Designing resilient plant communities: the Sheffield Method

Dr. Sally O' Halloran

June 2019

'The Sheffield School'

(in terms of planting design!)

https://www.sheffield.ac.uk/landscape

Professor James Hitchmough

## Professional and Academic Background

1975-79	University of Bath (School of Biological Sciences). B.Sc Honours Degree in Horticulture (Specialising in Amenity Horticulture), Second Class, First Division
1979-82	University of Bath (School of Biological Sciences) Postgraduate Research (Ph.D.) into: "Development of a Computerised Information System for Landscape Plant Selection". Awarded Ph.D in 1984.
1983-88	Lecturer in Amenity Horticulture at Victorian College of Agriculture and Horticulture, University of Melbourne, Australia
1989	Visiting Lecturer in Landscape Management, University of Manchester 1988-93 Senior Lecturer in Environmental Horticulture at Victorian College of Agriculture and Horticulture, Melbourne, Australia.
1993-95	Lecturer/Course Tutor in Environmental Horticulture at SAC Auchincruive, Ayr, Scotland
1995-2003	Reader in Landscape, Department of Landscape, University of Sheffield
2004	Professor of Horticultural Ecology, Department of Landscape, University of Sheffield

https://www.sheffield.ac.uk/landscape/staff/profiles/jhitchmough/profilepub
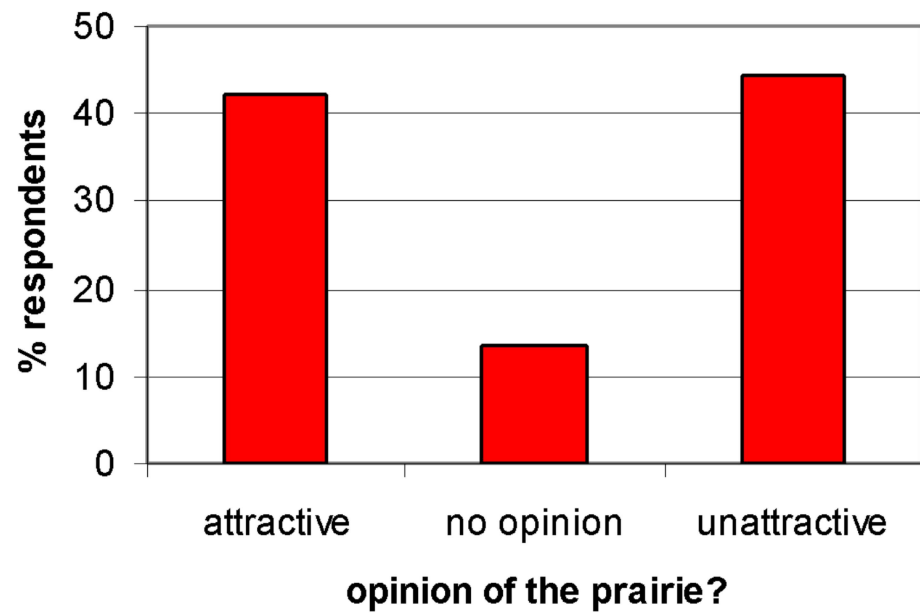
Professor Nigel Dunnett

Academic Qualifications

1981 - 1984: B.Sc Botany, University of Bristol

1985 - 1986: M.Sc Landscape Ecology, Design and Maintenance. Wye College, University of London

1989 - 1990: Garden Club of America Interchange Fellowship in Horticulture. North Carolina State University.

1991 - 1996: PhD: long-term dynamics of herbaceous vegetation in roadside verges at Bibury, Gloucestershire. Department of Animal and Plant Sciences, University of Sheffield.

Professional Background

1986-1989: Freelance botanical surveyor, specializing in woodlands. Garden design and construction, with work in UK and Italy.

1994 – 2002: Lecturer, Department of Landscape, University of Sheffield

2003 – 2007: Senior Lecturer, Department of Landscape, University of Sheffield

2006 – present: Director. The Green Roof Centre, University of Sheffield

2007 – present: Reader in Urban Horticulture, Department of Landscape, University of Sheffield

https://www.sheffield.ac.uk/landscape/staff/profiles/ndunnett/profilepub
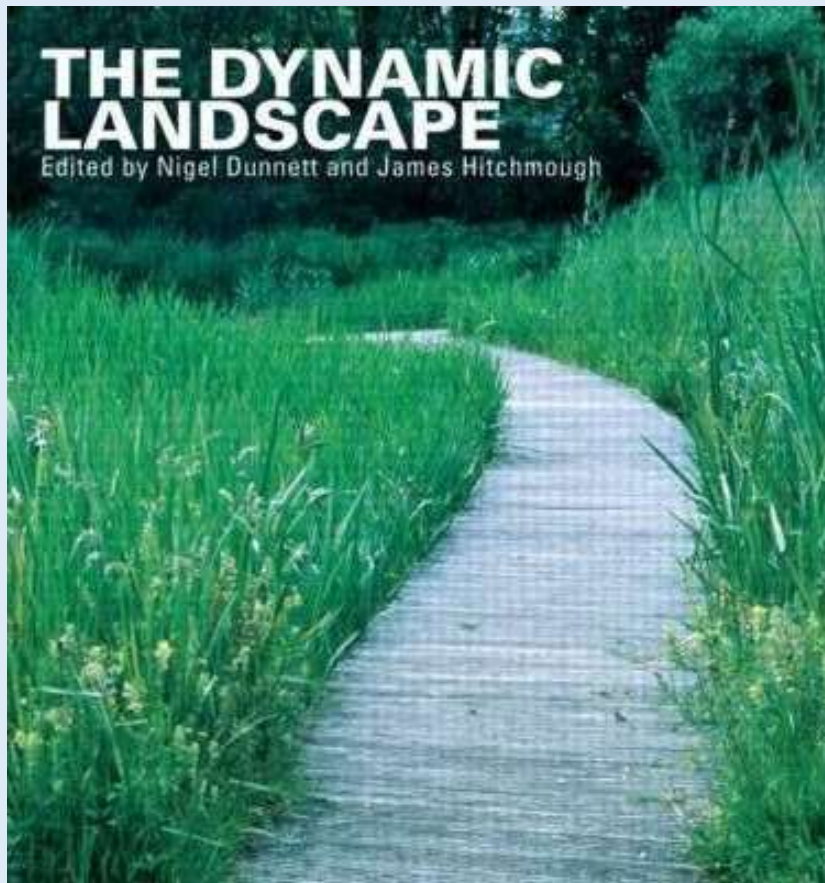
Pictorial Meadows established in Sheffield

RHS Chatsworth Flower Show, June 2019

The Dynamic Landscape: Design, Ecology, and Management of Naturalistic Urban Planning (2004)

- Naturalistic herbaceous vegetation differs from conventional herbaceous vegetation in that it mimics the spatial and structural form of semi-natural vegetation

- There will sometimes be distinct canopy layers; shade tolerant near the ground with spring interest

- The decline of early flowering species is masked by the growth of the next 'layer'

- Individual species are generally not planted in clearly defined groups or blocks

ornamantal planting	Mass Planting (single species) Block Planting Drift Planting
naturalistic planting	'New naturalism' Randomly mixed planting Seed mixes

Low genetic diversity (such as using a limited number of species or a large number of the same cultivar or clone) exposes the plant community to higher levels of health and biosecurity risk.

