Perennial assortment - What can be expected in the coming years?

Designing a Sustainable Plant Assortment for Changing Climates

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The current perennial assortment consists of thousands of various species, and especially cultivars of plants from various corners of the world.

Its development historically started with expeditionary journeys, an interest in new exotic plant species, and the evolution of ornamental gardens.

Later on, it also involved collecting and gradually progressed towards breeding, which opened entirely new possibilities for expanding the assortment.

Great Dixter, UK

The current range of varieties primarily arises from breeding and production companies (such as Terra Nova Nurseries, Jelitto Stauden Seeds, some companies in the Netherlands, Denmark, Germany, Japan, Poland…), research institutions, perennial nurseries (for example, Coen Jansen in the Netherlands), botanical gardens (for example, Chicago and Denver BG), thanks to the enthusiasm of individuals (collectors, amateur breeders) and some more probably...

Vitroflora, Poland

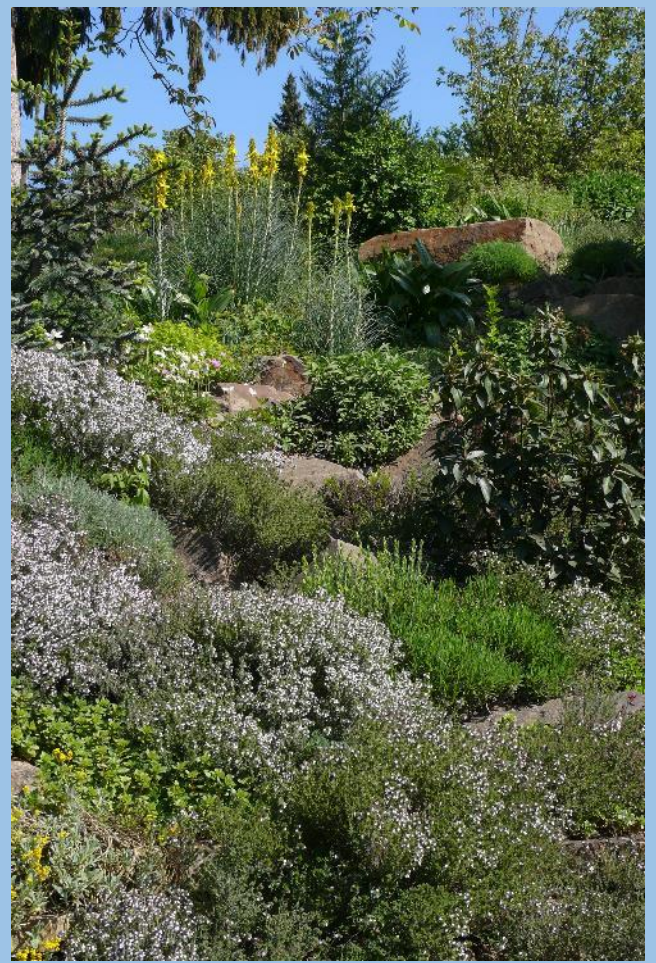
Experimental field of Jan Spruyt
Belgium

The perennial assortment currently faces, from my perspective, two potential problems or risks.

On the one hand, there's the threat of climate change and the accompanying extremes in weather.
For gardeners, this particularly means recurrent droughts, more frequent heatwaves, and very intense flash floods.

The chosen assortment and potential cultivation technologies should be able to react to these changes and adapt appropriately.
That is, selecting more drought-resistant species suited for high summer temperatures, etc.

the Mediterranean garden, BG Prague - Troja



private garden
South Moravia

The second risk, in my opinion, lies in the direction of breeding currently happening in many perennial species. While visually stunning and appealing to buyers, unfortunately, these plants are far less enduring than the original species or older varieties. There is a whole range of "perennials" available in the market whose actual vitality does not correspond to how the plant is presented (i.e., as being perennial).
The focus of many plant breeders and producers is on creating very attractive (pleasing), compact, and abundantly flowering plants. Their breeding originates from perennial species, but the resulting new varieties are often rather short-lived and suitable primarily for seasonal cultivation in containers rather than in flower beds.

Typical examples: many of new hybrids of *Echinacea, Coreopsis, Agastache, Achillea, Gaura, Monarda* etc.

´Sunseeker Salmon´

´Limerock Dream´

´Raspberry Summer´

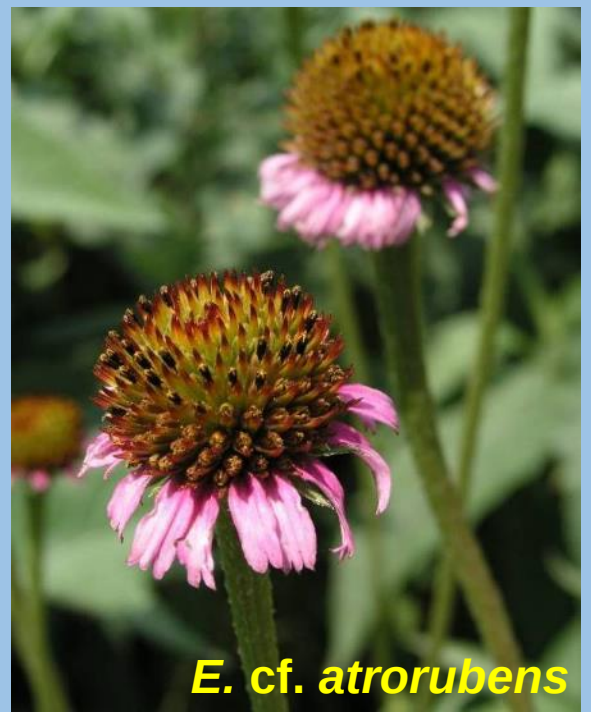
´Red Velvet´

A typical example is the *Echinacea* genus, which has transformed incredibly in roughly 20 years.
From a few predominantly pink-flowering varieties, the assortment has expanded to hundreds of pastel-coloured cultivars.
However, their endurance is often very problematic, more suitable as short-lived container plants.
There's nothing inherently wrong with this, but my concern is that they are not presented this way, and most customers still consider them as perennials. Of course, this doesn't apply 100%. Surely, even in the new assortment, there will be high-quality varieties in terms of endurance. However, their selection must be preceded by a longer-lasting cultivation evaluation.

Echinacea

E. tennesseensis

E. paradoxa
var. *paradoxa*



´Pink Poodle´

´Tomato Soup´

´Mac´n Cheese´

´Secret Affair´

´Secret Glow´

´Ellegance´

´Catharina´

´Balscanery´

´Butterfly Fisses´

´Mozzarella´


´Hot Papaya´


´Coconut Lime´


´Pink Double Delight´


´Cheyenne Spirit´

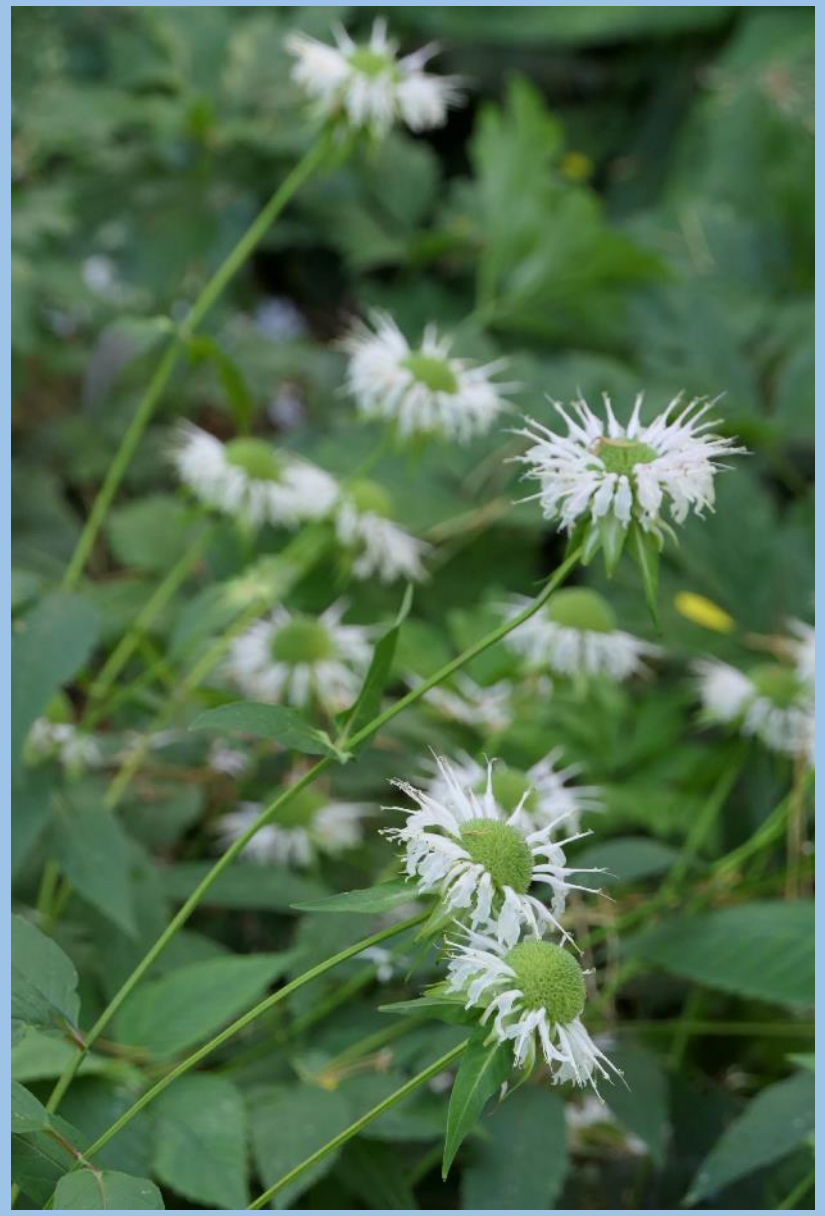

´Marmelade´


´Supreme Cantaloupe´

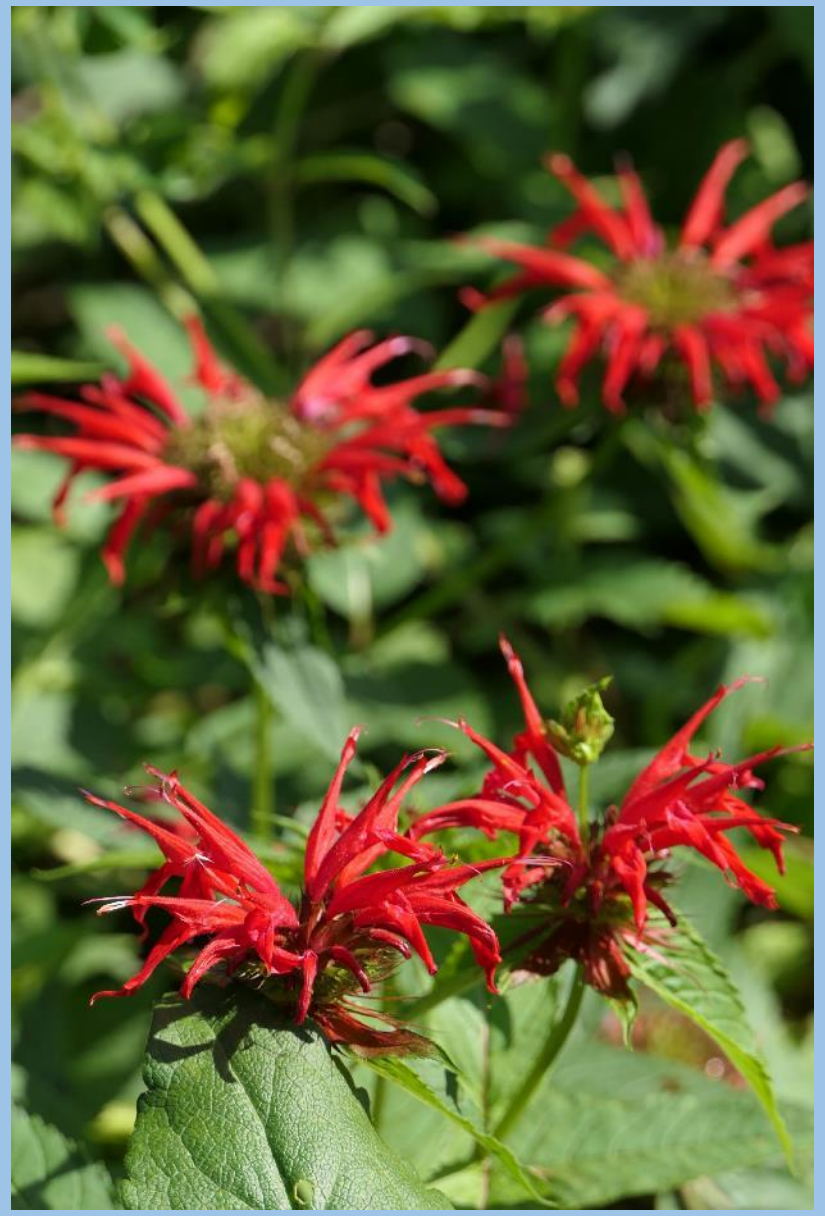
'JS Engeltje'

Monarda

Monarda cf. *clinopodia*



Monara didyma, Appalachian mountains, USA



Monarda

M. bradburyana

M. menthifolia

M. fistulosa


´Bee Free´


´Bee Happy´


´Knight Rose´


´On Parade´


´Prague Night´


´Kardinal´


´Pink Bergamot´


´Neon´

Agastache - In nature, they occur mainly in the regions of North America and partially in eastern Asia. North American representatives are primarily semidesert and prairie species such as *A. cana, A. aurantiaca, A. rupestris, A. pringlei, A. foeniculaceum*, and *A. breviflora*.
These plants prefere full-day sun exposure and summer drought well.
They need lighter soils and require very good drainage.


