2. Planting Styles

2.1 Historical Contexts

Overview of Garden History:

Gardens have been created and cultivated for thousands of years. Originally extensions of grand houses of the powerful and wealthy, gardens were used to impress visitors and demonstrate control over nature. As a result, most early garden design styles were formal, cutting a clear distinction with informal, natural landscapes. In more recent garden history, informality was introduced as a design concept. Today there are many garden styles that can be adapted to a range of scales and settings.

Renaissance Gardens:

Background:

This style **originated in Italy in the late 15th Century** and succeeded Mediaeval garden style. **Renaissance gardens were created around palaces and villas and reflected the formal architecture and symmetry of these buildings**. The Renaissance style spread from Italy into other European countries, including France, Germany and the UK. As the style spread some design elements evolved, though the design fundamentals remained the same. **Renaissance garden style began to appear in the UK during the 1600's.**

Villa Medici. Castello, Italy. This features a geometric, symmetrical layout typical of Renaissance gardens

The **Renaissance garden was intended to impress visiting nobles and the wealthy**. They coincide with a time where there were a few very rich and powerful families. Many people worked for them, often toiling for long hours with little pay. These workers developed specialist craft skills that enabled the creation of ornate garden features, including statues, garden buildings, stonework, woodwork, water features and more. The rich made their money primarily from trade and agriculture; they owned huge tracts of land, which was farmed by poorly paid labourers.

The Renaissance style celebrated the cultural developments of their time, including art, scientific development, architecture and literature. Unlike the smaller, often cloistered Mediaeval gardens, **Renaissance gardens spread outward and often encompassed views of surrounding landscapes, especially on sloped gardens where terracing was installed**. French Renaissance gardens were even more expansive than Italian ones. Renaissance gardens were designed not only to look impressive, but **carefully planned path networks allowed for exploration**. The wealthy could stroll the grounds, both as a way to take exercise and to impress visitors; **unexpected features were often integrated to surprise and delight visitors, hidden by tall, formal hedges**.

Examples of Renaissance gardens can be found at:

- Villa Medici, Fiesole, Italy
- Villa d'Este, Tivoli, Italy
- Château de Villandry, France
- Palace of Versailles, France
- Hampton Court, London, UK

Design features:

Formality. Renaissance garden style exhibited man's dominion over nature and contrasted surrounding informal, natural or farmed landscapes with formal layout. All features of **Renaissance gardens** are, in essence, **expressions of formality**.

- **Symmetry**. Renaissance designs feature a central plane of symmetry (axial symmetry) in each area, potentially with further planes of symmetry depending on the layout.
- **Geometric shapes** are integrated through the use of low, tightly clipped hedging in formal shapes – usually using *Buxus sempervirens* (common box). These are larger, more elaborate versions of Mediaeval knot gardens. **Low hedging is formed into straight lines or regular curves**, either forming the borders of squares, triangles, circles or other regular shapes. These shapes often have internal planting, such as:
  - Topiary, such as tightly clipped spheres, cylinders or other shapes. These would be reflected symmetrically across the design to enhance formality.
  - Low growing, infill plants – including colourful annuals used as bedding.
  - Gravel or stone infill.

Tightly clipped *Buxus sempervirens* (common box) used in a parterre

- **Parterres**, usually featuring *Buxus sempervirens* (common box) in tightly clipped, formal shapes as described above.
- **Terraces installed onto sloped sites**, demonstrating the power of man over nature. These **feature parterres and/or formal pools**, often with one cascading into another on a lower terrace. Terraces are often **edged with ornate balustrading**. Italian Renaissance gardens, in particular, tended to be constructed in higher regions on hillsides. This is, in part, due to the more favourable summer climate where malarial mosquitoes were not found (unlike the lowland, hotter regions during summer).