(5.4 Designing Plant Communities-The Landscape Consultants Toolkit)

2012 London Olympic Games showcased this approach (Photo Nigel Dunnett)

Getting the public on board with a very different aesthetic
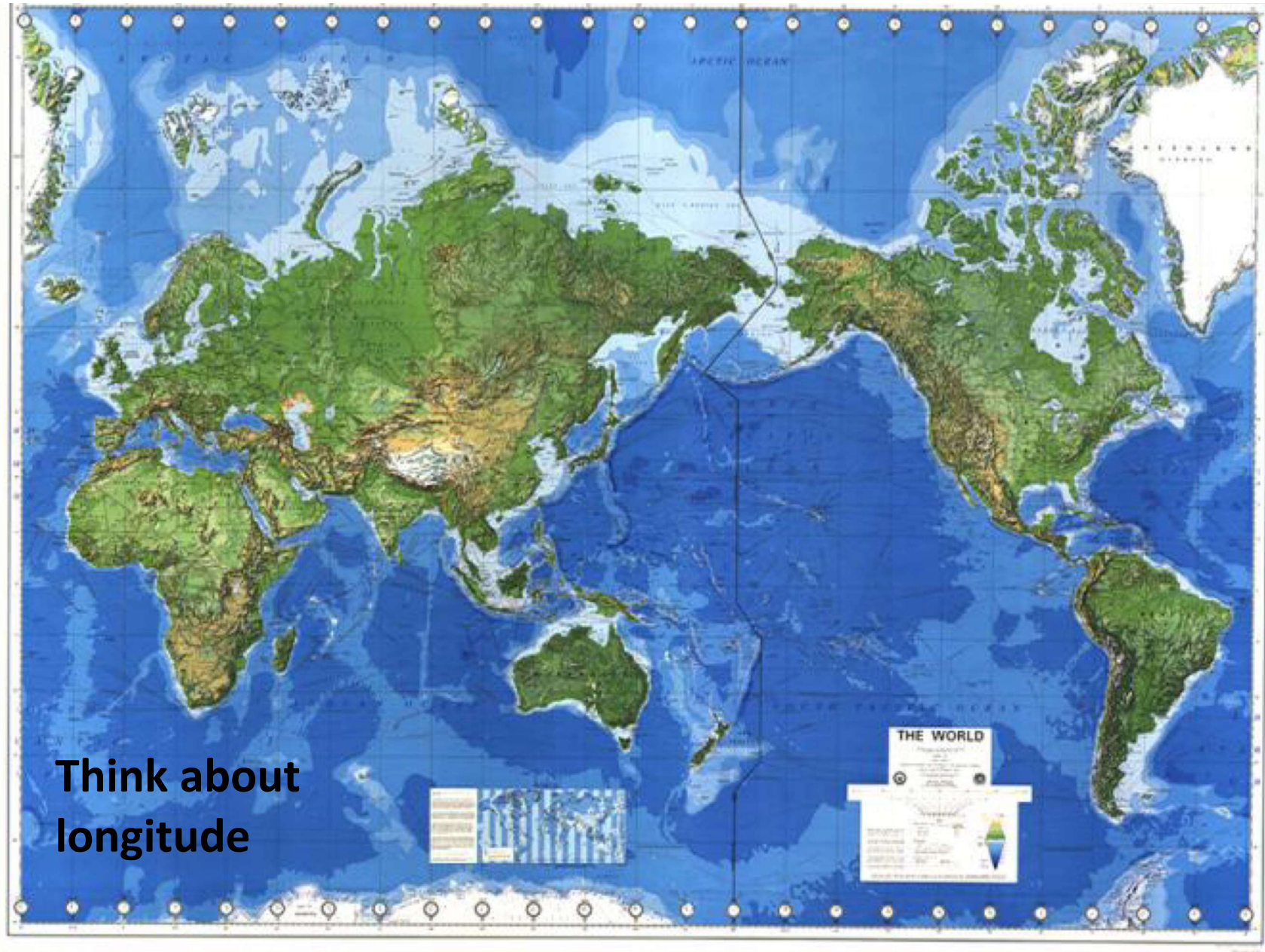
Tulipa sprengeri

2019 -Where do plants come from? Climatic similarity, especially growing season; temperature and rainfall increases likely robustness. Think about latitude.

Think about longitude

Western Sichuan at 4500m is climatically similar to Northern Britain

Western Sichuan at 1000m is very different from Northern Britain

Climate of the donor site (where the plants naturally come from)

Climate of the receptor site (where the plants are to be used)

	Hot dry summers, mild wet winters (Southern Europe or Mediterranean climates)	Hot, dry summer dry cold (snow) Winters (Western North America, Central/Eastern Europe)	Hot, very wet summers Dry Cold (snow) winters: (Central and southern China/USA)	Hot, very wet summers Mild dry winters: (Western and southern China/Florida, Eastern South Africa)	Cool, wet summers and mild cool winters (Coastal Western Europe)
Hot dry summers, mild wet winters (Southern Europe or Mediterranean climates)	✔✔✔	✘✔✔	✘✘✘	✘✘✔	✘✘✔
Hot, dry summer dry cold (snow) Winters (Western North America, Central/Eastern Europe)	✘✘✘	✔✔✔	✘✘✔	✘✘✔	✘✘✘
Hot, very wet summers Dry Cold (snow) winters:	✘✘✔	✘✘✔	✔✔✔	✘✘✘	✘✘✔

The Habitats plants have evolved in

- This has an over-riding impact on what they will tolerate as landscape elements

- The closer the planting site habitat to the wild habitat the better the fit

- Robustness, persistence

- Tolerance of shade-sun

- Tolerance of wet-dryness

Habitat of the donor site (where the plants naturally come from)

Habitat of the receptor site (where the plants are to be used)

	Wet, shady	Moist shady	Dry shady	Dry sunny	Moist sunny	Wet sunny
Wet, shady	✔✔✔	✘✔✔	✘✘✔	✘✘✘	✘✘✔	✘✘✔
Moist shady	✔✔✘	✔✔✔	✔✔✔	✘✘✘	✘✘✘	✘✘✔
Dry shady	✘✘✔	✘✘✔	✔✔✔	✘✘✔	✘✘✘	✘✘✘
Dry sunny	✘✘✘	✘✘✘	✘✔✔	✔✔✔	✘✘✔	✘✘✘
Moist sunny	✘✘✔	✘✘✔	✘✔✔	✘✔✔	✔✔✔	✘✔✔
Wet sunny	✘✔✔	✘✔✔	✘✔✔	✘✘✔	✘✘✔	✔✔✔

Silver *Artemisia* and *Lagochilus* in Kyrgyzstan, look at the soil

Plant species respond to stresses differently: plants grown outside their optimal conditions are likely to become stressed, and in turn are more susceptible to Pest and Diseases

(5.3 Specifying Plant Species- The Landscape Consultants Toolkit)

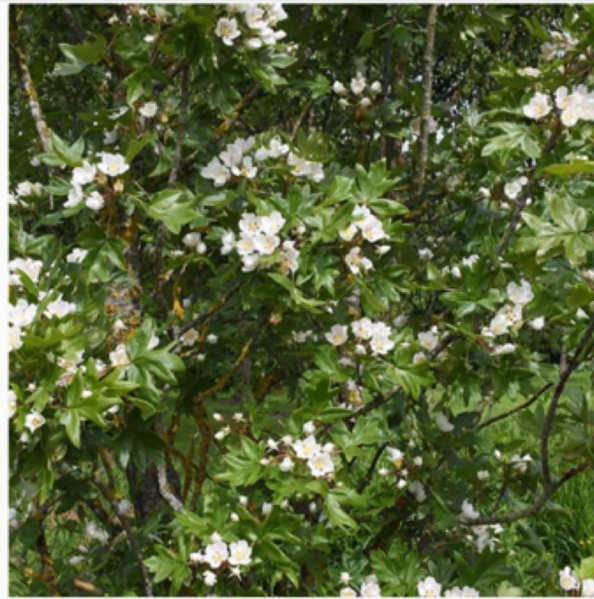*Kniphofia caulescens* (center) and *K. northiae* in the mountains of Eastern South Africa.

