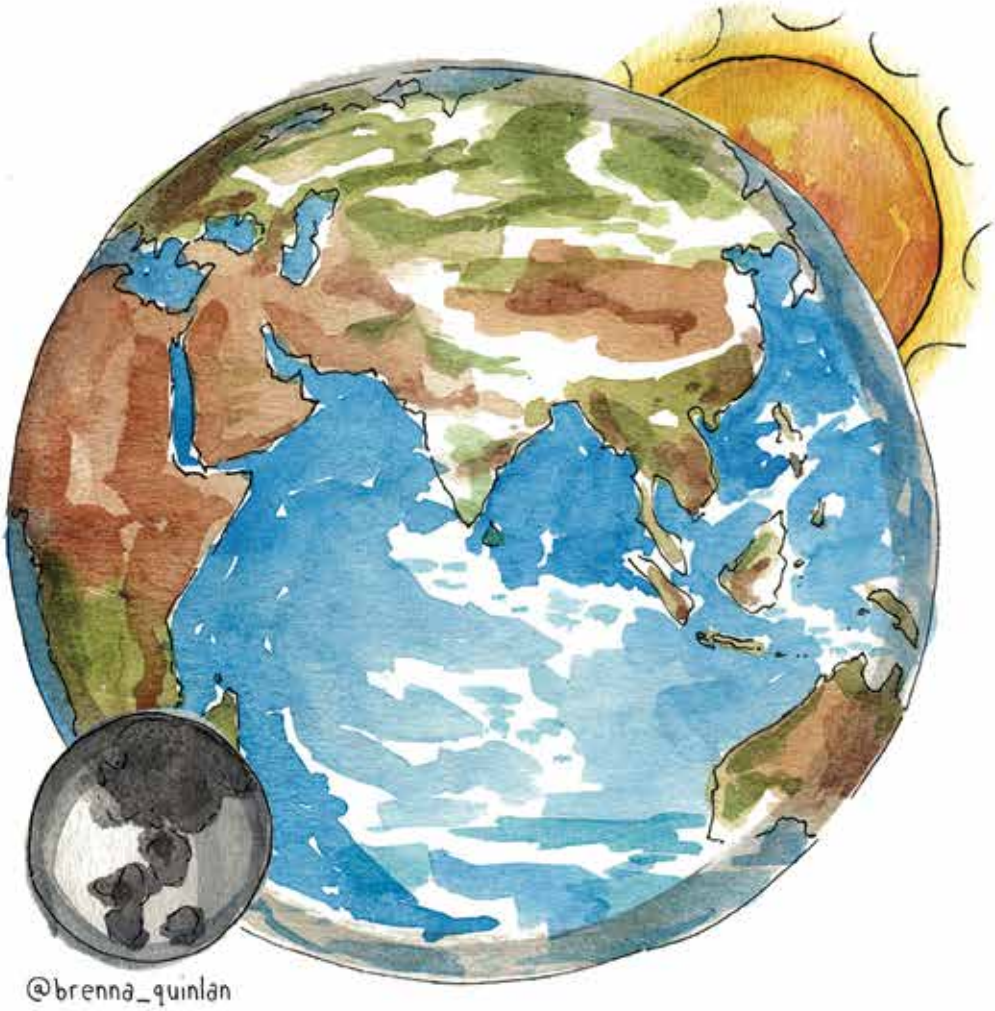
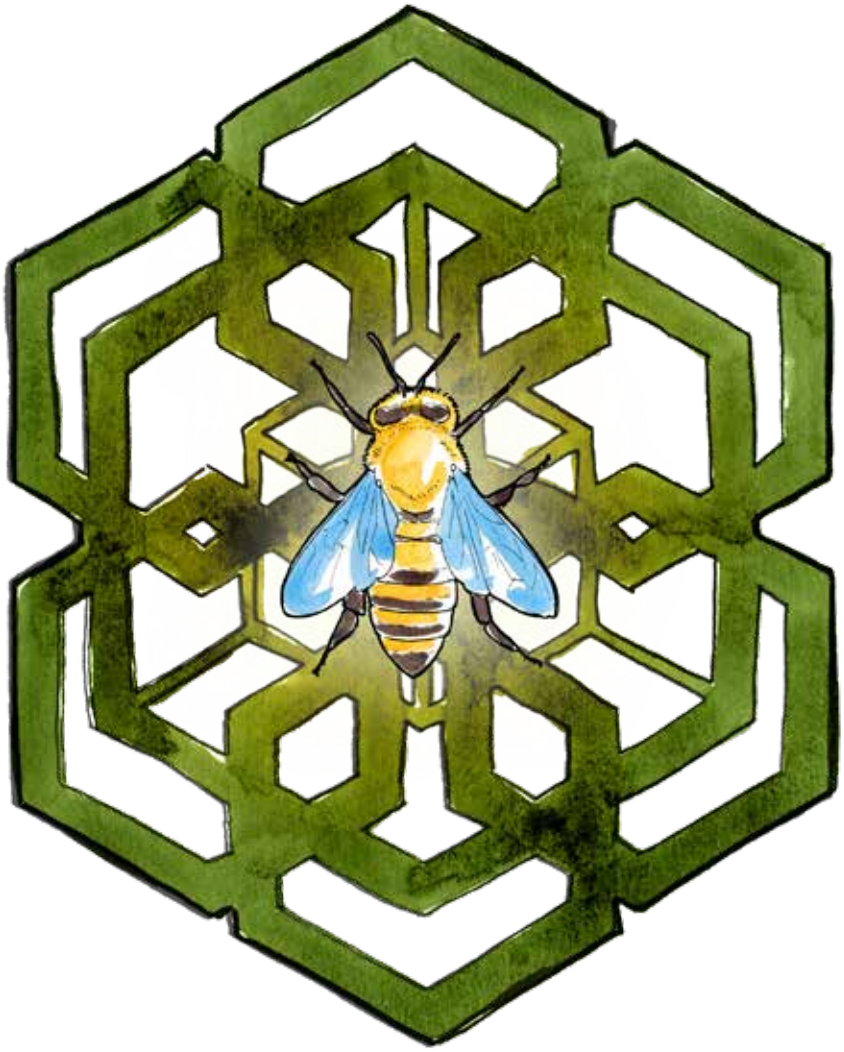


PERMACULTURE DESIGN NOTES

DELVIN SOLKINSON & GRACE SOLKINSON, KYM CHI
TAMARA GRIFFITHS, ANNALIESE HORDERN, DANA WILSON



Offered free download for the world community.
www.permaculturedesign.earth//permaculturedesignnotes

This is a work in progress, integrating feedback and new learnings.
Make sure you have the newest, most updated edition.

May 2021 Edition

www.permaculturedesign.earth
www.visionarypermaculture.com
www.permaculturedesign.ca

"Let's embrace sustainability not because we fear the future.
Let's embrace sustainability because we love the things we love about right now"
- Larry Santoyo

This book is dedicated to the beloved World Community.

We acknowledge the information in this text, passed down from pioneers of Permaculture, has deepest roots in the traditional cultures of the world. We recognize and give gratitude to all of the traditional cultures and their people as the source of permaculture and ecological knowledge. The permaculture movement is the modern expression of a lineage of earth centered understandings that is inherited from all who have come before us.

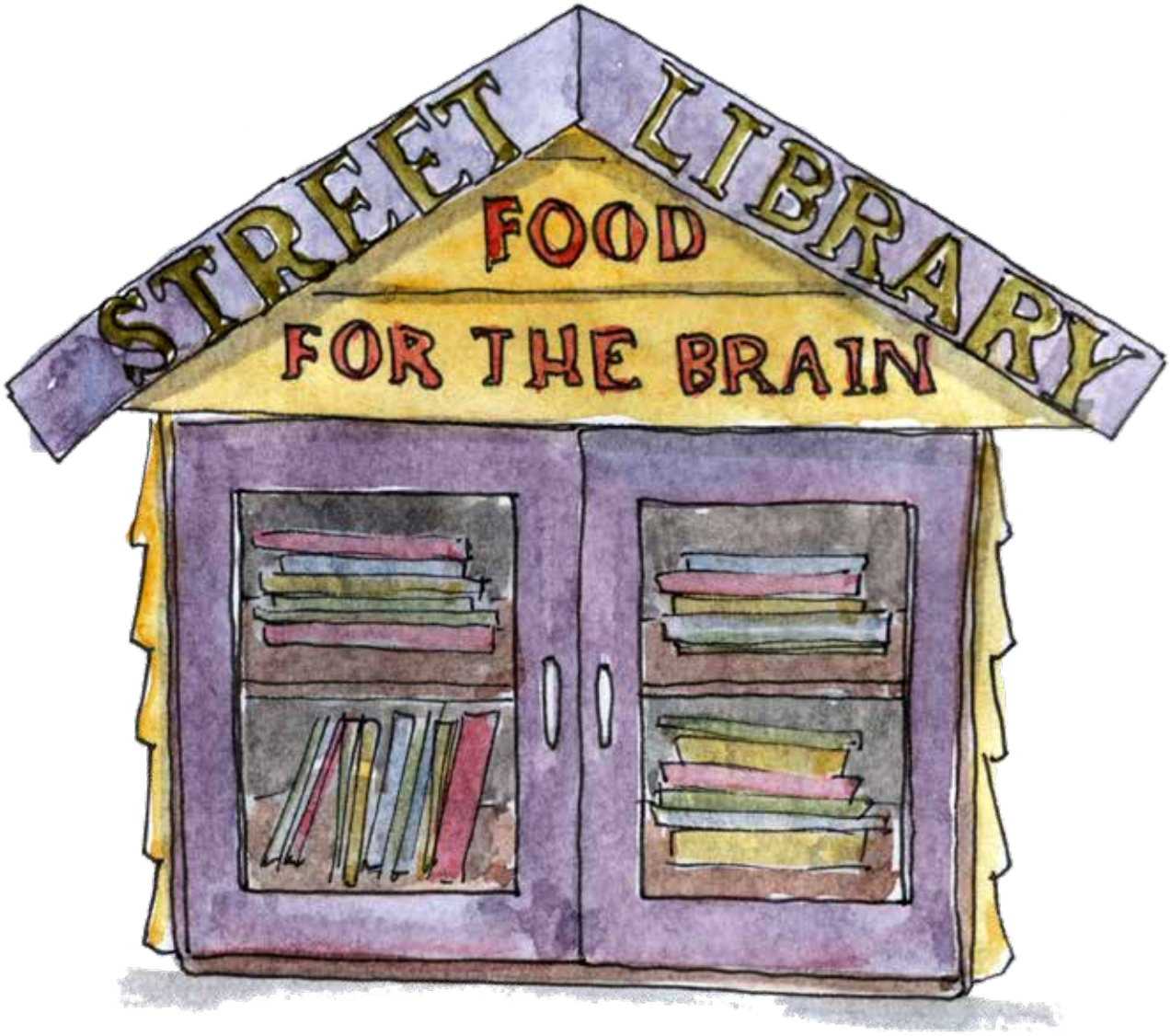
We hold the deepest appreciation and thanks for all the Traditional People who have shared their wisdom and learnings from the natural world so that we can in turn reconnect and heal our relationships with ourselves, each other and the land.

As settlers to the traditional territories where we reside, we are all grateful to live, work, play and help steward the land. We acknowledge that it would not be possible to be where we are without the ancestors of the land, their many contributions and sacrifices. We honour all of the living Indigenous Peoples who continue to steward the lands and carry the torch of their ancestral knowledge.

If you too are a settler to the land where you live, we encourage you to familiarize yourself with the land, learn about the Traditional Peoples, their cultural practices, plants with a history of use, traditional foods and seek ways to support their culture to thrive. As a path towards reconciliation, seek ways to decolonize yourself and reconnect with your ancestral roots.

How can you become more naturalized to the area where you live, acting as a friend and ally to the land and to the traditional peoples of the land?

“Being naturalized to place means to live as if this is the land that feeds you, as if these are the streams from which you drink, that build your body and fill your spirit. To become naturalized is to know that your ancestors lie in this ground. Here you will give your gifts and meet your responsibilities. To become naturalized is to live as if your children’s future matters, to take care of the land as if our lives and the lives of all our relatives depend on it. Because they do.”
- Robin Wall Kimmerer



"Between every two pines is a doorway to a new world."
- John Muir

Offered freely to the world community as a download, this book shares permaculture design to bring benefit to our collective present and future.

Delvin Solkinson entirely volunteers to create and distribute this work.

Gratitude to the generosity of many teachers, mentors, students, peers and friends for collaborating on this group project.

Deepest of thanks to all the Permaculture Pioneers who contributed, directly or indirectly, to this work.