Water features were situated along the axis of symmetry, often with a taller central feature acting as a focal point

- **Water features** such as **formal pools** in **geometric shapes** e.g. square, rectangular or circular, edged with stone. Statues feature as focal points within formal pools.
- **Straight paths with right angles, or regular curves**. Paths surfaced with stone slabs or gravel.
- **Formal steps connecting levels**. These are constructed of stone (usually the same stone as used in the main property to facilitate unity) and feature ornate balustrading.
- **Tall, tightly clipped hedges utilising evergreen plants** such as *Taxus baccata* (yew) are used to compartmentalise gardens and edge paths, screening different areas of the garden. Walkways alongside or within this hedging, with right angle turns into other garden areas, create potential for surprise features to impress visitors.
- **Pergolas** feature, creating long, shaded walkways.
- **Grottoes** create a surprise feature within the garden.
- **Statues**, sometimes set within formal hedging or ornate stone structures. These often act as focal points.
- **Bosquets** are wooded areas with trees planted in straight lines on an even grid or offset along alternate rows. These are sometimes enclosed within a formal hedge.
- **Lawns** feature, for example on parterres, creating a horizontal plane that contrasted the vertical hedge features, sauch as low *Buxus semperviewns* (common box) edging geometric beds.

Maintenance:

Renaissance gardens are high maintenance. They have an abundance of hedges that need regular clipping, paths that need weeding and gravel raking into position as footfall dislodges it. Water features need cleaning, lawns needing clipping, etc. If parterres feature bedding, this needs replacement each spring and autumn, with watering and deadheading during the summer.

Ornate, evergreen, tightly clipped geometric features require regular maintenance through the growing season

In the past there were sufficient gardeners to maintain these gardens, as the rich had money and labour was cheap. **Today Renaissance gardens can be expensive to maintain** due to the high level of staffing required, though in many gardens **volunteers help relieve the pressure on limited staff numbers**. In many gardens today the budget is rather more limited than in Renaissance times.

Mechanisation of jobs, such as the advent of mechanical hedge trimmers, have improved efficiency of garden tasks. Backpack batteries now enable gardeners to power lightweight machinery, making physically demanding tasks like hedge cutting or leaf blowing more manageable.

A major problem facing Renaissance style gardens today is the introduction of box moth caterpillar. This East Asian species was accidentally introduced into Europe around 2007/8. **The caterpillars rapidly consume the leaves of *Buxus sempervirens*** (common box), **defoliating plants**. They have made the continuation of box usage very challenging, requiring regular treatments through the growing season to prevent damage. This is compounded by the prior introduction of box blight and box rust, which both harm *Buxus sempervirens* and can lead to discolouration and potential death of plants.

Box alternatives are now encouraged for all new plantings and as replacements for affected stands of box. These include small leaved evergreen shrubs with a dense growth habit, such as *Ilex crenata* (Japanese holly), *Sarcocca confusa* (winter box), or*Lonicera ligustrina* var. *pileata* (box-leaved honeysuckle).

Biodiversity value:

Extensive monocultures (one species) of a few different hedging plants dominated Renaissance gardens, limiting biodiversity value

The Renaissance style features, in large part, monocultures. *Buxus sempervirens* (common box), *Taxus baccata* (yew), *Prunus laurocerasus* (cherry laurel), and *Salvia rosmarinus* (rosemary) were used as hedging or for topiary. If low growing annuals were used for bedding in parterres, they would be utilised in monochromatic (one colour) or dichromatic (two colours) schemes, with **limited plant diversity**.

Low plant diversity means **Renaissance gardens do not support a high biodiversity**. There is very limited forage throughout the year, and the regular clipping of hedges disturbs wildlife, deterring birds from nesting.

This style of garden is not compatible with gardens that intend to foster biodiversity.

Landscape Style:

Background:

In the **late 16th and early 17th Century**, a change in the approach to garden style started in the UK. The strict, formal Renaissance design began to be rejected in favour of a more **naturalistic, informal style** that **reflected elements of the landscape beyond a property's boundary**. **William Kent** was a pioneering designer of this style, taking inspiration from landscape paintings and other influences. His work can be seen at Chiswick House. In the 1700's, **Lancelot 'Capability' Brown** influenced and created some of the most revered English Landscape Gardens, including the development of Stowe Gardens, Chatsworth and Blenheim Palace.

