatilla.
- Rosa pisocarpa* Gray. Common along the Umatilla.
- Potentilla rivalis* Nutt. Common in damp places along the Umatilla.
- Potentilla permollis* Ryd. One specimen, near the Umatilla.
- Kunzia tridentata* (Pursh.) Spreng. Common and quite generally distributed in the desert. It is mostly dwarfed and depressed.
- Crataegus brevispina* (Dougl.) Heller. Quite plentiful along the Umatilla, where in places it forms dense thickets.
- Petalostemum ornatum* Dougl. Common and generally distributed in dry ground.
- Melilotus albus* Desr. Extremely abundant in moist ground, especially along irrigating ditches.
- Trifolium longipes* Nutt. Scarce, in damp places near the Umatilla.
- Trifolium pratense* L. Frequent in moist ground.

- Trifolium repens* L. Common in moist ground.
- Trifolium hybridum* L. Frequent in moist ground.
- Trifolium spinulosum* Dougl. One specimen, in damp ground along the Umatilla. Our material seems sufficiently distinct from *Trifolium fimbriatum* to merit recognition.
- Trifolium spinulosum* Dougl. Frequent along the Umatilla.
- Medicago lupulina* L. Frequent in damp ground.
- Medicago sativa* L. Alfalfa is practically the only crop grown in the area under consideration. It is common as an escape wherever there is sufficient moisture.
- Psoralea lanceolata scabra* (Nutt.) Piper. Abundant in dry, drifting sand.
- Glycyrrhiza lepidota* Nutt. Common in moderately dry ground.
- Hosackia americana* (Nutt.) Piper. Scarce, in slightly moist ground.
- Astragalus succumbens* Dougl. Scarce, in dry sandy ground.
- Geranium carolineanum* L. Scarce, along the Umatilla.
- Erodium cicutarium* (L.) L'Her. Very abundant throughout the dry area.
- Linum lewisii* Pursh. Scarce, in moderately dry ground.
- Euphorbia glyptosperma* Eng. The most characteristic desert annual. Hundreds of acres are reddened over by the peculiar tinge of the foliage.
- Piscaria setigera* (Hook.) Piper. Sparingly distributed in dry ground.
- Rhus glabra occidentalis* Torr. Found plentifully in one place along the Umatilla.
- Rhus toxicodendron* L. Occurs sparingly along the Umatilla.
- Malva rotundifolia* L. Common in cultivated ground.
- Sphaeralcea munroana* (Dougl.) Spach. Infrequent, on high dry ground.
- Hypericum scouleri* Hook. In a few places along the Umatilla.
- Mentzelia laevicaulis* (Dougl.) T. & G. In a few places on dry slopes.
- Mentzelia albicaulis* Dougl. Common and generally distributed in the desert.

Opuntia polyacantha Haw. Abundant in arid sections, but of uneven distribution, being quite wanting over large areas and in some places the dominant species.

Gaura parviflora Dougl. Common especially in the sandy strip along the Columbia.

Epilobium angustifolium L. One small specimen along the Columbia.

Epilobium paniculatum Nutt. Infrequent in moderately dry ground.

Epilobium adenocaulon Haussk. Very common in wet ground.

Oenothera biennis muricata (L.) Lind. Two specimens were found along the Columbia representing, apparently, two strikingly different "mutants" of this confused group.

Anogra pallida (Lindl.) Britt. An abundant and characteristic species of the low sandy strip along the Columbia.

Boisduvalia densiflora (Lindl.) Wats. Found sparingly along the Umatilla.

Myriophyllum sp. In alkaline pools; scarce.

Daucus pusillus Michx. Scarce, along the Umatilla.

Pteryxia terebinthina (Hook.) C. & R. Frequent in dry sand.

Berula erecta (Huds.) Cov. Frequent in swampy places.

Centaurion exaltatus (Griseb.) Wight. Very common in wet places.

Asclepias speciosa Torr. Scarce, in damp ground.

Asclepias mexicana Cov. Scarce, in moderately dry ground.

Phlox sp. A single specimen in dry soil.

Gilia inconspicua (Smith) Dougl. Frequent, in moderately dry soil.

Navarretia intertexta (Benth.) Hook. Scarce, in damp ground near the Umatilla.

Phacelia sp. Common in moderately dry to very dry ground.

Conanthus parviflorus Greenm. Infrequent, in dry ground.

Coldenia nuttallii Hook. Frequent in dry ground.

Heliotropium curassavicum L. Abundant in slightly moist, usually somewhat alkaline soil.

