Topic 4: Plant Specification

4.1 Right Plant, Right Place

This topic assimilates knowledge gained through topics 1, 2 and 3 into principles of plant specification. You'll notice many repeated concepts – this gives you a sense of A03, integration, as knowledge is woven in from across unit 1.

There are various factors to consider in the selection of plants suitable for a planting locality. Whilst there is often the wish to plant a desired plant, e.g. *Hydrangea macrophylla*, in a location where it may be aesthetically pleasing, the specific locality may not offer the conditions required by the plant for healthy growth. **Wrong plant, wrong place will result in a decline in the plant's health and its eventual death, often after many years of performing poorly**.

The example, *Hydrangea macrophylla*, performs best in semi-shade, consistently damp, nutrient rich soil, and a location that doesn't get morning sunshine as this can rapidly thaw frosts on early season growth, potentially damaging the incipient flower buds. Attempting to grow it in a sunny location that's prone to becoming dry will result in summer wilting, undersized and shorter-lived flowers, lack of vigour, increased incidence of pests and diseases, chlorosis due to reduction in the transpiration stream (which brings nutrients, as well as water, to the leaves) and increased competition from more vigorous nearby plants that are sun/drought adapted. Over time the hydrangea will die-back and eventually succumb, typically after an especially hot/dry summer.

In order to maximise plant health, plants need to be suitable for the location they'll be grown in. The reality is that some plants, however desired, should not be planted in certain locations. This may present design challenges and/or disappoint clients, but **it's a losing battle to choose wrong plant, wrong place**.

Maximising plant health encompasses the following benefits:

- **Resistance to pests and pathogens.**
- **Greater vigour of growth, resulting in rapid establishment and aesthetic/productive performance.**
- **Minimising labour and material inputs, such as establishment irrigation, feeding, staking, and managing competition (especially weeds).**

Right plant, right place requires an understanding of the physical site the plant(s) will be planted into, and an understanding of the plant's tolerances. These are detailed below:

Site Criteria:

This relates to qualities of the physical site – the garden, allotment or other locality.

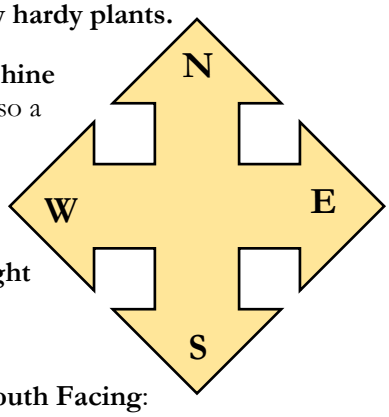
Aspect:

- This refers to the **direction the area faces**, particularly if it's backed by a wall or fence:

North Facing:
Does not receive direct sunshine – only **shade tolerant plants**;
Prone to sitting **colder in winter** so only **fully hardy plants.**

North-east facing:
Buffered from the prevailing south-westerly winds that often bring rain; this side of a building is in a **rain shadow.**

West Facing:
Receives **afternoon sunshine** during the heat of the day, so a hot/dry aspect;
Soil likely to become **dry** during hot/dry summer weather;
Sun/semi-shade, drought tolerant plants.



East Facing:
Receives **morning sunshine** and is in **shade** during the hotter **afternoon** so stays cooler;
Frost melts rapidly on cold, sunny mornings which can **damage** winter/spring **flowers** and **young leafy growth**;
Shade/semi-shade plants.

South-west facing:
Face prevailing winds; have less of a rain shadow, some rain can reach the soil adjacent to the building.

South Facing:
Direct sunshine all day – only **hot sun tolerant plants**;
Soil most likely to become **dry** during hot/dry summer weather; **drought-tolerant plants** are better choices.

This allotment site is very exposed to wind and would benefit from a shelterbelt. This would reduce windchill, creating a warmer microclimate and, ultimately, improving yields.

- **Heavy winds** can **damage plants** by snapping branches, tearing leaves, damaging flowers; this **increases the incidence of pathogen entry, causing disease**. Bacterial canker on cherry trees is an example of a pathogen that can enter through wounds.
- **Heavy winds can also reduce cropping in orchards** or other sites, as **bees** and other pollinators **do not fly in high winds**.

- **Shelter belts** can be planted to **break up winds** and **reduce their speed**, e.g. by planting a native mixed species hedge, which will increase biodiversity. It's important to **avoid constructing solid barriers**, such as closed-board (no gaps) fences or walls – these **cause eddies** to occur (very fast, swirling winds near the fence/wall), which can **damage plants**.
- On larger sites, a shelter belt could include wind-tolerant trees, as well as a shrubby understory, to break up winds at a range of levels.