Palladian bridges were formal features integrated into naturalistic landscaped grounds, providing a crossing over naturalistic rivers

Landscape gardens were large, belonging to wealthy land owners with impressive country estates. Like Renaissance gardens, they were **designed to impress visitors** with their vast scale. Unlike Renaissance gardens, landscape gardens featured elements of the countryside around the property, forming a relatively seamless union that allowed 'borrowed views' to extend the apparent size of the

2.2 Formal Planting

Overview of Formal Planting:

Formality in gardens is, in essence, an undertaking that **seeks to oppose the natural, as found in nature**. By creating spaces that are unnatural in layout, **people have demonstrated their perceived dominion of nature**. The grandest representation of formality in any garden style is Renaissance gardens, which were often extensive in scale and starkly contrasted the nearby countryside.

Formal planting is still used today in some Modern Gardens on a smaller scale, though it is often integrated with informal planted elements that soften the overall aesthetic.

Axial symmetry in formal garden

Geometric shapes set within formal paths. *Buxus sempervirens* (common box) is used for low hedging, requiring regular clipping throughout the growing season making it a high maintenance feature

Symmetry:

All formal gardens are designed around plane(s) of symmetry. **Most formal gardens have a main plane of symmetry running from the centre of the house or key property feature, splitting a garden area into two mirror images. This is axial symmetry**. **Other planes of symmetry may be used to break the garden up into smaller segments.**

Paths, formal planted areas, rills or canals can be used to define a plane of symmetry.

Geometric Layout:

Formal gardens have **regular shapes, such as squares or rectangles, diamonds, circles or ovals**. They do not feature asymmetrical shapes as these are informal features. **A geometric shape can be defined as having one or more planes of symmetry.**

The layout of a formal garden is broken up into these geometric shapes, which are reflected across planes of symmetry. The shapes are demarcated by garden beds with paths separating them. Beds typically have low, clipped hedging edging them.

Paths are usually straight with right angle corners. Sometimes paths follow a regular curve, such as around a circular water feature. Path surfaces are typically level and made of stone or gravel. Stone steps connect terraced levels.

Formal Hedges:

Different areas of formal gardens are often enclosed with tightly clipped, evergreen hedging such as *Taxus baccata* (yew) or *Prunus laurocerasus* (cherry laurel). **This frames the formal areas and emphasises the geometric layout, as well as providing a foil for the intricate designs and focal points**, such as statues.

Formal hedges require regular clipping throughout the season and are **high maintenance**, especially taller hedges that require a platform to safely trim them.

Low Enclosing Hedges:

Beds, laid out in geometric shapes, are usually edged with *Buxus sempervirens* (common box). This is tightly clipped on a regular basis, making it a high maintenance feature. The hedges have vertical sides, a flat top and right angled corners, or curved sides, depending on the shape of the bed. They are generally kept under 50cm tall.

- Sometimes drifts of perennials have **specimen trees or large shrubs situated** within them **as 'dot' plants**. These often act as focal points. The drifts of perennials continue beneath the woody plant(s), using shade tolerant selections. **Where these specimen woody plants are used, they are not arranged at regular intervals** as this would create formality.
- **Spring flowering bulbs can be integrated amongst drifts of perennials**. These can be scattered over the soil surface around existing plants, with irregular spacings between bulbs, and then planted. This contrasts to the regular spacings and arrangement of formal bulb displays, which are arranged in rows, either in a square grid, offset rows, or rings in circular borders.

Drifts of perennials fill this informally planted area. Note the contrasting formality of the tightly clipped hedge and pair of *Fagus sylvatica* Atropurpurea Group (copper beech) in the background

- **Matrix plantings**. These use **drifts of plants**, where each drift of a plant species or cultivar varies in size and shape. The **drifts utilise repetition of a few plant species to create a strong visual impact**. **Amongst the drifts, other selections are inserted in a seemingly random, irregular arrangement**.
  - For example, extensive drifts of *Achillea ptarmica* 'The Pearl' (sneezewort 'The Pearl'), *Echinacea purpurea* (purple coneflower) and *Salvia* 'Radio Red'.
  - Other plants, such as the taller, more airy *Oenothera lindheimeri* (gaura); upright grass *Calamagrostis* x *acutiflora* 'Karl Foerster'; and vertical flower spikes of *Verbascum* 'Southern Charm' (mullein 'Southern Charm') could be interspersed into the matrix as individuals or small clumps, creating a naturalistic effect with varied heights, forms and colours.