- Amsinckia intermedia* Fisch. & Mey. Abundant in dry soil.
- Piptocalyx circumscissus* (Hook. & Am.) Torr. Scarce, in dry ground.
- Marrubium vulgare* L. Frequent, in moderately dry ground.
- Lycopus lucidus* Turcz. Common in wet ground along the Umatilla.
- Mentha canadensis* L. Abundant in wet ground.
- Verbascum thapsus* L. Common in moderately dry ground near the Umatilla.
- Verbascum blattaria* L. Scarce, along the Umatilla.
- Pentstemon richardsonii* Dougl. A remarkable and handsome species, occurring in considerable quantities on moist basaltic outcroppings along the Umatilla.
- Ilysnathes dubia* (L.) Bern. Scarce, along the Umatilla.
- Veronica peregrina* L. Common in moist places.
- Veronica americana* Schwein. Found sparingly along the Umatilla.
- Mimulus pilosus* (Benth.) Wats. Frequent along the Umatilla.
- Mimulus longsdorfii* Donn. Very common in wet places.
- Mimulus floribundus* Dougl. Frequent in wet ground along the Umatilla.
- Verbena bracteosa* Michx. Abundant in moderately dry ground, especially along the Columbia.
- Verbena hastata* L. Common in slightly damp ground, especially along the Columbia.
- Solanum dulcamare* L. Frequent in thickets along the Umatilla.
- Solanum nigrum* L. Frequent along the Umatilla.
- Solanum triflorum* Nutt. One of the very abundant and characteristic species of the desert; very generally distributed.
- Nicotiana attenuata* Torr. Very common in rather dry ground.
- Orobanche comosa* Hook. Found in only one place; parasitic on the roots of *Iva axillaris*.
- Plantago major* L. Infrequent, along the Umatilla.

- Plantago purshii* Roem. & Schult. Very abundant in the more arid parts, sometimes imparting a gray appearance to large areas of ground.
- Galium aperine* L. In one place along the Umatilla.
- Sambucus glauca* Nutt. In one place along the Umatilla.
- Valerianella macrocera* (T. & G.) Gray. In one or two places in slightly moist ground near the Columbia.
- Dipsacus sylvestris* Mill. Well established but not common along the Umatilla.
- Cichorium intybus* L. In cultivated ground; scarce.
- Ptiloria paniculata* (Nutt.) Greene. Common in moderately dry ground.
- Symphoricarpos racemosus* Michx. In one or two places near the Umatilla.
- Agoseris heterophylla* (Nutt.) Greene. Scarce, in moist places.
- Taraxacum taraxacum* (L.) Karst. Frequent, in damp ground.
- Lactuca scariola integrata* (Gren.) Godr. Very abundant, especially in rather dry ground along the Columbia.
- Lactuca pulchella* (Pursh) D. C. Scarce, along the Columbia.
- Sonchus asper* (L.) Hill. Frequent, in moist ground.
- Iva axillaris* Pursh. Abundant in slightly moist, often alkaline ground along the Columbia and Umatilla.
- Xanthium speciosum* Kearn. Common along the Columbia and Umatilla.
- Xanthium oligacanthus* Piper. Scarce, along the Umatilla. A curious species, seemingly of very limited distribution.
- Gaertneria acanthicarpa* (Hook.) Britt. Very plentiful in moderately dry ground.
- Grindelia nana* Nutt. Common along the Columbia.
- Chrysopsis villosa* (Pursh) Nutt. Along the Columbia; rather scarce.
- Chrysothamnus viscidiflorus* (Hook.) Nutt. The most abundant of the shrubby Compositæ; to be regarded as the dominant desert species. Almost universally present, and only occasionally yielding precedence to any other form.

Chrysothamnus nauseosus (Pall.) Britt. Common in the desert section, but much less so than the preceding, and often wholly wanting.

Solidago serotina Ait. Common along the Umatilla.

Euthamia occidentalis Nutt. Abundant in damp ground.

Townsendia florifer (Hook.) Gray. Scarce, in dry ground.

Erigeron hispidissimus (Hook.) Piper. Frequent in dry ground.
Rays always white.

Erigeron poliospermus Gray. Though Umatilla is the type locality of this species, it seems to be very scarce, only one specimen being found. Very dry ground.

Erigeron canadensis L. Very common in moist or moderately dry soil.

Machaeranthera attenuata Howell. Scarce, in dry ground.

Lagophylla ramosissima Nutt. Frequent in moist to moderately dry ground.

Bidens vulgata Greene. Common along streams and ditches.

Bidens cernua L. Common, with the last.

Coreopsis atkinsoniana Dougl. Very common along the Columbia.

Balsamorhiza sagittata (Pursh.) Nutt. Frequent in very dry, sterile ground.

Helianthus annuus L. Frequent in moist ground.

Chaenactis douglasii (Hook.) H. & A. Infrequent, in dry soil.

Gaillardia aristata Pursh. Very common along the Columbia.

Helenium autumnale grandiflorum (Nutt.) Gray. Common along the Columbia.

Achillea millefolium lanulosa (Nutt.) Piper. Abundant throughout the arid section.

Artemisia dracunculoides Pursh. Abundant along the Columbia and in other moist places.

Artemisia canadensis Michx. Frequent along the Columbia.

Artemisia ludoviciana Nutt. Rather common along the Columbia. A form with mostly entire leaves.

Artemisia tridentata Nutt. Sagebrush is abundant but not evenly distributed, being often nearly absent in large areas. It is mostly low and dwarfed, reaching its best development on the low strip along the Columbia, and elsewhere in depressions where the moisture conditions are a little better than common.

Gnaphalium palustre Nutt. Common along the Umatilla.

Gnaphalium chilense Spreng. Scarce, in moderately dry places.

Carduus lanceolatus L. Common in moist ground.

Carduus undulatus Nutt. Found in rather dry ground in only a few places.

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