Light/shade:

- As well as **aspect affecting** the **sun** exposure a plant may receive if growing near a building or fence/wall, **shrubs and trees cast shade beneath them**.
- Plants that require full sun might grow in varying degrees of shade, but will have reduced flowering and a tendency to grow toward the light, resulting in weak, elongated growth. Likewise, plants that require some level of shade might survive in full sun, but will likely have yellowed, sun-bleached leaves, wilt more often in hot weather, lack vigour and suffer more during dry spells.
- There are **varying degrees of shade** and plants need to be selected according to the shade conditions, or the site altered (e.g. by pruning trees or shrubs to thin their canopy and allow more light through).

These flower borders are subject to varying degrees of shade along their length, making it challenging to achieve equal performance of a repeated plant selection along the full length.
In situations like this, the planting scheme might have to vary depending on light levels, meaning total symmetry is sacrificed.

Hardiness and Temperature Tolerance:

- **Hardiness is the ability of a plant to withstand cold**. It does not relate to heat tolerance. How hardy a plant is depends on its provenance, meaning where it's from and the cold temperature range it has evolved with.
- **Plant hardiness needs to be considered in relation to other requirements for plant health**. For example, many cacti and succulents come from desert regions that can have night temperatures well below zero, however they will not survive in the UK when combined with winter wetness and high humidity – they succumb to fungal pathogens during the winter.
- **The provenance of a plant is very important** – plant collectors who originally brought plant material to the UK were wise to select specimens from parts of their range that have the most similar climatic conditions to the UK.
    - For example, rhododendrons growing on a mountainside in subtropical regions of China: one species may be found with populations lower down the mountain in warmer, frost-free conditions. Other individuals of the population grow higher up the mountain where there is frost and snow in the cooler season. The genetics that relate to cold tolerance (hardiness) vary in the population and plant collectors would focus on collecting seeds or vegetative material from the higher altitude populations that are more likely to perform well in the UK climate. Lower altitude individuals may not have genetics for withstanding frost and snow.

Cosmos bipinnatus 'Xsenia' is a half-hardy annual and must be planted out after danger of frost has passed.

Agave americana AGM can survive winter in warm, sheltered microclimates on very freely-draining soil.

Papaver somniferum (opium poppy) is a hardy annual that can be sown direct in spring and will not be killed by frost.

- The **RHS** publishes **hardiness ratings**, and garden **plants are assigned a hardiness code**. Gardeners should be aware of their garden's hardiness rating, which might vary depending on differing microclimates across the garden – a sunny, south-facing wall is a warmer/less cold microclimate than a frost pocket.
    - **Plants should be hardy enough for the locality**. If they're more cold tolerant than the location will get, they are still suitable. Plants that are less hardy should not be planted in areas that get colder than their temperature limit.
    - The RHS hardiness ratings are as follows:
        - **H7: very hardy – can tolerate below -20°C without damage**
        - **H6: hardy – minimum -25 to -15°C**
        - **H5: hardy – minimum -15 to -10°C**
        - **H4: hardy – minimum -10 to -5°C**
        - **H3: half-hardy/unheated glasshouse - minimum -5 to 1°C**
        - **H2: tender/cool glasshouse – minimum 1 to 5°C**
        - **H1C: warm temperate/heated glasshouse – minimum 5 to 10°C**
        - **H1B: subtropical/heated glasshouse – minimum 10 to 15°C**
        - **H1A: tropical/heated glasshouse – minimum above 15°C**
    - The UK varies depending on locality, with more southerly and coastal regions having milder hardiness ratings. The hardiness rating can vary even between the top and bottom of a hill, so the site should be assessed using local weather data or other localised records.

- In selecting **'right plant, right place'** relating to **maximising plant health**, cultivars should be chosen not only to suit the soil and moisture levels, sun/shade, exposure etc., but also to resist pests and pathogens.
  - This is particularly important as new pest or pathogen species have reached the UK, and are surviving in the increasingly mild winters due to climate change.
  - **Best practice is to select cultivars that are resistant to pests and pathogens in order to avoid the need to either treat plant health issues, or live with reduced aesthetic or productive performance**.
  - An example of resistant cultivars includes Apple 'Garden Fountain' and Apple 'Greenfinch', which are resistant to both apple scab and mildew (both fungal diseases).

Specifying Plants:

The following plant characteristics have been discussed in topic 1. Their inclusion here relates to best practice in making plant selection choices according to 'right plant, right place'.