Woodland gardens have canopy trees, understory and groundcover. Plants are irregularly placed with no straight lines; this is essential for informality

- In **woodland gardens woody plants are arranged into layers**, with taller trees, shade tolerant understory shrubs and groundcover. The **woody plants are carefully arranged to appear random in placement**, without regularity.
  - For example, a line of trees is not acceptable; these should be placed in an irregular pattern without even distances between each tree.
  - Likewise, shrubs would follow an irregular arrangement to ensure the naturalistic aesthetic is maintained.
  - Herbaceous, shade tolerant groundcover would be planted in drifts or as a matrix planting. Spring flowering bulbs are usually integrated, with a scattered arrangement.

Woody plants are not pruned to regular shapes in informal gardens, unlike in a formal garden (which has tightly clipped evergreen hedging or topiary). **The exception is hedges**, which can follow straight lines, especially along a property boundary. However, informal hedges consist of different species of (usually) deciduous woody plants that are only pruned once or twice per year, meaning they are not tightly clipped and have a less formal appearance for much of the year.

Informal Colour Palette:

The **colour mixes** within an informal garden are **more relaxed** than the typically monochromatic, dichromatic or tightly controlled bedding schemes of formal gardens. Usually a **full array of colours are present**, with the drifts and matrix plantings offering a myriad of hues. Sometimes informal planting schemes have a loose colour scheme, such as cool pastels in shades of pink, purple, blue, white and primrose. Alternatively an informal scheme could be themed with hot colours, such as orange, red and bright yellow. What's important is that the range of hues and variation of colour is freer. Combined with the looser, free-flowing planting schemes a sense of informality is maintained.

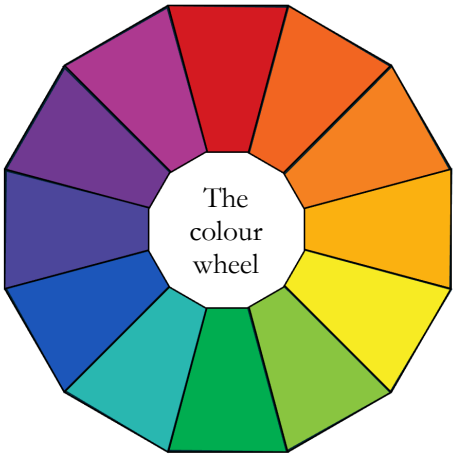
Informal colour palette utilises a wide range of colours, as seen in this display of annual wildflowers

2.4 Plant Associations

In any garden it is important that plants are not only ecologically compatible but that they 'work' together as a design. There are key principles discussed below. They centre around plant combinations that are in proportion (height and form), have a chosen colour scheme, create seasonal interest, and suit the design intention of the area.

Colour Schemes:

The selection of colours in a garden has a huge impact on the aesthetic and ambience. **In designing and maintaining gardens, choices are made which establish whether a colour palette is warm, cool, mixed or complimentary:**



- **A warm colour palette** utilises **red, orange and bright yellow** flowered plants. They can integrate dark purple leaved plants or bright yellow leaved plants. The colour range comes from **harmonising colours** – meaning colours adjacent to each other on the colour wheel. These colours **draw the eye and excite, creating vibrant areas**.
- **A cool colour palette utilises primrose yellow, blue, soft pink, purple and white flowered plants**. It can include plants with silver-green leaves and variegated leaves. These are also **harmonising colours**. **Cool colours are relaxing. They recede from the eye and can make spaces appear bigger.**
- **A mixed colour palette uses colours from around the colour wheel**, combining cool and warm colours. These create eye-catching displays that tend to draw the eye.
- **Complementary colours are used to create colour contrast**. **Any two colours that sit roughly opposite each other on the colour wheel** are complimentary, e.g. orange and blue, or yellow and purple. Complimentary colours are **commonly used in the dichromatic bedding displays** of formal gardens, such as an orange flowered *Tagates erecta* (African marigold) and blue flowered *Lobelia erinus* (trailing lobelia). Often, the green leaves of bedding plants softens the dichromatic aesthetic. Dichromatic schemes can also be created with white flowers contrasted with a coloured flower.

A cool colour scheme of harmonising shades

Plant Height and Form:

When designing planting schemes, **the size and shape of neighbouring plants must be carefully considered**. Pairing the tall *Helianthus* 'Lemon Queen' (sunflower 'Lemon Queen') with low growing *Stachya byzantina* (lamb's ear) would not look right. These plants are out of proportion with one another.