Download the file freely and share.
www.permaculturedesign.earth/permaculturedesignnotes

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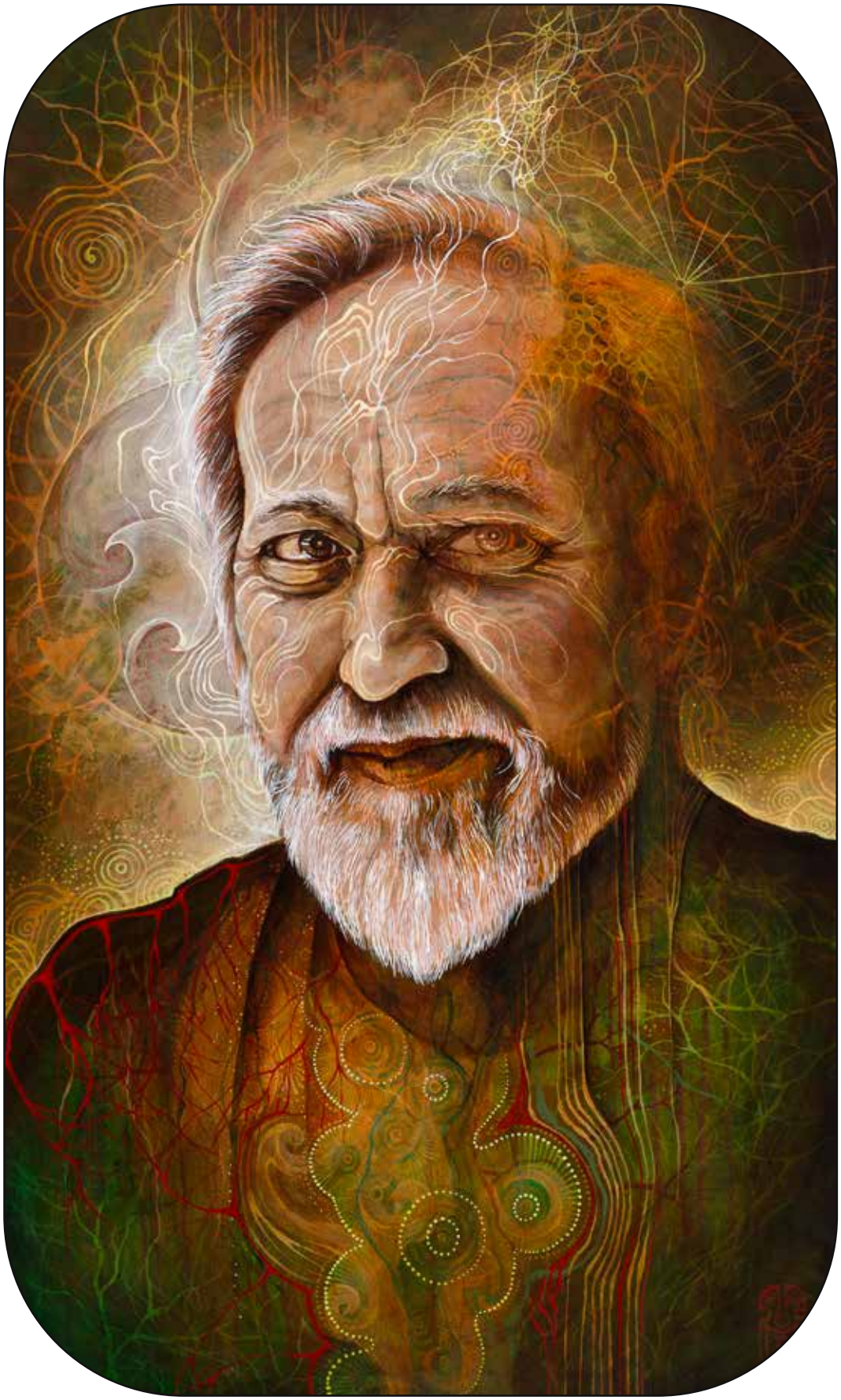
Hard Copies are available for purchase
Wholesale discounts are offered
Email delvin@cosm.org for more info

Permaculture Design is an evolving field. If you see any content that new mainstream science has proven otherwise through experimentation and testing, please let us know and we will do our own research to see if this could be changed in the next edition.

Our highest dream is to have this book published by a publisher with global distribution. We also envision different language editions.

Every effort has been made to provide accurate information. We apologize for any mistakes and will resolve inaccurate or missing information in subsequent reprintings of this book.



'Time Scout' Portrait of Bill Mollison by Martin Bridge

"As we read this, we stand in the plane of the present; we are the sum of all our ancestors, and the origin of all our descendants. In terms of our model, we are at an ever-changing origin, located on the boundary of past and future. As well, we are spinning with the earth, spiralling with the galaxy, and expanding or contracting with the universe... We are on the move in time and space...

The global village community... is the most remarkable revolution in thought, values, and technology that has yet evolved... the philosophy of a new and diverse approach to land and living

We permaculture teachers seek to empower any person by practical model-making and applied work, or data based on verifiable investigations...

Permaculture is information and imagination intensive… if we take the time to read, observe, discuss, and contemplate, we begin to think in terms of multidisciplines, and to design systems which save energy and give us yields...

I believe the key word here is commitment. Self-government is the first thing each individual has got to learn. Each person must make up his or her own mind and make a commitment... only then is he or she ready to go out and convince others. We all have to start within ourselves and get our own houses in order... and then we'll be ready to become missionaries for order...

It's a revolution. But it's the sort of revolution that no one will notice. It might get a little shadier. Buildings might function better. You might have less money to earn because your food is all around you and you don't have any energy costs. Giant amounts of money might be freed up in society so that we can provide for ourselves better... So it's a revolution. But permaculture is anti-political. There is no room for politicians or administrators or priests. And there are no laws either. The only ethics we obey are : care of the earth, care of people, and reinvestment in those ends...

There is no other path for us than that of cooperative productivity and community responsibility. Take that path, and it will change your life in ways you cannot yet imagine...

If you want to change the world, start at your back doorstep..."

- Bill Mollison, co-founder of Permaculture

PERMACULTURE
INSTITUTE

This work was created with the support of the Permaculture Institute
www.permaculture.org

Delvin Solkinson is the Diploma Program Co-ordinator.

The Peoples Diploma is a form of continuing education after the Permaculture Design Course (PDC). The PDC can be truly life changing, the Diploma helps students activate themselves post-PDC while providing a structure to support their work. This participant-driven program is designed for self-motivated learners who want to choose their own texts, site visits, design projects, and teachers to learn with, while being guided by a structure to complete their work. Participants create their own learning design in consultation with our staff, allowing them to apply permaculture to their own passions. Check-ins with our staff provide resources and direction for helping participants stay on course. The Peoples Diploma emphasizes contribution to the human and ecological community and is open to those working to create change after completing their PDC.

www.permaculture.org/diploma

"Permaculture comes out of a storytelling tradition. Bill Mollison was the ultimate storyteller. He told stories that were just unbelievable! As I travel and spend time in other cultures, I see that is part of how people communicate truth is through stories. Taking the permaculture design course is the new beginning of creating your own stories, of understanding that your story has value. It's worth remembering those stories and remembering your grandfather's stories, it's a way to communicate your humanity. These courses are what hold the light."

- Scott Pittman

PERMACULTURE
ASSOCIATION

This book was created with the support of the Permaculture Association
www.permaculture.org.uk

Delvin Solkinson is engaged in ongoing training as a Diploma Tutor and part of a vibrant network that helps people put permaculture theory into practice and develop a range of new skills.

The Diploma in Applied Permaculture Design is one of many ways to learn about permaculture and improve skills as a designer.

The Diploma is a distance learning course by the Permaculture Association. As an apprentice participants will produce a portfolio of ten designs that will demonstrate how they develop into a proficient permaculture designer. It is up to each participant which areas of their life and work the designs cover. It is expected that some of them will be land based and some of them cover non-land based subjects, such as education, community development, self care or business planning.

www.permaculture.org.uk/diploma

"Pro-active creative education is an exciting, challenging and effective path toward a truly sustainable society, or should I say Perma(nent)Culture. In looking back we realize that what we have been doing is applying the principles of Permaculture to a landscape called the 'classroom' we have permacultured education."
- Andy Goldring

The Permaculture Academy

This new edition of Permaculture Design Notes was done as part of a pilot project Doctorate and Post-Doc in Permaculture Education thanks to the extraordinary mentorship of Larry Santoyo and the Permaculture Academy. Without their support this book would not have happened. This educational program is ongoing and will result in the creation of future editions of this book.

Permaculture Academy trains the next generation of thought leaders that will steward systems that are regenerative and environmentally, socially, and economy sustainable.

As an internationally recognized school of Permaculture Design, the Permaculture Academy focuses on practical, tangible, and actionable principles and tools that honor permaculture's pioneering history while also maintaining a clear focus on the future.

www.permacultureacademy.com

"True riches are having something to contribute, having the time to be creative and being in love with everything again"
- Larry Santoyo

EDUCATIONAL PATHWAYS

Delvin Solkinson created this book as an ongoing project along a number learning journeys taking classes, courses, permaculture design certificate courses and teacher trainings between 2003-2020 including :

PDC, Diploma and Masters Degree with Bill Mollison
Permaculture Institute **www.tagari.com**

Diploma with Larry Santoyo & Scott Pittman
Permaculture Institute
www.permaculture.org

Diploma with Looby Macnamara
Permaculture Association
www.permaculture.org.uk

PDC and Teacher Training with Geoff Lawton
Permaculture Research Institute
www.permaculturenews.org

Experimental, non-accredited Doctoral Degree
with Larry Santoyo & Permaculture Academy
www.permaculturеacademy.com

SUPPORT

"This carefully curated collection from Delvin Solkinson's 18 year journey is a wonderful reference that will prove to be the perennial words of positive works everywhere."
- Larry Santoyo, Permaculture Academy **www.permacultureacademy.com**

"This is a foundational work that will inform and guide many into the future. I am deeply inspired and grateful for the immensely valuable contribution of the Permaculture Design Core Curriculum Notes. Everyone interested in learning, teaching and facilitating permaculture will benefit from this very practical and beautifully crafted text. It skillfully weaves together essence, depth of content and the 'Fair Share' ethic. It researches and brings forward wisdom and teachings from the past, flavours it with present brilliance and developments and offers a foundation for the next evolution of Permaculture."
- Robin Clayfield **www.dynamicgroups.com.au**

"This is a dense but well formatted book offering many strategies and techniques to teachers, designers and practitioners. Delvin and the team have summarized most of the knowledge we hold in permaculture. The summaries collate all material and information used by most teachers. I could see Delvin's encyclopaedic mind through it all. The team deserves a huge "thank you" for pulling all this together. It works best through its checklists and summaries. This book gives abundantly and freely to all people - permaculturists or not."
- Rosemary Morrow **www.bluemountainspermacultureinstitute.com.au**

"Permaculture offers a set of tools to design sustainable lifestyles. Permaculture Design Notes brings together the many elements that creates this integral whole system. The Foundational Concepts offer the reader a window into building blocks of Permaculture. As the book evolves, a Permaculture curriculum unfolds offering a guide to anyone who wants to practice and/or share the knowledge of this effective system in any environment- from teaching children to adults to direct application on the land and in community. This is a book of succinct and contemplative lists and critical thinking questions providing ideas to springboard the reader to further research and application."
- Jude Hobbs Cascadia Permaculture **www.cascadiapermaculture.com**

"Amazing energy and input. This is a gift to Permaculture."
- Looby Macnamara **www.loobymacnamara.com**

"A wonderful effort and full of great information."
- Max Lindegger **www.ecologicalsolutions.com.au**

"The book provides a useful summary for teachers and students of permaculture alike. It is well designed, thought provoking, and clear. I am going to be leafing through this potent, comprehensive collection for some time."
- Maddy Harland, Editor & Co-Founder of Permaculture Magazine
www.permaculturemag.org

"Scope and Depth. All projects, be they land or life require both to be successful. In an international pilgrimage to permaculture pioneers, practitioners and projects Delvin Solkinson has deftly crafted this tome sourcing from over two dozen living pillars of wisdom. For craftspeople, seeking high grade tools to progress their work in regenerative living, I recommend this book. My sincere gratitude for this work."
- Javan K. Bernakevitch **www.allpointsdesign.ca**

"Permaculture Design Notes provides permaculture teachers, students, and practitioners with a holistic outline for permaculture literacy. This book deserves a place on your bookshelf next to Bill Mollison's Permaculture: A Designers' Manual."
- Scott Mann **www.thepermaculturepodcast.com**

"The Design Notes are way more than just an outline of the Permaculture Design Course curriculum. They are an index to a whole process, from the culture of a class and presence of an instructor, to a road map of where students can go beyond the PDC. It's always fascinating to see how someone as deeply studied as Delvin arranges and sequences the curriculum, borne of his own trial and error and the trials and errors of his mentors and teachers. I will definitely be referencing this text as I do my own work, and am very appreciative that this is put together as an open source document to lift up all teachers in the Permaculture field."
- Andrew Millison **www.permaculturerising.com**

PERMACULTURE DESIGN NOTES

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Visionary Art Portrait of Bill Mollison : Martin Bridge

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"Just join with one or two friends to make your way in the confusion.
Others will follow and learn."
- Bill Mollison

CORE TEAM

Delvin Solkinson

Kym Chi

Grace Solkinson

Tamara Griffiths

Annaliese Nordern

Dana Wilson

Sijay James

Alexa Spaddy

Brenna Quinlan

CORE TEAM

Niki Hammond

Tes Tesla

Stephanie Johnson

Kate Houle

Ben Tour

Martin Bridge

SOURCE TEACHERS

Delvin acknowledges all the teachers he took classes with and whose teachings are the source curriculum for this book of notes.

Bill Mollison

David Holmgren

Rosemary Morrow

Larry Santoyo

Toby Hemenway

Looby Macnamara

Robin Clayfield

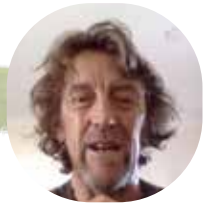
Michael Becker

Scott Pittman

Starhawk

Patricia Michael

Geoff Lawton



Mark Lakeman

Max Lindegger

Sam Bullock

Doug Bullock

Tomi Hazel

Jude Hobbs

Susun Weed

Robyn Francis

Bruno Vernier

April Sampson-Kelly

Graham Bell

Chris Evans

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PRETRO
INTENTION

Born from love and gratitude for this life and world, my work in permaculture is driven by an inspiration to be in service and give something back to help support others to Care for the Earth, its People and our Collective Future. In 2021, at the time of publication of this new edition, I have spent 18 years travelling the planet to learn from many pioneers of permaculture by taking 5 Permaculture Design Courses, 13 Advanced Permaculture Programs and 13 Teacher Trainings. From this experience I have gathered notes on the curriculum of the Permaculture Design Certificate Course and permacultural ways to teach any subject. Along the way I have teamed up with many people who contributed to this collaboration. This book is part of a toolkit that includes a companion game and card deck.

