

THE LARGE-TUFTED FEATHER-GRASS STEPPES OF RUSSIA

The typical Steppes of Russia are dominated by the Feather-grasses (*Stipa*). The transition from the Meadow-steppe through the northern Large-tufted steppe to the southern Small-tufted steppe is gradual, with many intermixtures. In a wide belt to the north, which grades into the Meadow-steppe, the main Feather-grasses form their tussocks on warm hillsides and the companion plants are more varied than in the south. Here the shallow valleys are still meadow-like. The Feather-grasses grow in thick tufts of old leaf-bases from which the new, long thin leaves shoot, and their dense widespreading system of fine roots sucks the ground thoroughly. The soil is Blackearth, but bare patches of ground show beneath the arching leaves of the grass clumps. Southward the wide grasslands, humped with these tussocks, are unbroken over the plains, except for thickets of Steppe-shrubs in gullies where the snowdrifts collect. Woods are confined to the steep sides of the valleys of the big rivers. On heavy clay land patches of salty soil begin to be more frequent, with their sparse greyish vegetation. Dense groves of Aspen (*Populus Tremula*) are also conspicuous in these areas. They grow in slight hollows, and occupy old salt-patches. These northern salt-patches, caused by intense evaporation in a drier climate of ancient times are now collecting more water and are being destroyed. Their salts are being washed out of them, and the deeper ones are already podsolized. Here the Aspen colonies a characteristic pioneer of such areas, together with bush-Willows, all having wind-borne seeds.

In the autumn and spring, where the soil is moist, annuals find room on these steppes, where as they are nearly absent in the crowded Meadow-Steppe. They mostly germinate in the autumn and form an early green carpet in the spring with myriads of small flowers, before the larger plants grow up and smother them. Bulbous plants, taking advantage of the same conditions, also are more common and bloom early.

Stipa stenophylla is the most abundant grass of these steppes. It forms large tussocks which give a curious rippled appearance to the slopes and levels, seen from a distance. It shows the typical delicate feather-like awns, as does *St Joannis*, another characteristic grass of the north. *St. Capitata* is also abundant, while *St. lessingiana* and *St. Ucrinica*, both southern grasses, grow in the drier places. *St. Rubens* appears east of the Volga. The small Fescue, *Festuca sulcata*, does not form a continuous sward on the dark ground, but grows in isolated tufts. In damp valleys or bushy hollows the Twitch-grass, *Agropyrum repens*, the bush grass *Calamagrostis epigeios*, and the Brome, *Bromus infermis* form tough stands, especially where the soils is loosened and the mat of other grassroots is broken to allow their long runners to push through.

In late April when the frosts have ended, the earliest annuals, having germinated in the autumn before, grow quickly and come into flower. They are small Crucifers, *Draba* and *Erophila*, or chickweeds (*Cerastium*) and their relatives, with wild Pansies (*Viola*), forgetmenots (*Mysotis*), and *Androsace Elongata*. Bulbous and tuberous plants sprout up, and soon the little Gageas, *Gagea Erubescens*, *G. Bulbifera* and *G. Pusilla* are in bloom, with them *Crocus Reticulatus* opens its wide stars, striped with purple on the outside and lilac or white within. It does not do well in gardens in Britain. *Hyacinthelia leucophaea*, and the Hyacinth-like *Bellevallia sarmatica* spread their small bells, with fine white *Ornithogalum gussonei*. The most beautiful flowers of early spring soon open. First the Dwarf Iris *Iris pumila*, whose blooms, ranging from lilac and blue to yellow and white, appear near the ground while its sword-like leaves are only just sprouting from the rhizomes. It is now one of the parents of several good garden hybrids. Then the tulips, *Tulipa biebersteiniana*, and *T. Schrenkii* open flat to the sun their bright golden flowers with reddish backs. With them *Adonis wolgensis*, with even larger and finer flowers than *A. vernalis*, blooms everywhere.

The plants grow quickly into the warmth of early May. The bush Peas *Lathyrus pannonicus* and *L. Palescens* show their pale heads, yellow Cinquefoils (potentilla) and a pinkish Valerian, *Valeriana rossica (tuberosa)* flower, while the Sedges *Carex supine* and *C. Praecox* hang yellow anthers from their dark spikelets. Two beautiful plants which are local in these steppes are the pure white *Anemone silvestris*, which is a northern plant, and soon disappears towards the south, and *Paonia tenuifolia*, the Paeony grows only on cool north slopes, where its finely divided leaves (so unusual in a Paeony), and its great blood-red bowls with a boss of golden stamens, are characteristic of the Feather-grass steppes. A few later annuals also flower now, species of Alyssum and Arabis, and annual Speedwells (*Veronica*).

In high summer, the last half of June, the large and very abundant Feather-grass, *Stipa stenophylla*, hangs out its long plumes, and the steppe turns silvery with multitudes. Half-lost among them flower the branching stalks of the Labiate, *Phlomis pungens*, and the handsome straw-yellow "cornflowers" of *Centaurea ruthenica* on tall stems above gracefully pinnate foliage. Several relatives of the Knapweed, *Erratula*, and *Jurinea*, show their mauve or purple tufts at this season. Below them and between the tussocks the yellow Ladies Bedstraw, *Galium verum*, is common, and so are Plantains (*Plantago*). Handsome plants which bloom in midsummer are *Gypsophila paniculata*, with its mounds of innumerable tiny white flowers on intricate slender twigs, and the Sea-Lavender, *Limonium (statice) Latifolium* with large spreading heads of numerous very small lilac blooms. Both are good and popular garden plants.

From late July the Steppes are dry, and the prevailing colour is pale brown. Only a few plants remain green and flower. These are mostly tough Umbellifers with long tap-roots, *Peucedanum*, *Seseli*, *Falcaria*, *Libanotis*, *Ferula* and *Bupleurum Falcatum*. The Bulleins *Verbascum lychnites* and *V. Orientale* send up their tall spires. *Cephalaria uralensis* and the related *Scabiosa ochroleuca*, both with pale yellow flowers, come into bloom. The latest of the grasses, *Stipa capillata*, produces its metallic spikelets, and the silky-grey scented Wormwood, *Artemisia austriaca*, sends up large pyramidal panicles from its semi-woody running clumps.

The Steppe ripens its seed and withers through the late summer, until the autumn rains cause the seeds of the annuals to germinate, producing a thin spread of green. The small grass, *Poa bulbosais* especially evident before the winter.