A. *foeniculaceum*


A. breviflora


A. rupestris


A. cana

In our (Czech) conditions, reliable winter hardiness is a problem for many species (especially those from warmer regions of North America), and only some can be considered relatively reliably winter-hardy. During the winter season, persistent waterlogging of the soil can be an issue, which, coupled with low and fluctuating temperatures, may lead to freezing in some species.

http://www.terranovanurseries.com

A.aurantiaca

´Blue Boa´

´Summer Fiesta´

´Summer Fiesta´

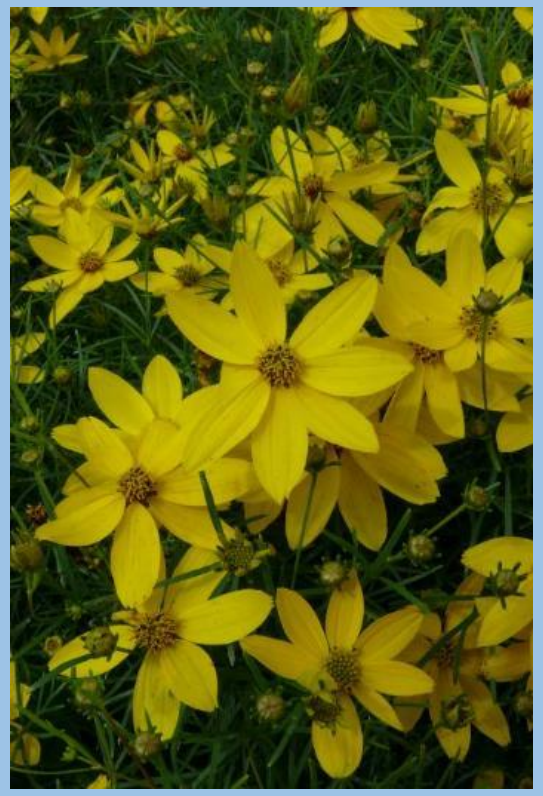
´Raspberry Summer´

´Summer Glow´

´Cotton Candy´

C.grandiflora

´Limerock Dream´



C.verticillata ´Zagreb´

C. tinctoria

´Cherry Lemonade´

´Ruby Frost´

´Summer Punch´

Coreopsis

´Dark Velvet´

´Summerwine´

´Laura´

´Pomegranate´

Achillea millefolium cultivars

Two ways of perennial breeding and production now?

1) Focus on sales in garden centres, at exhibitions, etc.
Large but compact, richly branched, and long-flowering varieties whose origin mostly derives from perennials.
However, it doesn't matter that these are often short-lived varieties less suitable for planting in perennial borders.

2) Plants intended for planting in flower beds – real perennials.
Breeding must also focus on the vitality and liveliness of varieties, at least within the parameters of the original species or commonly resilient varieties.

Important question: <u>Does a regular customer buying perennials also know about these two directions???</u>
The disappointment of customers buying "perennials" can lead over time to a drop in confidence in plant producers.

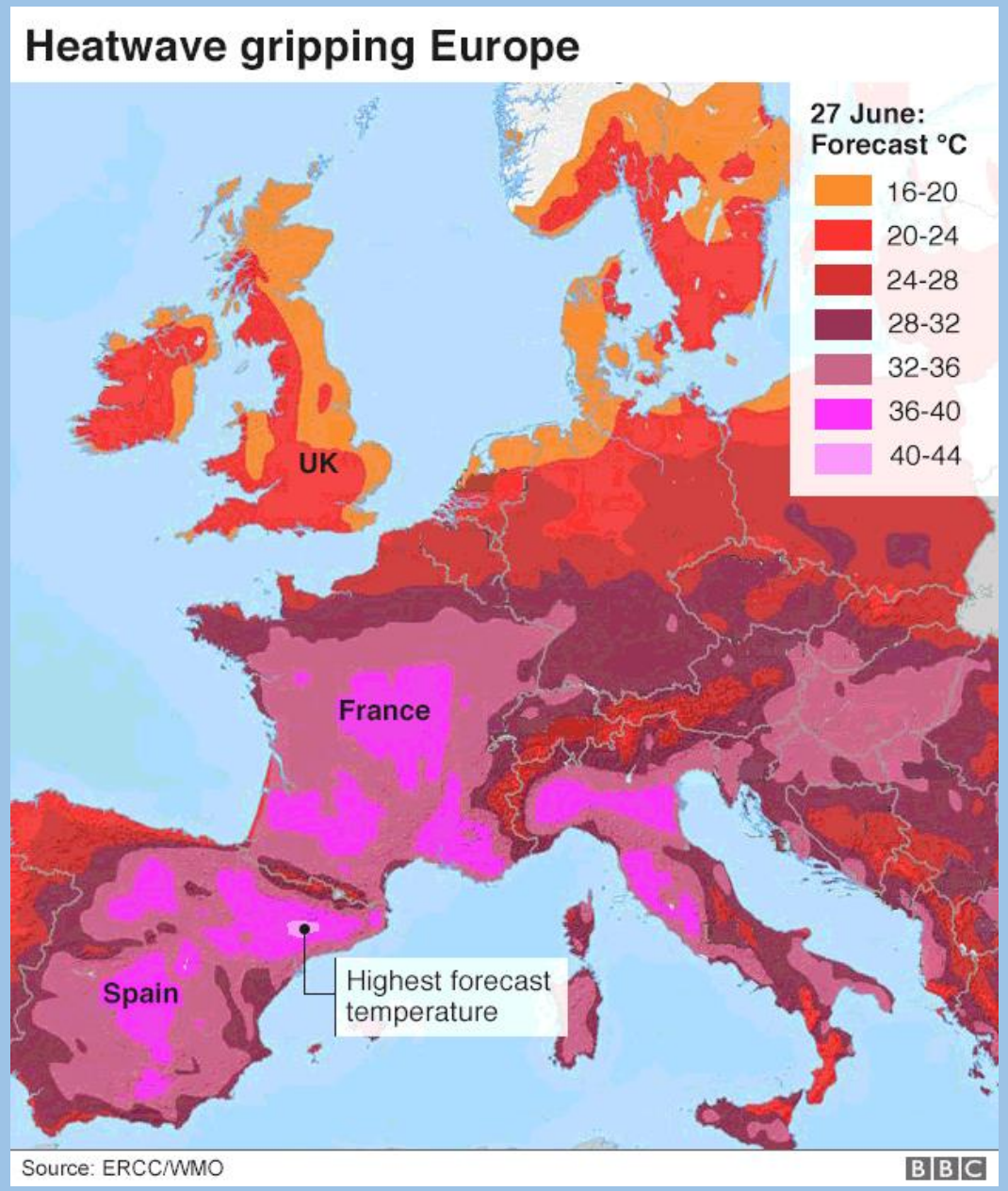
What challenges do we face (*not only in the cultivation of ornamental plants*)…?

drought
heat waves
torrential rain
floods
rapid weather changes
more wet and mild winters
more hot and dry summer
and ?????

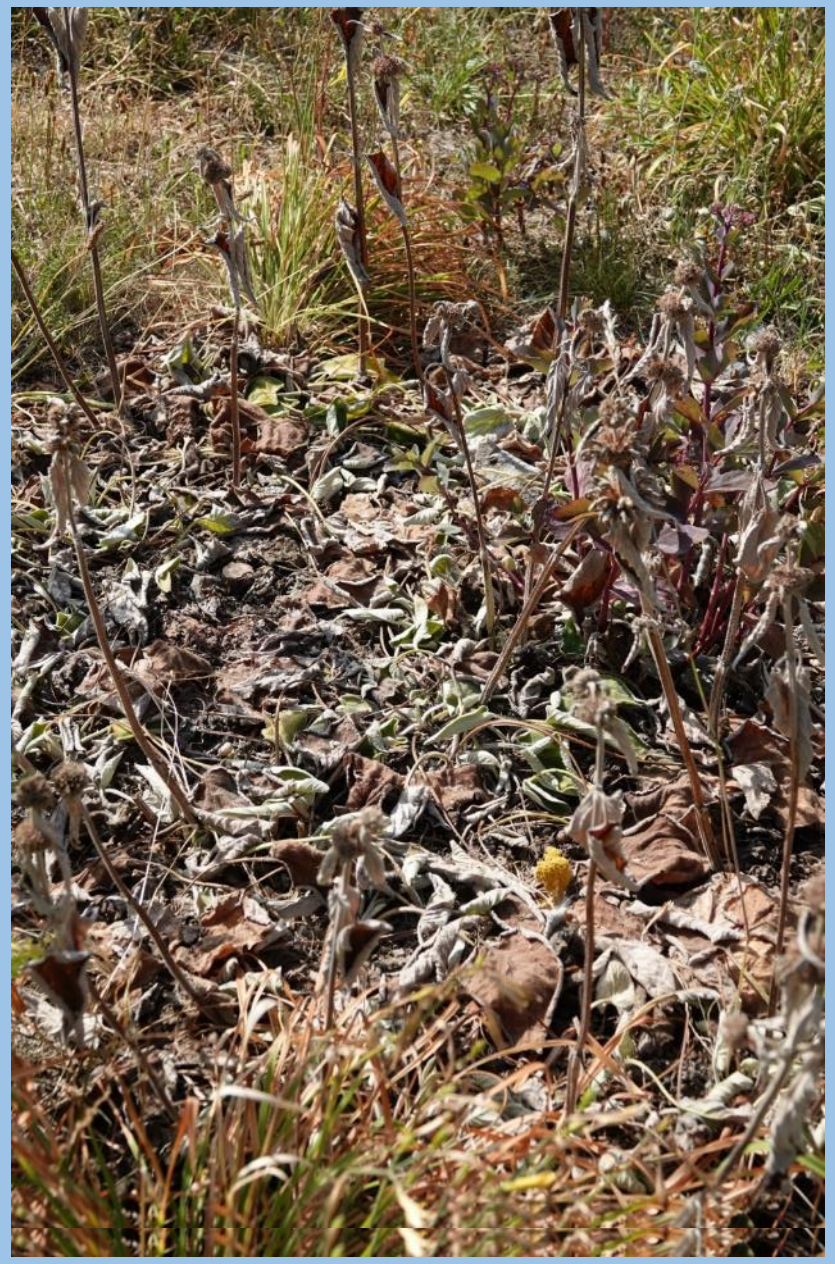
the age of extremes???

…….temperatures in North America, Asia, northern Africa, and the Mediterranean will exceed 40 degrees Celsius for an extended period this week, according to the World Meteorological Organization. It has warned that the heatwave will intensify this week, leading to increased nighttime temperatures and a higher risk of heart attacks and deaths. Concerns are growing that the heat will result in a greater number of fatalities…….

Paragraph from Czech News Server Aktualne.cz
19.7.2023; https://zpravy.aktualne.cz/zahranici/v-rime-padl-teplotni-rekord-namerili-tam-41-8-stupne

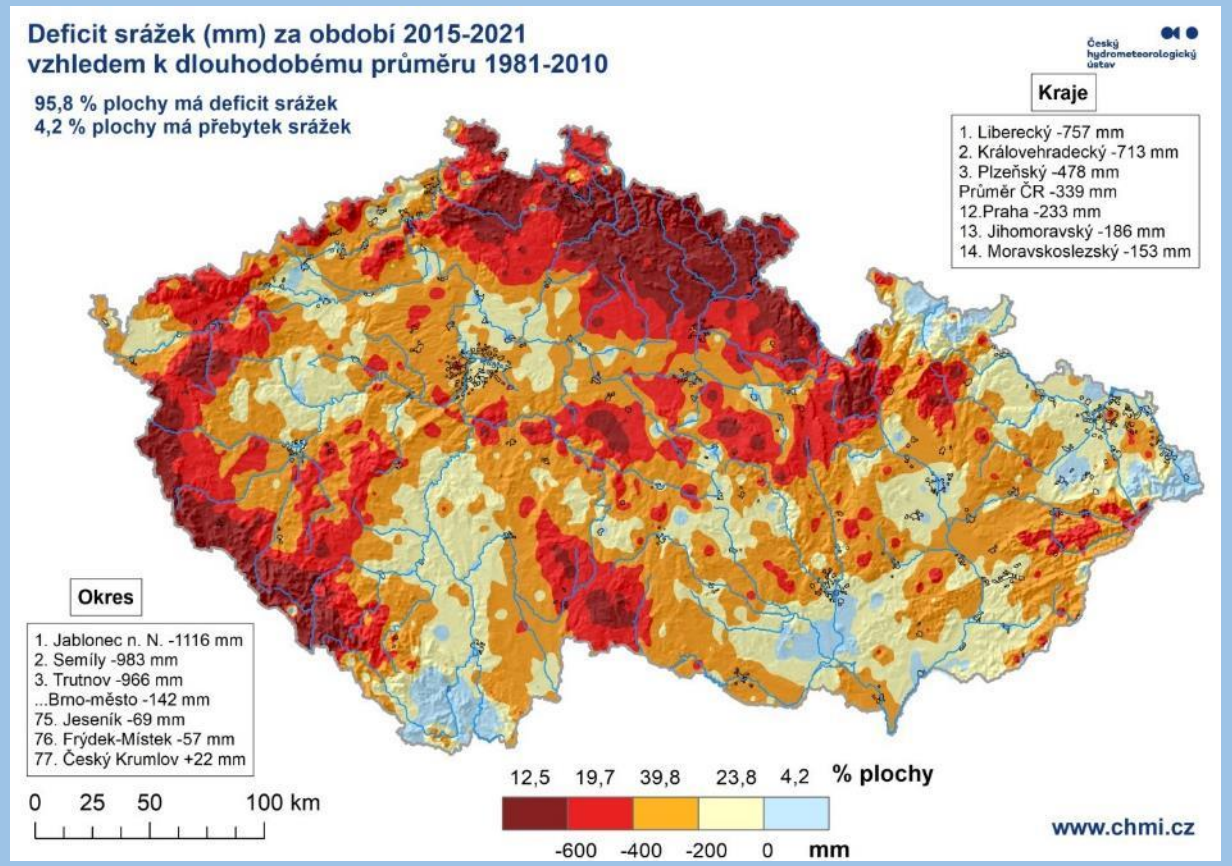


https://www.bbc.com/news/world-europe-48780685



Phlomis russeliana after a few weeks with temperatures around 30-35°C (38°) and precipitation absence…

During the period from 2015 to April 2020, there was a record dry spell, primarily due to high air temperatures and increased evaporation.
Despite this, a significant precipitation deficit accumulated during that time.
The largest precipitation deficit of over 700 mm is observed in the Liberec and Hradec Králové regions.
Overall, the precipitation deficit is still observed at 95.8% of the Czech rep. area.



Map of precipitation deficit for 2015-2021 in he Czech rep.

The common situation of lawns in parks and other public green spaces in Prague during summer and prolonged drought. (20.7.2023)

Daylilies (*Hemerocallis*), which belong to plants highly resistant to drought, can dry out in the long-term absence of water and in permeable soil.

Young trees left to "their fate" after planting, without providing them with at least 2-3 years of irrigation, typically gradually wither during extended periods of drought.

Why sustainable plantings ?

In ideal way…
- low irrigation requirements
- better water management in soil
- less demanding maintenance

withering lilac on the southern slope

How to achieve it?

- to grow **good garden plants**
  (real perennials)
- to choose **right plant for right place**
  (respect for the planting location)
- to use mulching

Main topics:

What is a good garden plant for sustainable plantings?

What is a drought-resistant (drought tolerant) plant for sustainable plantings?

