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from

Permaculture Design

A step-by-step guide

by

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Patterns

One of the first things we notice when we observe natural ecosystems is that certain **patterns** keep appearing, in many situations and at varying scales. These patterns occur in both time and space, and while the former determine our routines, the latter are often only considered for their beauty. However, nature's most common patterns have evolved over many millennia[†] as being the *most effective*



for survival. While conditions on the surface of the Earth have changed considerably over time[‡], life has always managed to adapt in order to survive and thrive here. So our challenge as designers is to identify what each of these patterns excels at doing and to apply them where appropriate in our designs.

Patterns in space

The study of patterns and their successful application in design is a fascinating and detailed subject much beyond the scope of this guide. That said, there are some key principles that, once understood, can help us to use them effectively in our designs. Firstly, patterns occur at the **edge** between two different media or systems. So the branching fractal form of a broccoli head is simply the edge between the plant and the atmosphere, the waves on the ocean the place at which the air mixes with the water. Resources are exchanged across these edges; needs are met and waste products eliminated, so by increasing surface area, nature increases the efficiency of this interaction and ultimately the size and health of the organism. Hence we find that many of the most common patterns we see around us in nature (branching, waves, spirals, webs and so on), all have extensive 'edge'. Of course the ultimate edge on this beautiful planet is the one between the earth and the atmosphere where almost everything lives, and that's because this is where all the key requirements for life occur together.

[†] Nature has done 3,500,000,000 years of Research & Development!

[‡] Levels of Oxygen in the atmosphere were once much lower and the temperature of the sun also considerably cooler, requiring higher levels of greenhouse gases.



Summary

So the key things to remember about the design process are:

Defining roles

- * When working for a client, clarify at the beginning of the design process, theirs and your own levels of involvement.
- * Identify the point at which you hand over the responsibility for the design implementation to them.
- * Put all this in writing at the start, in a design proposal.

Working as part of a design team

- * Identify everyone's skills and make best use of them.
- * Ensure that everyone feels heard and gets an equal chance to contribute.
- * Rotate roles in meetings and discussions.
- * Use the given meeting techniques to avoid needing to use those for conflict resolution.

Design frameworks

- * Provide us with a successful pattern to guide our process.
- * Help us to avoid missing out anything important.
- * All essentially follow the broad process of:
Survey, Analyse, Design, Implement and Maintain.
- * Different frameworks might be better suited to some design processes than others.
- * While they appear to be linear processes with a beginning and an end, they are effectively cyclical.
- * A design is never completely finished.

The Action learning cycle

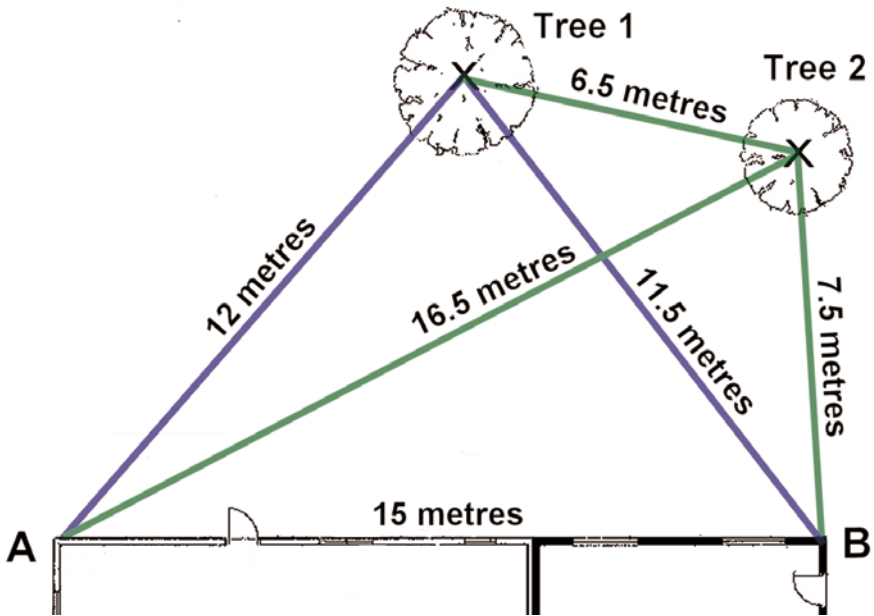
- * Outlines the way in which we learn naturally.
- * All the design frameworks are based upon this process.
- * Any mistakes are opportunities for learning.