Life cycle:

- **Annuals and biennials**
  - Many of these are deservedly popular and offer a **long season of colour**, such as *Cosmos bipinnatus* (cosmos) with nectar for pollinators, and *Helianthus annuus* (sunflower) with seeds for birds. These are also key players in **contributing to a garden design style**, such as *Digitalis purpurea* (foxgloves) in a cottage garden.
  - If they are to be specified, they will need to be **added into a garden annually** as their **self-sowing into the right places is not reliable**. If they're **purchased in pots each year, this embodies a higher carbon footprint** as plants are grown, transported and use materials in their production.

Calendula officinalis (French marigold), a colourful hardy annual popular with pollinating insects.

  - It's **more sustainable**, where practical, for annuals and biennials to be **grown from seed on site**, either by **direct sowing** or by **starting in pots** (which requires additional horticultural skill, equipment and time). **Seed can be saved each year for re-sowing**, further increasing sustainability of this option (although F1 and specific colour - or other characteristic - strains won't always come true to the parent, e.g. seeds collected from *Centaurea cyanus* 'Black Ball' may not produce all deep-maroon/black flowers, with the species regular blue colour likely to appear in future generations)
  - In general, **annuals and biennials are better used to augment perennial plantings given the higher time, expertise and potential carbon footprint** associated with purchasing and growing them.

- **Herbaceous perennials**

Bistortia officinalis 'Superba' AGM, a deciduous herbaceous perennial for damp semi-shade.

  - These are the mainstays of spring, summer and autumn colour and form in a garden, **offering visual change throughout the year as they go through their growth-dormancy cycle**. There is an enormous wealth of options for any soil type and microclimate, with different heights, forms, colour and scent to suit any growing situation.
  - They are either **deciduous** (most), dying to below-ground during their dormant season, or **evergreen. Evergreen** herbaceous perennials are usually either **woodland groundcover** plants for **shade**, or **mediterranean** or **alpine climate origin** and suitable as **ground cover for sunny, dry situations**. **Deciduous herbaceous perennials offer a much greater range of height and form**.
  - Herbaceous perennials are a **more sustainable option than relying heavily on annuals and biennials**. As they all have organs of perennation (rhizomes, stem tubers, root tubers, bulbs, corms, taproots) to store energy during their dormant season (usually winter), they live for many years.

4.2 Buying Plants

It's very common to acquire plants for new and established gardens. **Buying new plants always has an embodied carbon footprint and water footprint, as well as issues of biosecurity**. However, new plants can **increase the biodiversity** of a garden, **improve design potential**, and through selection of **pest and pathogen resistant cultivars, improve overall garden health**.

Before new plants are considered, **gardeners and designers should look within the garden to identify plants that perform well and might be increased via division or other clonal propagation, such as cuttings, or from seed**. This is the **most sustainable** way to increase the number of individual plants in a garden. The next step is to consider buying new plants for the garden.

There are a range of options for acquiring new plants. **The most sustainable way is to buy seeds and sow directly into the soil, however this is not practical in most situations**, takes longer to establish a garden, and eliminates the opportunity to grow cultivar plants. Overwhelmingly, **plants are bought in as dormant or growing specimens of varying size**. Options are detailed below.

Root containment:

Potted

- This is the **most common** (and often only) way in which plants are available to purchase (roses and grafted fruit trees are notable exceptions, being available as bare-root specimens in the dormant season).

- **Positives**:
  - **Plastic pots can be made from recycled, and recyclable plastic**, which is a more sustainable option (**but use of oil-derived plastic will never be fully sustainable** and needs to be phased out).
  - **Plastic pots are lightweight, reducing their transport carbon footprint** (especially compared to traditional terracotta pots, which are no longer used for mass production). They can also be **reused**, **prolonging** their **usable life** (although this is not standard industry practice).
  - **Plastic pots are impermeable**, unlike terracotta or biodegradable pots, meaning they **don't dry out as quickly, reducing water footprint**.
  - **Potted plants can** (technically) **be planted any time of year** as long as the soil isn't dry, waterlogged, or frozen, unlike bare root plants. **Best practice is to plant in autumn** so roots can establish in the still-warm, damp soil – this reduces establishment irrigation pressure the following summer.
  - **Potted plants can be kept/stored after they've arrived on site**, so their arrival doesn't need to be timed with immediate planting or temporary planting (heeling in), unlike bare root plants.
  - Because potted plants can be stored before planting, they can be **easily quarantined** as part of biosecurity within a garden health plan.

- **Negatives**:
  - **Pots** are almost always **made of plastic which is not sustainable**, although more sustainable biodegradable pots are also used, but only for small (e.g. 9cm or 12cm) pots and the range of plant options is limited.
  - **Potted plants have increased biosecurity risk vs. bare root** because pests and pathogens might be present in the growing media.
  - **Potted plants have the risk of being pot bound**, where roots densely circle the inside of the pot, causing eventual choking of the plant – this is a significant risk with woody plants whose roots increasingly thicken as they age.