Examples of „classical“ (common) drought tolerant assortment.

Examples of new (perspective) drought tolerant assortment.

Examples of sustainable plantings - Gardens as Islands of Biodiversity

Future risks?

BG Prague Troja
Part of short grass prairie
february 2022

So…, what to grow?

Use plants that you are familiar with and know what to expect from them.

What does it mean?

- knowledge of the planted assortment (what can be expected from specific species or varieties)

- longevity vs. short lifespan

- variety-specific characteristics (height of varieties of *Salvia nemorosa* for example)

- resistance to diseases and pests

- using of novelties (yes, but careful selection, they should not form the basis of the planting).

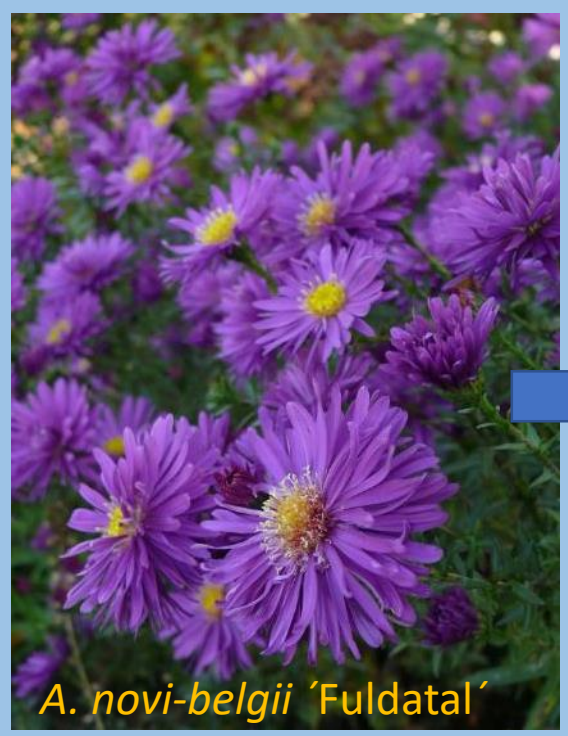
Ratibida columnifera
typically short-lived species
tolerates drought

Ratibida pinnata
very long-lived species, tolerates drought

What is a drought-resistant (or drought tolerant) plant for sustainable plantings?

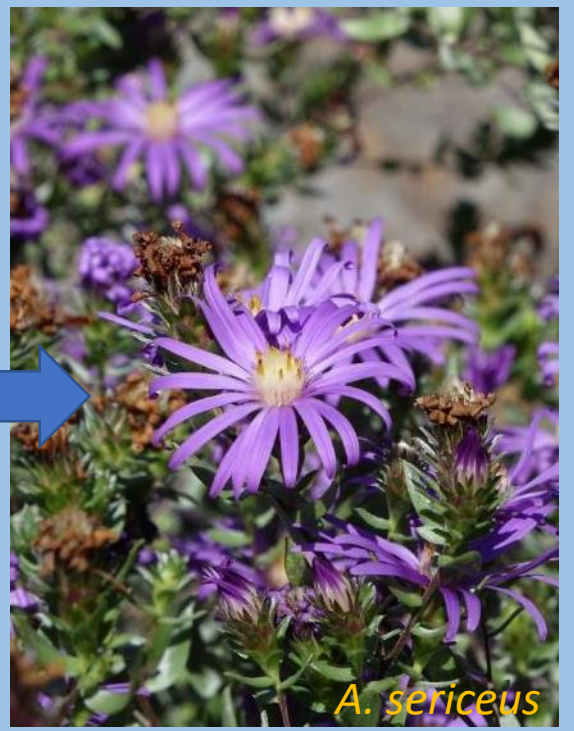
Drought resistance is a **relative matter** to a considerable extent. When choosing suitable species, it cannot be considered in an "absolute" way that some plants are drought-resistant and others are not. Instead, it is essential to remember that some species are more drought-resistant than others.

For example, a variety of New York aster (*Aster novi-belgii*), it almost will not thrive well in a flowerbed without irrigation. The New England aster (*Aster novae-angliae*) fares slightly better; although it also prefers well-drained soil, it can tolerate occasional dry spells better. Even better adapted to such conditions is the Italian aster (*Aster amellus*), originally from sunny and drier steppe areas of Europe (including the Czech Republic). Very drought-resistant is the North American species *Aster sericeus*, which can cope with almost no watering and can survive in semi-arid environments.


A. novi-belgii ´Fuldatal´


A. novae-angliae


A. amellus ´Brilliant´


A. sericeus

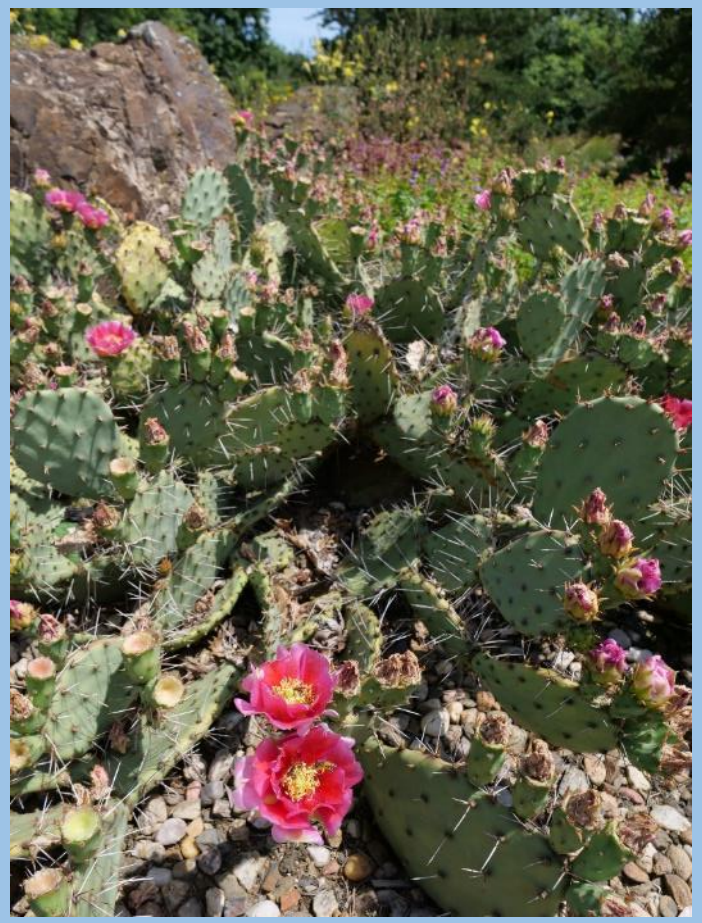
An another example is the popular coneflower (*Echinacea*). These plants are generally presented as drought-resistant. However, this is particularly true for species with taproots and fleshy roots, such as *Echinacea pallida, E. tennesseensis* and *E. paradoxa*. In the case of the most commonly cultivated purple coneflower (*E. purpurea*), its drought resistance heavily depends on the site and, above all, mulching. If planted in an unmulched flowerbed with regular garden soil, it tends to suffer from water scarcity and high temperatures relatively quickly. On the other hand, if the surface is mulched with gravel, it can withstand longer periods without rain very well.

Echinacea pallida *E. paradoxa* *E. tennesseensis* *E. purpurea*

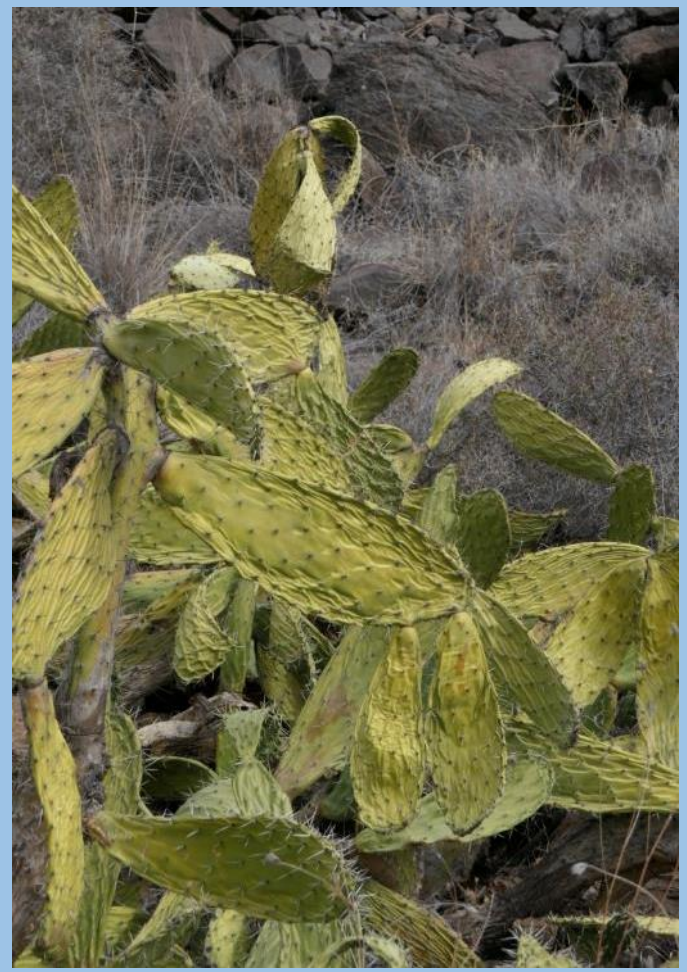
taproot system; more drought tolerant

fibrous roots – less drought tolerant

An extreme example could be cold-hardy cacti, especially some types of prickly pears (opuntias).
They are capable of enduring drought lasting for several months, but they must be planted in an exceptionally poor and permeable substrate, mainly composed of coarse gravel or crushed stone.
If someone plants them in a regular flowerbed and further enhances the soil with compost or other organic material, it will almost certainly lead to root rot and rapid decline of these cacti.



Hardy opuntias on the North American Semi-Desert Exposition
in the Prague Botanical Garden – the area is completely free of irrigation

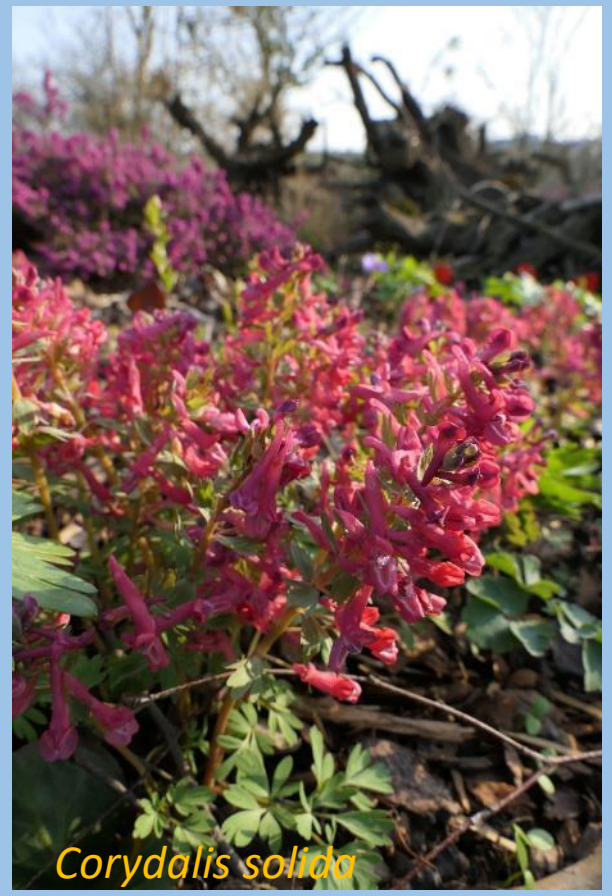


An extreme example of a drying *Opuntia* sp.
on the island of Gran Canaria

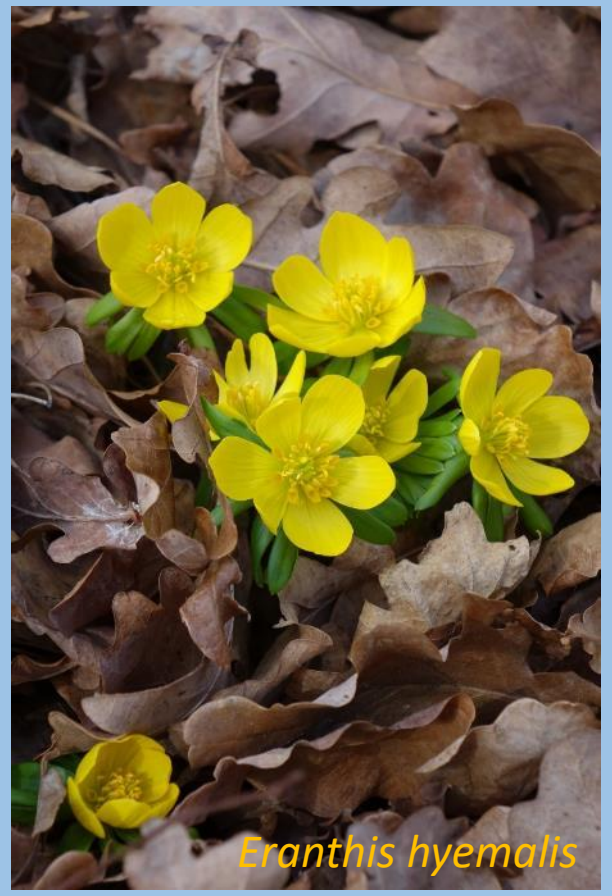
Examples of „classical“ (common) drought tolerant assortment. (from early spring to late autumn)

For early spring (March to mid-April)

Here, mainly small bulbous plants such as *Iris reticulata, Scilla, Chionodoxa, Corydalis solida, Cyclamen coum*, small-flowered *Crocus*, *Eranthis*, *Anemone blanda*, etc., are active. These plants vegetate very early and briefly, utilizing winter and early spring moisture. They survive summer drought in the form of bulbs and tubers.


Corydalis solida


Iris reticulata ‘Harmony’


Eranthis hyemalis


Chionodoxa forbesii


Cyclamen coum


Crocus tommasinianus


Iris danfordiae


Scilla siberica


Anemone blanda


Chionodoxa luciliae
´Pink Giant´


Puschkinia scilloides

Spring (late April to early June)

Among native species, examples include *Adonis vernalis*, various pasqueflowers (*Pulsatilla*), thyme (*Thymus*), woodland sage (*Salvia nemorosa*), swordleaf inula (*Inula ensifolia*), dittany (*Dictamnus albus*), *Asphodeline lutea*. Additionally, there are bearded irises (*Iris barbata*), *Nepeta racemosa*, thymes (*Thymus vulgaris*), mountain savory (*Satureja montana*), creeping phlox (*Phlox subulata*), some cranesbills (*Geranium cinereum, G. sanguineum*), rockroses (*Helianthemum*), various pinks (*Dianthus*), *Alyssum* and others.