Is this how the RHS tells you how to grow Kniphofia?
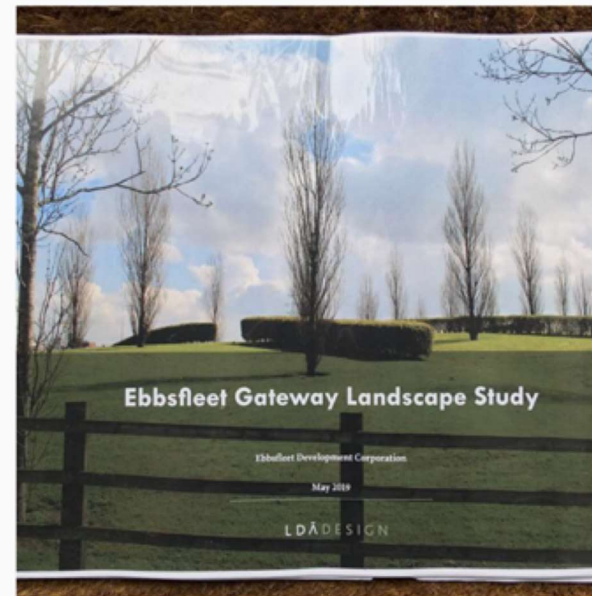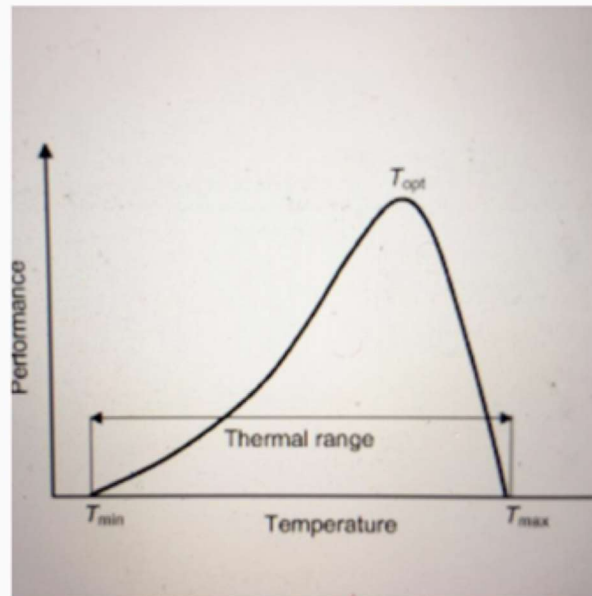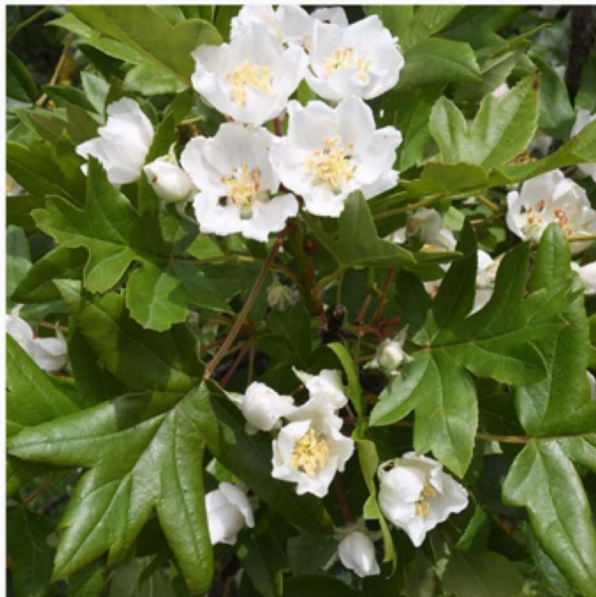
'Moist but well drained.
Soil – loam, sand'

https://www.rhs.org.uk/Plants/9751/Kniphofia-caulescens/Details

Merton Borders, Oxford University Botanic Gardens by James Hitchmough

For more information on the planting look at: http://vimeo.com/71742079

Estimating quantities of plants in mixes

Broad Guidance

Composition of a Mixed Perennial Planting
Structural (Emergent/Anchor) Plants   +/- 10%
Supporting (Satellite) Plants   +/- 40%
Ground covers   +/- 45%
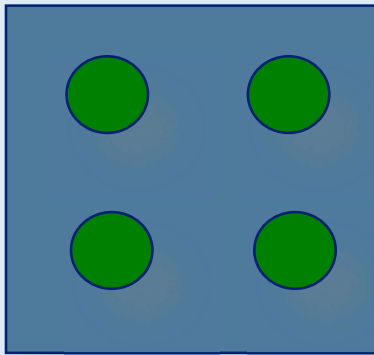Space fillers (short-lived)   +/- 5%
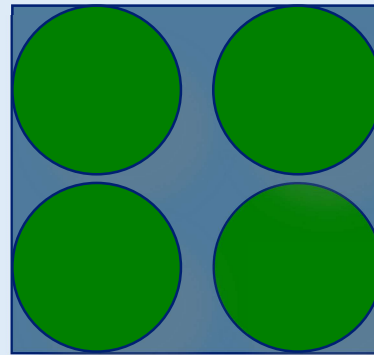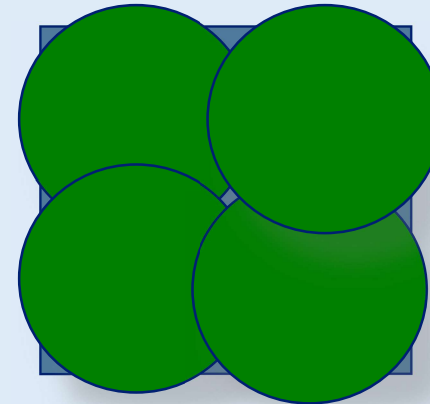Total   100%

                              Density 9/m2

(Bulbs 20-50/m2)

Why 9/m²?

Early spring   Late spring   Early summer

4/m²

9/m²
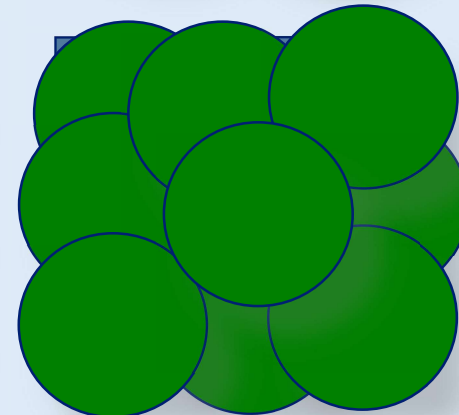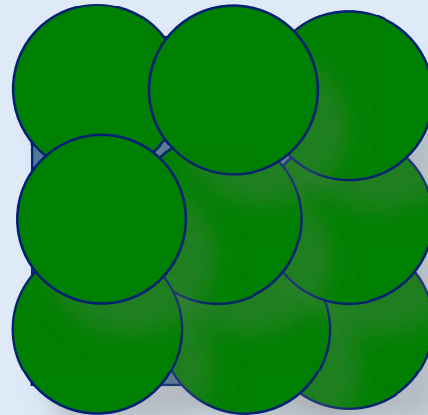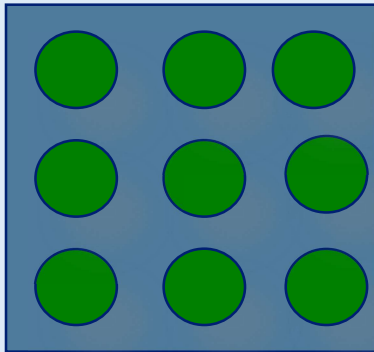
PLANTING DENSITY - HOW MANY PLANTS PER METRE?