In herbaceous borders, **plant heights often increase from the front to the back of the border**, creating a tiered effect. Some taller species may be integrated amongst shorter plants to create contrast and add dynamic interest, such as vertical spires of *Digitalis purpurea* (foxglove) amongst the mounded form of *Nepeta racemosa* 'Walker's Low' (catmint 'Walker's Low') toward the front of a border. Note that the foxglove is biennial and self-sown seedlings would need to be retained to maintain this aesthetic.

Herbaceous perennials used in borders have two general plant forms, which can be appreciated from a distance:

- Many **form mounded shapes, creating a somewhat cloud-like form when seen in combination** along a border. This includes *Geranium spp.* (cranesbill), *Achillea spp.* (yarrow), *Geum* 'Totally Tangerine' (avens 'Totally Tangerine', *Helenium* 'Moerheim Beauty' (sneezeweed 'Moerheim Beauty'), *Lavandula angustifolia* (English lavender), *Alchemilla mollis* (lady's mantle) and many others.
- Some **have distinct verticality, with upward inflorescences that can punctuate surrounding mounded forms**. This includes *Alcea rosea* (hollyhock), *Verbascum spp.* (mullein), many *Digitalis spp.* (foxgloves), *Allium* 'Summer Drummer', many *Lilium spp.* (lilies), *Delphinium spp.*, *Rudbeckia maxima* (great coneflower), *Verbena bonariensis* (purple top), and others.

2.5 Plant Uses

For each heading listed below you are expected to know suitable plants. A selection is given under each category and you may choose to augment this by adding plants you already know. **To ease the learning load, some plants are repeated in different categories.**

Height and Structure:

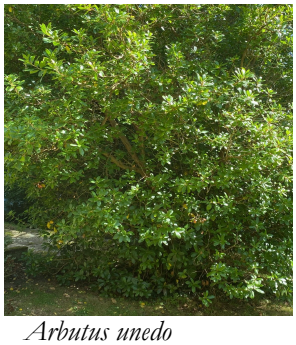
Plants are essential for introducing height within a garden, which creates interest, provides focal points, can compartmentalise areas, add privacy and screen unwanted views.

Plants that are selected for height are usually woody plants, which are **adapted via secondary thickening**. This enables them to retain above ground stems from which they can grow larger each year. Trees and shrubs are essential for adding year-round height to a garden, though tall herbaceous perennials can offer this on a seasonal basis.

Most gardens are not big enough for large trees, so **the following is a selection of smaller trees** that don't grow taller than 12 – 15m. They can be used as specimen trees:

- *Acer griseum* (paperbark maple). This tree has a rounded canopy with ornamental chestnut coloured peeling bark. Deciduous with vibrant red/orange autumnal foliage. 12m high x 8m wide at maturity.
- *Arbutus unedo* (strawberry tree). Glossy evergreen leaves, rounded canopy and attractive dark chestnut bark. White bell-shaped autumnal flowers which over a full year develop into round, red, hanging fruits. Tolerant of dry soils and sunny, exposed locations. 8m high x 8m wide at maturity.
- *Cercis siliquastrum* (Judas tree). Rounded canopy with heart-shaped deciduous leaves. Popular for its abundance of small purple spring flowers that can cover branches and older stems, especially if grown in a hot, sunny microclimate. Tolerant of dry summer conditions once established. A member of the pea family, *Fabaceae*, so its roots are adapted with nodules which contain symbiotic rhizobium bacteria that fix nitrogen, making it suitable for low nutrient soils. 12m high x 8m wide at maturity.