Adonis vernalis


Pulsatilla sp.


Salvia nemorosa


Nepeta racemosa ´Grog´


Asphodeline lutea


Phlox subulata cvs.


Dictamnus albus


Thymus pulegioides ´Kurt´


Geranium sanguineum ´Elke´


Thymus vulgaris

Summer (late June to August)

Red valerian (*Centranthus ruber*), daylilies (*Hemerocallis*), common rue (*Ruta graveolens*), lavender (*Lavandula angustifolia, L. ×intermedia*), cotton lavender (*Santolina chamaecyparissus*; which is decorative essentially all year round), clary sage (*Salvia sclarea*), pale coneflower (*Echinacea pallida*), globe thistle (*Echinops*), yarrow (*Achillea filipendulina*), yucca (*Yucca filamentosa*), oregano (*Origanum vulgare*), bee blossom (*Gaura lindheimeri*), *Hyssopus officinalis*.


Echinops microcephallus


Centranthus ruber


Ruta graveolens


Achillea filipendulina

Echinacea pallida

Gaura lindheimeri

Lavandula angustifolia

Santolina chamaecyparissus

Origanum vulgare

Hyssopus officinalis

Yucca filamentosa

Late summer and autumn (late August to October)
Michaelmas daisies and goldilocks aster (*Aster amellus, A. linosyris, A. sedifolius*), *Colchicum speciosum*, *C. byzantinum*, cyclamens (*Cyclamen purpurascens, C. hederifolium*), stonecrops (*Sedum spectabile, S. telephium* and their cultivars), bee blossom (*Gaura lindheimeri*), *Ceratostigma plumbaginoides*.


Colchicum sp.


Aster
linosyris


Aster sedifolius


Cyclamen hederifolium

Common ornamental grasses

Sesleria caerulea, *S. nitida*, *S.autumnalis*, *Stipa* spp., *Pennisetum orientale*, *Bouteloua gracilis*, *B.curtipendula*, *Festuca* spp. (several species and many cultivars), *Koeleria macrantha*, *Andropogon scoparius*, *Briza media*….


Bouteloua gracilis


´Blonde Ambition´

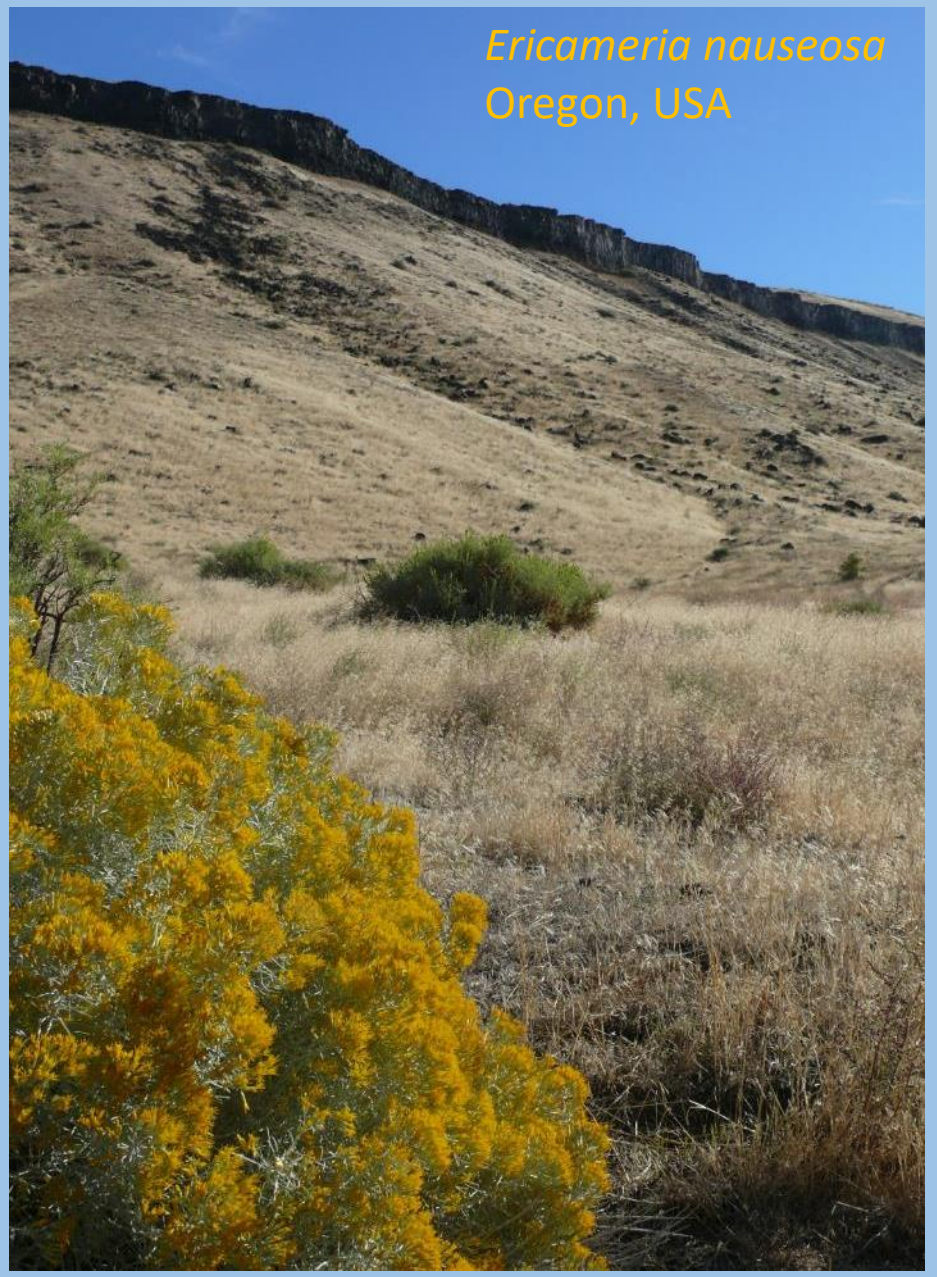

Sesleria spp.


Briza media


Buchloe dactyloides

Perspective and less known perennials for sustainable plantings

A number of horticulturally interesting species can still be found in the wild.



Baptisia

And botanical species like:
B. tinctoria, B. tinctoria var. *minor,*
B. sphaerocarpa, B. leucantha etc.

Amsonia

A. fugatei

Amsonia (*orientalis* ?) ´Blue Ice´

A. tabernaemontana ´Short Stack´

Good species for gardens: *A. elliptica; A. hubrichtii, A. illustris* and possibly more…

Amsonia cf. *illustris*
On north american semidesert garden in Prague Troja BG

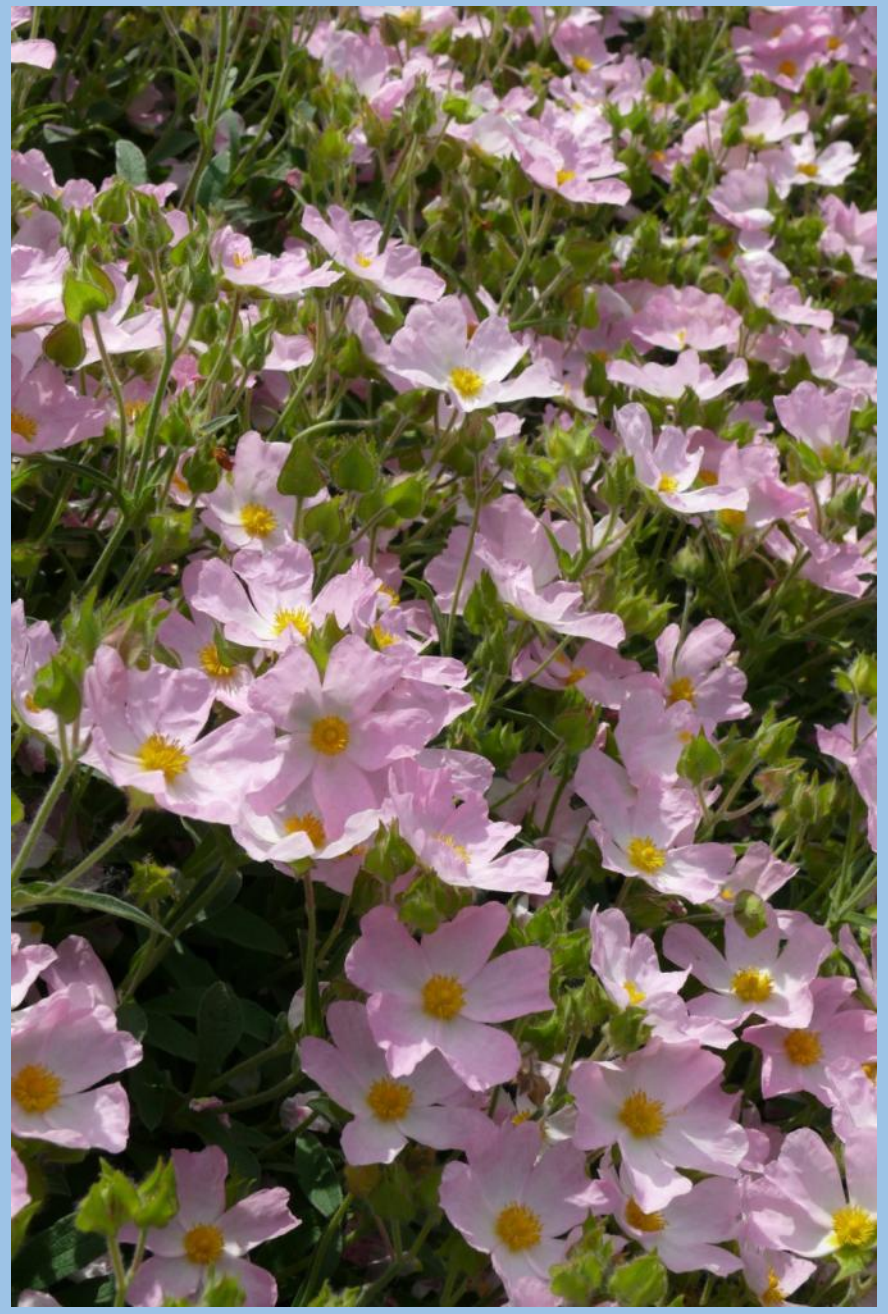
Cassia hebecarpa (syn. *Senna hebecarpa*)

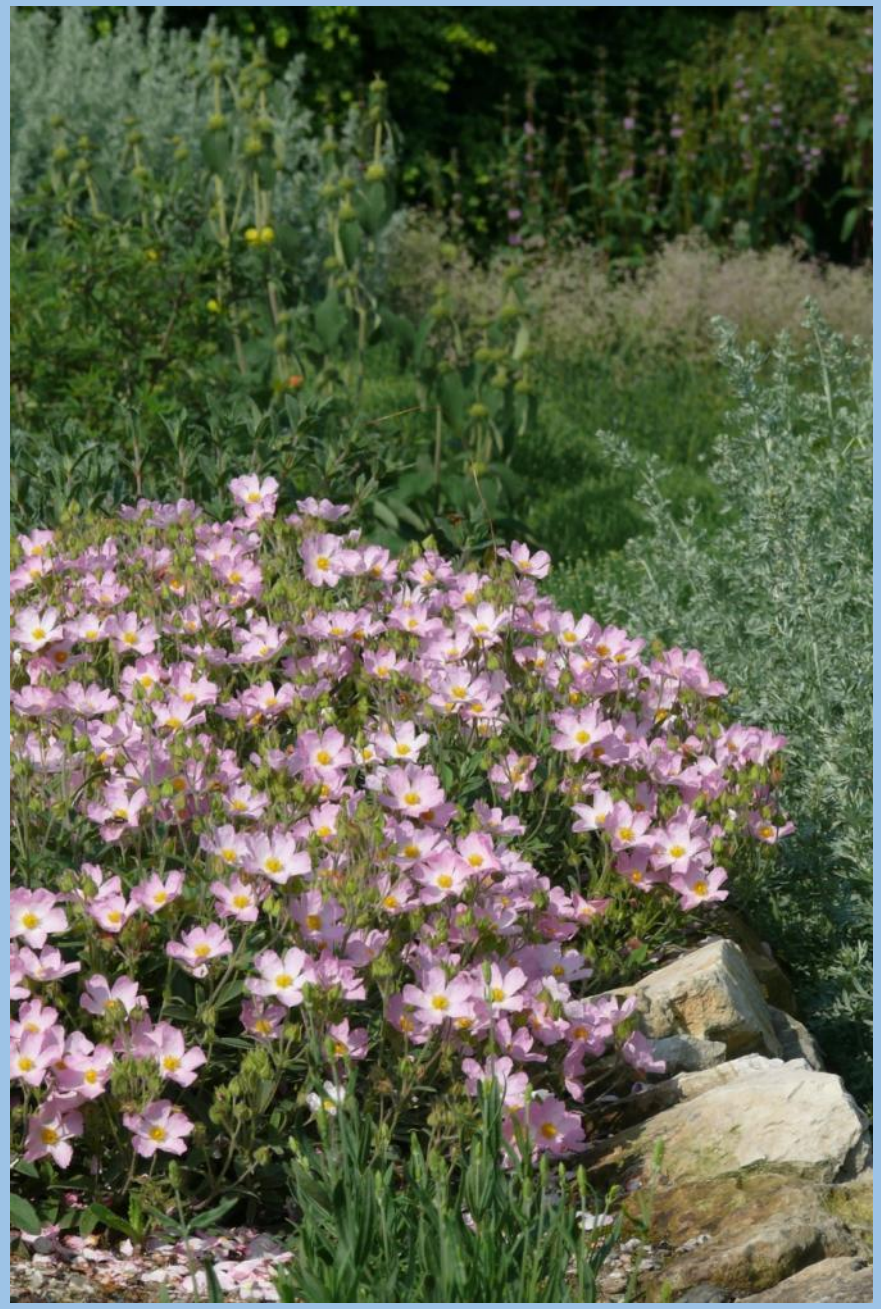
Centaurea

Centaurea simplicicaulis (+ a little bit bigger *C. bella*)

Dracocephalum

Cistus ×*lenis* ´Grayswood Pink´ (*C. sintenisii* x *C. parviflorus*)





Dalea purpurea (syn. *Petalostemon purpureum*)

Heuchera

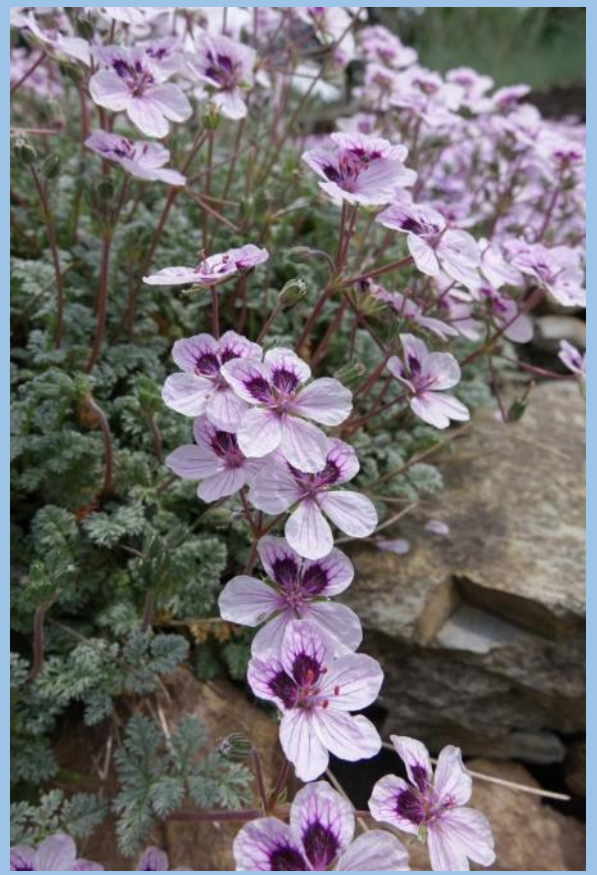
H.parishii

H.pulchella

Erodium ´Marchant´s Selection´
(*E.* ×*kolbianum* ?)