Choose your baseline

Next, plot the key fixed points on the site such as buildings, gateways, fencing corner posts, telegraph poles or big trees. Start by choosing two points, perhaps along one side and a good distance apart, from which you can measure everything else. If need be, drive in two posts yourself for this purpose. For most urban garden designs you might choose two corners of an adjacent building. Such walls are often straight, making it easy to measure between those points and so providing you with a useful *baseline* for your mapping.

Measure distances or take bearings



In this diagram we see a building being used as a baseline for the survey, corners A and B being measured as 15m apart. We know such a building will be easy to draw using one or more straight lines, so it will be a good way to start our map. From here, the simplest method of pinpointing the other elements on the site, such as Trees 1 and 2, is to measure their distances from each corner, A and B. You can use a site tape or pacing, see the online resources for a simple pace conversion table².

Are there any significant barriers to such flows, such as wildlife corridors into the site being interrupted by busy roads or by waterways? Where do people visit to perform tasks, collect things or to rest? Where are resources brought onto the site, stored or taken away? How does the current layout affect the performance of the site? Are any routes longer than they need to be, or passing through areas causing avoidable disruption?

Identify the different zones on the site

Zoning is all about how energy is being used on the site. We'll start by mapping current patterns of activity and later redesign for greater efficiency. Zones are focused upon main areas of use such as buildings (often called zone 0) and any well-used desire lines, where people move slowly enough to notice what's going on around them. To minimise work we'll later gather the things needing the most attention around these focuses.

Now sketch out the *current* zoning onto your *desire lines* and *access map* or overlay. Using a different colour for each zone is a great way of differentiating them, like in my example below.



The desire lines around my mobile home shaped my zoning of the space

Snow – The thaw after snow shows us more than we can normally see. Snow melts more quickly on the roofs of heated buildings that are poorly insulated. Capped wells and other underground bodies of water will melt snow more quickly than surrounding ground; a clear circle on a snowy yard is probably an old well that has been concreted over. Other favourable microclimates, such as around buildings, will also thaw snow quickly. Conversely, the chilliest spots will hang onto snow residues the longest. Desire lines are also easy to see in the snow. Where do people and animals prefer to walk? Now you know!



Fire – Hopefully you'll never experience a wildfire, by all accounts it's a pretty terrifying thing. If the site is in a fire risk area then designing to protect the site against it is a priority (remember designing for disasters?). Instead of waiting for one, find out about the history of wildfires in the area and their patterns. Radiant heat is the most destructive aspect of fire and burns from a considerable distance, even a small campfire can force a retreat. The main things to look for on site are:

- * Inflammable plants and trees; conifers and eucalypts (high resin content trees) burn particularly fiercely. Do prevailing winds blow on to the site from that direction?
- * Is the site on a slope? Fire travels very quickly uphill and is fiercest on ridges, which are usually the driest areas.
- * Where are access roads to the site routed?
- * Is there an emergency on-site gravity-fed water supply?
- * What are the buildings made of? Are they designed with fire-protection in mind (e.g. white painted, with door and window screens, simple roof shapes and screened undershot guttering that doesn't collect hot ashes, etc.)?

If your site has a variety of different microclimates and land uses, it's worth surveying the soil in a few places and then comparing your findings. What do these observations tell you about the underlying geology of this area? The base rock will determine the soil type and thus the basic growing conditions.†

Identify the site's remaining limiting factors

Our survey may have already identified some of the site's key limiting factors: perhaps excessively shady or boggy areas, very heavy or light soil, or crops regularly grazed off by insects or wild animals? Some of these factors we may seek to modify, others such as altitude we are going to have to accept and seek to discover the gifts they offer. Our role as designer is to identify key limiting factors, and then to design strategies to overcome them. Sometimes, by removing one limitation, the landscape will change dramatically, like removing grazing animals from a landscape to permit the re-growth of forest. Returning to our leaky barrel analogy, an effective strategy might be as simple as plugging some of those wasteful leaks. A quick look around many sites will quickly identify the tragic loss of energy and resources such as:



Chris Dixon in his woodland, which regenerated after sheep were removed

- * Heat escaping from buildings.
- * Fertility being washed out of the soil.
- * Water leaving the site before being fully utilised.
- * Crops being left to rot (most commonly under trees).
- * High maintenance, low output systems (e.g. most lawns).
- * Vandalism.