Acer griseum
(paperbark maple)



Arbutus unedo
(strawberry tree)

Cercis siliquastrum
(Judas tree)

Structural plants can include specimen trees, but this extends to **shrubs used to create permanent above-ground presence in a garden**. **This cannot be achieved by herbaceous perennials**, most of which are deciduous and die down during winter. **Structural shrubs are useful for creating height at the back of borders, framing views or entranceways, acting as focal points, understorey specimens beneath taller trees, or creating flow through a garden through repetition of the same shrub**. Evergreens are effective at creating visually impermeable year-round structure. Deciduous woody stems also provide structure and allow view through in winter, offering seasonal change. Some examples:

- *Camellia japonica* (camellia). Evergreen, slow growing shrub with glossy green leaves. Ideal as an understory plant in light shade, or in north facing sites. There are many cultivars available with different flower colours and forms, in shades of white through to deep pink. Some hybrids have red flowers. This is a winter interest shrub with a long flowering season starting in winter and lasting until early spring. Requires ericaceous (acidic) soil conditions and is best in damp summer soil, especially late summer when it sets flower buds. 4m high x 2.5m wide at maturity.
- *Forsythia* x *intermedia* (forsythia). An upright to arching, vigorous deciduous shrub. In spring the stems it grew the previous summer are covered in yellow flowers. Very robust, tolerant shrub which is suitable for most soils, performing best in full sun to part shade. Ideal for adding height and spring interest to the backs of borders; can be used for hedging but regular pruning will reduce abundance of flowers. 2.5m high x 2.5m wide.

Screening and Boundaries:

Taller plants, especially those that are adapted with secondary thickening, are key elements in creating boundaries and screening parts of the garden. Hedges are traditionally used for property boundaries or compartmentalising a garden. Trees and hedging can be used to create privacy, restricting views into a garden or screening unwanted views. **Evergreens provide year-round screening**, though they offer little seasonal change. **Deciduous woody plants do not offer much privacy in winter, though marcescent species** (which retain their dead leaves over winter) **offer reasonable privacy**; two commonly used marcescent species are *Carpinus betulus* (hornbeam) and *Fagus sylvatica* (beech).

Trees suitable for screening have been exemplified above, under 'height and structure' and 'shade'. Some popular **hedging plants are listed below**. These are all native, meaning they're also beneficial for garden wildlife:

- *Fagus sylvatica* (beech). This large tree responds well to pruning and can be kept much smaller if clipped once or twice per year. It is a popular hedging plant, tolerating most soils and can be grown in sun or semi-shade. Though deciduous, it is marcescent and therefore offers some privacy in winter.
- *Ilex aquifolium* (holly). An evergreen tree that can be pruned into a hedge. Its leaves are adapted with sharp spines, making this a deterrent to potential trespassers if used as a boundary hedge. Its dense evergreen habit and leaf spines also offer protection for nesting birds. Female plants produce berries that are eaten by birds. Holly can tolerate sun, semi-shade and shade, though its growth is less dense in shade.
- *Taxus baccata* (yew). A dense evergreen with dark green foliage. It is slow growing and is suitable for formal or informal hedging. Once established it is tolerant of dry soils, and will retain a fairly dense growth habit even in shade. Female plants produce berry-like arils that are eaten by birds. It is not tolerant of heavy soils that are waterlogged in winter.

Fagus sylvatica
(beech)

Ilex aquifolium
(holly)

Taxus baccata
(yew)

Ecosystem Services:

The term ecosystem services can be defined as:

'benefits to humans that are derived from the natural environment'

It is essential to remember that this term links nature and people, highlighting the different ways that people benefit from the natural environment. These services cannot be replaced and are justification for preserving nature and greenspaces for the benefit of humanity. Knowledge of ecosystem services is important to organisations justifying the need to preserve nature and natural ecosystems. Ecosystem services are summarised under four key headings:

Provisioning **Physical goods people can harvest, including:**	**Cultural** **Impacts on general wellbeing, education, recreation and spirituality, including:**
• **Food and drink** E.g. harvests from productive gardens, such fruit harvest from Apple 'Cockle Pippin'. • **Materials** Such as wood for timber, e.g. from *Quercus robur* (English oak). • **Natural medicines** E.g. a chemical extracted from *Taxus baccata* (yew) foliage can be used in cancer treatment medicine.	• **Inspiration** E.g. flowers, such as those of *Anemone x hybrida* 'Honorine Jobert', inspire painting, poetry, etc. • **Knowledge and Learning** Understanding plants, associated wildlife and garden history. • **Sense of place** Gardens and parks designed in particular styles build a sense of place, representing historical spaces.

2.6 Edible Landscapes

Overview of Edible Landscapes:

The term 'edible landscapes' encompasses **all green spaces where there is an element of edible crops being grown**, particularly referring to spaces where edible crops are a main or sole focus. This includes private garden vegetable plots, allotments, community gardens, orchards, walled vegetable gardens in heritage settings, and others.