E. chrysanthum

Erodium amanum



Erodium ×*kolbianum* ´Natasha´

Erodium **spp.**

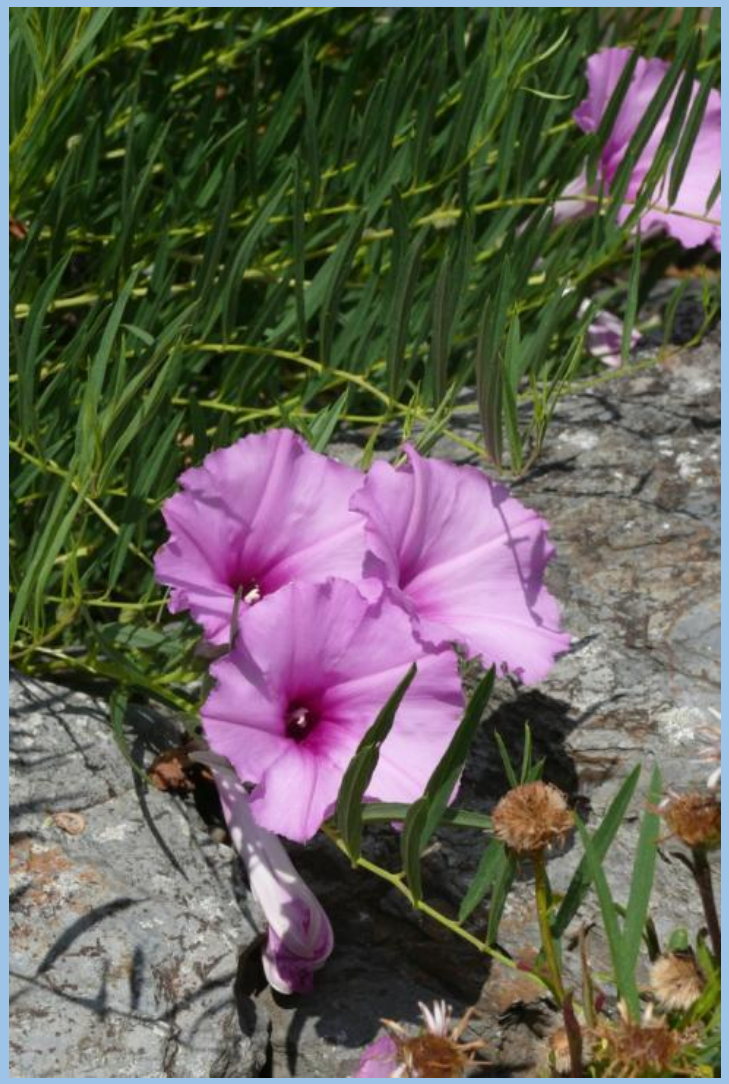
Elsholtzia stauntonii

Helichrysum trilineatum

Heliomeris multiflora

Heterotheca cf. *pumila*

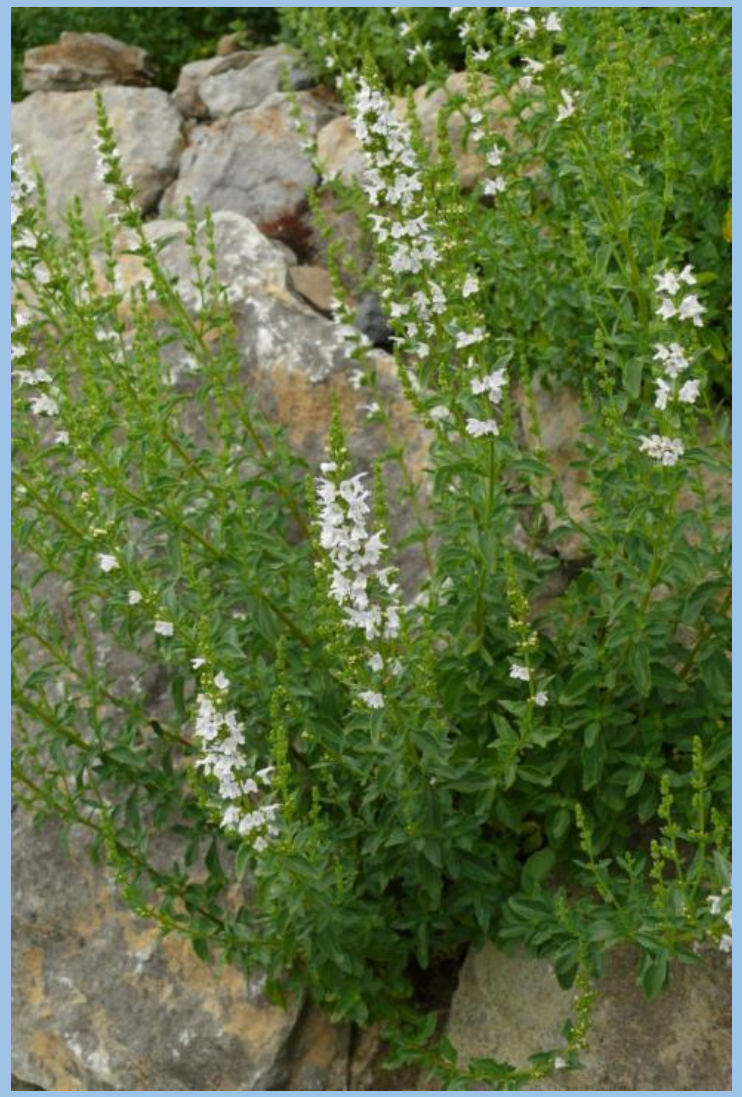
Ipomoea leptophylla



semidesert exhibition in Prague BG

Colorado, USA

Micromeria



M.thymifolia

M. croatica

M.marginata

Monarda bradburiana

Monardella odoratissima

Phlomis

Phlomis armeniaca

P. lychnitis

P. herba-venti

Potentilla micrantha

pictured 20.3.2016; also for dry shade

Allium ´Millenium´ (and other *A. senescens and A. lusitanicum* group cultivars)

Peganum harmala

Sandy areas along Issyk Kul lake Kyrgyzstan

Steppe vegetation with *P. harmala*, Kyrgyzstan, Chon Kemin National Park

Pycnanthemum

P. incanum

P. muticum

P. tenuifolium

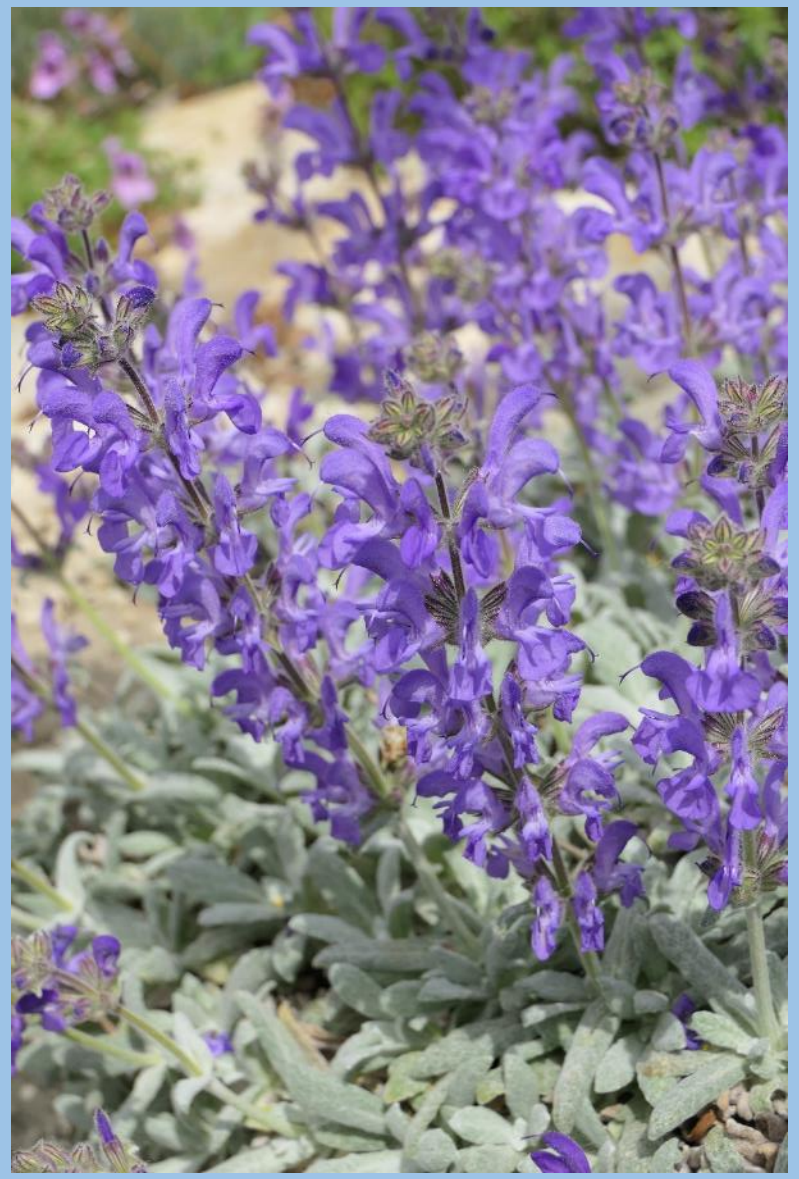
P. *albescens*
(also for dry shade)

Salvia

S. pachyphylla

S. lavandulifolia
subsp. *vellerea*
subsp. *oxyodon*
subsp. *blancoana*

Salvia



S. daghestanica

S. multicaulis

S. pisidica

Scutellaria

Scutellaria resinosa

Scutellaria incana

Solidago caesia

S. sempervirens

S. speciosa

Tanacetum densum subsp. *amanii*

Teucrium

T. flavum

T. ×ackermannii hort.

Zauschneria californica ´Catalina´

Zinnia grandiflora

in Prague BG

Arizona, USA

Aster

Aster turbinellus ´JS El Fin´

Aster sericeus

Ericameria nauseosa
(syn. *Chrysothamnus nauseosus*)

USA, Oregon

Prague BG – Troja
(exhibition of drought tolerant plants from North America)

Ornamental grasses

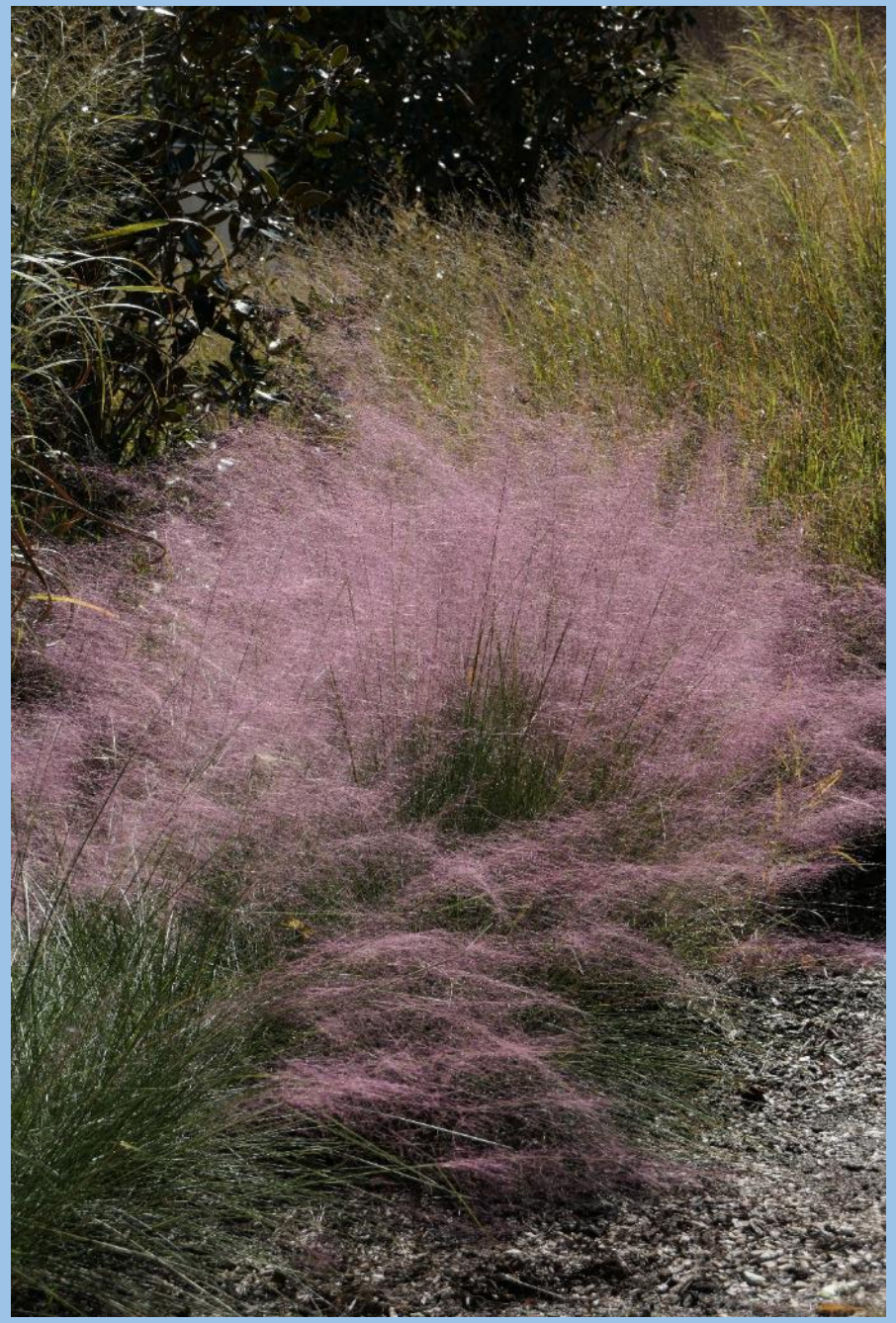
Sporobolus heterolepis

Sporobolus airoides

Andropogon gerardii ´Blackhawks´

´Red October´

Andropogon hallii ´JS Yellow Konza´



Muhlenbergia capillaris

´White Cloude´
Hofmann´s nursery, USA

Muhlenbergia reverchonii ´Undaunted´

in October

in March

Eragrostis spectabilis

Muhlenbergia rigens

Examples of sustainable plantings

Gardens as Islands of Biodiversity

Sustainable plantings. What is it??