This young *Digitalis purpurea* (foxglove), a biennial, is very pot bound.

4.3 Planting and Aftercare

Once plants have been responsibly acquired the **next stage is to plant and undertake aftercare to maximise speed of establishment and maintain optimum plant health**.

The following factors should be considered:

Soil Amelioration

- Traditionally soil might have been heavily ameliorated prior to planting by digging in copious organic matter via single or double digging (primary cultivation techniques), however this damages soil structure and should not be practiced.
- **Modern gardening practice does not advocate disturbing the soil** to incorporate organic matter or fertiliser. Instead, **gardeners should work with the soil they have**. Plant selection must suit the soil within the garden, even if that means desired plants can't be grown. This is fundamental to best practise, garden health plans, and **'right plant, right place'**.
- Soil does not need to be ameliorated other than through **mulching with organic matter** and allowing soil organisms to do the work. Therefore, **soil amelioration is minimum-intervention focused**, with only decompaction**,** drainage systems or hard landscaping projects justifying any significant level of soil disturbance.

Planting

Whether a newly planted area, or planting into established borders, there are techniques that need to be followed to ensure new plantings are spaced correctly, have suitable soil-root contact once in the ground, are stable and don't lack water or sufficient nutrients to allow effective establishment.

Timing

- **The best time to plant most plants is in early autumn when the soil is damp from autumn rains, but still retains summer warmth to allow roots to establish before winter**. This gives new plants greater time to establish a deeper root system before the following summer, reducing irrigation needs.
- **The next best time is in spring, allowing some root establishment before summer droughts may occur**.
- Planting in summer is not recommendable due to the potential irrigation needed.
- Winter planting is not suitable on heavy soils, which are typically waterlogged through winter, though it may be undertaken on lighter, more workable soils such as sandy soil.
- **Plants should never be planted into dry, waterlogged or frozen soil**.

No plant should ever be planted in its pot, unless the pot is biodegradable (and plastic is not).

Spacing/density and positioning

- **Specimen plants**, such as **trees**, are usually **planted on their own** and their **position** is **triangulated from a plan in new designs**, or **very carefully considered and implemented in established gardens**.
- **Group plantings, such as of herbaceous perennials, usually have several of the same cultivar in each grouping to make a larger clump**, e.g. 5 x *Monarda* 'Cambridge Scarlett' in a clump. The aim of this is that once the plants grow through spring and summer, their foliage and flowers close the gaps between plants, creating a seemingly single mass of one plant species, hybrid or cultivar.

- Bark chip mulches decompose more slowly, needing to be replaced less often. However, it's slower to enrich the soil with organic matter. The converse is true of most other organic mulches.
- **Mulching around new plantings reduces evaporative loss of water from the soil surface**, preserving soil moisture and reducing the need for irrigation.
- **Mulches are usually darker than the soil surface**; darker colours absorb the sun's heat, **warming the soil more** and promoting root growth and soil life activity, speeding new plant establishment.
- **Mulches block light from getting to the soil surface, reducing weed seed germination** and ultimately competition, as well as time spent removing unwanted competing plants.

This tree has been planted too deep and mulched up to the trunk, above the root flare. Some years later it's now showing signs of rotting, with the bark flaking off.

- **Gravel mulches** are often used in dry/mediterranean style gardens. They also reduce surface evaporation and help preserve soil moisture, and reduce soil-surface weeds from germinating by blocking light, but they do not benefit the soil via decomposition and increasing organic matter content. They should only be used in appropriate locations.
- After a couple of years, as blown in debris and weed seeds wash into the gravel, these mulches become very effective for seed germination and can become quite weedy, requiring constant weeding in spring and autumn. Finer grades of gravel, like pea shingle, experience this more than coarse/larger grades of gravel.

Irrigation after planting

- **Plants should be irrigated straight after planting**, even if the soil is damp, to quickly settle soil around the roots and ensure maximum soil-root contact.
- **If plants**, as recommended, **are planted in the autumn they will not need irrigating again unless dry weather the following summer is causing drought-related stress.** Details of irrigation options are discussed below in 'longer term aftercare'.

Rhubarb has been planted on an allotment site within a raised 'doughnut' of soil. This makes any necessary establishment irrigation much more effective, with water kept within the rhubarb's growing vicinity and eliminating runoff. Water will more effectively be able to soak deep into the soil, encouraging the rhubarb roots to grow deep, maximising its drought resilience.