You may also identify other opportunities being wasted like:

- * Workers having insufficient to do, or being wasted on low value tasks. Volunteer help not being made use of.
- * Free or cheap local resources, not being collected, or utilised.

† *The Living Landscape* by Patrick Whitefield has an excellent chapter on this.



Working with multiple clients or community groups

When working with larger client groups it is important to ensure that everyone feels heard. Ultimately, the success of a community project depends heavily upon the degree of ownership a group feels over the end product. I've seen well-meant projects, such as community orchards, created with little or no consultation with the local residents. Inevitably those projects suffer vandalism, because those carrying out the damage have no connection to this thing that 'just landed' in their neighbourhood.



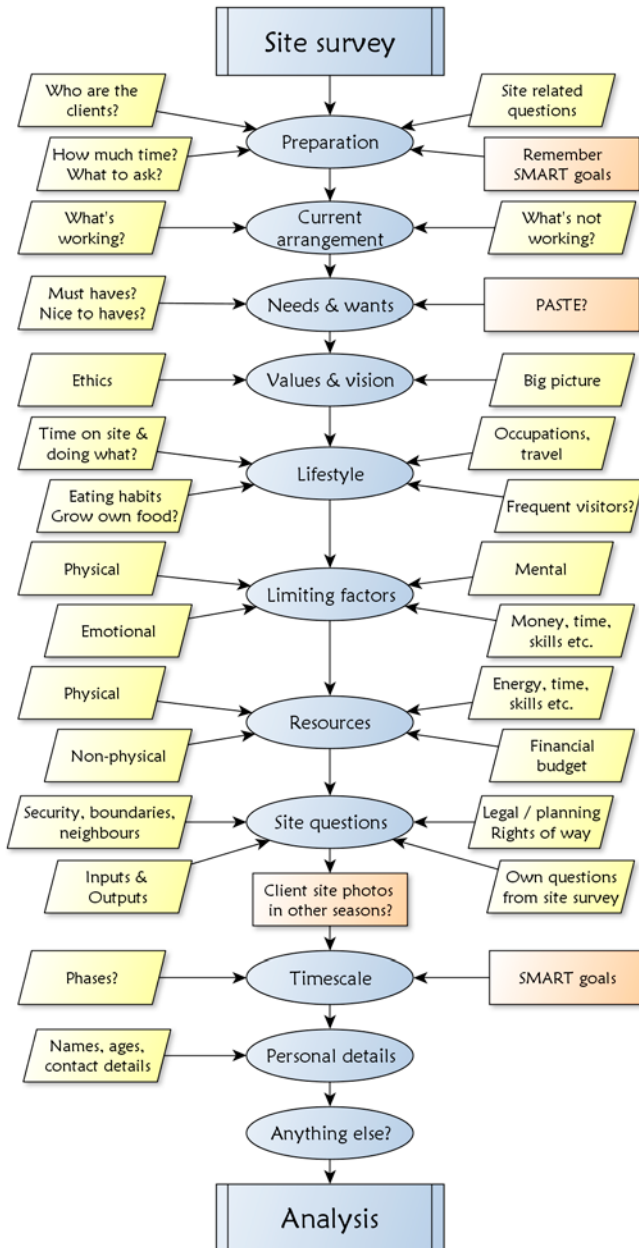
Here's a small selection of tools that have been developed to help groups successfully make decisions, any of which may prove useful in particular circumstances. If you plan to work with groups of more than just a few clients, then I recommend that you investigate at least one of the following methods in more detail than I have room for here. I provide just a brief overview of each below, but each is well documented either in books, on the Internet, or both. When working with groups in this way, you might be offering a set of questions for the group to go away and consider their answers to, or be stepping into the role of an outside facilitator in their process. However, if you are considering taking on the latter role, I would certainly suggest that you get some training first.

Small community processes

Any of the methods previously offered to assist design teams in working together could also be useful to small groups of clients in establishing a collective vision and set of priorities. Two additional processes follow that take up more time, but offer a way to ensure equal participation in any key decision making. These work well for up to 10 or 15 people, maybe more, but as the group size increases, the time needed for the process may expand accordingly.