As horticultural styles have progressed, traditional approaches to vegetable growing have evolved. There's an increasing desire to grow food in more sustainable ways, eliminating synthetic fertilisers and pesticides. Many community green spaces focus on growing edible crops to improve nutrition in the locality.

This section details a range of approaches to growing edible crops, the different settings in which edible landscapes can be found, and the wider benefits to society and the environment.

Growing Systems in Edible Landscapes:

- **Traditional methods:**
  - This approach follows methodologies from bygone times. **Traditional practices damage the soil and can cause a net loss of soil organic matter. Soil erosion, particularly in winter, is a problem. There are many positive aspects that can be integrated into more environmentally friendly growing methods.**
  - Traditional vegetable growing involves **primary soil cultivation practices such as ploughing, rotavating and single or double digging the soil each winter.** This is very time consuming and if machinery is used, has a significant carbon footprint.
  - **In disturbing the soil through primary cultivation its structure is damaged**, fungal networks are destroyed, and soil organisms such as earthworms can be harmed.
  - **Weed seeds are brought to the surface**, where they often germinate on exposure to light (assuming other germination triggers are suitable). This creates an annual weed problem that makes extra work.
  - **The high level of aeration that working the soil introduces means there's abundant oxygen to hasten the breakdown of organic matter, potentially reducing the soil carbon store**. However, organic matter such as well rotted farm year manure can be incorporated, which can offset some or all of the losses.

Traditionally the soil would be ploughed, rotavated or dug every winter

Lines of vegetables are sown or planted into exposed soil

- **Nitrogen**, which is found in nitrates, **is liable to be leached from the soil during winter as there are no plants to absorb it**. Nitrates are mobile in soil water. They cannot adhere to the surfaces of clay or humus particles and be held in the soil, unlike most other nutrients. This results in nitrogen leaching from the soil through winter.
- **Bare soil over the winter is liable to soil erosion from runoff**. Winter in the UK is wet, and saturated winter soils can't absorb further rainfall meaning increased runoff and soil erosion. This is a problem as valuable topsoil is lost each year. Soil takes thousands of years to form, so if there's a net loss it is a huge problem for growers. Soil biodiversity is also lost to soil erosion.
- Before seeds are sown or young plants planted, the **ground is consolidated and raked to a fine tilth. This requires further time and on a larger scale, specialist equipment**.
- **Plants are sown or planted in straight rows**, with set spacings between plants depending on the crop type. Until the crops grow larger, there's a lot of bare soil, meaning weed seed germination and potential soil erosion. However, **weeding with a hoe is quicker and more efficient down straight** rows.

- Compost all organic material on site. Decomposers and detritivores add to a garden's biodiversity.
- Foster healthy soils by minimal disturbance/digging and mulching with organic matter. Healthy soil is very biodiverse.
- Adopting a potager approach to vegetable growing allows for a greater biodiversity of plants and associated garden wildlife, such as pollinators, than traditional cultivation methods.
- If there is space, a forest garden will boost biodiversity through the broad range of species grown in a single area.
- Plant a native mixed species hedgerow. This provides refuge for wildlife and nesting opportunities, as well as a wind break if sited correctly (usually to the south west where prevailing winds come from).

Bug hotels made from logs, sticks and old bricks create overwintering spaces for invertebrates

- **Adapting to climate change**:
  - Anticipate the expected changes in UK climate. Wetter, windier winters with more intense rain and high wind events; drier, hotter summers with increased duration of dry weather, likely combined with hotter temperatures leading to drought conditions.
  - In response to these changes there are many ways to adapt traditional edible landscape growing methods. Strategies are outlined below:
  - Growing a cover crop, such as *Phacelia tanacetifolia* (lacy phacelia) over winter will reduce soil erosion from heavier winter rainfall events, as will mulching the soil.
  - Do not dig the soil. This damages the soil structure and makes it more vulnerable to soil erosion.
  - Plant a shelterbelt of native mixed species hedgerow or an edible hedgerow. This will buffer winds, reducing wind damage to plants. During dry spells, less wind around crop plants results in lower evapotranspiration. This reduces water loss via transpiration and evaporative losses from the soil surface, meaning the soil retains water for longer.
  - Fostering a healthy soil with a high organic matter content makes it more moisture retentive, important in slowing the onset of drought conditions in dry weather.