Some students struggle to take notes in class. Some teachers struggle to identify and deliver the core curriculum since the body of information in permaculture design is so vast. Using the teaching technique Larry Santoyo describes as 'Teaching by Overwhelm' does work to reprogram one's paradigm and upgrade their way of seeing the world. However, with no tests given in the permaculture design certificate course, retention of specific information can be low. This work is both more than could be included in a standard PDC as well as surely missing information taught in many PDC's around the world. This is not a definitive document, but rather a collection of notes I have put together over my studies with the help of many others who I strive to acknowledge. This is a work in progress and will be updated regulary. Corrections, input and new information welcomed. The intention of this work is to support students and teachers alike by freely sharing this information with the World Community. It's my hope that this will be translated into many languages and be freely shared with people of all cultures. These curriculum notes can also be a design method, a driver for your design process. Read through them and see what you have incorporated already and what concepts may still inform your design. What core concepts can you incorporate into the design of your life, project, relationship, home, business, garden, or farm?

- Delvin Solkinson, Summer Solstice 2019, Bird-in-Hand, Landcaster

GRATITUDE
PRETRO

"As we express our gratitude, we must never forget that the highest appreciation is not to utter words, but to live by them" - John F Kennedy

May any merit generated by this work be dedicated to the benefit of all beings.

Deepest thanks to my dear wife Grace for the love and learning. Our life adventure is a wonder of my world. This would never have happened without her extraordinary support, encouragement and ceaseless contributions to my practice in countless ways. Our love is a real life fairytale.

Acknowledging my primary mentors and teachers who are at the very heart of this work. Taking classes with these visionary pioneers of permaculture, my notes of things they said while teaching are the source of the content in this book. I am a lineage bearer helping to transcribe what has been part of an oral and written tradition that traces back through all cultures and peoples on the planet. This shares part of our collective inheritance from traditional wisdom & modern innovation.

The foundation of this work comes from my time spent over a 7 year span of study with Bill Mollison. This included completing a PDC, Diploma and Masters Degree with Bill Mollison and the Permaculture Institute. Bill lifted me up and empowered my work on so many levels, placing me firmly on the permaculture path. I am forever grateful for his generosity, guidance and mentorship. During my time with Bill in Melbourne and Tasmania, he was a gentleman and a scholar.

Awesome gratitude to Permaculture Jedi Larry Santoyo for his guidance on this 7 year journey starting in Autumn 2012. Deep bows also go to his extraordinary son Elijah Santoyo. Without the Santoyo's this work would be a shadow of what it became.

Profound thanks to true visionary Looby Macnamara who has taken my work to new heights and creative agility. Her pioneering in permaculture has helped unlock my permaculture practice. Grateful to have her contributions to this book help bring it to a new edge.

PRETRO
INTENTION

Soul gratitude to Rosemary Morrow for helping me to refine the language in this book and who recognized my life mission to continuously advance my skills by completing advanced courses and teacher trainings to become an increasingly capable mentor for graduates. Her reveiw of this book over many years and countless contributions to its content is a blessing of the highest order.

Profound gratitude to Geoff Lawton for bringing permaculture to people from all aspects of society and for giving me a mission 'to make myself redundant'.

Epic recognition to my hero Michael Becker whose mentorship has raised my permaculture practice into new possibilities.

Deep respect to Starhawk who transformed the way I understand permaculture and aligning my ritual practice.

Respect goes to David Holmgren who taught me so much of the foundational concepts, design principles and processes of permaculture in the three classes I took with him at Melliodora, his site in Hepburn Springs, Victoria, Australia.

Deep thanks to Jason Gerhardt, Director of the Permaculture Institute, an enduring inspiration for this work. By believing in me and giving me opportunities to work with the Permaculture Institute, he helped make this work possible.

Acknowledgements to Scott Pittman a worthy leader and guide for the movement. The three teacher trainigns I took with him were life changing.

Loving appreciation to visionary Robin Clayfield who catalyzed my creativity and evolved my practice. Studying with her changed my game and unlocked my work.

So many thanks to beloved teacher Toby Hemenway whose inspiration rings through this work with his clear and accessible transmission of the art and science of permaculture.

GRATITUDE
PRETRO

Loving thanks to Patricia Michael whose core influence and support during my Masters Degree made this possible.

Deep thanks to Robyn Francis whose heroic permaculture practice has helped take permaculture into mainstream education in Australia. Taking her teacher trainings supported my evolution in permaculture.

Mark Lakeman rocks for bringing so much spirit to the movement. His intelligence and inspiration make him a bright light for people everywhere.

Tom 'Haze' Ward has shared so much practical insight into our world. Jude Hobbs' foundational contributions are the soil of this learning garden. Robina McCurdy's sacred presence in this work is a beautiful blessing. Bows to Doug and Sam Bullock whose classes at their exceptional food forest site shared an inspirational vision of what is possible with permaculture.

Thanks to April Sampson-Kelly my first permaculture teacher along with the remarkable Lance Wildwood.

Kind gratitude to extraordinary mentor and teacher Susun Weed who has connected me with wellness, health and herbalism in profound new ways.

To my teacher Bruno Vernier, I am ever grateful. Bows to Chris Evans for oustanding help with final clarifying upgrades to this book. Many thanks to Graham Bell for mentorship, tutoring and empowering me on this project. Deeply grateful for support from Peter Cow, Dan Palmer & Scott Mann for foundational support.

Endless gratitude to my epic level mentors Allyson Grey and Alex Grey who have taught me so much about learning, teaching, mentoring and counseling as well as editing, organizing and evolving. Their guidance is the inner heart of this work. This book is part of my permaculture ministry at CoSM, Chapel of Sacred Mirrors.

PRETRO INTENTION

Thanks to influential curriculum documents created by the Education Working Group (EWG), a voluntary group of members of the Permaculture Association with special thanks to Graham Bell.

Deep thanks to Permaculture Educators Guild (PEG) with special thanks to Graeme George and colleagues for sharing a comprehensive Syllabus for Permaculture Design in South Eastern Australia and some key corrections, issues and upgrades for the book.

Dear thanks to Robin Wheeler, a master herbalist and profoundly important mentor in my life who co-taught the 144 hour PDC with me in the early days where the morning was a permaculture design class and the afternoon was hands-on homesteading skills. After 18 years as as a student of permaculture, I am co-facilitating Intro days, PDC's, APDC's, Advisory Sessions, Diploma Mentorships and Tutoring sessions thanks to all those who taught me. Appreciate heartfelt support from the Permaculture Association including Andy Goldring, Jemma Findley, Ryan Sandford-Blackburn, Wilf Richards, Catherine Marsh. More thanks to Permaculture Australia including Virginia Solomon, Keri Chiveralls and Kym Blechynden.

Awesome gratitude to exceptional Permaculture Teacher & Illustrator Brenna Quinlan whose friendship, collaboration & artwork have given this work artful color & life.

Epic thanks to visionary designer Alexa Spaddy for collaborating with Brenna's hand drawn and painted work to designing all the layouts four differen times to bring this book into being.

Gratitude to Ben Tour whose art took the permaculture design toolkit to a new level of awesome, especially the companion game. Deepest of thanks to artist Martin Bridge for gracing this work and the companion game with his incredible art, I am grateful to have him on the core team.

GRATITUDE
PRETRO

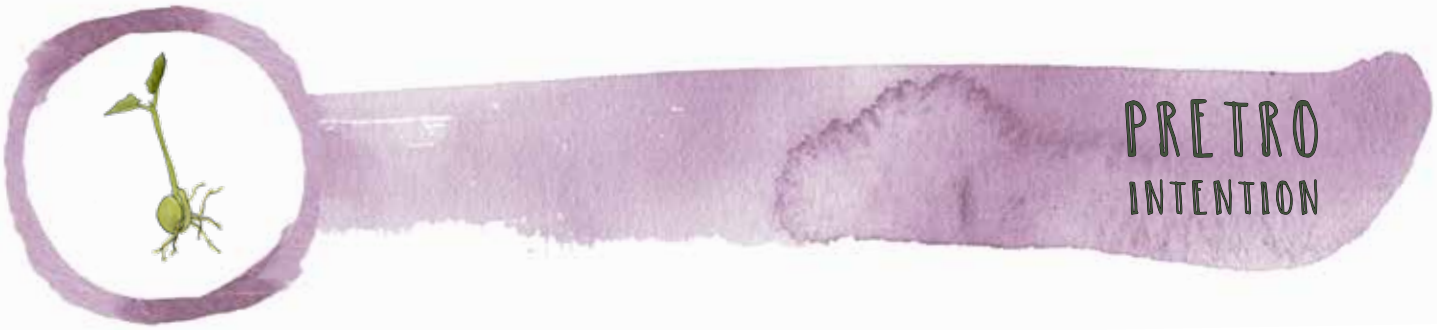
Profoundly grateful for amazing support from a team of co-teachers and permaculture allies who helped refine, edit and expand these notes into a holistic Core Curriculum. This has truly become a group project. The core team has uplifted this book far beyond what I could have ever done.

Deepest thanks to to my Canadian co-teacher Kym Chi. She spent three years helping to read through, edit and playtest the Core Curriculum Notes over numerous PDC's. She has made many significant contributions throughout the body of this work including her own chapters on Design for Resilience and Medicine Making. It was awesome to teach six 12 month long PDC's together while using these notes to anchor in, refine and curate our creative expression of the PDC Core Curriculum. We got to travel together to take classes from many permaculture pioneers. I am profoundly grateful for her collaboration on this work.

Sacred gratitude to Annaliese Hordern who has been instrumental in this project on many levels. She adventured around the planet with me to life changing classes with permaculture elders. Her key contributions of core content and extensive editing to this work across many editions are a next level upgrade.

Epic level thanks to Dana S. Wilson whose presence in planetary adventures to learn permaculture in England, Greece, USA, and Canada included filming interviews with Permaculture Pioneers. Her extraordinary contributions to this work are a blessing of the highest order.

Planted gratitude to one of my permaculture heroes Tamara Griffiths who contributed in a foundational way to this work. Since meeting her at Tagari Farm on Tasmania where she worked with Bill Mollison, I have been continually impressed and inspired by her wealth of knowledge about all things permaculture. Her countless upgrades to core curriculum content making up foundational parts of this work.



Loving gratitude to my permaculture partner and beloved wife Grace Solkinson, the project manager for this book and the fundraising to give it life. Grace's visionary intelligence, kind wisdom and intuitive insight has guided this book to an artful new level. She contributed her own chapters on animal care, food preservation and natural building and has served as a creative project manager in all aspects of this new edition.

Glowing thanks to Niki Hammond and Tes Tesla whose keen proofing helped address countless errors and typos from past and current edition. They are Jedi and have contributed significantly to this work.

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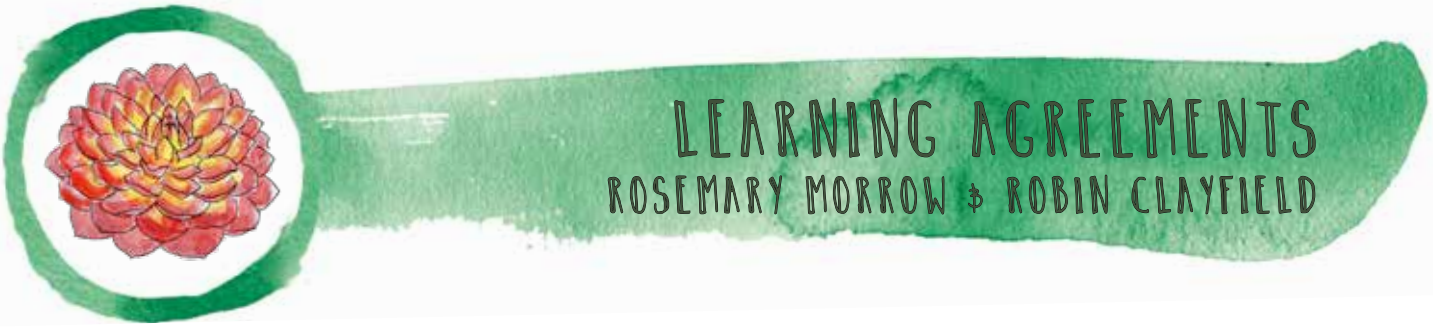
- Delvin Solkinson at CoSM, Chapel of Sacred Mirrors
Autumn Equninox 2020

SECTION 1

PERMACULTURE DESIGN COURSE CURRICULUM NOTES



CLASS CULTURE
CREATING CONSCIOUS LEARNING ENVIRONMENTS

- Remain Present & stay on topic
- Everything is optional
- Communicate & meet your own needs
- Forgive yourself and each other
- Be kind, considerate and compassionate
- Make positive appreciative comments, never ridicule yourself or others
- Build people up, don't put people down
- Use hands signals when people are talking
- Speak up loudly so everyone can hear
- Use 'I' statements, speak only for yourself and userespectful language
- Be punctual
- Everyone has the right to speak and to pass on speaking
- Respect the airspace and just speak for yourself
- If you have a problem with someone, communicate with them directly
- Stick to the topic
- Accept that we are all at different places on our learning journey
- Co-operate not compete
- Shh : secrets stay here, confidentiality
- Honor disabilities and special needs
- Recognize we are all teachers and learners

From Robin Clayfield and Rosemary Morrow

READING TEXTBOOKS
BEST PRACTICES

RESEARCH AND READING

Spread out the readings! Don't try to do it all at once. Reading one chapter of *Section 1 : Permaculture Design Certificate Core Curriculum Notes* per month for 13 months at the pace of the class is a great way to do this. The book is modular so can be broken up easily into short reading periods. Each essentialized note is a signpost to reserach and learn more when you find a relevant, practical or interesting note.