THE SMALL –TUFTED FEATHER-GRASS STEPPES OF RUSSIA

As the Blackearth becomes thinner in a hotter, drier climate, the northern Feather-grasses gradually give way to the smaller southern species. The companion perennial plants become fewer, and mostly not so tall or luxuriant. The tussocks stand apart from each other (across the plains), with very few companion plants on the higher, drier land, full of their roots. Of the strongly rooted, tough perennial plants which compete with them, several produce intricately branched stems and inflorescences which dry and break off near the ground when ripe. These are blown together, sometimes in huge tangled balls, which roll and bound across the steppe in the autumn gales, spreading their seeds. On the slopes and bottoms of the small valleys which the streams cut through the land, flowering plants become much more abundant, and their diverse foliage and tall flower-heads are a welcome contrast to the unvarying Feather-grass of the high plains. Autumn-germinated annuals, especially the little grass, *Poa bulbosa*, grow in enormous numbers in the bare spaces between the grass tussocks, and turn the steppe green like a meadow in early spring. Numerous early-flowering bulbous and tuberous plants finish their blooming and food-storing before the summer drought and reappear in the spring also. Solonets areas become fairly common, showing bare soil, mud in the spring, drier in the summer, among their stunted plants. Steppe-thickets still fill the best-watered valleys. There are several regional forms of the southern Feather-grass steppes, influenced by the higher land and rockier soil south of the Donetz River, or the proximity of the Black and Azov Seas, differing in certain plants, but their general aspect is the same.

The smaller Feather-grasses, *Stipa lessingiana* and *S. Ucrainica*, with the Fescue, *Festuca sulcata*, make up the overwhelming bulk of the vegetation. *Stipa capillata* is also common, especially in the west, and *S. Borysthenica* (*S. Joannis sabulosa*) becomes important east of the Volga. *S. Ucrainica* is taller and has longer awns than *S. Lessingiana*, and is more western in distribution,

but both are medium-sized grasses with narrow, inrolled leaves growing from tufts of dead leaf-bases. Each of the few seeds on their heads produces a thin curved or waved awn, several inches long, winged with silvery hairs. There are few other grasses on the open plains, except the dwarf *Poa bulbosa*, which is very abundant, and behaves like an autumn annual, resting during the long summer drought as bulbous leaf-bases.

In April the last snows are melted, leaving the land wet and dark. Only the winter annuals, *Holosteum* and *Cereastium*; *Androsace* species and *Erophila*; *Veronica* and *Myosotis*; and *Poa bulbosa*, are green, and soon come into flower. The tips of the Feather-grass leaves are already out of their sheaths, but are inconspicuous yet. Through this low mat of greenery the bulbs come into bloom, first the Gageas, *Gagea bulbifera* and *G. Szoviitzi*. Restricted to an area in the southwest Ukraine and Crimea, and not general over the steppe is the very beautiful little Cloth-of-Gold Crocus, *Crocus susianus*, which opens its orange-gold stars quite flat in the early spring sunshine. It is feathered on the back with dark brown-purple. Next to bloom are the vivid Tulips, *Tulipa biebersteiniana* and *T. Schrenkii*, short yellow with orange stripe, neither of which is easily obtainable in Britain. With them flower the Dwarf Iris *Iris pumila* and the deep gold *Adonis Wolgensis*.

In May and early June the steppe reaches the peak of its growth, with the Feather-grasses floating their plumes on the wind and making the whole land seem washed with waves of moving silver. *Festuca sulcata*, very like Sheep's Fescue, is also in bloom below them. The slim spires of *Verbascum phoeniceum* open their beautiful soft purple flowers in the morning, but they are withered in the afternoon, and replaced by others the next day. It is an excellent garden plant, and the parent of most of the coloured hybrid Mulleins. It is characteristic of these Steppes. The pale yellow *Centaurea ruthenica* and Chrysanthemum (*Pyrethrum*) *Millefoliatum*, with Yarrow-like foliage and heads of deeper yellow come into bloom. The flowers of *Phlomis pungens* open, with the red-purple tufts of the Thistle *Carduus uncinatus*, which is especially common in overgrazed areas. The spikes of rich blue hooded flowers of *Salvia nemorosa* with their purple bracts are handsome and conspicuous. Another Sage which blooms at this season, *Salvia aethiopsis*, usually a biennial, is very different, with its cottony leaves and spiny heads of white. This plant, together with the Saw-wort *Serratula Xeranthemoides*, and a few species of Sea-Lavender (*Limonium*), with sometimes *Gypsophila*, are the main constituents of the "windwitches", or balls of dead stems and seed heads which blow across the winter steppes. The finest of the Sea-Lavenders in flower now on the steppe is *Limonium tataricum*, which is a shorter, stiffer plant than *L. Latifolium*, but with similar beautiful sprays of pink or lilac.

From mid-June the steppe is shimmering in the heat, the plants are withering, and only a small number with tough leaves remain unscorched. Nothing comes into flower in midsummer. But in

late summer a few plants bloom in the dry steppe. If the early rainfall has been heavy they reach full development, but in dry years they are stunted, *Stipa capillata* flowers, and locally, some species of Wild Onion, among them two handsome ones. First the graceful *Allium pulchellum* dangles its trusses of little dusty mauve-pink bells from tall stems, followed by the compact drumstick clusters of *allium Sphaerocephalum (Descendens)*, whose flowers colour red-purple like bunches of tiny grapes. Here and there tough Umbellifers, *Peucedanum ruthenicum*, *Seseli*, some species of *Ferula*, and *Cachrys* spread their first wheels; a form of Goldilocks, *Linosyris (aster) villosa* opens its heads of bright yellow tufts; while inconspicuous little flowers cover the bushes of the biennial knapweed *Centaurea diffusa*. Another late-flowering plant is the Field Eryngo, *Eringium campestre*, smooth and waxy grey, with grey-white cones of flowers surrounded by long spines. Last to bloom are the scented grey bushes of the Wormwoods *Artemisia austriaca* and *A. taurica*.

With the cooling of the days and the first autumn rain, the seeds of winter annuals germinate, and *Poa bulbosa* sprouts, and the steppe changes from burnt brown to fresh green below the dead sticks and tatters of the summer. The Feather-grasses begin to shoot a little.

RIVER VALLEYS AND ROCKY SOIL IN THE STEPPES OF RUSSIA

The greater rivers across the Steppes have washed away the Blackearth and loess, and cut their valleys deeply into the bedrock beneath. They therefore have steep and rocky sides in many places. The bottoms are nearly flat and subject to flooding in the spring thaw, sometimes for long periods of weeks, or even months in the lower courses and estuaries. The soil is alluvium or sand-bars; or in the south, in places not far above the watertable and without drainage back to the river, it is salty mud. "Gallery woods" of Oak or Pine grow on the valley sides far into the steppe, with patches of Alder near the water.