Client interview flowchart



Functions, systems and elements

Still confused about the difference between functions, systems and elements? Maybe this will help: elements are individual things that make up a system when connections exist between them. Several systems can also connect up to create bigger systems. Either elements on their own, or complete systems, perform (one or more) functions. A function is *what you want to achieve* and the system or element is *the means by which you achieve it*. Here are some examples:

Function	System	Elements
<i>Windbreak</i>	Hedge	Hazel, elder, ash, bramble etc.
	Fence	Posts, concrete, wooden slats etc.
<i>Irrigation</i>	Roofwater harvesting	Gutter, diverter, downpipe, water butt or tank, pond
	Earthworks	Dams, sluices, gulleys, trees etc.
<i>Soil improvement</i>	Slope stabilisation	Terracing, swales, gabions, net and pan, trees
	Nutrient cycling	Composting, green manures, liquid feeds, mycorrhiza, treebog
	Mulching	Cardboard, bark, compost, straw, wood chip etc.
<i>Food production</i>	Veg garden (plants)	Carrots, potatoes, onions etc.
	Veg garden (structure)	Raised beds, composting system, greenhouse, hand tools
	Orchard	Apple, plum, pear trees etc.

Note that while Hazel has appeared here as an element in a hedge system to provide wind protection, it could also have been listed as an element fulfilling the functions of soil improvement or food production.

Remember, ‘adaptable’ (multi-functional), resilient (multiple elements for each important function) and ‘high efficiency’ (least work for greatest effect) are always design *aims* and don’t need to be considered as separate *functions*.



Placement

Now we'll experiment with best placements for the different elements and systems in our design. If there's a fixed point of focus on the site (such as a house), then we'll be placing everything most efficiently in relation to that. However, when starting with a 'blank canvas' we get to choose the best place to site our centre of activity. If we're arranging our design around a proposed new house or other structure, its placement will probably be our most important decision. If we're designing a site without an obvious central element, then we'll need to identify the most important elements to place first and go from there.

Around an existing main element

When designing around a fixed point of focus like a building, we've a number of methods we can use to plan the layout of the site. Using our base map and overlays from the survey, we'll aim to make our mistakes 'on paper', instead of in the landscape itself. One helpful tool for this process is the **landscape modelling** technique I use to teach zones and sectors.

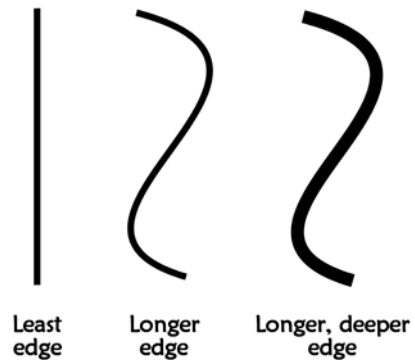


Using landscape modelling to explore placement of systems and elements



Some edges can be significantly deep, though defining the exact distance where an effect becomes negligible is difficult, as it can vary with changing environmental conditions such as the weather or soil moisture levels. Just think how you might choose to cycle into town on a sunny day, yet take the car instead when it's wet and windy. Pollinating insects behave in a similar way! Such things are extremely fuzzy²³. Beneficial effects can be short-term or year round, depending upon the means of interaction.

So when increasing edges we can do so by making them both longer and deeper. Nature's patterns, like crenellation (wavy-ness) already show us how to make them longer. Depth can be increased by wherever possible helping the agents of transmission, like planting a windbreak hedge for pollinating insects or by buying a good waterproof jacket for a hesitant cyclist! By



creating ponds with gently sloping edges we increase the area of shallow water that warms in the sun: a popular microclimate where creatures such as tadpoles thrive. Adding mycorrhizal fungi when planting most plants and trees creates a beneficial relationship that increases their ability to 'reach' soil nutrients.

Remember though that while increasing edges in our designs is generally a good idea, that we should always *optimise* rather than maximise them. If we produce more of a resource than we can make use of, we create more work for ourselves having to harvest it all and find new uses or outlets for it. If we leave it we risk creating an imbalance in the system, any unused resources having the potential to become pollution and attract pests. Don't be greedy, match your design to your needs. You can always increase that edge again later when you have the capacity to deal with the extra yields. Remember, **start small and work out from well managed areas.**

...but don't be an obsessive *edgetarian*.