There are two main principles (from my point of view…)

Principle of stability.
The planted area should have an appropriate (assumed) lifetime. Perhaps 10-15 years or even more.

Principle of change (dynamic state).
The planted plant community gradually changes over time, but should remain in the state of the vegetation involved.

Beth Chatto gravel garden

Ideally, the demands for irrigation and maintenance of the planted beds should be minimized.

Gardens (and planted public spaces) can serve not only as aesthetic spaces but also as refuges for hundreds of plant and animal species.

Examples of sustainable plantings

7.5.2015

Mixed planting of Mediterranean herbs and shrubs – Prague BG

Planted species:

Thymus vulgaris
Salvia officinalis
Lavandula angustifolia
Origanum vulgare
Rosmarinus officinalis (´Arp´, Sissinghurst´, ´Weihenstephan´)
Santolina spp.
Salvia jurisicii
Salvia sclarea
Verbascum spp.
Cistus ´Ann Baker´
Digitalis ferruginea
Lavandula x *intermedia*
and more...

22.9.2015

1.6.2016

30.6.2016

20.7.2017

July 2017

Mixed planting of Mediterranean herbs – vineyard area of Prague BG

Planted species*:*

Salvia officinalis (cultivars), *Lavandula officinalis, Nepeta racemosa* (cultivars) *Santolina spp., Thymus vulgaris, Hyssopus officinalis, Origanum vulgare, Satureja montana, Salvia nemorosa. Antirrhinum majus, Vitis vinifera*

Mixed planting of Mediterranean herbs and shrubs – Prague BG

5.5.2011

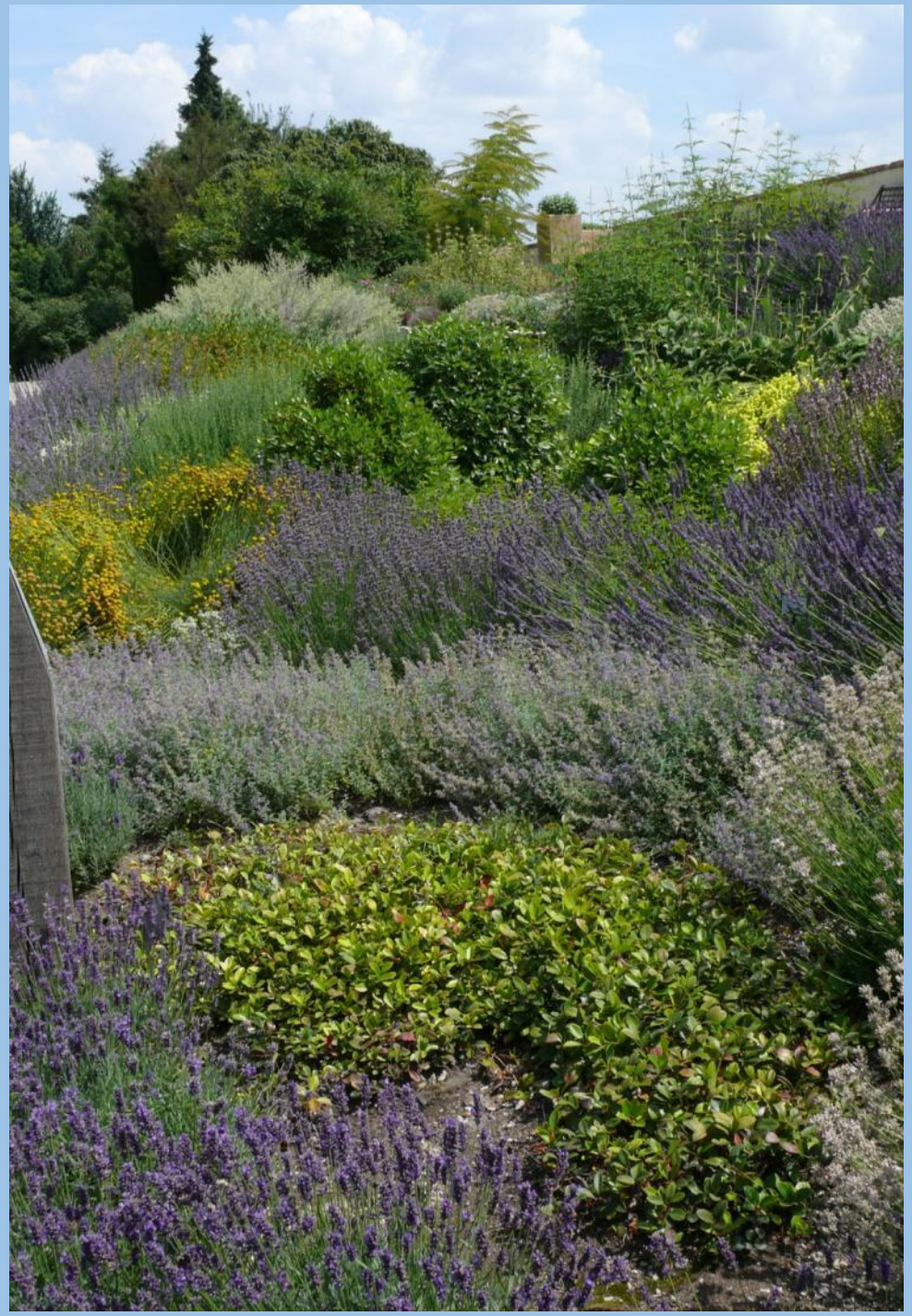
13.7.2011


9.6.2013


30.6.2015

10.6.2014

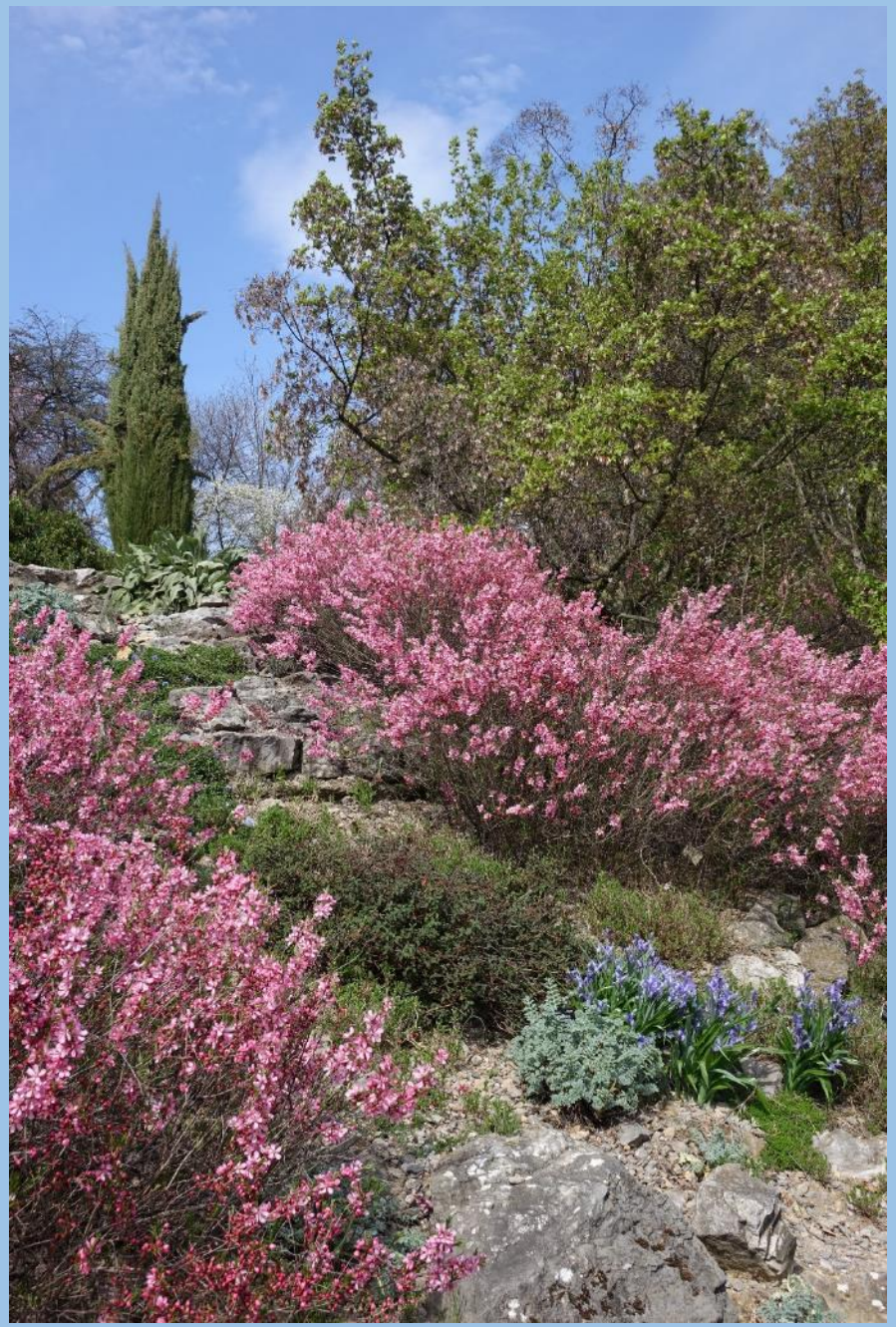
16.12.2015



Planted species*:*
Lavandula angustifolia (cultivars)
Lavandula × *intermedia* (cultivars)
Lavandula × *chaytorae*
Santolina spp. (about 5 species)
Salvia lavandulifolia
Thymus spp.
Cistus spp. (about 10 species)
Phlomis spp.
Centranthus ruber
Origanum vulgare (cultivars)
and more.

Shrubs:
Bupleurum fruticosum
Viburnum tinus
Arbutus unedo
Vitex agnus-castus

Mediterranean garden – Prague BG




Cistus laurifolius

North American prairie garden – Prague BG

14.6.2015

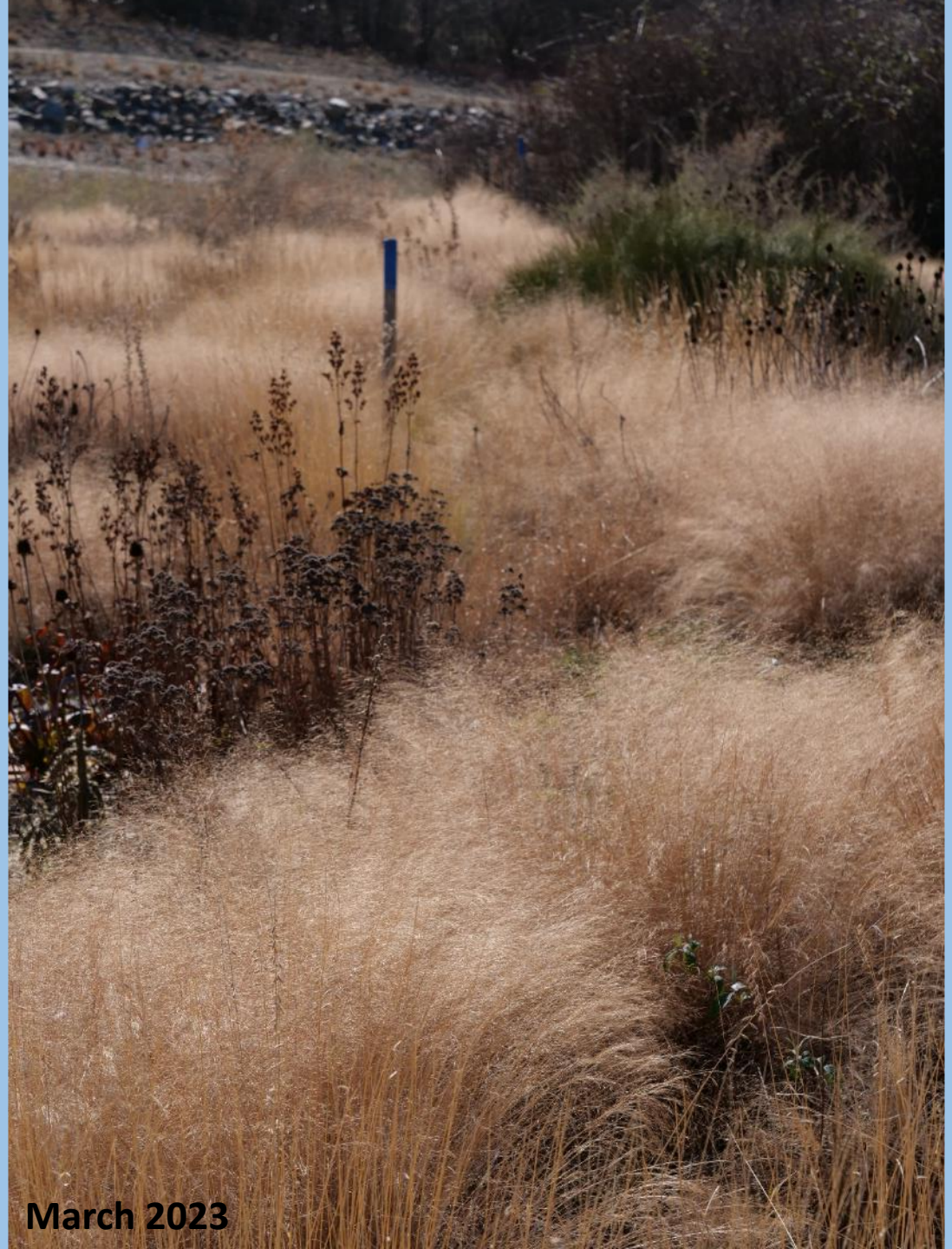
3.10.2015

New high-grass prairie garden
Prague BG – Troja
(planted 2021)