Beyond the range of the woodlands in the south, where the valley sides are steep and rocky, several plants are common which are not found in the steppe as well as on rocky slopes in the higher country south of the middle Donetz River. Some of these are also characteristic of where the rock outcrops at the base of the Crimean mountains and the northern outliers of the Caucasus. Among the very scattered tufts of the grasses *Festuca sulcata*, *Stipa capillata* and others, grow the spreading bushes of *Ephedra Distachya*, leafless, with green cylindrical branches like a dense clump of Rushes. It is a plant of ancient race, unrelated to any of the flowering plants except the Conifers. Creeping Thymes (*Thymus*) and mats of the papery-headed *Paronychia* are common. Other abundant plants are the yellow Yarrow *Achillea leptophylla (Pubescens)*, Catchflies, (*Silene*), and various pea-flowers, (*Astragalus*, *Hedysarum*). The bushy tufts of *Onosma simplicissimum* with narrow leaves and crosiers of yellowish-white trumpets grow here and there, with the low

woolly-white leaved mounds of the Germander, *Teucrium polium*, showing yellow, lipped flowers in a head of grey bracts. A well-known and beautiful garden plant which is wild and common on the rocky slopes near the Sea of Azov is the Golden Alison, *Alyssum saxatile*, grey-leaved, and smothering itself with rich yellow sprays. Some annuals, including small-flowered Pinks (*Dianthus*) and *Tunica* (or *Kohlrauschia*) flowering the spring. Common larger plants are a relative of the Scabious, *Cephalaria*, and an Umbellifer, *Pimpinella*.

The floors of the valleys are not quite flat, or of uniform soil. The annual flooding lays down fine silt in some parts, and piles up coarser material in others. This is because the water flows over the land, and then back again into the main channels in a regular pattern. Also as the river changes its course it erodes away new stretches. So there are basins and flats of alluvium, some drained in the summer by subsidiary brooks, others undrained and swampy, as well as drier elevations, usually along the riverside. In addition there are banks of sand, some of it blown into dunes. The Meadow-Foxtail, *Alopecurus pratensis* with the narrow-leaved creeping Fescue, *Festuca rubra*, Meadow-grasses (*Poa*), and Bents (*Agrostis*) as the main grasses. The running *Bromus inermis* and the Twitch or Couch, *Agropyrum repens* spread where the soil is coarser. Among the grasses the fluffy cream-coloured panicles of the Meadow-sweet, *Filipendula ulmaria* show, with tall golden Buttercups (*Ranunculus*), the spreading clumps of the Gland-Bellflower, *Adenophora liliifolia* with slender spikes of powder-blue bells, and the Common Loose-strife, *Lysimachia vulgaris*, whose heads of flat yellow stars on leafy stems are equally handsome. The numerous black-red drumsticks of the Great Burnet, *Sanguisorba officinalis*, contrast with the more vivid colours, as do the light sprays of the Meadow Rue *Thalictrum minus* over its bushes of beautiful foliage, and the stiffly branching heads of *Eringium planum*, which are grey-blue, including flower-cones, encircling bracts, and even stems, over flat Dock-like green leaves. The Wild Asparagus, *Asparagus officinalis*, and various meadow Clovers (*Trifolium*) grow in well drained places with the blue Tufted Vetch *Vicia cracca* and the yellow Pea *Lathyrus pratensis*.

The ridges of coarser material become dry in summer, and are covered by Steppe plants such as the grasses *Festuca sulcata*, *Stipa Joannis*, and others; the Sickle Medick, *Medicago falcata*; the Dropwort, *Filipendula Hexapetala*; and the White Clover *Trifolium Montanum*.

The badly-drained and swampy hollows and flats in the north are overgrown by large Sedges (*Carex*, *eleocharis* or *scirpus*), and the handsome clumps of the Tussock-grass *Deschampsia caespitosa*, with its long arching foliage and airy, cloud-like panicles on tall stalks. Near pools the Reed Sweetgrass *Glyceria maxima* (*Aquatica*) and the wild Gardeners-garters, *Diagraphis arundinacea* spread into the water.

Further south, with no late summer rain, and intense evaporation, these undrained areas become brackish, and in the far south, salty. The first signs are the replacement of the Meadow-foxtail by its relative *Alopecurus ventricosus* and the appearance of the Umbellifer *Silaus beseri*, the Strawberry Clover, *Trifolium fragiferum*, the stemless Thistle *Cirsium acaule esulentum*, and a few more. The sweet-water plants drop out meanwhile. Other plants marking salty soil are the low clumps of the fine-leaved Rush, *Juncus gerardi* with its dark brown tufts of polished spikelets, the fleshy-leaved Plantain *Plantago cornuti*, the Dandelion *Taraxacum bessarabicum*, and some Sea-Lavenders (*Limonium*). Such salty patches, common in the south-eastern deserts, reach their northern limit in these valley bottoms.

PLANTS OF THE FEATHER-GRASS STEPPES ON BLACKEARTH

The Meadow-steppes along the borders of the forest merge into Feather-grass steppes southward. The northern Feather-grass steppes on Blackearth are dominated by large-tussocked Feather-grasses, with many other plants also common in Meadow-steppe, though some soon disappear southward, such as *Anemone silvestris*, *Filipendula hexapetala*, *Trifolium montanum*, *Echium rubrum* and others. These, and the big Feather-grasses, are replaced in the drier southern and eastern steppes by small-tufted Feather-grasses such as *Stipa lessingiana*, growing further apart and with fewer companion plants. Others, such as the Desert Oat-grass *Helictotrichon desertorum* and *Stipa rubens* become common east of the Volga and in Siberia.

The northern steppes with many flowering plants stretch from west of the River Prut through the country round the great bend of the Dnepr (Dneiper), the upper Don basin to the Volga, and from the southern Ural foothills through north Turgai, the upper Ishim basin to the Kulunkinskaya steppe and Kuznetskiy. The southern drier steppes with smaller Feather-grasses and few other plants extend along the Black Sea, the lower Don basin, the Caucasian foothills and the mid course of the Ural, east through Turgai, Pavlodar, the southern Kulundinskaya steppe to the Altai and Tarbagatai foothills and south to Chingiz tau.

The steppes are also varied locally due to broken ground in hilly country, the influence of the Black Sea and areas of sandy soil, as well as moister hollows, river plains and salty patches. In Siberia are stretches where low bushes become the main vegetation among the grasses, while steppe shrubs are common in hollows in the more northern richer steppes.

In the south where the Blackearth thins and then merges into a chestnut coloured soil, the grasses and other flowering plants become confined to moist hollows, and the flatter land is occupied

mainly by scattered wormwood (*Artemisia*) subshrubs, with here and there tufts of the small Fescue (*Festuca sulcata*), and is Semi-desert.

The Grasses

Stipa joannis (*pennata joannis*) A large-tussocked Feather-grass with long feathery awns. Very common in north Russian steppes

Stipa stenophylla Also forming large tussocks. Often dominant in northern Russia and Siberian steppes

Stipa capillata Awns without feathers. Widespread and common locally all over Russian and Siberian steppes

Stipa lessingiana A small-tufted Feather-grass with long feathery awns widespread, often dominant in southern Russian and Siberian steppes, also scattered in the north

Stipa ucrainica The main small-tufted Feather-grass of the south-west Russian Black Sea steppes

Stipa rubens Becomes common east of the Volga in both northern and southern steppes

Stipa korshinskyi Common in small-tufted steppes in Siberia

Stipa kirghisorum In Siberian hilly steppes and bush-steppes to the foothills of the Altai and Tarbagatai

Stipa orientalis On broken ground of hills, Mugodzharry and eastward

Stipa sareptana With *Stipa korshinskyi* in southern Siberian steppes

Stipa borysthenica (*joannis sabulosa*) In small-tufted steppes east of the Volga on sandy soil. Also in Russia.