LOW DENSITY - 5 PER SQM

MEDIUM DENSITY - 9 PER SQM

HIGH DENSITY - 15 PER SQM

DENSITY	COST	MAINTENANCE	AESTHETIC
LOW	LOW	HIGH	LOW
MEDIUM	MEDIUM	MEDIUM	MEDIUM
HIGH	HIGH	HIGH	HIGH

Piet Oudolf & Noel Kingsbury

Planting
A NEW PERSPECTIVE
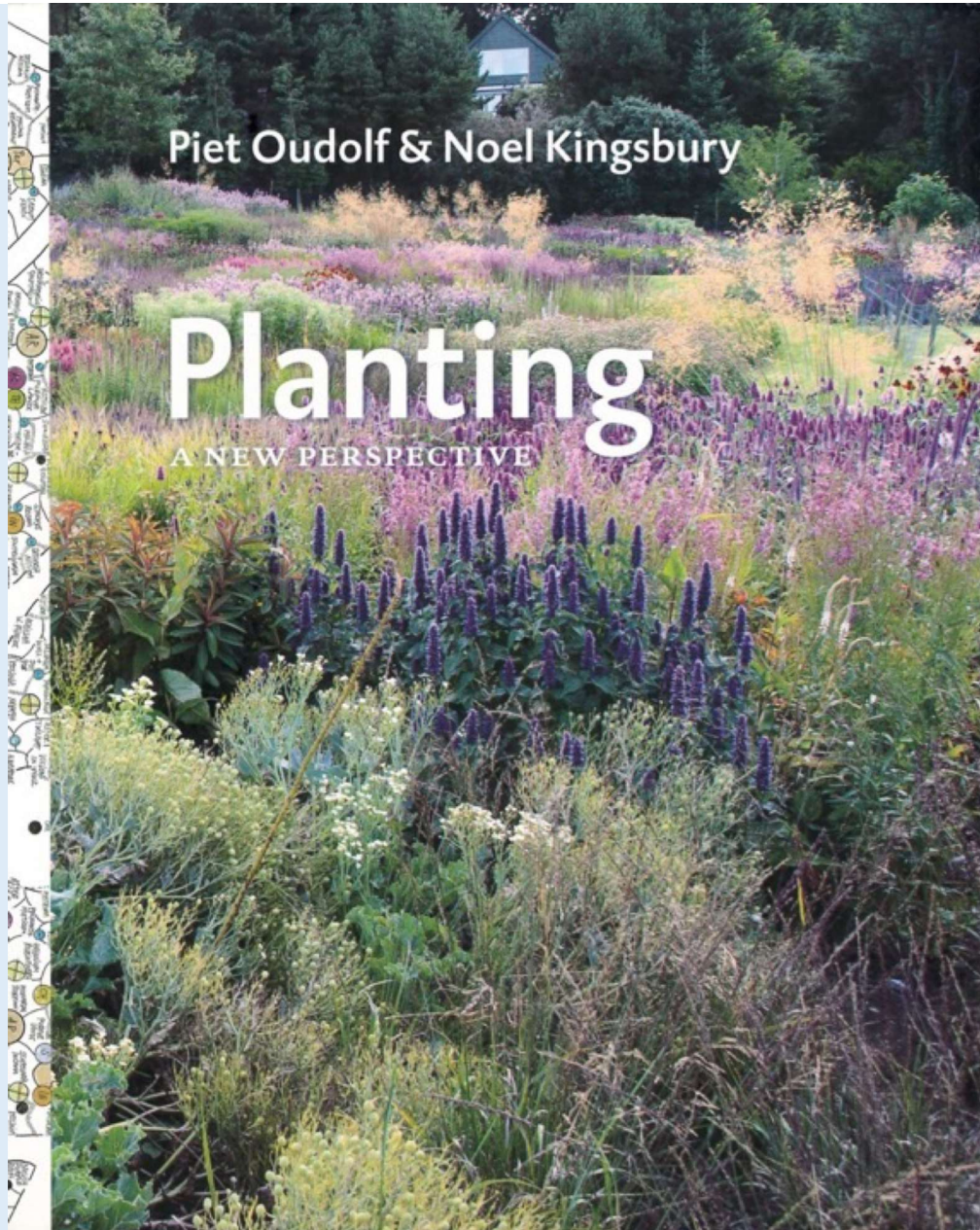
This book has a 'Plant Directory' at the back with height, spread and density per m^2.

	HEIGHT (M)	SPREAD (M)	N° PER M²
Aruncus dioicus	T	0.5-1.0	3
Asarum europaeum	L	0.25-0.5	11
Asclepias incarnata	M	0.25-0.5	7-9
Asclepias tuberosa	M	0.25-0.5	9
Asperula odorata (Galium odoratum)	L	0.25-0.5	11
Aster ageratoides	M	>1.0	5
Aster cordifolius	T	0.5-1.0	5
Aster divaricatus	M	0.25-0.5	7
Aster ericoides	M	0.25-0.5	5
Aster laevis	M-T	0.25-0.5	7
Aster lateriflorus 'Horizontalis'	M	0.5-1.0	7
Aster novae-angliae	M-T	0.25-0.5	5
Aster oblongifolius 'October Skies'	M	0.5-1.0	3-5
Aster tartaricus	M-T	0.5-1.0	7
Aster umbellatus	T	0.25-0.5	7
Aster ×herveyi 'Twilight' (A. macrophyllus)	M	0.5-1.0	7
Aster ×frikartii	M	0.25-0.5	7
Astilbe chinensis varieties	M	0.25-0.5	7
Astilboides tabularis	M-T	0.25-1.0	7

	HEIGHT (M)	SPREAD (M)	N° PER M²
Astrantia major	S	0.25-0.5	11
Baptisia australis	M	0.5-1.0	1
Baptisia alba (B. leucantha)	M	0.25-1.0	1
Bergenia spp. and cvs.	L	0.25-0.5	9
Boltonia asteroides	T	0.25-0.5	7
Brunnera macrophylla	S-M	0.25-0.5	11
Buphthalmum salicifolium	S	0.25-0.5	7
Calamintha nepeta subsp. nepeta	S	0.25-0.5	11
Campanula glomerata	S	0.25-1.0	11
Campanula lactiflora	T	0.5-1.0	7
Campanula persicifolia	S	0.25-0.5	9
Campanula poscharskyana	L	0.5-1.0	7
Campanula trachelium	M	<0.25	9
Centaurea montana and cvs.	S	0.5-1.0	7
Cephalaria gigantea	T	0.5-1.0	5-7
Ceratostigma plumbaginoides	S	0.25-0.5	11
Chaerophyllum hirsutum 'Roseum'	M-T	0.25-0.5	5
Chelóne obliqua	M	0.25-0.5	9
Clematis heracleifolia, C. integrifolia and hybrids	M	0.5-1.0	3-5