August 2023

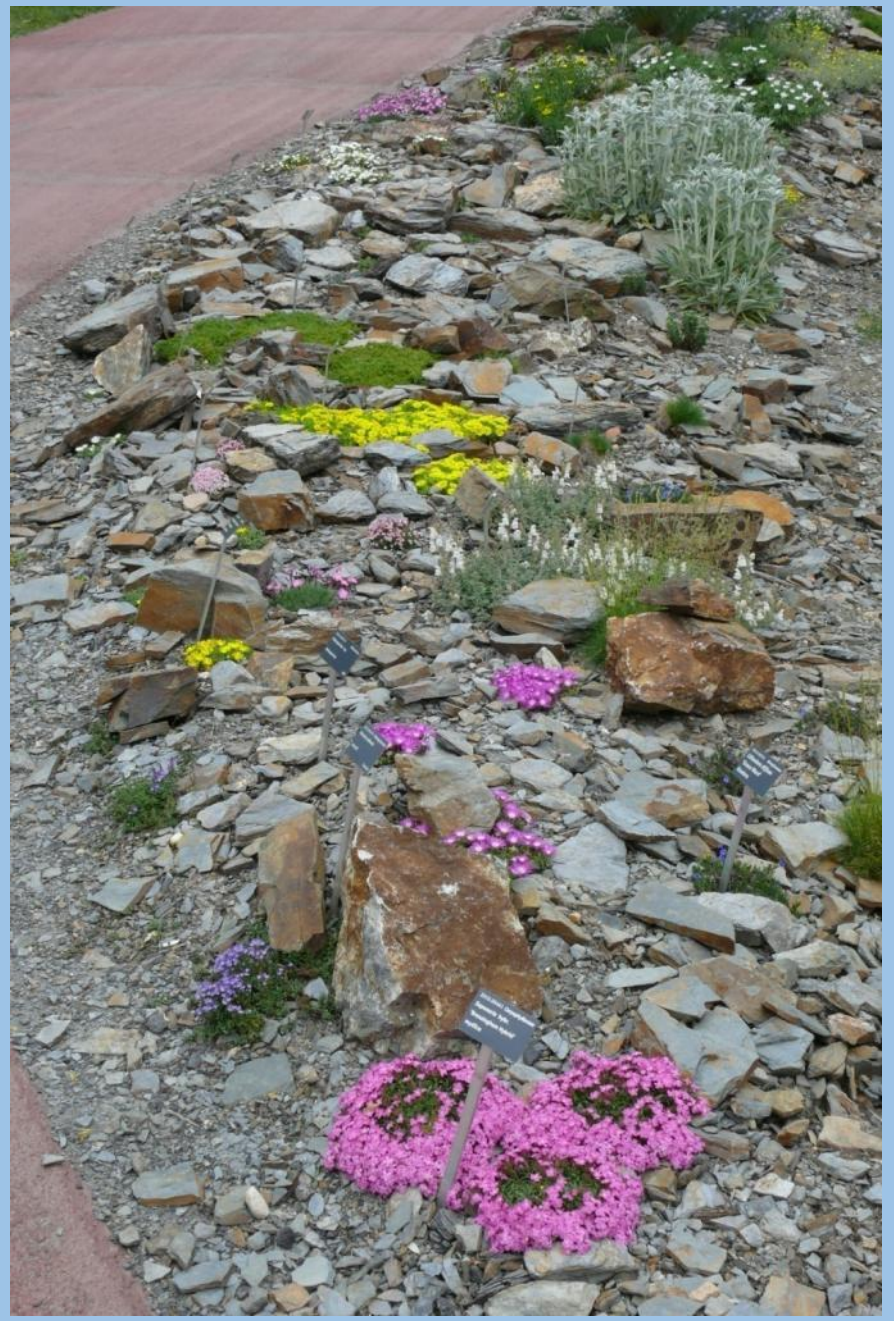
Short-grass prairie
Prague BG – Troja

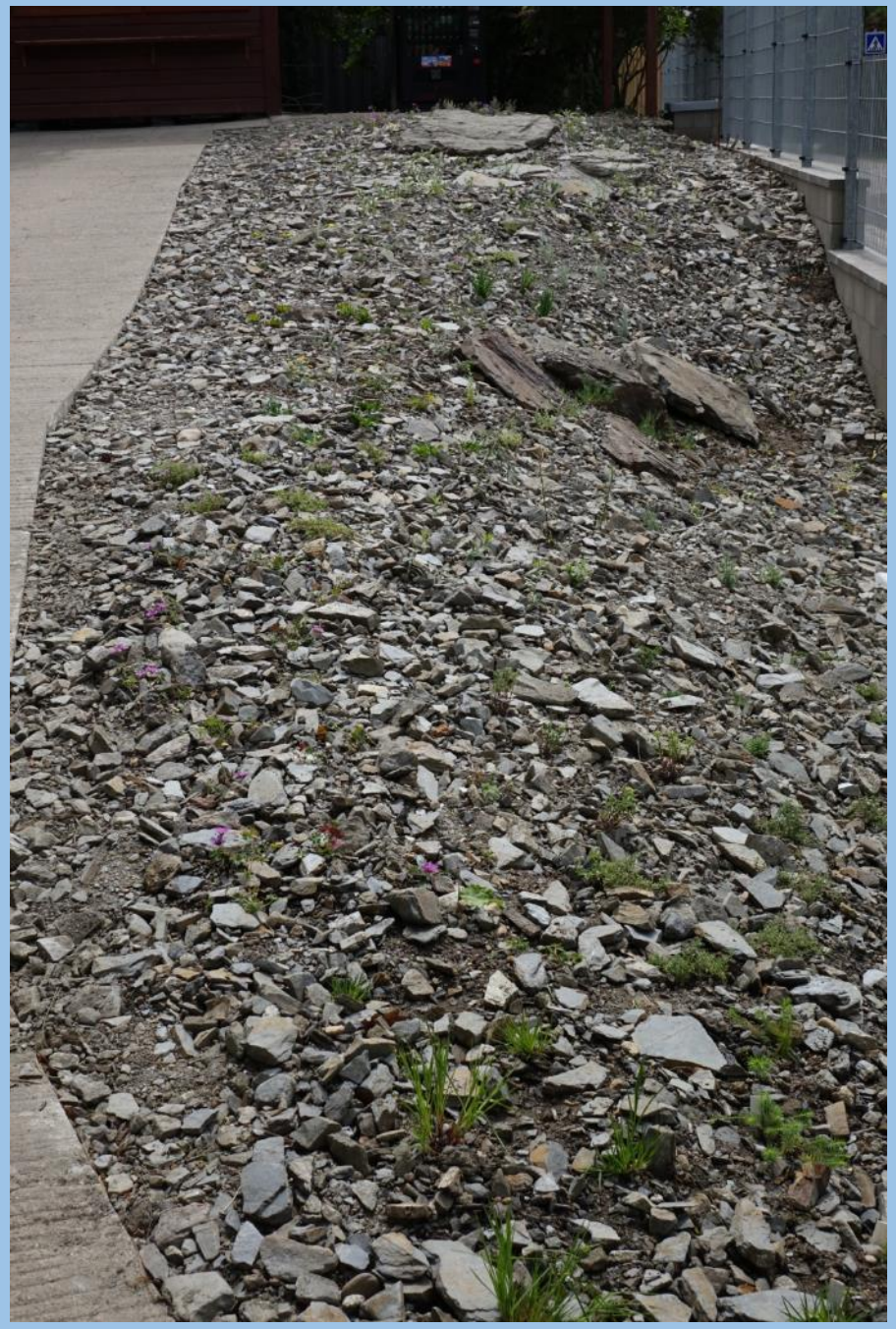
June2020



Short-grass prairie
Prague BG – Troja

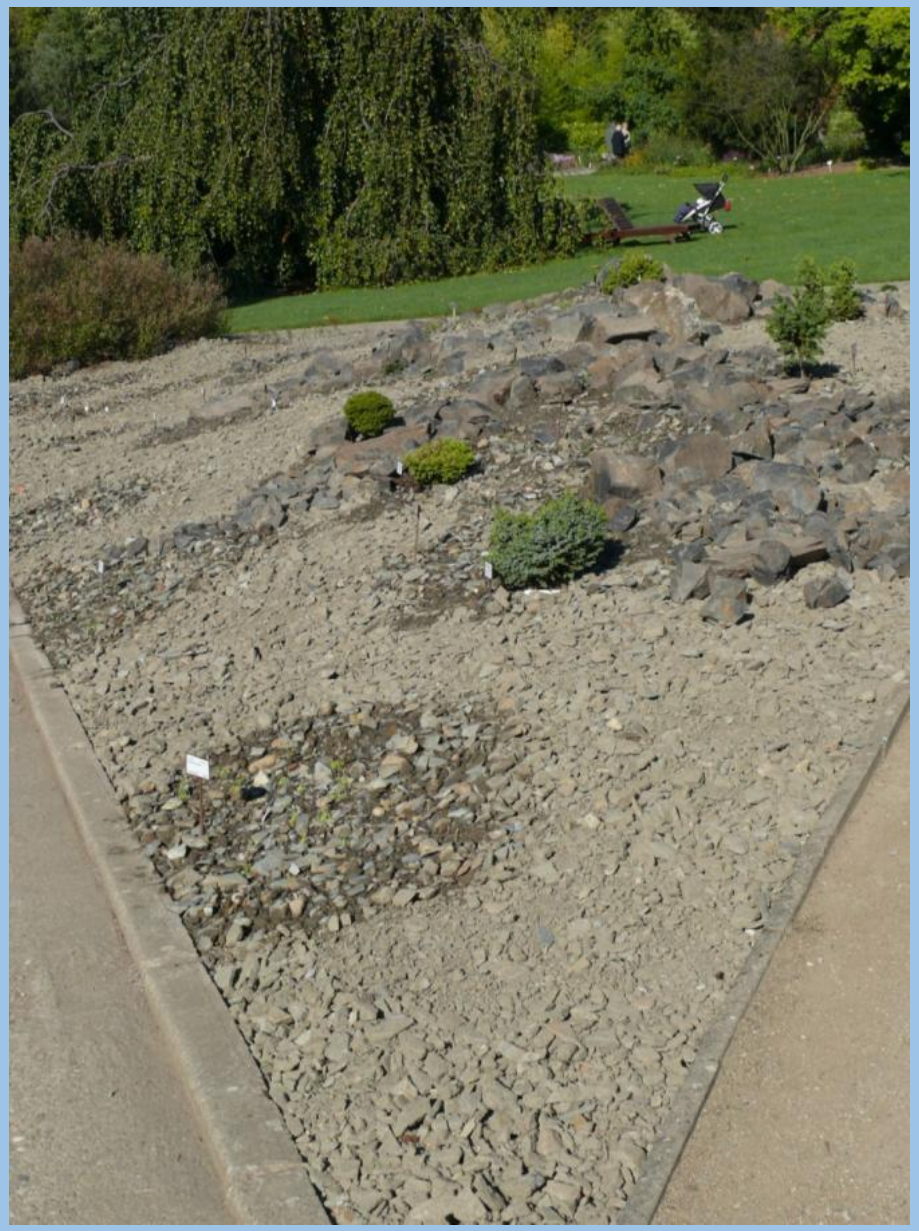
Planting in stone rubble (scree) – Prague BG





VI. 2016

V. 2018



3.9.2013

North American semidesert garden Prague BG

Dendrological garden Průhonice
Czech rep.

Flowerbeds desigden by Mr. Adam Baroš

Practical Recommendations for Biodiversity

Diverse plantings with blooms from spring to autumn.
Flower meadows instead of intensively mowed lawns.

The Future of Gardens as Biodiversity Islands
Public and Private Green Spaces:

Reservoirs of biodiversity
and improved microclimates.

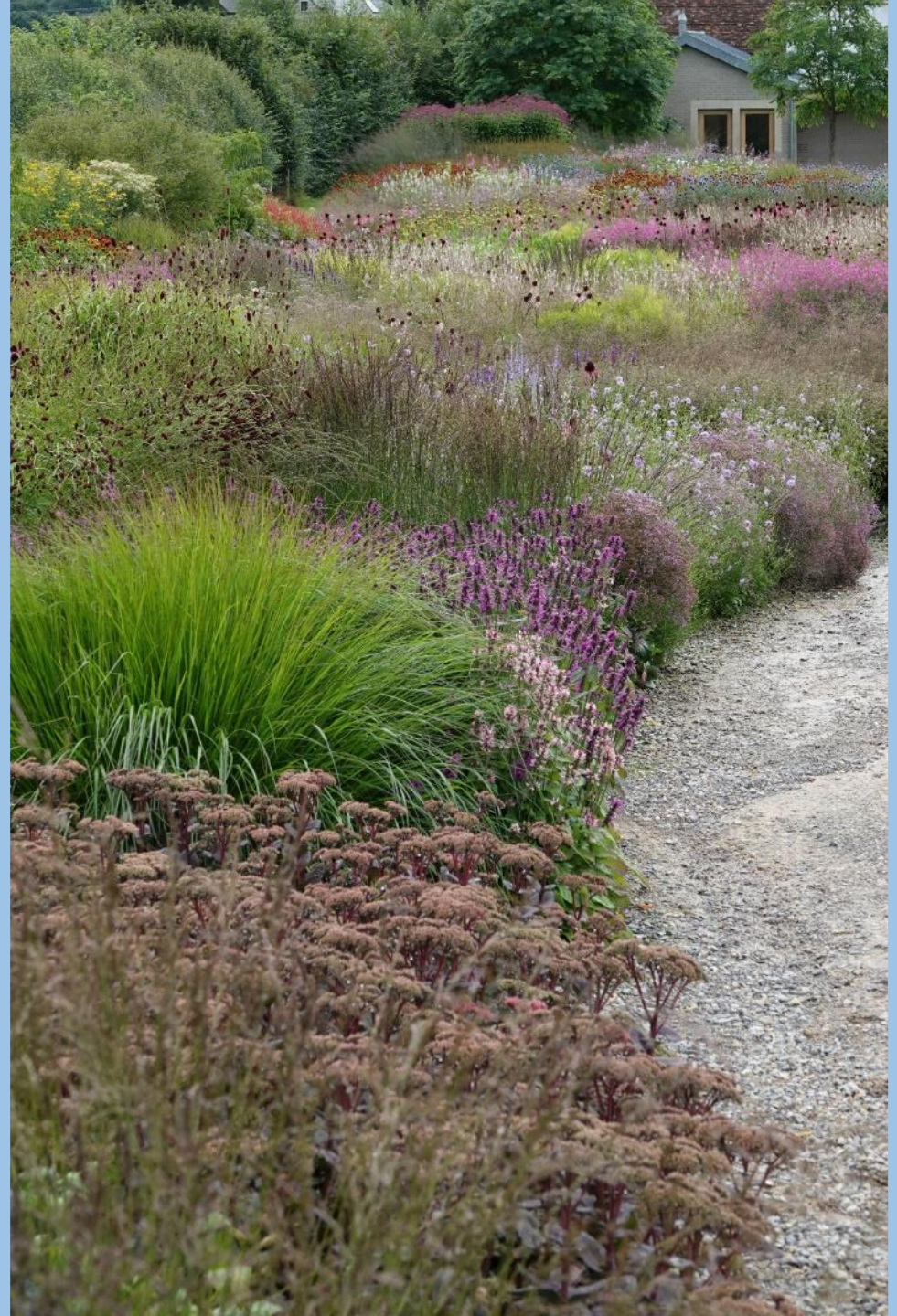
Easier and less demanding care
compared to traditional lawns.