No need to memorize the information, there are no tests in the Permaculture Design Certificate course (PDC). It's more about knowing where the information is than trying to take it all in. This is a meta program, more will get into your mind than you may be conscious of.

Escape getting distracted by stuff you don't understand, make a note and move on. Further research on those topics can happen later. Permaculture textbooks are full of super dense information, a sentence is like a paragraph, a paragraph is like a chapter, and chapter is like a book.

Take notes or highlight. Some people retain more information if they do some creative note taking or doodling.

Read with others! Buddy up for reading sessions to help motivate the reading. You could even read it aloud. Some have success in using this book for reading clubs that meet weekly or monthly to discuss. Remember you never know where this information will take you. Pay attention to things even if they don't seem relevant in the moment. You may find yourself working, living or teaching in a different climate or taking care of more of your own needs one day. Combine the readings with observational walks around your home, community and nature. Find working models demonstrating permaculture in your bioregion. Visit examples of permaculture gardens and farms, businesses and sites of different scales. Most of all, have fun! See how you can creatively use your understanding of your own learning styles, ways of reading and approaches to text book work to help you get the most out of the process.

DEFINITIONS
WHAT IS PERMACULTURE?

The word 'Permaculture' is a conjunction of permanent and agriculture or culture. Here are some definitions of permaculture from the pioneers of the movement.

"The aim is to create systems that are ecologically-sound and economically viable, which provide for their own needs, do not exploit or pollute, and are therefore sustainable in the long term... Permaculture uses the inherent qualities of plants and animals combined with the natural characteristics of landscapes and structures to produce a life-supporting system for city and country, using the smallest practical area."
- Bill Mollison

"Permaculture offers an understanding of how biological processes are integrated, and it deals primarily with tangibles: plants, soils, water, animal systems, wildlife, bush regeneration, biotechnology, agriculture, forestry, architecture, and society in the areas of economics, land access, bioregions and incomes tied to right livelihood."
- Rosemary Morrow

"Permaculture is an ecological design system for sustainability in all aspects of human endeavour. It teaches us how to design natural homes and abundant food production systems, regenerate degraded landscapes and ecosystems, develop ethical economies and communities, and much more. As an ecological design system, permaculture focuses on the interconnections between things more than individual parts."
- Scott Pittman

"Permaculture is about the beautiful simplicity of taking away what cannot be… decision making and problem solving protocols based on the patterns of nature."
- Larry Santoyo

WHAT IS PERMACULTURE?
DEFINITIONS

"Permaculture is a set of design strategies for making decisions, a set of tools for arriving at sustainable solutions." - Toby Hemenway

"Reclaiming our place in nature as earth stewards, our sense of place, of belonging to the earth, Permaculture fosters respect for life and its complexity, awareness of the consequences of our actions, and accepting responsibility for how we meet our needs. Permaculture draws from the wisdoms of traditional and indigenous cultures and weaves this with our contemporary knowledge of ecology, earth science and technology to create abundance, regenerate the land and build resilient communities.

Human creativity, passion and innovation shapes the diverse ways people apply permaculture and adapt it to local resources, climate and cultural context. Every system is unique. Permaculture empowers us in a practical way to explore and realize our potential as positive agents of change, individually and collectively.

Living with the challenges of the Anthropocene, permaculture provides a way forward to make our human impact meaningful, to restore the balance by being conscious consumers, to live within the Earth's bio-capacity and respect our interdependence with all life. Permaculture is dancing with nature, and nature leads the dance."
- Robyn Francis

"Permaculture is a philosophy of working with, rather than against nature; of protracted and thoughtful observation rather than protracted and thoughtless labour; and of looking at plants and animals in all their functions, rather than treating any area as a single product system." - Bill Mollison

"Permaculture is not just about the elements in a system, but the relationships between the elements - this is synergistic design." - Michael Becker

DEFINITIONS
WHAT IS PERMACULTURE?

"Permaculture is a solution-based way of life that offers opportunities to live in right relationship with the Earth, its people and future generations to come. By taking a whole systems approach to design, permaculture looks to the root of the world's problems and seeks answers that are thoughtful, inclusive and long term with a goal of building a regenerative, healthy and thriving natural and social ecology." - Kym Chi

Elementary
Permaculture is about creating and maintaining relationships. Developing healthy communities, permaculture people live by sharing resources and supporting each other. It begins with all the plants and animals, buildings and resources that can be found in and around your home. Permaculture is a continuing process exploring the ways in which you can fulfill the needs of the things around you while having your own needs met.

Intermediate
Permaculture is a process of growing awareness. Linking people with plants and animals, permaculture promotes conscious living, sustainable development and resource conservation. It is a response to the industrial urbanization of the Earth and resulting toxification of the biosphere. The permaculture path opens dialogues about finding creative solutions for problems in the present.

Advanced
Permaculture consciousness enhances our ability to work with maps and connect to the territory. It looks towards saving energy, conserving resources and forming long-term interdependent relationships with whole communities of living things. Permaculture develops applied understandings of the subtle implications and felt impacts of our actions on the world around us. This whole system design post-paradigm can help us to upgrade the way we plan the course of human development.

ETHOS
ETHICS & VALUES

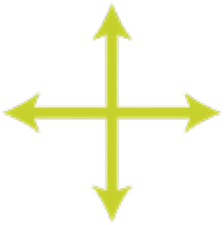
Permaculture is an Ethos, a spirit of our age. It is less involved in judgement of right and wrong and more focussed on appropriate action as well as modelling right relationship with people and planet. Appropriate actions at this time include a duty of care to look after the world and its people and build healthy foundations for the future. The Prime Directive of Permaculture from Bill Mollison : "The only ethical decision is to take responsibility for our own existence and that of our children."

EARTH CARE : Care for and protect the Earth. Work for the holistic health of all livings things on our planet. A covenant we can have with our world in exchange for the gift of our life. Larry Santoyo says, "Our mission is to repair, conserve and regenerate the Earth."

PEOPLE CARE : Care for the health and welfare of our human family. Providing healthy homes, food, water and medicine is a part of this. A covenant we can have with each other to care for and protect all people. Larry Santoyo says, "Our mission is to seek peace and guard human rights everywhere."

FUTURE CARE : Originally Bill Mollison characterized this as "Set Limits to Population and Consumption" which was also described as "Generate Surplus and Reinvest in People Care and Earth Care". At the turn of the millennium it was essentialized as "Fair Share". The African School of Permaculture brilliantly describes this as "Future Care". All living things have the same inherent value and right to live a healthy life, including the generations to come. Generate an abundance and share the Earth's resources generously and equally with all things now and into the future. Larry Santoyo says, "Our mission is to invest all capital intelligence, goodwill and labour to Earth Care and People Care."

TRANSITION



Our world is in transition and cannot become sustainable in one giant leap but rather in many small steps. In times of transition it is ok to use unsustainable means when creating a sustainable system. What better use for the last supplies of our world's oil than to build systems that are not dependent upon oil to work? Let go of judgement of yourself or others for being raised in an unsustainable society. Model good behaviours. Never blame or shame others. Move slowly with great intention. Learn from mistakes and commend yourself and others for the good that is done. Aim to live in alignment with your own deeper values.

You can see more Ethical Principles in the Permaculture Design Deck, a companion to this book. A free download at
www.permaculturedesign.earth/designdeck

Ethics Symbols visioned by Kym Chi & Heather Lipplod
Designed by Shannon Reinholdt

KEY CHARACTERISTICS

WHAT IS PERMACULTURE?

KEY CHARACTERISTICS

- Behaves like a natural ecosystem
- Designs involve right relationships and beneficial connections
- Develops goals, strategies and methods, not cookie cutter approaches
- Thinks at a strategic level about all the possibilities before arriving at a solution
- Favours multi functionality
- Intensive rather than extensive land use
- Promotes diversity in species, cultivars, yields, microclimates, habitats and functions
- Involves the integration of agriculture, animal husbandry, forestry, foraging, and landform engineering
- Is adaptable to edges and marginal lands
- Makes use of the naturally inherent characteristics of animal, plant and land relationships
- Uses wild and domestic species
- Values appropriate technology
- Focuses on long term sustainability
- Helps make people self-reliant
- Roles and leadership are interchangeable and revokable
- Arrives at solutions, does not impose them
- Enables surrounding ecosystems to still function
- Encourages succession
- Seeks to create self-managed systems
- Is regenerative
- Emphasizes personal responsibility and skill building
- Encourages friendships and meaningful connections using social design
- Supports landscape planning, site specific design and design of specific components of a site
- Permaculture design is an iterative process, a repeating cycle of operations and analysis. At each step you may have to go back to a previous step to repeat, assess, evaluate, adapt and redesign the process

PERMACULTURE PRINCIPLES
O.S. GAIA

Nature has an operating system : **O.S GAIA**. This brilliantly designed and regenerative system transforms the energy of the sun and stars into life, cycles energy and produces no waste. Secrets to nature's success are its underlying design principles.

"Permaculture principles are protocols for decision making and problem solving."
- Larry Santoyo

"Permaculture Principles are indicators of sustainability."
- Toby Hemenway

"Apply the design principles as closely as you can you'll end up with wonderful production of good systems."
- Rosemary Morrow

DESIGN PRINCIPLES from
Introduction to Permaculture by Bill Mollison & Reny Mia Slay
(inspired in part by John Quinney Design Guidelines for Small Farms)

- Relative location
- Each element performs many functions
- Each important function is supported by many elements
- Efficient energy planning: zone, sector and slope
- Use biological resources
- Cycle energy, nutrients, resources
- Small-scale intensive systems; including plant stacking and time stacking
- Accelerate succession and evolution
- Edge effect
- Everything works both ways

DESIGN PRINCIPLES
BILL MOLLISON & DAVID HOLMGREN

Design Principles shared from
Bill Mollison in *Permaculture A Designers' Manual*

- Work with nature rather than against it
- The problem is the solution
- Make the least change for the greatest possible effect
- The yield of a system is theoretically unlimited, or only limited by the imagination and information of the designer
- Everything gardens by modifying its environment

The Design Principles
from David Holmgren in *Permaculture Principles & Pathways Beyond Sustainabilty*

- Observe and interact
- Catch and store energy
- Obtain a yield
- Apply self regulation and accept feedback
- Use and value renewable resources and services
- Produce no waste
- Design from patterns to details
- Integrate rather than segregate
- Use small and slow solutions
- Use and value diversity
- Use edges and value the marginal
- Creatively use and respond to change

DESIGN PRINCIPLES
O.S. GAIA

Find many of the Design Principles, Attitudinal Principles, and Strategic Principles shared in the Permaculture Design Deck, a companion to this book, available freely as a download online **www.permaculturedesign.earth/designdeck** *Here are some of the principles from that deck.*

ETHICAL PRINCIPLES

Ethical Principles incorporate guidelines that encourage beneficial relationships, honour life and uphold freedom. Having deep moral values of love and caring reflect the higher capacities of conscious humans. Follow a code for respectful behaviour.

- Value People
- Share Surplus to Need
- Right Livelihood
- Voluntary Simplicity
- Make Yourself Redundant
- Work to Completion
- Relinquish Power

ATTITUDINAL PRINCIPLES

Attitudinal Principles bring perspectives that inform analysis, design and implementation. Bring new creativity to help refine and clarify possibilities. Practice ways of being that raise awareness.

- Work with Change
- Use Precaution
- Clear, Concise, Connected
- Problems are Solutions
- Value Diversity
- Holism
- Positivism
- Everything is Solvable

ATTITUDINAL PRINCIPLES CONT.

- Get Creative
- Spend More to Get More
- Embrace Change
- Embrace Mistakes
- Revitalize
- Refuse
- Be Adaptable
- Have Fun
- Practical and Productive

STRATEGIC PRINCIPLES

Strategic Principles create ethical, effective and efficient design systems. Safeguard nature and manage resource use appropriately to minimize environmental impact. Apply protocols for working with nature.

- Start Small
- Obtain a Yield
- Celebrate
- Get Back to Work
- Feed What you Want to Grow
- Find the Others
- Make it Beautiful
- Build Connections
- Relocalize
- Create Closed Loops
- Dispersal of Yield
- Advance Evolution
- Make the Least Change for the Greatest Effect
- Work with Nature
- Use Biological Resources
- Work Within your Means
- Urbanize Growing
- Work with Succession
- Long Term Planning
- Chop & Drop
- Smart Energy Planning
- Use & Value Diversity
- Accept Feedback
- Use Edges

STRATEGIC PRINCIPLES CONT

- Slow Solutions
- Patterns to Details
- Plan for Disaster
- Reduce Eco-Footprint
- Eat Wild Foods
- Slow Food
- Regenerate Land
- Embrace Weeds
- Work Where it Counts
- Invest Wisely
- Map, Protect, Extend
- Be Realistic
- Be Ruthlessly Honest
- Maximize Production
- Overcome Limits
- Create Conditions
- Find the Friendlies
- Low Tech
- Fill Fundamental Functions First
- Strengthen Links
- Use Onsite Resources
- Slow Money
- Catalyze
- Upcycle
- Harvest When Ripe
- Get More Mileage
- Work Where it Counts
- Observe and Interact
- Naturalize
- Strategic Planning

DESIGN PRINCIPLES

Design Principles cultivate deeper understanding of Nature's Design System. Ecological approaches support and sustain life processes. Practice permaculture and wisdom from the Earth.