	HEIGHT (M)	SPREAD (M)	N° PER M²
Coreopsis tripteris	T	0.25-0.5	7
Coreopsis verticillata	S	<0.25	7
Crambe cordifolia	M	0.5-1.0	1-3
Crocosmia hybrids	M	0.25-0.5	9
Darmera peltata	M	0.25-1.0	9
Delphinium hybrids	T	0.25-0.5	9
Desmodium canadense	M	0.25-0.5	5
Dierama spp. and cvs.	M-T	0.25-1.0	9
Digitalis spp.	M-T	<0.25-0.5	11
Doronicum spp. and hybrids	S-M	0.25-0.5	9
Echinacea spp. and cvs.	M	0.25-0.5	9
Echinops spp. and cvs.	M-T	0.5-1.0	7-9
Epimedium spp. and cvs.	S-M	0.25-0.5	11
Eryngium bourgatii	S	0.25-0.5	9
Eryngium ×tripartitum	M	0.25-0.5	9
Eryngium yuccifolium	T	0.5-1.0	9
Eupatorium maculatum and related spp.	T-VT	0.25-1.0	5-7
Eupatorium perfoliatum	M-T	0.25-0.5	7
Eupatorium rugosum	M	0.25-0.5	5

Use density as a tool to reduce rate of change-weed invasion

This operates for both woody and herbaceous plant communities

Operates through increasing shade and degree to which resources are fully utilised
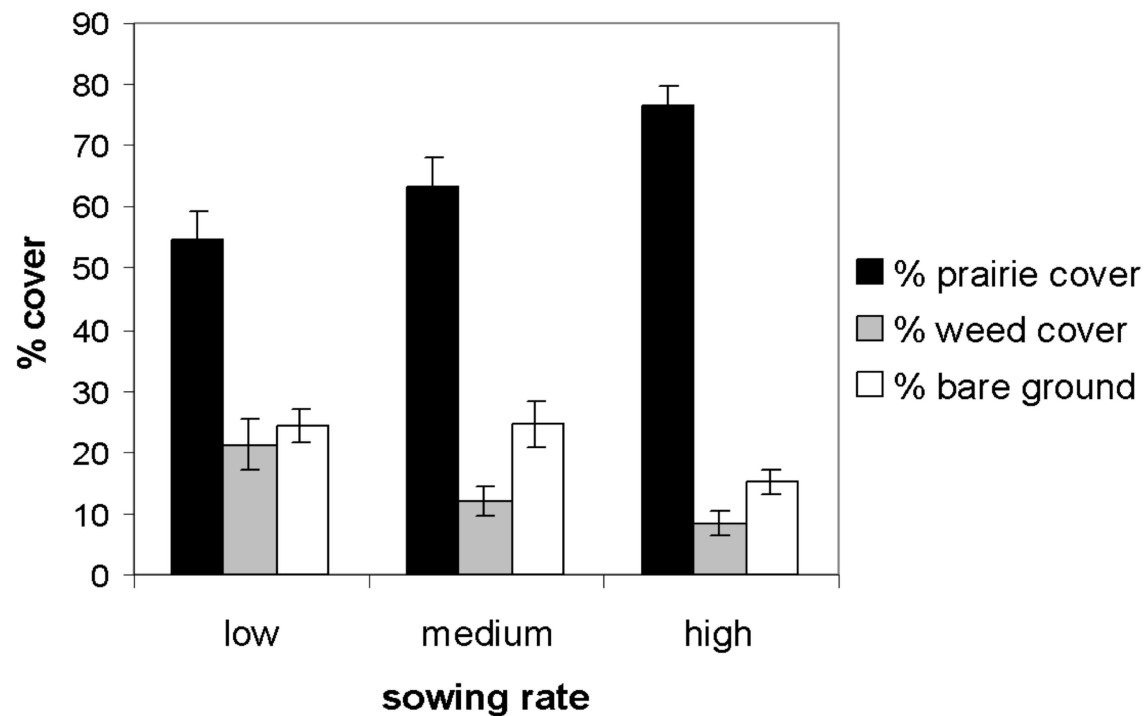
For herbaceous plants and shrubs, it is often better and more cost effective to specify a larger number of smaller stock size plants to ensure designed plants are able to out compete weeds.

(5.5 Specifying plant sizes and form Landscape Consultants Toolkit)

This book explains the concept of mixes by seed in much more detail with real case studies

Nigel's approach

- Planting design is an art form: tuned to nature
- Framing Nature: the context for a more natural style of planting design
- Reading Nature: design lessons from wild plant communities
- Making Nature: Planting Design methods and examples
- There is an un-ending source of inspiration for planting design from natural plant communities
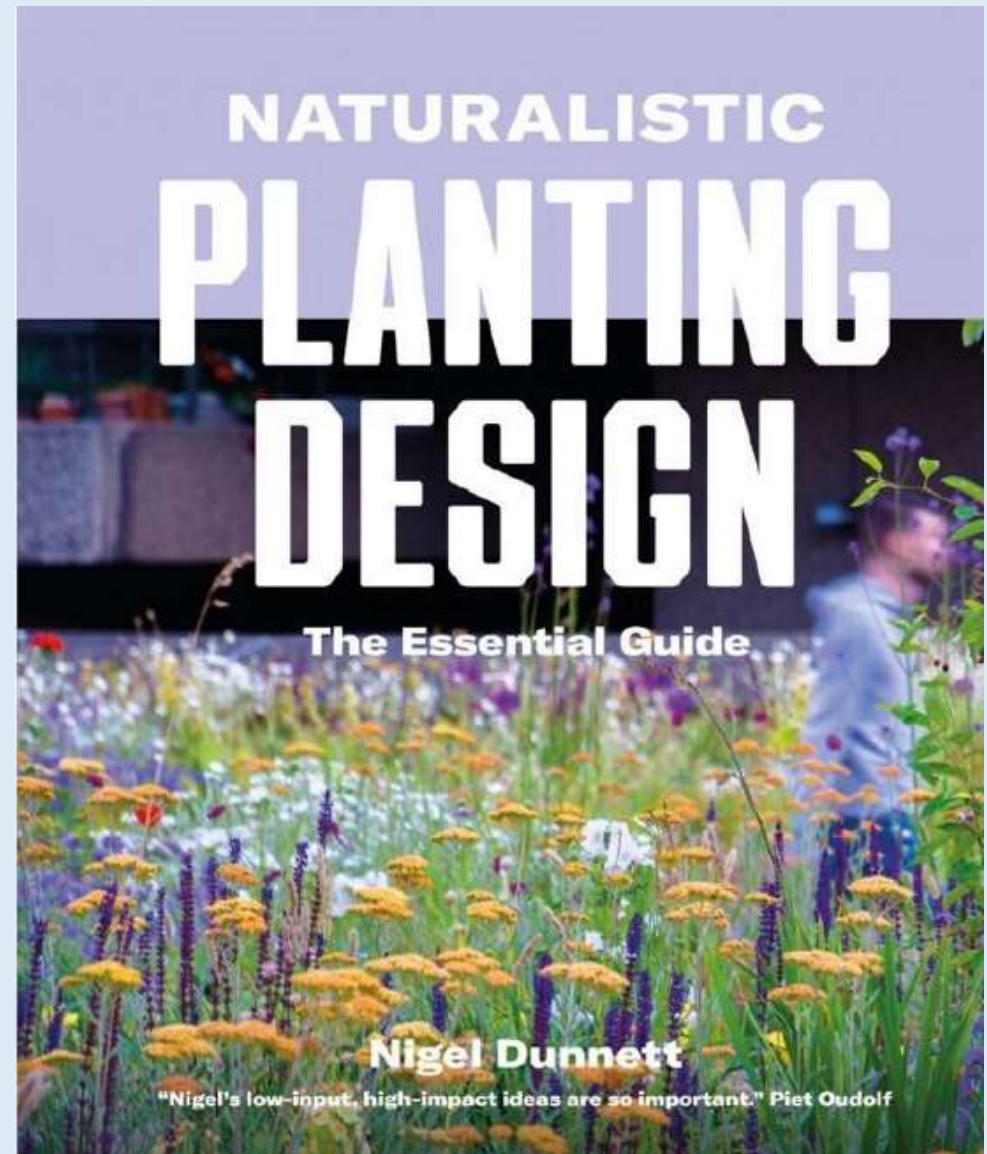
EXAMPLE: THE BARBICAN