Challenge:
Recognizing gardens as ecological
as well as aesthetic elements.

Supporting the trend
of nature-inspired garden designs.

Piet Oudolf plantings

Oudolf Field
Bruton
Sommerset, UK



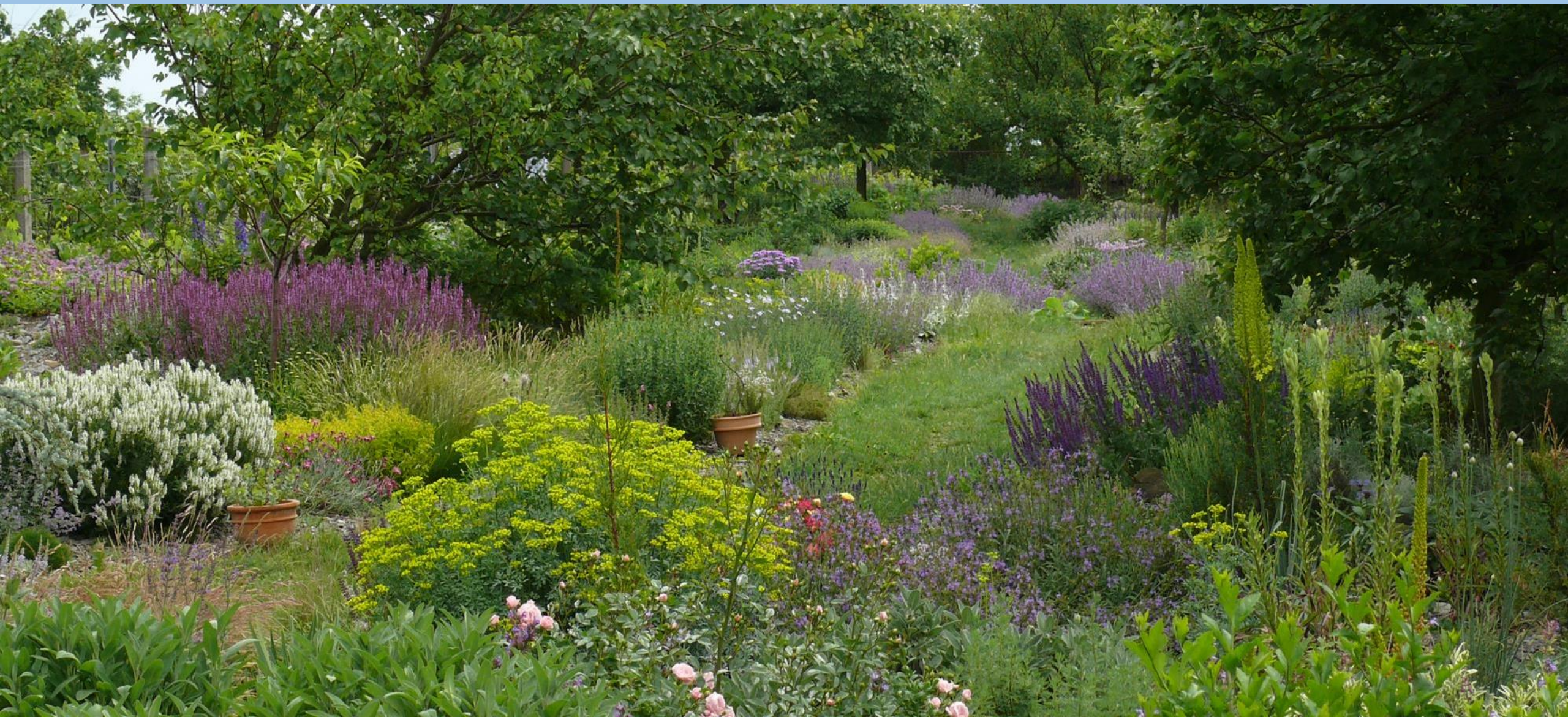
Oudolf Field
Bruton
Sommerset, UK

Prairie garden and perennial nursery of Jan Nussbauer, south Bohemia

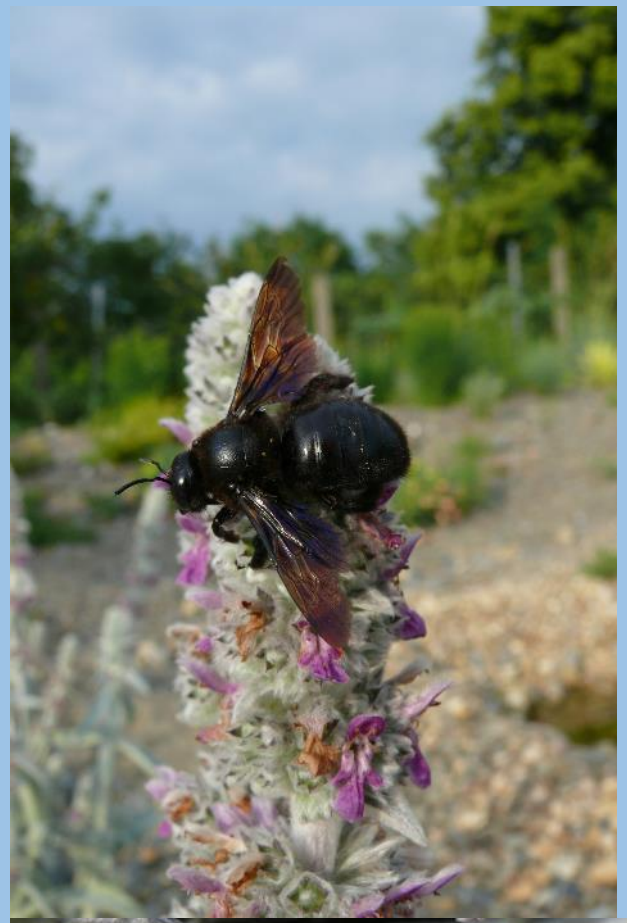
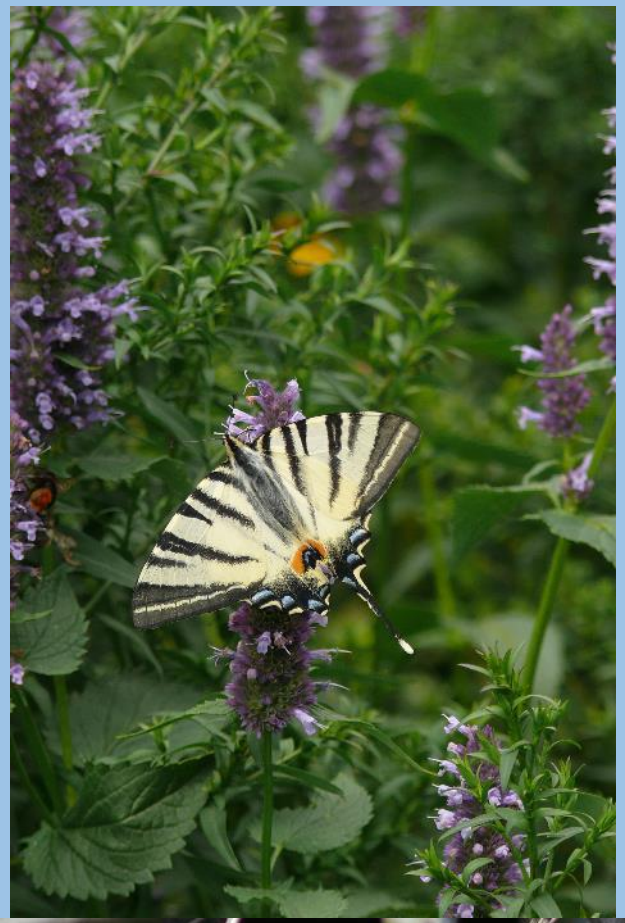
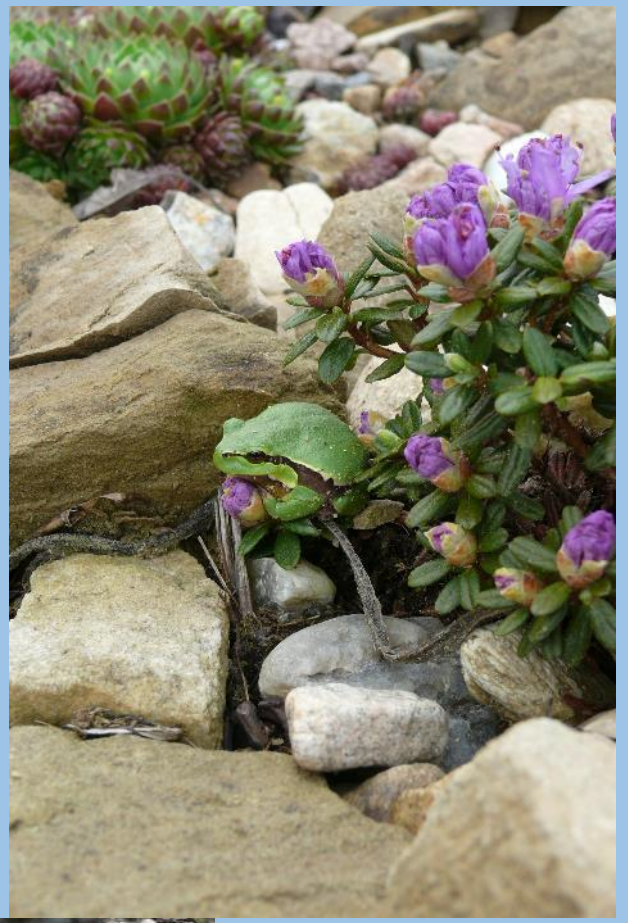
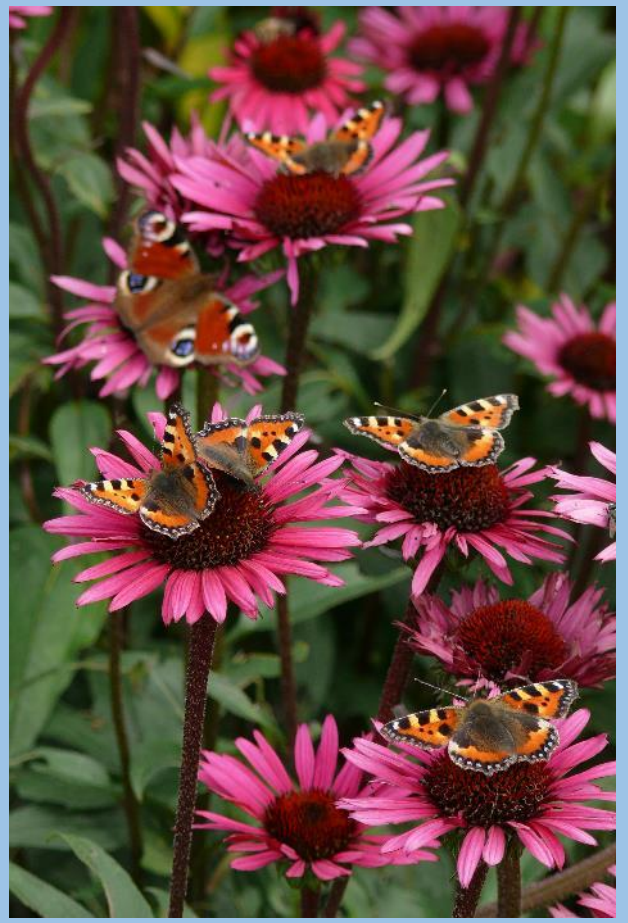
Steppe species in planting in front of open air museum Niedersulz , Austria

Prairie garden of Lianne Pot, The Netherlands

Dry tolerant perennials and species-diverse plantings – private garden, south Moravia, Czech rep.



Example of rich diverse planting in front garden


Examples of several species living in a single, plant species-rich garden,
with a variety of different habitats.

Future risks of a new plants assortment?
What we need to look out for?

Possible arrival of new diseases and pests.

The spread of invasive plant species.

Especially watch out for species that sow themselves very easily.

Examples of plants that easily self-seed

Solidago rigida

Stipa (Nassella) tenuissima

Gaura biennis

Examples of plants that easily self-seed

Aster novae-angliae (*A. novi-belgii, A. dumosus, A. lanceolatus…..*)
Nepeta racemosa
Mellica altissima
Miscanthus sinensis (some cultivars)
Phlomis russeliana
Centranthus ruber
Echinacea purpurea
Monarda fistulosa
and more…

Disposal of invasive *Isatis tinctoria* on protected steppe sites on Palava Hills (south Moravia)

https://palava.nature.cz/

Disposal of *Heracleum mantegazzianum*
in the Karlovy Vary Region (western Bohemia)

Reynoutria (syn. *Fallopia*) is one of the most challenging invasive species in the Czech Republic.
Its negative impact on biodiversity is significant, not only in riparian vegetation.
With its rhizome system and vigorous above-ground biomass, it is capable of displacing many native species from the invaded areas.
The negative influence of knotweed also extends to the socio-economic sphere.
For example, its rhizomes disrupt riverbanks and increase risks during floods. Photo by Jan Pergl.

https://www.casopis.forumochranyprirody.cz/magazin/analyzy-komentare/invazni-rostliny-v-chranenych-uzemich

Disposal of *Opuntia* sp. on Mohelno serpentine steppe, Moravia

Opuntia sp. oppresses the endangered fern *Notholaena marantae*, critically endangered species of Czech flora, Mohelno serpentine steppe

https://www.idnes.cz/jihlava/zpravy/mohelenska-hadcova-step-kaktus-ochranci-priroda-rezervace-rostlina.A241101_824835_jihlava-zpravy_mv