- Design from Nature
- Layering & Stacking
- Perennial Systems
- Appropriate Technology
- Design for Gravity
- Cycle Energy
- Stay Out of the Wild
- Put your House in Order
- Plant More Trees
- Elements
- Intensive Systems
- Edge Effect
- Everything Gardens
- Guilds
- Map
- Design
- Co-operate
- Everything Works Both Ways
- Equal Exchange
- Food Kilometers
- Recarbonize
- Conscious Water Use
- Clean Waste
- Design for Stability
- Buffer Climate
- Refill the Aquifer
- Build Soils
- Design for Disaster
- Preserver, Extend, Restore
- Reduce Impact
- Law of Return
- Effective, Efficient, Ethical
- Nature Functions in Wholes
- Maximize Production
- Connect
- Slow, Spread, Sink & Store
- Just Add Water
- Tipping Points
- Biomimicry
- Design with Native Plants
- No-Dig Gardening
- Build Resilience
- Highest Use
- Pattern Literacy
- Work Creates Work
- Cultivate Self-Reliance
- Foodshed
- Energyshed
- Catch & Store Energy
- Value the Renewable
- Emergy
- Integrate
- Life Creates Life
- Design Relationships
- Everything Teaches
- Everything is a Resource
- Right Relationship
- Placemaking
- Energy Cycling
- Every Element Plays Multiple Functions
- Every Function Supported by Multiple Elements

ETHICS & PRINCIPLES

Care for the land
Care for all the peoples of the land
Promote biological diversity
Observe, and cooperate with wildness
Conserve resources, both renewable and non-renewable
Share the Surplus
Promote carrying capacity limits to population and consumption
Promote harmony, cooperation and beauty

Chaos has form, but is not predictable, thus :
Study and mimic natural patterns and shapes (Biomimicry)
Consider meta-stability, complexity, entropy, synergism and symbiosis
We observe carefully before action
Protracted and thoughtful observation rather than protracted and thoughtless action

In our learning and practice as designers, we remember to :
Turn problems into solutions
Turn constraints into resources
Cherish mistakes as tools for learning (feedback loop)
Make the least change for the greatest effect
Integrate our living and our work
Retain the ability to say "No" to the possible
Work within and as part of Nature
Value long term association and follow through
Maintain our goal of regional resilience through self reliance, not self sufficiency
Keep responsibility local and specific (no passing the buck)
Use local & biological resources with as much implication & recycling imaginable
Plan seven generations hence (take the long view)
Think globally while we act locally
Avoid errors that are irreversible
Look to review planning and enhance team work

TOM WARD
ETHICS & PRINCIPLES

Keep our imagination and skills as bigger limits to yield
than any physical limitations; abundance is unlimited

Arrange systems that self manage
Start small with intensive and productive systems that are manageable

While designing specific sites, we remember to :
Slow down and observe the site for one year before making major changes
Use onsite resources first and local resources second
Use biological intelligence primarily (observe and replicate natural patterns)
Choose native species first, unproven exotics last
Focus on connections within diversity, not diversity for its own sake
Follow the sequences of ecological succession
Consider relative location by stacking functions and elements

Stocking elements with diversity, connections and carrying capacity in mind
Placing elements in ways that create time saving connections
Setting up working relationships between plants, animals, people,
land and structures so the needs of one component
are met by the yields of another component

Set up redundancy : every function is supported by many elements,
every element provides many functions
Hold water and fertility as high on the landscape as possible
Eat a bioregional diet
Consider time as an element of design

Other assumptions from systems theory and observations include :

Our goal is systems with closed loops and conservation of nutrients

ETHICS & PRINCIPLES CONT.

We create a balanced energy flow :
Calories spent come from calories gained
Appropriate technology implies accessibility and ecologically restorative operations
The role of authority lies with biology, every action is weighed against ecological restoration

There is no waste or pollution : all outputs are potential inputs
Make nothing that cannot be recycled, as in industrial ecology

In synergistic systems, the behaviour of the whole is not predicted by the behaviour of the elements

Even without mechanical proof, there is a spiritual aspect to our work
As we increase biodiversity, we attract pests, plan ahead,
Build new businesses whose primary aim is ecological and cultural restoration
We are all facilitators, we are not separate from natural and artificial systems, our lives are a transformative force,
we reach for beauty, bounty and celebration!

The Law of Conservation of Energy : Energy cannot be created or destroyed.

The Law of Degradation of Energy : Some energy is degraded during processes.

Laws of Thermodynamics

- When two systems are sitting in equilibrium with a third system, they are also in thermal equilibrium with each other.
- When heat is added to a system, some of that energy stays in the system and some leaves the system. The energy that leaves works on the area around it. Energy that stays in the system creates an increase in it's internal energy.
- No process or reaction is 100% efficient. Some amount of energy in a reaction is always lost to heat. A system cannot convert all of its energy to working energy.

"Nature and, in effect, life and well-being, health and restoration, is the heart of permaculture practiced through conscious analysis and design. Permaculture must inform your work though its principles and ethics which are most adaptable to everyone else's work. The future of permaculture depends on teachers and its uptake. Permaculture as a curriculum has been a major success in education on a global scale. There are few curricula that can claim such broad adoption of the essential principles and features. Whether it is taken up formally, or not, it will continue to spread and sometimes be acknowledged, and sometimes, not. Permaculture infiltrates all parts of life."

- Rosemary Morrow

DESIGN PROCESS
FOUNDATIONS

Permaculture design process is a touchstone for effective design. There are many permaculture tools & frameworks to direct and organize an approach to the process of designing. These processes bring depth and breadth of research, consideration, logic, functionality and creativity to designs during their inception, application and assessment.

Sequential stages of permaculture design may be helpful for beginners.
1. Vision, location, scope, legal constraints
2. Description, observation, base map, data collection, reading the landscape.
3. Analysis & assessment, use of design tools.
4. Concept designs are often created after initial observations, feasibility studies and appraisals have been done and represent the initial pattern stage of a design process. Schematic designs evolve next and include more functional, practical and conceptual considerations such as costs, planning strategies, phasing and logistics.
5. Detailed designs including all elements and components as well as how they all work together.
6. Design implementation, assessment, evaluation
7. Management and maintenance with feedback, review & further phased development.

David Jacke (*Jacke and Toensmeier 2005*) first set out a step-by-step process for Permaculture Design: Goals Articulation (with mapping), Site Analysis and Assessment, Design Concept Development, Design, Implementation, Review.

Aranya (2012) sets out a detailed step-by-step guide: Design Proposal, Surveying the Site, Maps, Recording Site Information, Client Interview, Analysis, Placement, Design Proposal, Implementation, Maintenance and Evaluation.

The **Permaculture Educators Guild** (SE Australia) builds on Jacke's approach: Client Brief, Project Description (with Mapping), Analysis and Assessment, Conceptual Design (from Goals Articulation to Schematic Design), Detailed Design, Design Implementation, Ongoing Management, Feedback and Review.

DESIGN PROCESS
DAN PALMER

Dan Palmer from **Making Permaculture Stronger** describes a number of different approaches to the process of designing which can combine

- **Assembling** : Choose elements and join them into whole systems
- **Partitioning** : Differentiate or partition a pre-existing whole system into distinct sub-wholes (parts)
- **Transforming** : Acknowledge we always start with a pre-existing whole-and-its-parts then intentionally and iteratively transform both
- **Fabricating** : Complete an up-front design or master plan, then start implementation
- **Hybrid** : Complete a high-level, broad-strokes concept plan ahead of implementing, then let the details emerge from within the creating/doing/implementing process
- **Generating** : Focus on a rigorous process for repeatedly honing in on the best next step then taking it, where design and implementation are never separated

Permaculture's potential lies more in iteratively enhancing life in pre-existing whole systems than drawing then implementing clever assemblages of elements.

Holistic Decision Making was inspired by the work of Allan Savory and Carole Sanford and includes identifying the holistic context in which a design is taking place. This can include quality of life statements and appropriate goal setting.

Living Design Process, a practical design process philosophy, can be used to guide the design, development and retrofit of anything, at any scale, and at any stage of prior development. This includes deep immersion in all the different aspects of a given situation.

Learn more
www.makingpermaculturestronger.com
www.holisticdecisionmaking.org
www.livingdesignprocess.org

DESIGN FRAMEWORKS
DECISION MAKING

DESIGN FRAMEWORKS are procesess that help to organize and structure design work as well as order the design sequence .

MASTER PATTERN : Observe, Analyze, Design, Do, Maintain

ACTION LEARNING CYCLE : Observe, Reflect, Plan & Design, Do and Repeat

DESIGN WEB : Vision, Helps, Limits, Patterns, Ideas, Principles, Integration, Action, Momentum, Appreciation, Reflection, Pause

S.A.D.I.M.E.T. Survey, Analyse, Design, Implement, Maintain, Evaluate, Tweak

O.B.R.E.D.I.M.E.T. Observe, Boundaries, Resources, Evaluate, Design, Implement, Maintain, Evaluate, Tweak

G.O.B.R.A.D.I.M.E. Goals, Observation, Boundaries, Resources, Analysis, Design, Implementation, Maintenance & Evaluation *(Heather Jo Flores)*

G.o.S.A.D.I.M. (e.t.c.)
Goal setting : What do you want?
Survey : What have you got?
Analysis : What are your limiting factors and potential resources?
Decision Making : What do we need to change?
Implementation : How will we achieve that change?
Manage : How will we continue to manage and maintain our project?
Then the addition steps of
Evaluate : Get feedback on what's working and what's not working so well
Tweak : Make minor changes and alterations based on feedback
Celebrate, then go round the cycle again... *(Graham Burnett)*

E.G.A.D.I.M.E. Establish aims & objectives, Gather information, Analyse, Design, Impliment, Maintain, Evaluate *(Deano Martin)*

DESIGN METHODS
CREATIVE APPROACHES

A.E.I.O.U. Activate, Explore, Inspire, Ownership, Undertake

R.E.A.P.M.O.R.E. Reason, Explore, Assess, Place, Maintain, Observe, Refine, Enjoy

APPRECIATIVE INQUIRY : Define, Discover, Dream, Design, Destiny
(David Cooperrider & Suresh Srivastva)

DRAGON DREAMING Dreaming : Gather information, Motivation, Awareness
Planning : Considering Alternatives, Design strategies, Testing / Prototyping
Doing : Implementation, Administration & Management, Monitoring progress
Celebrating : Discerning wisdom, Transforming results, Acquiring new skills
www.dragondreaming.org

DESIGN TREE : (Phase One) Roots : Observe & Survey, (Phase Two) Trunk : Organize & Analyse, (Phase Three) Branches : Design Tools, Leaves : Principles, Blossoms : Ideas, Techniques & Appropriate Technologies, Elements & Components, Finished Design. *(James Chapman)*

WHOLE FARM PLANNING : Assess, Evaluate, Strategise, Design in Detail, Review and Repeat

I.I.E.P.C.I.O.R.R. Identify, Investigate, Evaluate, Possible Options, Concept Design, Implement, Observation, Review & Reflect

RRiDeM Reverse Ripple Design Methodology is made up of concentric circles. Starting with the outer circle : gather information, analyze and write results in the next inner circle. Apply a survey, analysis, implimentation, management or design tool and write conclusions in the next inner circle. Do a test design in next inner circle and repeat the process iteratively. Once you have gone through stages of applying tools and designing a number of times, write the resulting design in the center. *(Rakesh "Rootsman Rak")*

DESIGN PROCESS
DECISION MAKING

DESIGN TOOLS are methods that inform and support parts of your design process. These tools can be used as part of design frameworks.

YEOMANS SCALE OF PERMANENCE : Address most permanent elements first. Climate, landform, water supply, roadways, trees & plant systems, microclimates, buildings, fences, soil. *(P.A. Yeomans)*

PROCESS FLOWS : Chart a sequence of elements and actions that together perform a process. Each step, or sub-process, may be performed by different elements at different times and in different places. Elements play different functions and have different properties. Elements can be located relative to their place in the flow of events, both in space and in time. Intervene and redesign to improve the effectiveness of the system. *(Aranya)*

ROSES, THORNS & BUDS / ACTION LEARNING GUILD
What is going well? What has been challenging?
How would you do it different next time?
What are your long term visions and goals?
What are your next achievable steps?

SIMPLEST DESIGN PROCESS : Brief, Ideas, Survey, Design *(James Chapman)*

Information Phase : Observing and collecting data
Analysis Phase : Reflecting, examining & collecting data, recognizing patterns
Design Phase : Determining strategies
Management Phase : Implementing, monitoring and managing *(Ross Mars)*

DESIGN PROCESS WHEEL : Gratitude & Mystery, Vision, Goals, Analysis, Assessment, Preliminary Design, Reality Check, Final Design.
(Charles Laurel inspired by D. Jacke, J. Young & M. Morey)

VIRTUOUS CIRCLES : Spirals of abundance where beneficial action feeds back to create increasing amounts of beneficial action.

ENERGY INTERVENTION : To achieve your goals choose as low on the scale as possible because step is a greater intervention
1. Do Nothing
2. Generate, collect, catch & store local energy flows
3. Conserve and reduce system leaks of stored energy
4. Consume & degrade a resource, fossil fuel or energy source to provide power, nutrient or a needed material

SPIRAL OF INTERVENTION : Every intervention you make increases the necessity for another intervention. What is the least you can do to achieve your outcome?