Festuca sulcata Related to *F. ovina* (Sheep's Fescue) Low tufts of needle lvs. Very widespread in all steppes, common in the south, both in Russia and Siberia and extending into the Semi-deserts

Koeleria gracilis (*crinata*) Tufted Hair-grass. Low tufts of grey-green lvs, narrow panicles. Widespread in northern and southern Russian and Siberian steppes, and on hilly ground in bush-steppe

Helictotrichon (*avena*) *desertorum* Desert Oat-grass. Often the dominant grass in some drier eastern Russian large-tufted steppes and Siberian bush-steppes

Helictotrichon schellianum In northern herb-rich steppes of Russia and Kazakh

Bromus riparius (*erectus riparius*) Close to Upright Brome (*B. erectus*). Common in northern Russia and Kazakh large tufted steppes

Phleum phleoides (*boehmeri*) Purple-stem Catstail. In northern Russian and Siberian steppes with many flowering plants

Poa pratensis angustifolia Narrow-leaved Meadow-grass. Narrow lvs, spreading panicles of small spikelets. In northern herb-rich Russian and Siberian steppes

Calamagrostis epigeios Bush grass. Creeping, tall, Reed-like panicles. In damp hollows in northern Russian and Siberian steppes

Eromus inermis Awnless Brome. In broken ground in northern Russian and Siberian steppes

Agropyron repens Twitch or Couch. Widely creeping in broken ground in northern Russian and Siberian steppes

Agropyron desertorum In dry bushy northern steppes often on limestone, Siberia

Aneurolepidium (Elymus) ramosum In southern small-tufted steppes of Russia and Siberia

Cleistogenes Squarrosa In sandy steppes of Russia and Siberia

The Steppe Shrubs

The steppe shrubs, the Ground Cherry and Dwarf Almond (*Prunes creasier*) and *P. Tennille*), and the Brooms (*Stylises*), still occupy better watered hollows in the northern part of the Feather-grass steppes in Russia while the Spiraeas and Pea-trees (*Caragana*) spread from Russia across Siberia to the Altai foothills, the Caraganas being so abundant in the foothill steppes of the Altai and Tarbagatai ranges as to form bush-steppes.

On broken hilly ground on the Mugodzhary and other highlands, mountain and forest bushes grow in gullies, such as *rosa cinnanomea*, *Berberis sipirica* and *Lonicera microphylla*. *Berberis sibirica* 2 ft, yellow hairy shoots, multiple spines, small oblong, green, toothed lvs, yellow fls, dark red berries. With small Feather-grasses on broken ground, Mugodzhary and other hills

Caragana arborescens Pea-tree. Bush or small tree 15-20ft, pinnate lvs on spine-tipped leaf-stalks, clusters of few yellow pea-fls on slender stalks. With larger Feather-grasses on Altai and Tarbagatai foothills

Caragana frutex (fruitescens) Non-spiny bush to 10ft, lvs of 2 pairs of leaflets, yellow pea-fls on slender stems from spurs. In both large and small Feather-grass steppes from the Volga to the Altai, and in bush-steppe

Caragana leucophloea In many Feather-grass steppes on hilly ground. River Tobol to Altai. Common in bush-steppe.

Caragana pumila In steppes on hilly ground from Mugodzhary to Altai foothills. Common in bush-steppe

Lonicera microphylla Small stiff shrub, very small lvs, pale yellow trumpet fls, red berries. In open low steppes in hills. Mugodzhary and elsewhere

Lonicera tatarica Bush to 10ft, oval smooth lvs, paired pink to white trumpet fls in axils, red berries. In hilly country from Russia, Mugodzhary, to Altai and Tarbagatai

Juniperus Sabina In hill country, Mugodzhary and south Russia

Rosa spinosissima Burnet Rose. Suckering, 1-3 ft, bristly, small pinnate lvs, large white to pale pink fls, purple-black round fruits. Hills Russia, Mugodzhary, to Altai

Spirea hypericifolia Densely branched, lvs broader at tip, clusters of small white fls along arching shoots. Common and widespread in most steppes from Russia, across Siberia to Altai in hollows

Spirea crenata Bush of 3-5 ft, lvs broader and toothed at tip, grey-green, white fls in round umbels from spurs. In both Blackearth steppes, from Russia, and Kazakh to Altai

Spirea trilobata Small twiggy shrub, rounded toothed to lobed lvs. Clusters of white fls. On hills, Mugodzhar and elsewhere

Perennial Plants
Artemisia austriaca Creeping stock, 8"-2'. much cut silky lvs of narrow segments, pyramidal heads of drooping spikes of small orange stained fls. Widespread in both northern and southern steppes from Azov to Volga, east to Altai and Tarbagatal

Artemisia dracunculus Tarragon. 2 ft, erect, simple narrow pointed green lvs lower cut into threes, long loose panicles of round greenish-white fls. In northern large-clumped Feather-grass steppes from Russia across Siberia

Artemisia latifolia. With Tarragon in Siberian northern steppes.

Artemisia lessingiana In dry southern small-Stipa steppes

Artemisia frigid Straggling sub-shrub, 10-20", white-silky lvs of narrow forked segments, tall leafy panicles of small round yellow fls. Dry Siberian steppes often with Desert Oat grasses, to bush steppes of Altai and Tarbagatal foothills, with Caragana species and *Spirea hypericifoli*

Adonis wolgensis 9-12", branches stems, much cut lvs, shining yellow many-petalled fls before lvs. Common in both northern and southern steppes from eastern Russia to the Altai

Are aria koriniana Sub-shrubby, straggling, rough-edged grassy lvs, bell-shaped white fls in loose heads. In southern small Feather-grass steppes from Volga to Altai.