Design: Nigel Dunnett

Design Objectives:

To create a 'climate-adapted' urban landscape that does not require regular irrigation

To use 'steppe' plantings to achieve this: perennials and grasses adapted to exposed dry conditions

To deliver very long season of flowering, using successional layers to create waves of colour

To have visual interest in winter as well as at other times of the year

To use simple maintenance method

To create an overwhelming 'immersive' experience of being in nature
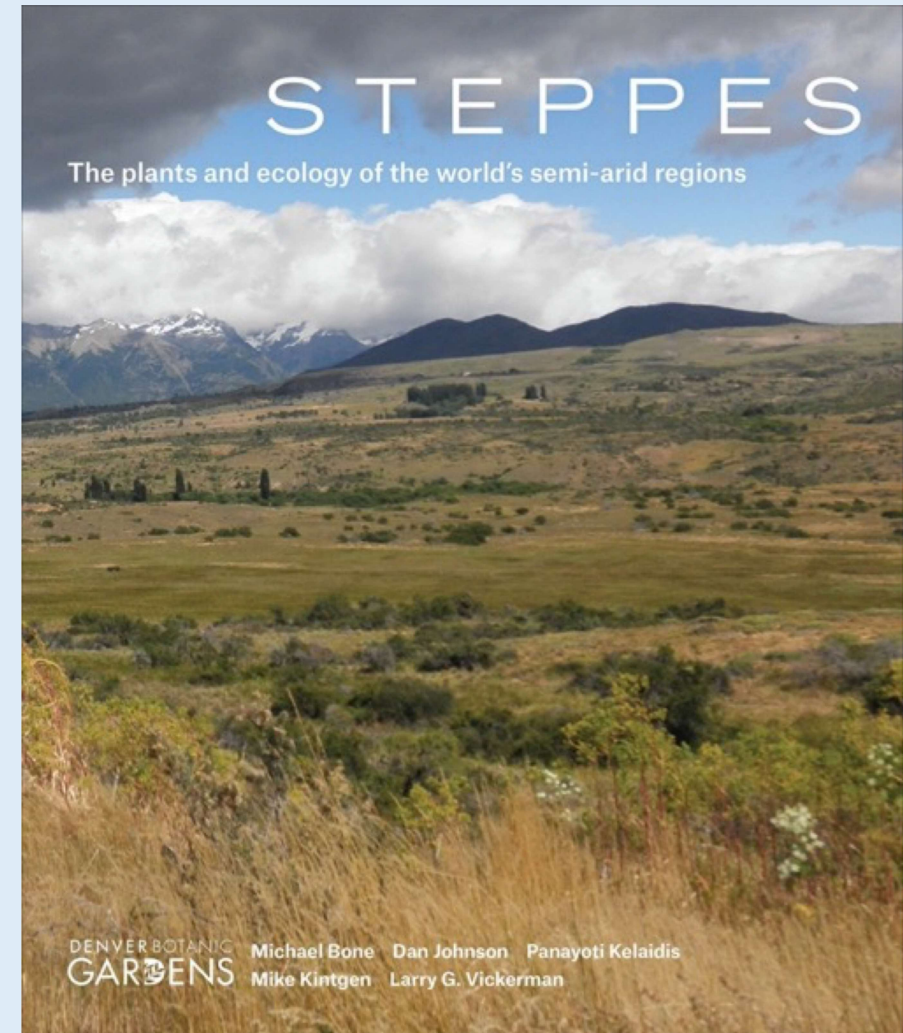
http://www.nigeldunnett.com/barbican/

'Clean Cultivation' – low diversity, bare ground beneath plants

Steppe is a term for semi-arid grassland vegetation

WORLD STEPPES

STEPPES
The plants and ecology of the world's semi-arid regions

DENVER BOTANIC GARDENS   Michael Bone   Dan Johnson   Panayoti Kelaidis
Mike Kintgen   Larry G. Vickerman

The planting scheme consists of three main 'Designed Plant Communities

1. STEPPE plantings in full sun. These are mixtures of grasses and perennials that are naturally adapted to dry, exposed conditions.

2. SHRUB STEPPE plantings which combine similar mixes of perennials and grasses to the steppe plantings, but with additional low-density shrubs and multi-stemmed trees, to create multi-layered plantings with year-round structure and interest.

3. LIGHT WOODLAND plantings in part-shade, and where the growing medium depths enable tree growth. Multi-stem trees, widely spaced, with a scattered understory of shrubs, and a diverse perennial ground layer.

Broad Guidance

Composition of a Mixed Perennial Planting
Structural (Emergent/Anchor) Plants   +/- 10%
Supporting (Satellite) Plants   +/- 40%
Ground covers   +/- 45%
Space fillers (short-lived)   +/- 5%
Total   100%

                              Density 9/m2

(Bulbs 20-50/m2)

'I always start with what I call 'Anchor Plants' – the main ones that define the framework of the planting. They don't have to be large, architectural or structural, but they are the starting point, around which everything else revolves: the centres of gravity, or the core plants, of the planting' (Dunnett in http://www.nigeldunnett.com/barbican/)

Matrix Anchors: plants that form a framework or network that other plants are embedded within

http://www.nigeldunnett.com/barbican/

The second set of plants to be set out are 'Satellite Plants' that work in association with the anchor plants, and which start to fill out the main bulk of the planting.

Finally, the 'Filler Plants' are those species that are rather more in the background, or which provide seasonal highlights, and which are used to fill the remaining spaces.

In spring the steppe plantings are full of vibrant colour, as bulbs and smaller perennials flower amongst the grasses and the emerging foliage of the later flowering species.

Species tulips and other small bulbs from arid places are perfect for these sorts of plantings.