CASCADE OF INTERVENTION : When intervening to address a challenge, aim to do as little as possible in order to limit work, pollution and waste
- Consider the least invasive and energy intensive strategies first
- Do nothing and allow your system to demonstrate its own evolution
- If doing nothing doesn't work, do a bit more of what you were doing to scale up production and account for losses
- If that does not work, try biological intervention like bringing predators onto the site or using natural sprays
- Next try mechanical intervention such as traps, fences or buried barriers
- Next consider redesigning the system in order to work with nature
- Final option if absolutely needed is a chemical solution that may include killing of pests with natural means that don't damage other life *(Graham Bell)*

DESIGN THINKING
Stage 1 - Empathize : Research users' needs
Stage 2 - Define : State your users's needs and problems
Stage 3 - Ideate : Challenge assumptions and create ideas
Stage 4 - Prototype : Start to create solutions
Stage 5 - Test : Try your solutions out
(Hasso-Plattner Institute of Design at Stanford - d.school)

DESIGN PROCESS
DECISION MAKING

V.I.S.A. Visible, Impactful, Simple, Appropriate

D.A.F.O.R.M. Dominant, Abundant, Frequent, Occasional, Rare, Missing

S.C.I.L. Selfcare, Community, Infrastructure, Livelihood *(Wenderlynn Bagnall)*

F.A.B. Features, Advantages, Benefits

K.I.S.S. Keep It Simple Stupid

O.H.I.O. Only Handle It Once

H.C.E.P. Hopes, Concerns, Expectations, Priorities *(Jed Picksley)*

E.R.O.E.I. Energy Returned On Energy Invested

R.E.K.S. Respectful, Enthusiastic, Knowledgable, Safe

A.A.A. Approve, Avoid, Assist (*Rosemary Morrow)*

P.M.I. Plus, Minus, Interesting

P.A.S.T.E. Plants, Animals, Structures, Tools, Events

S.M.A.R.T. GOALS Specific, Measurable, Achievable, Realistic, Timely
Articulate Goals, Analyze and Assess, Design, Implement, Evaluate

S.W.O.C. Strengths, Weaknesses, Opportunities, Constraints

N.E.W.W.P. Nutrients, Energy, Water, Work, Protection

ENGINEERING DESIGN PROCESS - NASA : Identify the problem, Identify criteria & constraints, Brainstorm possible solutions, Generate ideas, Explore possibilities, Select an approach, Build model or prototype, Redefine the design.

P.R.I.M.E. Problem, Research, Ideas, Make, Evaluate

G.R.O.W.T.H. Goal, Reality, Options, Will, Tactics, Habits

G.R.O.W.E.R. Goal, Reality, Options, What / Where / When, Evaluation, Reflection *(Barry Jones)*

G.R.O.W.I.N.G. Goal, Reality, Options, Will, Implement, Notice, Gaiety/Goal (celebrate and go round the process again!) *(Carla Moss)*

AQAL INTEGRAL THEORY QUADRANTS : Interior Individual (I), Exterior Individual (It), Interior Collective (We), Exterior Collective (Its). *(Ken Wilber)*

6 THINKING HATS : White (unbiased facts), Red (emotional issues), Green (creative ideas), Yellow (benefits), Black (critical thinking), Blue (thinking about thinking). *(Edward de Bono)*

HOLISTIC GOAL SETTING : Quality of life desired, forms of production that can lead there, future resource base that the forms of production depend on. *(Holistic Management / Alan Savory)*

INCREMENTAL DESIGN : Design in small chunks, waiting until after implementation and evaluation to design subsequent areas.

ELEVATIONAL PLANNING : Design & element location based on height.

C.E.A.P. Collect, Evaluate, Apply, Plan

RANDOM ASSEMBLY : Randomly assemble elements and connecting concepts like : on, besides, in, below, over to locate functional assemblies.

BIOMIMICRY DESIGN SPIRAL : Distill, Translate, Discover, Emulate, Evaluate

DESIRE LINES : Routes we want to take things in.

DESIGN PROCESS
DECISION MAKING

WILD DESIGN : A visionary process for taking design out of the box.

NEEDS & EXPECTATIONS MAPPING : List needs, wants and expectations.

FROM INNER TO OUTER : Start at the beginning & at the center & move outwards.

RISK ANALYSIS : What can go wrong? What is the relative likelihood of each risk event? How can you mitigate risk? How will project outcomes change due to impact of risks? Identify benefits and learnings.

RELATIVE LOCATION : Design elements in relation to their distance from each other so they mutually benefit from being close to, or far away from, other elements.

7 WAYS TO THINK DIFFERENTLY : Abundance Thinking, Solutions Thinking, Systems Thinking, Thinking like Nature, Co-operative Thinking, Thinking for the Future, From Thinking to Doing *(Looby Macnamara)*

8 SHIELDS : N : Winter (Co-Ordination), NE : Heavens (Spirit Support), E : Spring (Beginnings), SE Future (What's Next?), S : Summer (Hard Work), SW : Earth (Grounded Support), W : Autumn (Presenting), NW : Healing (Connection) Love & Compassion, Quiet Mind, Happiness, Focus & Commitment, Empathy, Truly Helpful, Fully Alive *(Jon Young)*

QUADRANTS : Chart four sections that compare and contrast data.

BUILDING BLOCKS AND LIMITING FACTORS : What will help or hinder?

ACTION RESEARCH : Seeks transformative change though the simultaneous process of taking action and doing research with critical reflection throughout the process *(Kurt Lewin)*

DESIGN METHODS
CREATIVE APPROACHES

WEB OF LIFE : Explore interconnections between elements in a system.

STAKEHOLDER INTERVIEWS & ANALYSIS : Gather input from all stakeholders, both direct and indirect, and document their needs, priorities, and interests. Identify conflicting needs and priorities and raise as discussion points for the group.

WEIGHTED REQUIREMENTS GRID : Assign a Level of Effort (LOE) and Value score to tasks. Prioritize and sequence tasks starting with those that have the greatest LOE to Value ratio.

FISHBONE DIAGRAM : A visualization that explores cause and effect. Start with writing down the manifestation of the problem, and list as many possible causes as you can think of. Then, for each of the causes, trace back the reasons for those issues. Continue for as many iterations as need to find root causes, and then explore solutions from the most granular upward.

MONITORING SYSTEMS : Gather feedback to observe, assess and evaluate.

WORKPLAN : Calculate needs, goals, costs and time estimates with buffers.

GANTT CHART : Visual view of tasks and dependencies scheduled over time.

DATA FLOW DIAGRAM : Maps out the flow of information for a process or system.

OVERLAYS : Use layers of data to analyze relationships between different systems.

MIND MAP : Diagram for visually organizing information.

BIOTIME DIARY : Recording regular observations of natural patterns.

Note : Groups & guilds of principles can also be used as tools or frameworks.

ZONES
SELF

"Energies from the outside can be thought of a so many arrows winging their way towards the home, carrying both destructive and beneficial energies; we need to erect shields, deflectors, or collectors. Our choice in each and every sector is to block or screen out the incoming energy or distant view, to channel it for special uses, or to open out the sector to allow, for example, maximum sunlight....Thus we place hedges, ponds, banks, walls, screens, trellises, hedgerows or any other component of design to manage incoming energy." - Bill Mollison

ZONE ANALYSIS
Zones are areas where elements are placed according to the distance from where people spend time, the frequency of their use, amount of care and upkeep they need, as well as their scale or size. Consider each element in relation to function, structure, nutrient, energy, water and access needs.

SELF AND BODY : The foundation of your ability to interact with the outer zones

Use : all the time
Area : your body
Components : physical, emotional, spiritual, mental experiences
Life Systems : digestive bacterias and friendly flora, neurochemicals, hormones, enzymes and blood cells
Techniques : local seasonal eating, integrative nutrition, exercise, conscious relationships, personal healing, massage, professional fulfillment, love
Water : drink up to 2 or 3 litres of clean, alkaline water per day
Protection : from bacteria, disease, physical and mental illness
Functions : physically strong & resilient, emotionally centred, mentally clear
Goals : maintain overall health and self-awareness

HOME
ZONES

HOME : Designed to support the Self and Body

Use : almost every day and night
Area : living space
Urban Area : apartment, condo or house
Components : kitchen, sleeping area, bathroom, laundry, office, storage, mudroom
Plants : herbs, indoor plants for purifying air, aquaponics, worm farm, recycling station, compost pre-station
Techniques : relative location, indoor gardening, sustainable technology, insulation, greywater, low energy appliances, passive heating, recycling, solar cooking
Water : locate 'wet rooms', kitchen, laundry, bathroom to be able to share greywater with garden, water catchment and storage, greywater treatment and utilize waterless toilets when appropriate, water purification
Animals: cats, dogs and other pets to provide companionship, protection, eat scraps and reduce rodents, intensive care for sick or baby animals
Protection : from elements and climatic factors, security from invaders
Functions : a climate regulated, safe place to live, love, eat, relax, sleep and work
Goals : catch, store and conserve energy, save heat, produce food, process food, store food, use renewable energies, passive solar, lit by natural daylight all day, form (design) and function match, local materials used when possible, meet its own needs for energy and water and food, non-polluting, limited creation of waste, non-consuming, non-toxic, suitable for climate

"Design is an elusive and enigmatic alchemy. Yet the magic of design lives, not in any design technique we might learn and use, but inside each one of us. The (design process) techniques serve only to connect each of us to our own living creative process. " - Dave Jacke & Eric Toensmeier

GARDEN ZONES

GARDEN : Intensively cultivated and cared for

Use : daily
Area : space immediately surrounding the home
Urban Area : yard
Components : small greenhouse, trellis, patio, outdoor kitchen, outdoor gathering area, bird feeder, workshop, storage, bathroom, cold frames, worm compost bin, small compost station, propagation area, stone wall, shade house, vegetable garden, fencing, shed, clipping beds, plucking beds, board and narrow beds, tiny pond, windbreak, keyhole, mandala and dome beds
Plants: herbs, salad greens, flowers, soft fruit, dwarf trees, low shrubs, tender annual veggies, cultivated mushrooms, deciduous vines to shade house in summer
Techniques : intensive planting, sheet mulching, dense planting, espaliering, abundant and diverse plantings, functional pathways
Water : rain barrel, small ponds, grey water, back up drinking water storage, rain water catchment, small rainwater tanks, grey & black water treatment, compost toilet, aquaculture
Watering : intensive irrigation
Animals : wild birds, rabbits, guinea pigs, quail, soil organisms, beneficial insects, small animals help with weeding and maintenance, frogs, lizards and ducks to control pests
Food Shed : home garden
Energy Shed : energy captured and stored on your property, recycle compost and waste from the house
Protection : from elements, climatic factors and animals
Functions : modify house, create and utilize microclimates, daily food and flowers, social space, meet nutrient needs of garden
Goals : reduce energy and water needs, harness natural resources, create a harmonious place to love, live, work and play, meet 80% of household foods, limit maintenance required, keep monitoring system

FOOD FOREST
ZONES

FOOD FOREST : Semi-intensive cultivation and care

Use : visited almost everyday
Area : area just beyond the garden
Urban Area : walking distance 'pedosphere'
Components : larger greenhouse, barn, tool shed, shop, wood storage, smoke house, large compost, small orchard, chicken coop, beehives, fire break, guest housing
Plants : staple and canning food, fruits and nut trees
Techniques : heavy mulching, cover crops, seasonal pruning, drying and smoking food, stacking of plants, multi-purpose walk throughs, free ranging poultry, high diversity of plants, nutrient from green manures and living mulches, polycultural orchard guilds, floral pasture, windbreaks to prevent drying out from winds and to protect yields
Water : water tanks, well, bore, pond, irrigation, swales, back up systems, ripping, terracing, ditches, net and pan, fire defence, wind deflection, safeguarding animals and pest reduction, small earthworks, water bodies for reflecting light
Watering : intensive irrigation, water well during dry periods the first year
Animals : rabbits, fish, bats, geese, ducks, poultry, animals help to prune, fertilize, scratch, control pests and provide local small protein option, intensive care for birthing or sick farm animals
Food Shed : neighbours, CSA, community garden
Energy Shed : energy captured and stored in your community
Protection : from wind, hail, fire, flood and snow
Functions : home food production, local food resiliency, market crops, plant propagation, wildlife habitat
Goals : intensive production, cycling energy

"Gardeners plant like we will live forever." - Bill Mollison

FARM ZONES

FARM : Semi-frequent seasonal cultivation and care

Use : visited every couple of days, very little in off-season
Area : broad scale land base
Urban Area : biking distance 'cyclosphere'
Components : feed storage, field shelters, main perennial crops, large orchard, grazing fields, windbreaks, firebreaks
Plants : cash crops, large fruit and nut trees, animal forage, shelterbelts, hedgerows
Techniques : cover crops, little pruning, movable fences, spot mulching, diverse forage, pasture cropping, alley cropping, cell grazing, regenerative agriculture, erosion repair
Water : large water tank with pump, large ponds, swales, diversion channels, contour ripping, treelines, dams with spillways, key point dam diversions, keyline design, limonia, gabions
Watering : light irrigation, animal water troughs
Animals : cows, horses, pigs, sheep, goats, donkeys, cattle, large animals to eat surplus, fertilize the ground and support healthy soil, guard animals like maremma sheepdogs, llamas or alpacas.
Food Shed : farm gate, farmers market
Energy Shed : energy captured and stored in your region
Protection : from climate, predators, fire, invasive species, toxins
Functions: market crops, firewood, lumber
Goals : high yields, energy efficiency, regeneration, storage, back-up systems, good planning, products for market and distribution, rehydrate the land, earn an income