Anemone sylvestris In northern steppes only, with large Feather-grasses Russia to Kazakhstan

Astragalus onobrychis Wide downy clumps of pinnate lvs of many leaflets, heads of bluish-lavender pea-fls. In northern and southern steppes with large and small Feather-grasses. South Urals to Altai

Astragalus other species Mostly in southern open-ground steppes

Aster alpines In large-Stipa steppes in highlands and foothills east to Altai

Bupleurum falcatam (Umbelliferae) 1½-3 ft, semi-woody, lance-lvs, umbels of small yellow fls. In large-Stipa steppes, Russia

Carex supine A small Sedge common in large-Stipa steppes, Russia to Kazakhstan

Carex praecox In large-Stipa steppes, Russia

Carex uralensis In small-Stipa steppes, Kazakhstan

Campanula uralensis In large-Stipa steppes, Russia

Crambe tatarica (Cruciferae) 1-3 ft, branching, grey-green deeply cut lvs, dense heads of many white fls. In large-Stipa steppe, east Russia, Kazakhstan

Centaurea ruthenica To 3 ft, pinnately cut lvs, branching heads of thistle-fls in cups of papery bracts. In large-Stipa steppes, Russia and Kazakhstan

Centaurea other species

Cephalaria uralensis (Dipsaceae) Pinnately cut lvs, pale yellow fls. In large Stipa steppes, Russia to Kazakhstan

Clematis integrifolia Semi-woody, 3-4 ft, simple oval lvs, solitary blue to purple fls. In Russia large-Stipa steppes

Clematis pseudoflammula Semi-woody, lvs of few rounded leaflets, heads of white fls. In large-Stipa steppes, Kazakhstan

Chrysanthemum (Pyrethrum) millefolium A low plant. Much-cut pinnate lvs, yellow daisies. Widespread in Russian and Siberian steppes, more common in southern small-Stipa steppes

Chrysanthemum (pyrethrum) achilleifolium 2 ft, creeping stems, fine-cut grey hairy small oblong lvs, dense heads of yellow daisies. In southern Small-Stipa steppes, Volga and Caucasus east to Tarbagatai

Carduus uncinatus A Thistle common in small-Stipa steppes, south Russia Crimea

Cachrys odontalgica (Umbelliferae) Much cut lvs into fine segments. In small-Stipa steppes, Azov to Mugodzhary, Caucasus and Crimea

Dianthus acicularis Related to *D. Aquarrosus*, 9-12", mats of narrow green lvs, wavy stems, very frilled white to pink fls. In dry large-Stipa steppes. Urals to Siberia

Dianthus other species In dry steppes of both large and small Stipa grasses, Russia and Kazakhstan

Euphorbia stepposa In large-Stipa steppes of Russia and Kazakhstan

Echinops ruthenicus (*ritro tenuifolius*) 3 ft, pinnately-cut leathery spiny lvs cottony beneath, round blue ball fls. On open dry Siberian steppes often with *Crostachys*, *Eurotia*, *Onosma* and *Chrysanthemum millefolium* on limestone

Echium rubum (Boraginaceae) Biennial, 1-2 ft, erect unbranched, narrow pointed lvs, tall one-sided spires of red-purple trumpet fls. In northern large-Stipa steppes only, Russia to Kazakhstan

Eurotia ceratoides (Chenopodiaceae) Shrub, 3-4 ft, grey-white downy narrow lvs dense spikes of small woolly fls forming a panicle. Widespread in large and small-Stipa steppes, on broken ground and in semi-desert. Russia and Siberia

Filipendula hexapetala Dropwort. In northern large-Stipa steppes only, Russia and Kazakhstan

- Filipendula stepposa* Related to *F. Ulmaria*. In moist ground of large-*Stipa* steppes east of the Volga
- Falcaria sioides* (Umbelliferae) 1-2½ ft, greyish lvs cut into pointed forks, white umbels. In large-*Stipa* steppes, Russia, Kazakhstan
- Fragaria viridis* Common in northern large-*Stipa* steppes of Siberia
- Ferula orientalis* (Umbelliferae) A Giant Fennel. 3-5 ft, large much-cut lvs into fine segments, umbels of pale yellow fls. In hilly small-*Stipa* steppes, Azov Crimea, Caucasus
- Ferula songarica* In bushy steppes of Altai and Tarbagatai foothills
- Ferula caspica* In hilly small-*Stipa* steppes from Azov and Mugodzhary east to Altai and Tarbagatai
- Galatella fastigiata* (*Aster hauptii*) Narrow pointed lvs, large purple many rayed daisies. From northern large-*Stipa* steppes of Siberia to bushy foothill steppes of Altai and Tarbatatai
- Galium ruthenicum* Very close to *G. Verum*. In both northern and southern steppes from the Volga to Altai and Tarbatatai
- Galium verum* Ladies Bedstraw. In more northern Russian steppes across Kazakhstan to bush foothills of Altai and Tarbagatai
- Gypsophila paniculata* From northern large-*Stipa* steppes of Russia to bushy steppes of Altai and Tarbagatai
- Hieracium echioides* (Compositae) A yellow Hawkweed. In northern large *Stipa* steppes of Siberia
- Jurines multiflora* (Compositae) Thistle-like plant. In both northern and southern steppes, Russia and Kazakhstan east to Tarbagatai
- Jurines arachnoidea* Grey-hairy lvs, purple thistle fls. In northern large-*Stipa* steppes of Russia and Kazakhstan
- Kochia prostrate* (Chenopodiaceae) Sub-shrub, greyish to reddish tufts of narrow lvs, small round fls in leafy spikes, 1-2½ ft. Widespread in dry steppes and semi-deserts, Russia, Siberia
- Limonium latifolium* A Sea-Lavender. Rosettes of large oval lvs, foot-high stems, spreading heads of small lilac-blue fls. In large-*Stipa* steppes of Russia and Kazakhstan
- Limonium sareptanum*
- Limonium bungei* In small *Stipa* steppes,, Azov, Crimea, Caucasus to Trans Volga
- Limonium (Goniclimon) tataricum* Wide clumps of stiff oblong lvs, triangular clusters of small deep red fls on 1-1½ ft stems. In both large and small-*Stipa* steppes in hills, Azov, Crimea Caucasus to Mugodzhary
- Limonium (Goniclimon) speciosum* Lvs broader at tip, winged stems, crowded rosy-purple fls from white-edged calyces. From large-*Stipa* steppes, Caucasus, Kazakhstan to bushy foothill steppes of Altai and Tarbagatai

Linosyris villosa (Aster *linosyris villosa*) goldilocks. 6"-1', narrow lvs, close heads of rayless yellow fls. Widespread in dry steppes, Russia and Trans Volga east to Tarbagatai

Lathyrus (Orobus) pannonicus 1 ft, 2 or 3 pairs of narrow leaflets, heads of many white, pale yellow to purple pea-fls. In large-Stipa steppes of Russia

Lathyrus pallescens In large-Stipa steppes, Russia and Kazakhstan

Medicago romanica (Leguminosae) A Medick. Widespread in both northern and southern steppes, Don basin to Caucasus, across Siberia to foothill bushy steppes of Altai and Tarbagatai

Myosotis suaveolens In large-Stipa steppes from Don basin to Kazakhstan

Oxytropis pilosa Erect to 6", hairy pinnate lvs of many leaflets, oblong spikes of pale yellow pea-fls. In northern large-Stipa steppes, Russia and Siberia to Altai

Onobrychis vicifolia arenaria A variety of Sainfoin. Pinnate lvs of many leaflets, 1-1½ ft stems with heads of striped pink pea-fls. In large-Stipa steppes, Russia and Siberia

Onosma simplicissimus (Boraginaceae) Large clumps of narrow white-spine tipped lvs, 6" – 1' stems, crosiers of white-downy tubula fls. In dry hilly steppes often on limestone, Crimea to Siberia.