Across the whole site, the acid yellow *of Euphorbia polychroma* and *Euphorbia characias* mix with the bright colours of the bulbs, and early perennials such as cowslips and pasque flowers

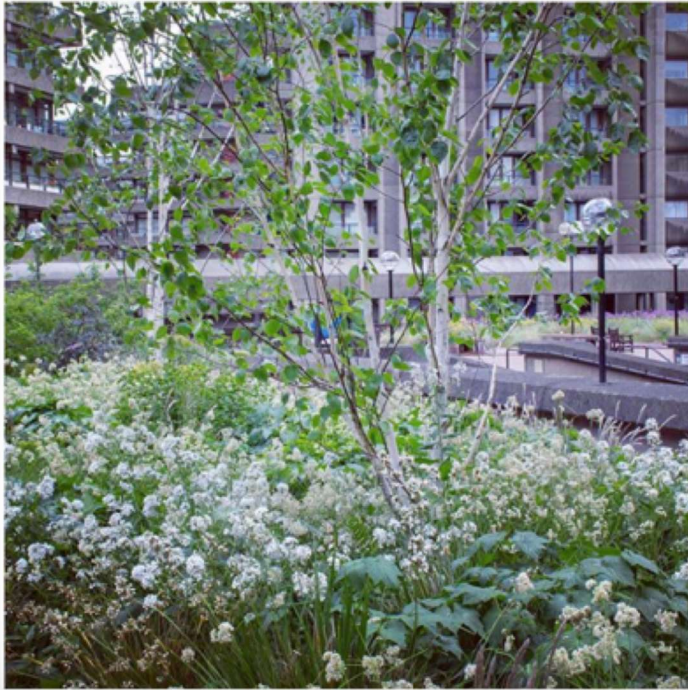http://www.nigeldunnett.com/barbican/

In late spring and early summer the steppe plantings take on the character of sparkling dry meadows, full of pink, blue and mauve flowers.

The P3 Rule - At any one time there are probably only three plants look good even though there are more in the mix; there is a sequence of colour.
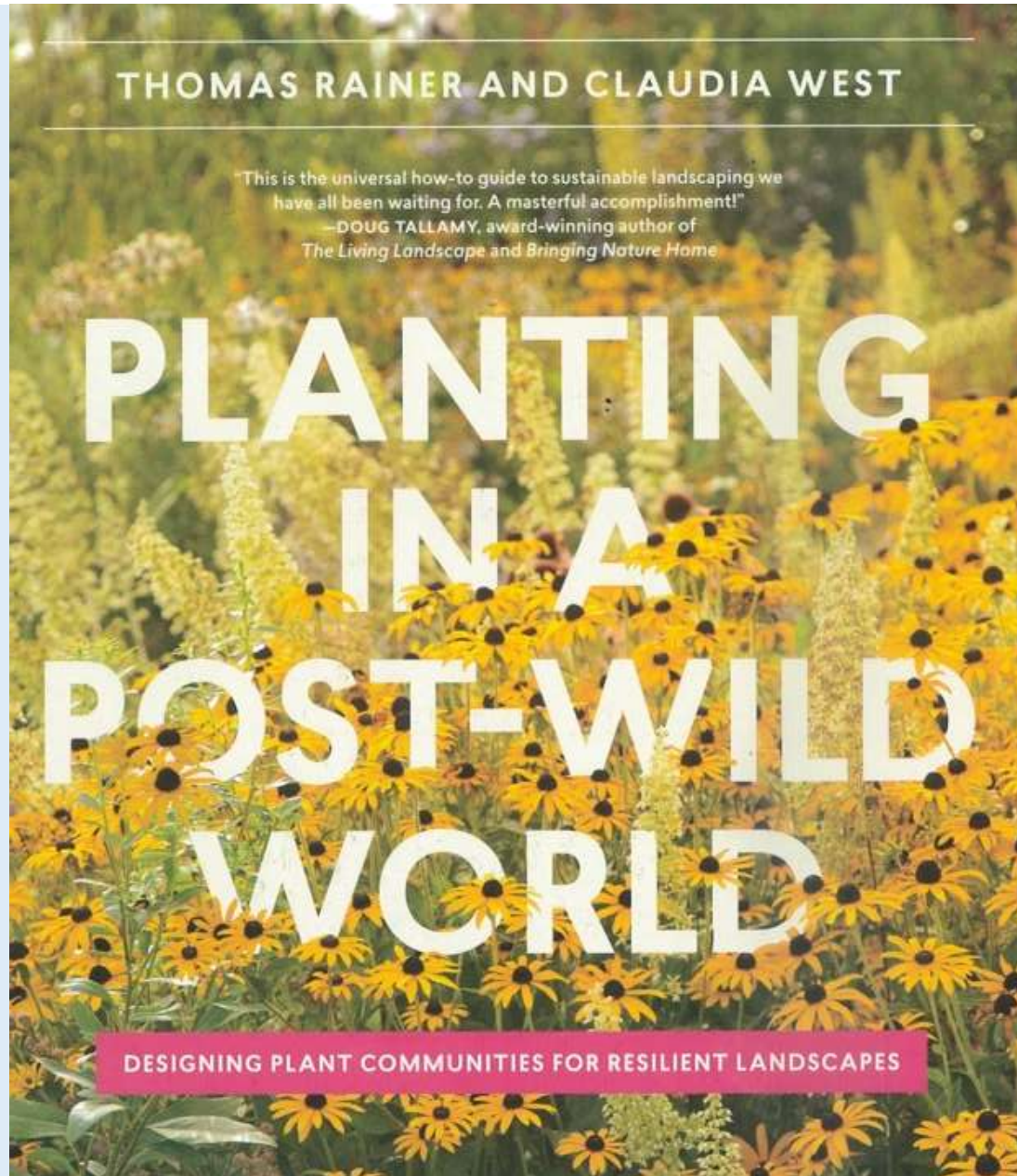
Follow Nigel on Twitter @NigelDunnett and on Instagram @nigel.dunnett

THOMAS RAINER AND CLAUDIA WEST

"This is the universal how-to guide to sustainable landscaping we have all been waiting for. A masterful accomplishment!"
—DOUG TALLAMY, award-winning author of *The Living Landscape* and *Bringing Nature Home*

PLANTING IN A POST-WILD WORLD

DESIGNING PLANT COMMUNITIES FOR RESILIENT LANDSCAPES

Chapter titled; 'Creating and **Managing** a Plant Community' – pp.189-242

'Smart management is a creative process requiring a large vision as well as attention to details' (p.241)

Ecological Maintenance/management of landscape vegetation

What are some of the characteristics of horticultural maintenance?