WOODLAND
ZONES

WOODLAND : Minimal care

Use : visited weekly
Area : area beyond the farm zone
Urban Area : reachable by bus or short drive
Components : open pasture, cultivated woodland, dams, wind mills
Plants : firewood, timber, native plants, non-timber forest products, mushrooms, medicine plants, food, forage
Techniques : pasturing, controlled burns, hand transplanting, selective forestry, coppice managed woodland, long term tree planting, understory plantings, green mulching, plant around the fences, start with pioneering nitrogen fixing trees which are eventually cut and mulched, plant high value short use timbers next to the nitrogen fixers for firewood, trees and plants for tools, poles, fences, plant high value longer term timbers in woodland for construction beams and feature long thick boards, start edges with berries and short trees
Water : animal troughs, ponds, lake, river, wetlands, reforestation, watershed management is a must for rural areas
Animals : grazing and protecting space, fixed and mobile species, large animals like cattle, deer, pigs, sheep, turkeys, goats, and wild animals
Food Shed : independent grocer with regional focus
Energy Shed : energy imported from neighbouring regions
Proctection : from logging, trespassing, poaching, fire, wild animals
Functions : hunting, gathering, grazing, wildcrafting, selective logging, forestry, long term development
Goals : make good use of the land requiring minimal maintenance, animals supply nutrients to forest, diverse yields and functions, stores carbon, filters light, enhance mycelium, planting for the future, multiple benefits

WILD FOREST ZONES

WILD FOREST : Unmanaged nature

Use : weekly or monthly
Area : natural space beyond all developments, around rivers & slopes over 18%
Urban Area : reachable only by plane or long-distance transport
Components : wildlife corridors
Plants : native plants, indigenous forest & ecosystems, ground covers, prickly plants
Techniques : unmanaged, remove farm animals, erosion control, natural barrier, plant back original vegetation, broad scale carbon sequestration, start in the middle and work out, vegetation to prevent erosion, branch scatter and hand broadcast tree seeds or use pellet bombs, mechanical reseeding
Water : lake, creek, rehydrate the landscape and replenish the aquifer
Animals : native animal reserve habitat, extend wildlife corridors
Food Shed : chain supermarket featuring health food isle
Energy Shed : energy imported from another country
Protection : from logging, trespassing, poaching, fire, wild animals, human with domestic cat and dog
Functions : inspiration, nature preserve, observational learning
Goals : preserve true nature without interfering, restore native habitat, stabilize soil and water, maintain wildlife corridors, replant the ecosystem, recharge rivers and aquifers, minimum disturbance, ideally 30-45% of broad scale land is under perennial systems and 70% is designated as native forest. Rosemary Morrow says to find the more desirable spot on the landscape and protect it instead of developing it. For forests, native ecosystems and watersheds outside our property, we must defend them from destruction.

PERSONAL ZONES : Self, Life Partner, Close Family & Friends, Neighbourhood, Wider Community, Associates & Colleagues, Replenishing Forces of Nature & Culture

SOCIAL ZONES : Self, Family, Neighbourhood, Community, Bioregion, National, Global.

TRANSPORTATION ZONES : Home, Walking Distance (Pedosphere), Biking Distance (Cyclosphere), Public Transit, Long Distance Drive, Flight

SECTORS
ENERGY & INFLUENCE ANALYSIS

SECTORS

Sector mapping identifies and tracks the movement of energies and influences from outside that come onto, or through, the design site. Sectors may be shown visually on a map using colors and arrows marking the source and direction of flow. Sectors include visible energies like sun, water and wind as well as invisible influences like politics, war, neighbours, building codes, social trends, crime, easements, zoning bylaws and building codes. Sector patterns may change hourly, daily, weekly, monthly and seasonally. Micro-sectors note specific detailed information about sectors. Designing for sectors gives you the option to block, channel, or capture and store the energies and influences. Sectors include forces we have to work with, or protect against.

SUN : The sun rise and set changes in different seasons. Identify hours of sun, shade and dappled light on your land. Walk around on a sunny day every hour from dawn till dusk to get a super accurate sun micro-sector map. Use a program or app like suncalc.org to find the position of the sun in relationship to your property any day of the year.

WIND : Note seasonal patterns of prevailing cool and warm winds. Identify the wind channels or wind breaks. Walk around on a windy day to chart wind micro-sector. Read trees for wind direction and strength.

WATER : Track the flow of running water and note drainage in seasonal brooks, streams, rivers, dams, and creeks. Locate standing water like ponds, lakes, marshes, wells, rain barrels, swales, and damp soil areas. Note the path that water runs through the site, and calculate how much water the site catches. Look for patterns of erosion on the site and consider how to reroute or block energy to prevent further erosion. Walk around your site after it has been raining for a day or two and look for damp areas or standing water. Cherish and protect springs. For coastal properties track highest tides, and sea level rise. Look at the history of damage from past storm surges and map land that may be eroded as climate change progresses. What is the flood or drought history of the site?

SECTORS
ENERGIES & INFLUENCES

FROST : Cool air moves downhill and stays in low lying areas condensing as frost on cold mornings. Note frost pockets by doing a micro-sector map on a frosty morning. Identify frost free areas.

PEOPLE AND ANIMAL MOVEMENT : Note movement of animals and people through the property. This may indicate existing pathways, roads or driveways, or show where these should be added.

NOISE : Where is noise coming from? Listen for pleasant and unpleasant noises. Micro-sectors for noise may include identifying daily or even hourly noise patterns that can be heard on your site.

SMELLS : Pay attention to pleasant and unpleasant scents and note where they might be coming from. Document the times of day or times of year when you notice these smells. Check wind sector.

FIRE : Fire usually comes up a hill or from the direction of your hot summer winds with a secondary sector from the cool summer wind change. Dry areas like grasslands and eucalypt woodland may be pathways for fires to travel. Sometimes fires behave unusually in hills and gullies. Look into the history of bushfires or forest fires in your area to learn more about fire sectors and fire disasters. Locate the safest place on the property to be if a fire comes. Where are the evacuation routes?

DISASTER : Are you in danger of earthquakes, tsunamis, hurricanes, typhoons, lightning, extreme weather, industrial pollution, bushfire or forest fire, flood, drought, dust storms, nuclear fallout or any other nature or man made disaster? Plan for 100 year disaster or climactic events.

ENERGIES & INFLUENCES
SECTORS

VIEW : From different places on site, where are the ugly or beautiful views?

URBAN : Look at boundaries where people or animals may come onto the site. Note places that dumping, crime or vandalism might be an issue.

POLLUTION : Is pollution on the site? Do a soil test to check for lead and other poison levels in your soil. Is heavy industry nearby? How does it impact your site and surrounding ecosystems? Pollution can also come from roads. Water flowing onto your property can bring pollutants. Are there any neighbours using poisons that can blow or wash onto the property? Are you near superfund or toxic dump sites?

CLIMATE CHANGE : How has climate change already affected the property? Impacts include a greater variation in high rainfall and low rainfall per year, less snowfall, extended dry periods, a change in winds, sea level rise, changes in seasons, or more extreme weather events. Explore how climate change may affect the property over the next 75 years.

MICROCLIMATES : Explore the site looking for small differences in temperature, sun, shade, moisture, slope, frost, wind, exposure or soil type.

What other micro-climates can be observed and recorded on a map?
Look at physical factors as well as non-physical influences.

Energy and resources can flow from areas of abundance to areas of deficit. Incoming energy can be directed and diverted away from fragile areas and towards energy sinks. Consider potential energy and embedded energy (stored), kinectic energy (producing work), and embodied 'emergy' (amount of energy used, directly and indirectly to make a product or service) when assessing your resources.

MAPPING PROJECT
PRACTICAL OBSERVATION

Permaculture Mapping deepens our conscious connection with the world. Observing a design site for at least a full year of seasonal changes, we can learn about what is already going on as well as what might be appropriate elements to move around, add or take away. You may want to use a Biotime Log or Phenological Journal to note the natural patterns and cycles throughout the year like flowerings, ripenings, weather and bird visits.

MAP FOLIOS can help you stay organized and keep all your notes, observations, ideas and design visions in one place. Documenting the process of applying any design is highly beneficial, enhances learning, and feeds back into adapting and strengthening the ongoing design. This folio could include a base map, plant and animal list, zone map and sector / micro-sector map as well as the application of ethics, principles, design frameworks and methods found in the companion Permaculture Design Deck.

BASE MAPS include all the elements on your site such as

- Structures & pathways
- Contours
- Water
- Plants & trees
- Gardens
- Resources
- Locate water, gas and electric lines and shutoffs.
- Utilize a home-made A-Frame or Bunyip Water Level to identify contours.
- Use your own measured pacing, or mark a spot on a bicycle wheel and measure circumference of wheel per rotation to calculate longer distances on the land.
- Using Google Earth or digital resources from the mapping department of your local government website can help you get a traceable photograph showing your property from above. Go into the local regional government offices directly, there is usually a mapping department who will provide free maps of your watershed, property boundaries and many other features.

PRACTICAL OBSERVATION
MAPPING PROJECT

PLANT AND ANIMAL LISTS include any animals, birds and insects that live on, or pass through, the design site throughout the year. Creating food and habitats for beneficial animals can encourage them to spend more time on site.

Try to get the exact species of plants and animals using ID books. If possible see if you can photograph special plants and animals to help illustrate your map folio. Any plants that you can't identify, try an online plant ID app or take a leaf and flower into a large nursery or botanical gardens for correct identification.

> "As far as plant ID goes, I also think that once you have a positive ID, it is very helpful, after sending a gratitude to the plant, to snap off a small branch. Is the stem hollow or solid? Does it give off a scent? Ooze or sap? Hold a leaf in your mouth - is it faintly fuzzy? What else is it giving off? Bite down and lick your teeth, it is super difficult to poison yourself with such a tiny amount, but it will stimulate many different parts of your brain to 'know' and remember that particular plant. Pick several different grape leaves and line them up, or different strawberry leaves, you will slowly see the very subtle differences. This will help your book learning." - Robin Wheeler

ZONE MAPS shares a zone analysis to your site. Look at elements relative to their frequency of use, maintenance, scale, and distance from the places you spend the most time.

SECTOR MAPS identify the energies and influences passing onto, or through, your design site. Once you identify the sectors you can always choose to block the energy from entering, allow it to come through easier, channel it through the site in a specific way, or even capture and store the energy for future use. Consider doing a sector analysis each season. Later you might even do one in every month. Include a microclimate analysis.

DESIGN IDEAS you have during your mapping process are good to write down.

DESIGN WITH PATTERNS

NATURE'S LANGUAGE

The natural world of forms and processes is made of patterns. The human world of behaviours and habits is also made out of patterns. Patterns are the language of nature and can teach us how to design.

PATTERN RECOGNITION : Cultivating sense awareness of the environment in order to identify patterns and recognize their functions.

PATTERN LITERACY : Seeing the world as made of patterns which are either functional or disfunctional. Applying that understanding to decisions and design process. Learn to recognize patterns of casualty. Anchor in functional patterns with routines and habits, while designing disfunctional patterns out of the design.

READING THE LANDSCAPE : Relearning the pattern language of nature to understand how plants and animals are rich sources of information about the bioregion. From plants, animals, soil and geography we can learn so much about the past, present and future of a place including weather, fires, natural disasters, food sources, environmental opportunities and challenges.

ORDERS : Every pattern has orders from large to small. Think of a big tree that has a trunk (order 1), to main branches (order 2) to medium sized branches (order 3) to small branches (order 4) to the tiny branches (order 5). Each time you move between orders, you half the size and material being transferred. Orders indicate changes in size or scale and are a measure of size, volume or concentration contained within the same form or pattern. Orders are related to gathering and dispersing of contents (eg. nutrients, waste, energy flows). Orders are numbered from 1 - 7 but may be as few as 5. Orders can be found in branching streams and rivers, wave saltation and sand dunes, spiral draining water and galaxies.

PATTERN RECOGNITION
NATURE'S FORM

STACKING PATTERNS : Patterns occur like fractals; on all scales, in time and in space.

NETWORK PATTERNS : Every element in every order is a node in a network pattern. All feeding relationships, social relationships and nutrient cycles are networks. They consist of two elements: links and nodes. Networks are very resilient if they have many nodes. Networks are very hard to destroy because they are non-hierarchical and you can remove many links and nodes and still not destroy the whole structure. For example, Bees are links in a network where trees and flowering plants are the nodes. Bees pollinate about 1/3 of the world's food supply. The greater the number of bees, the stronger the network. In our soil ecosystem, nitrogen fixing trees are key nodes and mycelium are key links.

DESIGN BY STRUCTURE
Organizing elements by what fits well together.

DESIGN BY EXCLUSION
Apply filters to reduce design options, until all that remains is the answer.

DESIGN BY ANALOGY
Be inspired by what is observed in native plant communities.

DESIGN BY FUNCTION
Combine elements that play complimentary functions.

DESIGN BY CHUNKING
Test strategies and techniques on small areas then scale up, replicating successes but not failures.

DESIGN BY PRECEDENT
Try applying strategies and techniques that have been successful in sites and climates similar to your own.

PATTERN LITERACY
NATURE'S LANGUAGE

The function that patterns play are part of the secret to nature's success. All human technology is based on replicating the functional patterns of nature.

SPIRAL
Allows for growth and movement. Uniformly fills space and maximizes material holding potential. Increases exchange, transport and helps with anchoring. Enables things to move against gravity. Concentrates or disperses, speeds up or slows down flow depending on which direction the spiral is moving.

BRANCHING
Enables the collection and distribution of materials and resources. An efficient way to reach many points in an area while traveling the shortest distance.