Crostachys (Sedum orcotyledon) spinosa Houseleek-like rosettes dying after seeding of dark green white-spine tipped lvs, narrow spikes of yellow star-fls. In hilly steppes from the Volga to the Tobol hills, east to Tarbagatai

Polygala comosa Straggling stems, narrow lvs, spikes of winged blue to pink fls. In large-Stipa steppes, Russia and Siberia.

Potentilla cineria arenaria To 8", grey-hairy palmate lvs of 3-5 leaflets, loose sprays of yellow fls. In large-Stipa steppes Russia

Potentilla humifusa (concinna) Mat-forming, 5-fingered white-backed lvs. Widespread in both large and small-Stipa steppes, Russia across Siberia to Tarbagatai

Potentilla schurii In large-Stipa steppes, Russia and Kazakhstan

Pylosatilla pratensis nigricans Much-cut spreading lvs, black-purple small hanging bell-shaped fls. In large-Stipa steppes of Russia

Pulsatilla multifida In large-Stipa steppes of Siberia

Pulsatilla flavescens Upright yellow fls before woolly lvs grow up. In large-Stipa steppes of Siberia

Paeonia tenuifolia Much-cut lvs crimson bowl-fls with boss of yellow stamens. In large-Stipa steppes of Russia

Pedicularis dasystachys Semi-parasitic. In large-Stipa steppes, Russia

Plantago stepposa In large-Stipa steppes, Russia and Kazakhstan

Phlomis pungens To 2', forking stems, shining green narrow-oval lvs, whorls of blue-purple hooded fls. Common in both large and small Stipa steppes of Russia

Phlomis tuberosa In large-Stipa steppes of Russia and Siberia to bush steppes of Altai and Tarbagatai foothills

Peucedanum ruthenicum (Umbelliferae) In large-Stipa steppes, Russia and Kazakhstan

Peucedanum morisoni

Peucedanum other species In large-Stipa steppes and Siberia to bushy foothill steppes of Altai, Tarbagatai

Salvia nutans 2-3 ft, toothed wrinkled oblong lvs, spires of drooping violet lipped fls in close whorls. In large-Stipa steppes of Russia and Kazakhstan

Salvia austriaca In large-Stipa steppes, Russia and Kazakhstan

Salvia other species In large-Stipa steppes

Serratula radiata (Compositae) Centaurea-like plants. In large-Stipa Russia

Serratula zeranthemoides In both large and small-Stipa steppes from Azov Crimea and Caucasus across Siberia to Tarbagatai

Seseli libanotis (Libanotis intermedia) Triangular compound lvs of paired feathery segments, umbels of white fls. In large-Stipa steppes, Russia and Kazakhstan

Seseli ledebourii In large-Stipa steppes of Siberia

Seseli eriocarpum In large-Stipa steppes of Siberia

Scabiosa ochroleuca 2ft, long-stalked pale yellow fls. In large-Stipa steppes of Russia and Kazakhstan

Scabiosa isetensis In large-Stipa steppes of Siberia

Silene multiflora In large-Stipa steppes in Siberia

Silene wolgensis In bushy steppes of Siberian foothills east to Tarbagatai and Altai

Senecio jacobaea Ragwort. 2 ft, pinnate lvs, flat heads of yellow daisies. In large-Stipa steppes of Russia and Siberia

Sanguisorba officinalis Great Burnet. Pinnate lvs, dark red drumstick heads. In rich large-Stipa steppes, Russia and Siberia

Trifolium montanum In northern large-Stipa steppes only. Russia

Thymus marschallianus Widespread in large and small-Stipa steppes, Russia and Siberia

Thalictrum minus In large-Stipa steppes, Russia and Siberia

Vicia tenuifolia (cracca tenuifolia) Scrambling to 4 ft, pinnate lvs of many shining pointed leaflet spikes of blue pea-fls. In large-Stipa steppes, Russia, Kazakhstan

- Veronica incana* Silvery-leaved mats, spikes of purple fls. In northern large-Stipa steppes, Siberia
- Veronica spicata* Bushy growth, blue spikes. In northern large-Stipa steppes, Russia and Siberia
- Veronica pinnata* 1 ft, woody rootstock, many pinnately cut lvs of narrow segments, long-branched heads of blue fls. In bushy steppes of foothills of Altai and Tarbagatai
- Valeriana tuberosa* 4-14", basal lvs oval, stem lvs narrow pinnately cut flat heads of small pink fls. In large-Stipa steppes of Russia
- Viola ambigua* Rosettes of heart-shaped lvs from woody rhizomes, clear violet fls. In large-Stipa steppes, Russia, Kazakhstan
- Verbascum lychnites* White Mullein. In large-Stipa steppes of Russia
- Verbascum orientalis* (Related to *V. Chaixii*). In large-Stipa steppes of Russia
- Verbascum phoeniceum* Purple fls. From large-Stipa steppes of Russia and Siberia to bushy foothill steppes of Altai and Tarbagatai

The Bulbs and Tubers

- Bellevalia (Hyacinthus) sarnatica* Low-growing, early-flowering, spikes of bell-shaped fls. In large-Stipa steppes, of Russia and Kazakhstan
- Crocus reticulatus* White to lilac, yellow-throated, feathered purple cut side. In large-Stipa steppes, Russia and Kazakhstan
- Crocus susianus* Low growing, orange-yellow within, Brown-feathered outside. In small-Stipa steppes, southwest Ukraine, Crimea.
- Gagea species* Small early-flowering plants, with narrow lvs and heads of yellow star-fls.
- Gagea erubescens* In large-Stipa steppes of Russia
- Gagea pusilla* In large-Stipa steppes, Russia, Kazakhstan
- Gagea bulbifera* In large and small-Stipa steppes, Asov, Crimea, Caucasus, Don basin to Kazakhstan
- Gagea szovitzii* In small-Stipa steppes, Azov, Crimea, Caucasus to Mugodshary
- Hyacinthus leucophaeus* Low early-flowering, narrow lvs, spikes of small blue bell-fls. In large-Stipa steppes, Don basin to Kazakhstan and Siberia
- Iris pumila* 4-5", almost stemless, creeping rhizomes, 3-4 sword-lvs, few or solitary yellowish-white to violet-blue bearded fls. In large and small-Stipa steppes, Russia, Kazakhstan, east Mugodzhary
- Ornithogalum gassonei* Heads of white starry fls. In large-Stipa steppes, Russia and Kazakhstan

Ornithogalum fiacherianum In large-Stipa steppes east of the Volga

Tulipa biebersteiniana 6-10", bell-shaped yellow fls nodding in bud. In large and small-Stipa steppes, South Russia from Azov, Crimea, Caucasus to Kazakhstan

Tulipa schrenkii Red to yellow fls. In large and small-Stipa steppes, south Russia, Azov, Crimea, Caucasus to trans Volga Kazakhstan