Drawing

Draw your design directly onto the base map

Perhaps our simplest option is to draw our design ideas directly onto our base map. If we made multiple copies of this earlier for recording site information, we can use one of those. If we wish to separate out some aspects of our design, or distinct implementation phases, we can avoid clutter by spreading these details over a series of maps. Below is the plan I made of my mobile home garden, drawn directly onto the base map.



Design: Aranya

Base map and overlays

Another way of presenting a design is to instead draw it onto an overlay. If you chose earlier to record site information in this way, you can use the same technique to present your final ideas. Use good quality (high transparency) tracing paper if you can; this will also allow you to show multiple overlays at the same time when useful.

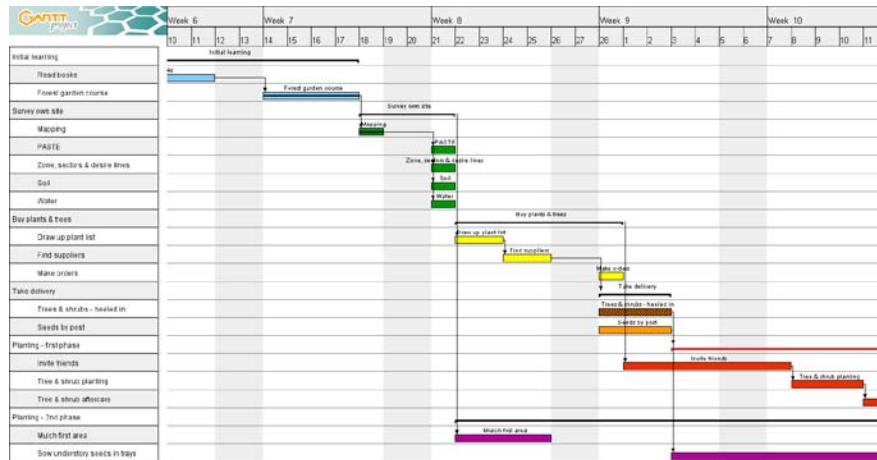


The kind of things that can go wrong include:

- * Poor communication, the team don't know what to do
- * Disagreements, personality conflicts and walk outs
- * Failure to meet standards or regulations
- * Bad management and poorly defined goals
- * Inclement weather

Being prepared for such eventualities gives you a better chance of dealing with them effectively should they occur.

A good tool for taking a simple Work Breakdown Structure and turning it into something more precise that we can work from is a **Gantt project planning chart**.



Gantt chart created using Open Source software, though you could also use paper to lay one out.

One advantage of using software is that if a task is delayed, then all dependencies can be easily shifted along the timeline in response. If you are computer-literate, the best way to learn how to use this useful tool is to download one of the free Gantt programs and play with what it can do. A Gantt chart places all the chunked tasks down the left side of a grid, in the order of implementation. The timeline runs left to right, and for each task a coloured bar is placed indicating the anticipated start and finish times.



Presenting to a Client

Now that you've finished your design, you may be faced with presenting your ideas to the client(s). The first thing to remember is that however well they know the site, they won't have been through the same design process as you and won't be familiar with many of the analysis tools. Your job then is to communicate not just your recommendations, but also the reasoning behind the choices you've made. Sometimes you'll disagree with what they initially asked you for; if so, show good reasons, so that they can see why your ideas are a much better choice. Have at least one trial run presentation, particularly if you're not a confident public speaker. In my experience though, knowing the subject is the best cure for any pre-presentation nerves.

Observations

Describe your key site observations.

- * Explain what you've discovered about the overall landscape surrounding the site (a map can help).
- * Present your base map with any overlays showing zones, sectors, access points, desire lines etc.
- * Describe your observations about slope across the site.
- * What did you notice about microclimates across the site?
- * What is the soil like? Does it vary in content, depth, pH etc. across the site?
- * How does water flow and settle across the site?
- * What significant flora, fungi and fauna are present?
- * What are your observations about structures on the site?
- * How is energy being harvested and used?
- * How are any natural or social events affecting the site?
- * Use photos where necessary to illustrate these points.

The Client interview(s)

- * What are the key points you took from the interview(s)?
- * Reflect back on their values and vision.
- * Reflect back their timescale and budget for the design.