- Each plant species present is given specific treatment
- It is based on a process of trial and error followed by refinement
- It may involve unnecessary resource expenditure; confuse the practice of craft skills with what is essential?
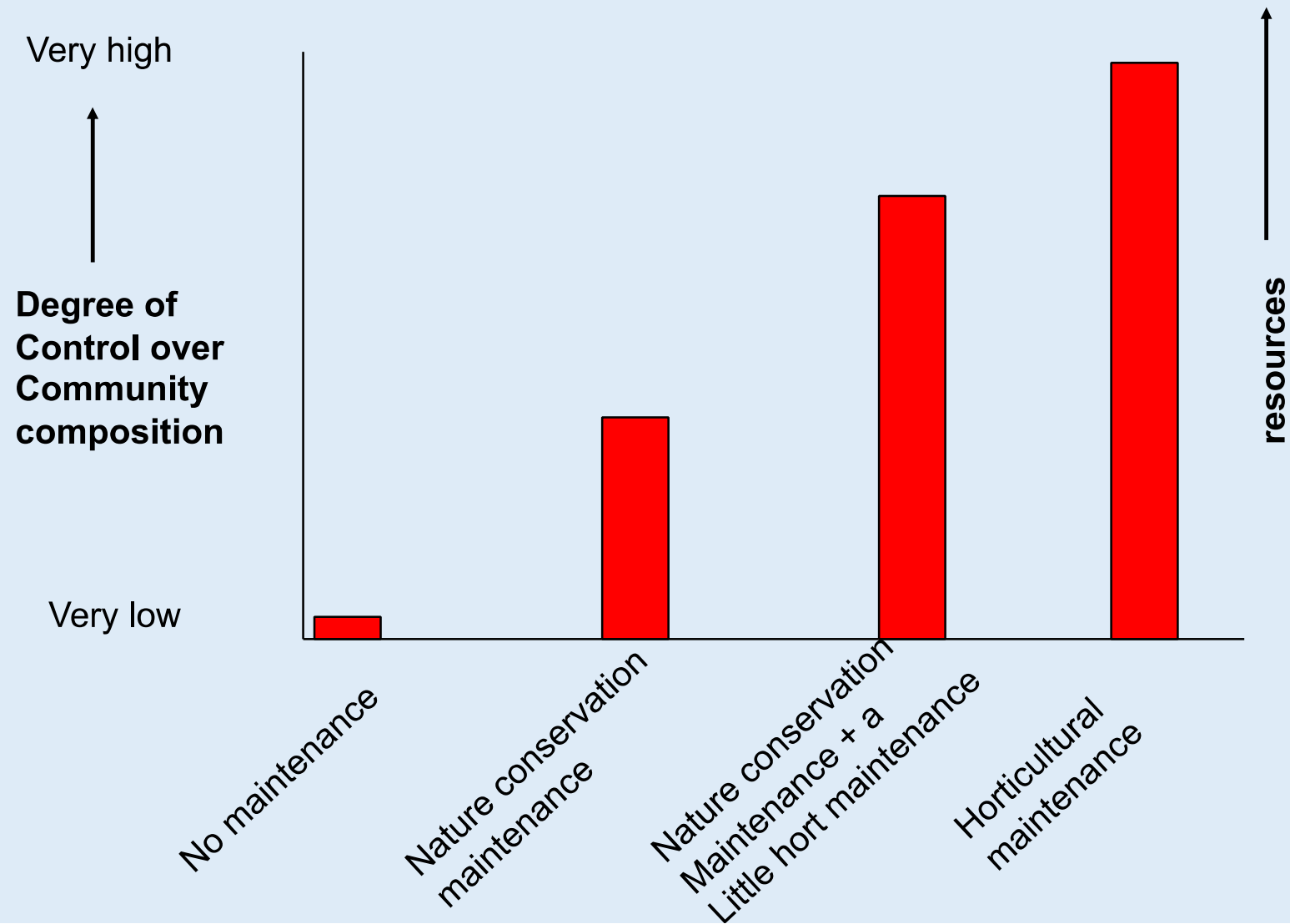
What are the characteristics of ecological (nature conservation) maintenance?

- The same treatment is applied to all plants in a community on the same day

- It is about the community not the individuals making up the community

- This allows inputs to be simplified, whether it's a woodland, shrub or herb community

- The flip side is that it requires more understanding of how the individual plants will respond to these management actions
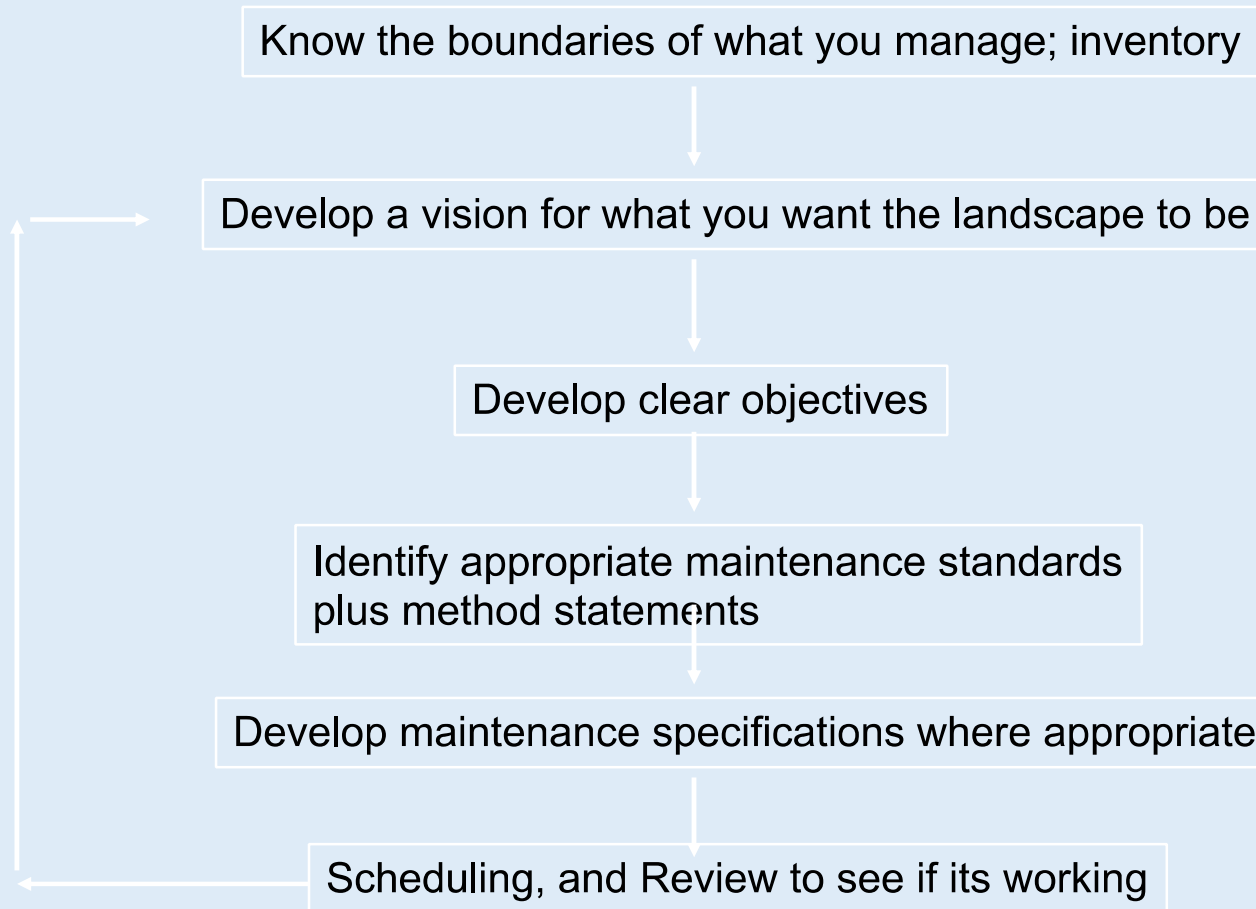

North American Prairie, Sheffield Botanical Gardens. February 2019

Very high

Degree of
Control over
Community
composition

resources

Very low

No maintenance

Nature conservation
maintenance

Nature conservation
Maintenance + a
Little hort maintenance

Horticultural
maintenance

Feedback on visit to Burgess Park 11th September 2014

James Hitchmough Design and Management

Western slopes

Generally quite good. The focus needs to be all about keeping the slopes as grass free and open as possible (other than the *Festuca amethystina*), and editing out the bad weeds as we discussed

Work on the bad weeds is as follows:

Now;

Hand pull *Conyza* before anymore seed is spilt, and visually tidy up the slopes, also tall *Epilobium* in swales near Camberwell Road. In the future hand pull the *Conyza* in late summer before seed release.

Use a fork to prize out of the ground plants of *Artemisia*, plus *Tussilago*
Remove seed heads of Docks; try to minimize seed spill. Use big bag over the top, bend and cut base of stems. Again in future years do this before seed set

Autumn, split some *Calamagrostis* and plant to bring more forward into the swale. Move the *Calamagrostis* on mound 1 to space them out across the slope towards the swale.

Fidelity International, Offices in Kent

Most successful management according to James Hitchmough in Sowing Beauty

It's for sale!