Tulipa patens In small-Stipa steppes from the Volga across Siberia to the Tarbagatai

Allium pulchellum 12-24", narrow channelled lvs, heads of nodding rosy-purple bell-fls. South Russia, trans-Volga to east Mugodzhary in small-Stipa steppes

Allium sphaerocephalum (descendens) 16-30", semi-cylindrical channelled lvs, dense cylindrical heads of small deep red-purple fls. Russia, trans-Volga to east Mugodzhary. Small-Stipa

Allium guttatum Trans-Volga, East Mogodzhary

The Annuals of Ephemerals

Small annuals or ephemerals which have overwintered as seeds are not very common in the large-tussock Stipa steppes with their many perennials but in the more open southern small-tufted Stipa steppes they are abundant in the early spring. With the small grass *Poa bulbosa* which overwinters as swollen leaf-bases, they make a thin green carpet everywhere for a short time. *Arabis auriculata* 4-10", small white fls, Russia

Arenaria serpyllifolia Greyish, sprawling very small white fls. Russia and Siberia

Arenaria other species

Androsace elongate Rosettes of lance-shaped lvs, umbels of very small white fls. South Russia, Asov, Crimea, Caucasus, Siberia

Androsace turczaninovii Asov, Crimea Caucasus

Alyssum desertorum South Russia, Asov, Crimea, Caucasus

Cerastium ucrainicum A Chickweed of Asov, Crimea, Caucasus, to east Mugodzhary

Draba nemorosa 4-12", spires of small yellow fls on leafy stem. Siberia, Russia

Erophila verna (Cruciferae) Small rosettes, very small white fls. South Russia, Azov, Crimea, Caucasus, Siberia

Holosteum umbellatum Related to *Stellaria*. 2-12", oval small greyish lvs, umbels of white to rose small fls. South Russia, Siberia

Myosotis micrantha 2-8", clear blue small fls in uncurling spike. Asov, Crimea, Caucasus, Siberia

Myosotis other species

Veronica verna 2-5", lvs cut into 5 segments the end one largest, pale blue fls in close groups. Russia, Siberia

Viola kitaibeliana Close to Wild Pansy (*V. Tricolor*), branching stems, fls small, yellow marked violet on upper petal, South Russia, Asov, Crimea, Caucasus, east Mugodzhary

Poa bulbosa Small grass, widespread and common. South Russia and Siberia

Plants of Broken or Rock Ground of hills and Highlands in Blackearth Region

On the highlands south of the Donetz River, where there is much rocky ground, and near the Sea of Asov, the steppe includes several plants not found in the lowland Feather-grass steppes, among them some northern ones. Other dry hill steppes species on the Crimean and north Caucasian foothills, and the southern extension of the Urals called the Mugodzhary, where the Sabine Juniper, Barberries, bush Spireas, bush Honeysuckles and Caraganas grow on the higher rocky slopes. Northeastwards in Siberia the high country round the mid-course of the River Tobol in the Blackearth region, to the foothills of the Altai and Tarbagatai ranges, grow bushy steppes on rocky ground between 1,300 and 2,000 feet.

Stipa lessingiana Crimea, Tobol, Altai, Tarbagatai

Stipa Capillata Dontez, Crimea

Stipa orientalis Mugodzhary, Tobol, Altai,, Tarbagatai

Stipa kirghisorum Tobol, Altai, Tarbagatai

Festuca sulcata Donetz, Crimea, Mugodzhary, Altai, Tarbagatai

Koeleria gracilis Donetz

Koeleria sclerophyyla Mugodzhary

Koeleria brevis Crimea

Agropyrom pectiniforme Dontez

Andropogon ischaemum Crimea

Cleistogenes bulgarica Crimea

Artemisia lessingiana Tobol, Altai, Tarbagatai, dominant on Mugodzhary

Artemisia frigida Tobol, Altai, Tarbagatai

Artemisia larchiana (incana) Mugodzhary

Alyssum tortuosum 6", shrub, twisting stems, hairy lance-lvs, narrow heads of yellow fls. Donetz, Mugodzhary

Alyssum saxatile Golden Alison. 12", shrubby, grey downy lvs dense heads of many yellow fls. Common near the Sea of Azov

Alyssum hirsutum Donetz

Achillea leptophyllia (pubescens) Donetz, near Sea of Azov, Crimea

Achillea glaberrima Near Azov Sea

Bongardia chrysogonum (*Leontice odessana*) Berberidaceae. 6", basal blue-green pinnate lvs of short, purple-spotted, cut-tipped leaflets, open heads of long-stalked buttercup-like fls. Near Sea of Azov, often with *Alyssum saxatile*

Chrysanthemum (*Pyrethrum*) *millefoliatum*. Small plants, much-cut pinnate lvs, yellow daisies. Donetz, Siberian highlands

Chrysanthemum (*Pyrethrum*) *achilleifolium* Taller, oblong lvs, dense heads of yellow daisies. Volga, Caucasus, Mugodzhary, to Tarbagatai

Cephalaria uralensis (Dipsaceae) Donetz, Crimea

Dianthus pseudoarmeria Related to Sweet William. Donetz, Crimea

Dianthus other species Around Azov Sea

Ephedra distachys (Gretacace) Shrubby, sprawling, dark green, Rush-like branches, scale-lvs, red fruits. Donetz, Mugodzhary east to the Altai

Helicrysum arenarium Donetz, also on sandy soils

Edysarum grandiflorum (sericeum) Almost stemless. Pinnate lvs silky beneath, dense spikes of purple pea-fls. Russia, Crimea, Caucasus

Jurinea stoechadifolia (Compositae) Crimea

Kochia prostrate (Chenopodiaceae) Small grey to reddish shrub. Widespread in dry ground, Mugodzhary, east to Altai foothills

Onosma simplicissium Large clumps of spine-tipped lvs, curled heads of tubular fls on 6"-1' stems. Often on limestone, Crimea, trans-Volga

Orostachys (*Sedum* or *Cotyledon*) *spinosa* Rosettes of spine-tipped lvs, narrow spikes of yellow fls. East of Volga, Tobol, Altai, Tarbagatai, to 2,000 ft

Potentilla astracanic Crimea, near Azov Sea

Pimpinella titanophila (Umbelliferae) Donetz, Crimea, Caucasus foothills

Pimpinella stenophila Donetz

Paronychia cephalotes (Caryophyllaceae) Mat-forming, small lvs, heads of very small fls in large white papery bracts. Crimea, Caucasus foothills

Silene supine Donetz, Crimea, Caucasus foothills

Silene other species Around Sea of Azov

Stachys angustifolia Near Sea of Azov

Thymus dimorphus Donetz

Thymus mugodzhharicus Mugodzhary, Tobol, Altai, Tarbagatai

Thymus other species

Teucrium polium Sub-shrubby, 5-6", grey-hairy wavy-edged lvs, spires of yellow-white to purple hooded fls in whorls. Donetz, near Sea of Azov, Crimea, Caucasus foothills