This allotment has been mulched with compost on planted beds and woodchip for paths. The woodchip is from a local tree surgeon, meaning it has a low transport carbon footprint

- Increasing the proportion of perennial crops that have more extensive, deeper root systems results in a more resilient edible landscape that's more capable of surviving dry weather events.
- Growing higher water requiring plants, e.g. leafy crops such as spinach, rocket, courgettes, runner beans, in the same area means irrigation can be focused where higher soil water is needed. This can coincide with application of a thicker mulch to improve soil water retention.
- Saving winter rainfall in water butts means summer irrigation doesn't put pressure on tap water.

[It is essential that in answering a question relating to climate change that you state the expected climatic change first, followed by the mitigation strategy.]

- **Educate**:
  - By teaching the importance of growing local food in a sustainable way, knowledge can be shared with the local community and passed down to younger generations.

- **Unite people**:
  - Many edible landscapes, such as community gardens and orchards, city farms, etc. focus on bringing local community members together. This is an essential part of social sustainability, promoting togetherness in responding to climate change and gardening in more sustainable ways.

2.7 Short-term Plantings

Overview of Short-term Plantings:

Traditional bedding, annual meadows and maize mazes are examples of short-term planting. They are intended to provide interest for a limited period of time, usually covering either winter into spring or summer into autumn.

Historically short term plantings have been used in garden styles including colourful annuals used in Renaissance parterres, and tender perennials and annuals used in Gardenesque bedding displays. More recently, annual meadows have become popular in gardens, particularly those intending to increase their biodiversity value. Maize mazes are popular annual recreation features which, unlike mazes with perennial hedging, can be redesigned into new shapes each year.

Suitable Plants:

Traditional Bedding Displays:

Plants must be uniform in growth and colour, and easy and cheap to propagate via seed or cutting. They must also be floriferous and robust in growth to resist changes in growing environment and transplant shock. They are often grown from true-to-type seeds or F1 hybrid seed to maximise uniformity. Tender perennials are often grown from cuttings overwintered in heated greenhouses. Example plants:

- **Hardy Annuals:**
  Calendula officinalis (common marigold), *Nigella damascena* (love-in-a-mist), *Orlaya grandiflora* (white laceflower)
- **Half-hardy annuals:**
  Cleome houtteana (spider flower), *Cosmos bipinnatus* (cosmos), *Tagetes patula* (French marigold), *Zinnia elegans* (zinnia)
- **Hardy or short-lived perennials** (these are removed after their first flowering season):
  Erysimum cheiri (wallflower), *Oenothera lindheimeri* (gaura), *Viola tricolour* (heartsease)
- **Tender perennials used as annuals:**
  Impatiens walleriana (busy lizzie), *Pelargonium zonale* (zonal geranium), *Petunia* x *hybrida* (petunia)
- **Bulbs (spring):**
  Allium 'Purple Rain', *Crocus tommasinianus* (early crocus), *Tulipa* 'Ballerina' (tulip 'Ballerina')
- **Shrubs:**
  Cordyline australis (cabbage tree), *Nerium oleander* (oleander), *Ricinus communis* (castor oil plant)

A dichromatic display of *Impatiens walleriana* (busy lizzie) bedding

Annual meadows:

These consist of native or non-native, usually hardy annual plants that self-sow. It is unusual for annual meadows to perform well in subsequent years unless the conditions suit annual flowers, such as low-nutrient, fast draining soil where grasses are unable to become dominant. In many situations, the meadow needs to be prepared again and resown to increase the prevalence of annual flowers.

Annual meadows flower from late spring through summer, continuing into autumn if long flowering annuals are included, e.g. cosmos. Example plants:

Agrostemma githago (corn cockle), *Centaurea cyanus* (cornflower),), *Cosmos bipinnatus* (cosmos), *Papaver rhoeas* (field poppy), *Rhinanthus major* (yellow rattle)

An annual meadow in august

Maize mazes:

These are monocultures of maize, which is sown into labyrinthine patterns in spring. By late summer the maize will grow tall enough to form effective 'walls'.

- *Zea mays* (maize/sweetcorn)