Xeranthemum annuum (Compositae) to 2 ft, narrow lvs, solitary papery purple fls. Donetz

Berteroa spathulata (Cruciferae) Related to Alyssum, but fls white. Mugodzhary

Astragalus subulatus Crimea, Caucasus foothills

Plants of Rocks
Sedum acre Yellow Stonecrop. Wallpepper

Sempervivum ruthenicum Rosettes closed in winter, green, fls pale greenish-yellow, Europe

Cystopteris fragilis Brittle Bladder Fern

Asplenium trichomanes Common Spleenwort

Asplenium septentrionalis Forked Spleenwort

Woodsia alpina

West Siberia

On damp soil only flooded for part of the year.
Alopecurus pratensis Meadow Foxtail. 1-3 ft, slender poker-heads, Europe, Siberia

Agrostis stolonifera Creeping Bent. Heads of very fine spikelets. Also called Fiorin or White Bent, Europe, Siberia

Agrostis syreistschikovii Siberia

Deschampsia caespitosa Tussock-grass or Tufted Hair-grass, large dense tussocks, big heads of fine spikelets. Europe, Siberia

Festuca pratensis Meadow Fescue. Narrow panicles of long spikelets, Europa, Siberia

Poa pratensis. Meadow-grass. Pyramid of purplish spikelets. Europe, Siberia

Poa palustris Swamp Meadow-grass. Open panicles. Europe, Siberia

Agropyrum repens Twitch or Couch. Wide-creeping, in drier, more sandy or broken ground. Europe, Siberia

Bromus inermis Hungarian Brome. Also wide-creeping in drier open ground. Europe, Siberia

Achillea (ptarmica) cartilaginea 1-2', narrow toothed lvs, flat heads of small white daisies. Often on river banks with Lythrum. Europe, Siberia

Adenophora liliifolia (liliiflora) 18", heart-shaped round-toothed basal lvs, open pyramidal heads of pale blue bells. Europe, Siberia

Asparagus officinalis Common Asparagus. No lvs, thread-like cladodes, red berries, 1-5 ft. Sometimes in rather salty soils, but not wet. Europe

Althea officinalis Marsh Mallow. 3-4', big downy heart-shaped lobed or toothed lvs, leafy spires of pale pink fls in axillar heads. On wet river sides, Europe, Siberia

Artemisia pontica 1½-4', Grey-velvety much-cut lvs, narrow spikes of small round yellow fls. On river banks, Europe, Siberia

Artemisia paniculata On river banks, Europe

Cenolophim fischeri Europe

Carex caespitosa Tufted Sedge. Creeping rhizomes but clump-forming, 12-32", rough stems, large yellow-green lvs, top spikelets male, reddish, lower female blackish. In wet places often with Tussock-grass, Europe, Siberia

Eryngium planum 2 ft, lower lvs, heart-shaped, upper 5-parted, rather small round steely-blue heads in blue spiny bracts. Europe

Euphorbia virgata 1-5 ft, lance-shaped lvs, branching stems, heads of green-yellow fls with olive glands. River banks, Europe

Filipendula ulmaria Meadow-Sweet. 2-3', large pinnate lvs, top leaflet cut into 3, branching sprays of cream-coloured small fls with many stamens. Europe, Siberia

Lysimachia vulgaris Yellow Loosestrife. 2½ ft, downy, whorls of broad lance-lvs, branching pyramidal leafy heads of yellow star-fls, Europe and Siberia

Lythrum salicaria Officinalis

Lythrum virgatum 2-3', lance-lvs, twiggy panicles of 3 purple fls in axils. Europe Riversides

Sanguisorba officinalis Great Burnet. 2 ft, pinnate lvs, dark red drumstick fl-heads. Europe, Siberia

Serratula coronata Allied to Centaurea, pinnately cut hard-tipped toothed lvs, spreading heads of few-rayed purple fls from cones of woolly bracts. Europa, Siberia

Trifolium Montana White fls. Europe, Siberia

Thalictrum minus majus 2-4 ft, much cut lvs, open trusses of small pale yellow fls. Europe, Si-beria

Tragopogon pratensis brevirostris Goatsbeard. Narrow grass-like lvs, ligulate (Hawkweed like) Yellow fls from pointed bracts. Europe, Siberia

Plants of Marshes and Standing Fresh and Slightly Salty Water *Beck*

Bulb

Carex Vulpena

Carex gracilis

Carex Milanostachys

Carex

Digi

Glycera aquatic

Calyc..... glaba

.....

Sparganium ramosum

Typha angustifolia

Typha latifolia

Can't decipher handwriting!

Plants of Salty Hollows in the Flood-Plains

Water steppes become widespread in the semi-deserts of the south, but salty hollows begin to appear in the flood-plains of rivers in the south of the blackearth steppe region. *Alopecurus ventricosus* A Foxtail grass of rather salty soil

Puccinellia (Glyceria) tenuissima A Salt-marsh grass. Panicles like those of *Poa*

Carex disticha A creeping Sedge. 1-2ft, long spires of spikelets on triangular stems. Europe, Siberia

Juncus gerardi (compressus gerardi) Round-fruited Rush. 1-1½ ft, clumps of dark green needle-lvs, short-branched heads of glossy brown spikelets. Europe, Siberia

Cirsium esculentum A low Thistle. Europe

Plantago cornuti 16-24", stalked oval shining lvs, long narrow spikes of small black-bracted fls. Europe, Siberia

Silvaus besseri (Umbelliferae) Much cut lvs on angular stems. Europe, Siberia

Trifolium fragiferum Strawberry Clover. 4-12", stems rooting at nodes, trifoliate lvs round heads of pink fls in swollen reddish calyces. Europe, Siberia

Taraxacum bessarabincum 2-6", uncut long-oval lvs, solitary small yellow ligulate fls. Europe, Siberia

In more salty places*Artemisia monogyna*

Artemisia nitrosa

Atriplex verrucifera (Chenopodiaceae) An Orache

Limonium tomentellum A Sea-Lavender with woolly rootstock, rosette of small downy lvs broader at tip, 18" downy sprays of small lilac fls. Europe, Siberia

Salicornea europaea Marsh Samphire. Annual, leafless succulent green branches. In wet salty mud. Europe, Siberia

On Deep Soils and Solonets in Russia *Festuca sulcata valesiaca*

Koelaria gracilis

Koelaria delavigna

Stipa Capillata

Artemisia (maritime stepposa)

Artemisia pontica

Kochia prostrate

Aster linosynis

Aster villosus

Achillea nobilis

Achillea setacea

Artemisia

Artemisia austriaca

Allium paniculatum

Limonium (statice) grelini

Innula Britannica

Lotus cochionlatus

Potentilla angentea

Sedum.....

Veronica spicata

Plants of the Flood Plains on Alluvium of the Large Rivers in the Steppe Regions of Russia and West Siberia *Meadow foxtail*

Can't decipher handwriting!