SCATTER
Helps energy release and the ability to spread material quickly. The place where the scattered seeds or materials land is the scatter pattern.

WAVE
Allows for movement, circulation and transportation. The pattern of a heartbeat.

CIRCLES WITHIN CIRCLES / NESTED PATTERN
Stabilizes and protects. Allows objects or social structures to be stacked inside one another.

Pattern art drawings by Kym Chi

PATTERN RECOGNITION
NATURE'S FORM

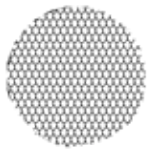
WEB
A resilient system made of nodes and links. If one node or link is broken it does not collapse the whole system. Conserves space, resources, time and energy. Good for collection, filtering and small surface exchange.

SPHERE
Balances inner and outer forces. Offers the most volume for the least amount of surface area. Minimizes heat loss. Easy to roll.

STAR
Expands and spreads.

STREAMLINE
Allows for effective flow of fluids and gases past fixed bodies.

SCALE
Creates strength while remaining flexible.



LOBE
Increases energy transfer across surfaces. Provides a longer edge surface for growth.

OVERBECK JET
Enables the natural streaming of gases and fluids past objects or forms. Generates vortices and spirals.

GUILDS
MASTER PATTERN

A guild is a collection of living and non-living things that work together symbiotically, where the products and outputs of one fulfills the needs of another. This is a master pattern for life in the universe. Here are some functions that plants can play in a garden guild :

FOOD PRODUCER : Creates edible food for people, plants, insects or animals. Ensures that the guild is valuable to maintain and protect.

MEDICINE PRODUCER : Provide medicine for people, animals, insects and plants. Ensures the guild is healthy.

MULCH : Covers the soil, provides nutrients and organic matter, moderates root temperature and buffers climactic effects, suppresses weeds, retains water, builds soil and prevents erosion.

LIVING MULCH : Frances Michaels coined this term to describe perennial herbaceous plants covering the soil typically in an orchard system. They provide nitrogen to soil and its organisms, improve soil by breaking it up with their roots, allowing greater water infiltration and retention, reducing evaporation while protecting soil from erosion. An inoculant introducing symbiotic bacteria to assist successful growth is often helpful. Living mulches keep soil cooler in the summer and warmer in the winter, moderating climatic effects and reducing competition from weed species. These plants often provide bee forage and attract beneficial pests. When cut, living mulches return nutrients to the soil.

GREEN MANURE : Frances Michaels describes a green herb layer of legumes and grasses are used to provide nitrogen and organic matter to the soil and prepare soil for planting crops. Typically the layer is slashed or dug into the soil while green, before seed develops, returning these nutrients and minerals to the soil. Used to out compete weeds.

REPEL PESTS : Help to discourage and repel pests or predators that threaten the healthy functioning of the guild.

NUTRIENT BIO-ACCUMULATORS : Absorb, increase and store high levels of nutrients and minerals.

NITROGEN FIXERS : Participate with particular soil microorganisms to fix nitrogen into the soil. When their foliage is chopped or eaten by above-ground animals, the plant roots recess causing nitrogen to be released into the soil.

SPIKE ROOT PLANTS : Have roots and tubers that decompact and oxygenate the soil, allowing more water to penetrate the soil.

HABITAT CREATION : Providing habitat for other native plants, animals or insects is a key support for the larger ecology.

AIR PURIFICATION : High biomass plants breathe carbon dioxide, producing oxygen that help clean and cycle the atmosphere for humans and animals to breathe.

WATER PURIFICATION : Filter water and draw out toxins. These can be very helpful in cleaning rain or greywater.

BIOREMEDIATION : Draw up heavy metals and other toxins from the soil to help remediate areas where life is hampered by toxicity.

USEFUL PLANTS : As gardeners, we have lots of reasons to care for and protect guilds containing plants that can provide material for fuel, building, tool making, fibre for weaving, dyes, consciousness expansion or any other productive functions.

SACRIFICE SPECIES : Give food and habitat for pests so they don't bother other plants.

BANKER PLANTS : Attract and provide habitat for pests in order to provide a year round food supply for beneficial predators.

DESIGN FOR SOIL
LIFE FOUNDATIONS

It's not simple. Soil is a complex mixture of several components, capable of supporting plant life. It originally formed by the weathering of the earth rocks.

Typical soil contains approximately the following proportions of four main parts:

1. Minerals : about 45%
2. Water : about 25 %
3. Air : about 25%
4. Organic matter & living organisms : about 1 to 5%

The soil's minerals come from the underlying rocks. Composition of typical soils would include: Organic matter, microbes, earthworms, decomposers, nitrogen, silicon dioxide, aluminum dioxide, iron oxide, phosphate, potash, manganese, zinc, copper, molybdenum, magnesium, nickel, cobalt, boron and chlorine.

The water in soils is necessary for plants, since plant tissue contains about 80% to 90% water. Water is especially important because it dissolves and carries nutrients and other materials inside the plant and in the soil. Air, including oxygen, carbon dioxide and nitrogen, is essential for root growth, water and nutrient uptake, and for biological activity (soil life). Organic matter makes up less than 5% of the volume in most soils, but has an importance far out of proportion to its amount. Carbon and a complex, dynamic mixture of substances make up organic matter, playing major roles in the chemical, biological and physical aspects of soil fertility.

> "Yet soil is miraculous. It is where the dead are brought back to life. Here, in the thin earthy boundary between inanimate rock and the planet's green carpet, lifeless minerals are weathered from stones or decomposed from organic debris. Plants and microscopic animals eat these dead particles and recast them as living matter. In the soil, matter recrosses the boundary between living and dead; and, as we have seen, boundaries-edges-are where the most interesting and important events occur."
>
> - Toby Hemenway

SOIL SCIENCE
ELEMENTS

PRIMARY ELEMENTS

N - Nitrogen : Plant growth and feeding microorganisms, is part of DNA, important in photosynthesis, needed to make plants green.
- Found in higher quantities in comfrey, stinging nettle, kelp, dandelion, yarrow, clover, lupine and chickweed.

K - Potassium : Plant digestion, resistance to disease, cold, pests, develops buds, root development.
- Found in chamomile, chickweed, clover, stinging nettle, oak bark, yarrow, comfrey, dandelion, crabgrass, morning glory and kelp

P - Phosphorus : Root growth, establishing young plants, photosynthesis, respiration, cell development, plant growth, and is an important mineral in DNA. Light bearer.
- Found in higher quantities in chamomile, chickweed, dandelion, yarrow, lamb's quarters and morning glory

SECONDARY ELEMENTS

Mg - Magnesium : Central component of chlorophyl. Ripening and germination of seeds, and absorption of P, N and S.
- Found in higher quantities in comfrey, dandelion, horsetail, kelp, yarrow and stinging nettle

Ca - Calcium : Development of root system, cell walls, ripening of fruits & seeds. Knitter.
- Found in higher quantities in chamomile, comfrey, kelp, horsetail, stinging nettle, yarrow, morning glory and lamb's quarters

S - Sulphur : Neccisary for chlorophyll production and helps plants absorb K, Ca and Mg.
- Found in higher quantities in stinging nettle, kelp, garlic, mullein, plantain & alfalfa

MINOR ELEMENTS

Fe - Iron : Chlorophyll production.
- Found in higher quantities in comfrey, dandelion, horsetail, kelp, yarrow and stinging nettle

B - Boron : Overall plant health & resiliency, formation of fruit & absorption of water.
- Found in higher quantities in cardboard, kelp and euphorbia

Mn - Manganese : Seed germination and nitrogen assimilation.
- Found in higher quantities in chickweed, kelp, bracken fern, burdock, garlic and plantain

Mo - Molybenum : Nitrogen assimilation and fixation.
- Found in higher quantities in clover and legumes

Cl - Chlorine : Stimulates photosynthesis. Cleanser.
- Found in higher quantities in kelp

Cu - Copper : Activates enzymes and chlorophyll production.
- Found in higher quantities in dandelion, stinging nettle, valerian, yarrow, kelp, bracken fern and legumes

Zn - Zinc : Protein synthesis, enzymes and growth hormones.
- Found in higher quantities in kelp, legumes, hay and kentucky bluegrass

Si - Silicon : Utilizing nitrogen, enzyme activation and stress tolerance.
- Found in higher quantities in legumes

Ni - Nickel : Protection from disease and stress.
- Found in higher quantities in horsetail, borage, valerian and plantain

Co - Cobalt : Growth, cell division and nitrogen fixing.
- Found in higher quantities in bracken fern, horsetail and vetches

Al - Aluminum : Stimulation of root growth, increased nutrient uptake and enzyme activity
- Found in high amounts in the earth's crust

ESSENTIAL ELEMENTS

O - Oxygen : Required by life for respiration. Released by plants in their breathing process as a biproduct of photosynthesis.

H - Hydrogen : Part of water H20, an essential element of life. Combined with Carbon in photosynthesis which generates starches, sugars and oxygen.

N - Nitrogen : All life needs nitrogen to make proteins. Plants get nitrogen from nitrates in the soil and not directly from the air.

C - Carbon : Building block of all living things on Earth. Animals and humans can convert carbon into carbon dioxide during respiration. Plants get carbon from carbon dioxide in the air. Essential in photosynthesis.

MEASURE OF ACIDITY AND ALKALINITY

pH : A measure of acidity and alkalinity with high acid (0) and high PH (14) and 7 being neutral (neither acid or alkaline). Most nutrients are available at a pH of 5.5 - 7.0 but some plants can exist in highly acidic or alkaline soil.

SOIL IN ALL ZONES

ROSEMARY MORROW

Soil building techniques can vary across zones and scales.

ZONE 1: GARDEN

- Spot mulching, small compost

ZONE 2: FOOD FOREST

- Living mulches, green manures, brown mulch, large compost, chop and chip

ZONE 3: FARM

- Farm animals, cover crops, huge compost

ZONE 4: WOODLAND

- Big animals, rough wood, chop and drop

ZONE 5: WILD FOREST

- Wild animals, nature

Move from small to large nitrogen fixers as you go out through the zones

WEEDS

ROSEMARY MORROW

FUNCTIONS OF WEEDS

- Promotes biodiveristy
- Holds and protects soil, prevents evaporation, windbreak
- Protects and repairs soil, moisture
- Food and shelter for wildlife
- Natural barriers and windbreaks
- Nutrition accumulators
- Erosion protectors
- Pollinators
- PH indicators
- Fertilizers

WHY WEEDS ARE IN THE GARDEN

- To help us garden
- In response to environmental conditions
- Some flourish in rich soil or in poor soil
- Some live in a specific soil pH
- Caused by weeding or ploughing
- Humans and wildlife plant them
- Come to live by a water source
- Exist due to a lack of windbreak to filter weedseeds, or animals to eat them
- A response to overgrazing
- Part of natural succession

HEALTH INDICATORS

PLANTS & SOIL

Plants are indicators of soil health. The conditions in which they live as well as the functions that they play can inform us about the properties of the soil they grow in.

DANDELION : Indicates soils are acidic, cultivated, compacted, clay rich and are low in fertility and phosphorus.

Soil functions : tap roots break up the soil, accumulates calcium, iron, copper, potassium and sulphur.

STINGING NETTLE : Indicates soils are acidic, heavily cultivated, compacted and rich in clay.

Soil functions : accumulates, nitrogen, copper, potassium and sulphur.

CLOVER : Indicates soils are heavy, acidic and low in nitrogen.

Soil functions : fixes nitrogen, cover crop, accumulates potassium and phosphorus.

CHICKWEED : Indicates soils are nitrogen rich, heavily cultivated, clay rich, fertile, wet or damp and alkaline.

Soil functions : accumulates magnesium, manganese, potassium, phosphorus.

PLANTAIN : Indicates soils are compacted, have poor drainage, heavily cultivated, clay rich, low in fertility and acidic.

Soil functions : accumulates silicon, sulphur, manganese and iron, reduces soil acidity.

PLANTS & SOIL
HEALTH INDICATORS

THISTLE : Indicates soils are high in nitrogen, heavily cultivated, clay rich or dry.

Soil functions : tap roots break up the soil and accumulate iron.

SHEEP SORREL : Indicates soils are sandy, acidic, have low humus and low fertility especially potassium and phosphorus.

Soil functions : accumulates calcium, phosphorus and minerals that alkalinize the soil. Turning sorrel under makes minerals more available.

DOCK : Indicates soils are wet or poorly drained and acidic.

Soil functions : tap roots break up the soil, accumulates calcium, iron, phosphorus and potassium, helps develop soil structure.

MULLEIN : Indicates soils are: dry, crusty or compacted and have low fertility.

Soil functions : accumulates magnesium, sulphur and potassium.

HEALTH INDICATORS
PLANTS & SOIL

QUACK GRASS : Indicates soils are wet, clay rich and have a crusty surface.

Soil functions : helps control erosion on steep banks, accumulates silicon and potassium. Contains certain insecticidal properties that cause nerve damage to slugs. Some people use chopped quack grass as a mulch to repel slugs (with the caution that too much of the mulch could damage plantings).

VETCH : Indicates soils are low in fertility.

Soil functions : cover crop, fixes nitrogen, accumulates phosphorus, potassium, copper and cobalt.

SCOTCH BROOM : Indicates soils are low in fertility and acidic.

Soil functions : fixes nitrogen.

NUTRIENT DEFICIENCY INDICATORS

PLANTS & SOIL

Plant appearances can indicate nutrient deficiencies.

NITROGEN

General yellowing of older leaves at bottom of plant.
The rest of the plant is often light green.

Amendments : Heavy mulching or cover cropping with clover, vetch or other legumes
- Apply seaweed extract
- Apply compost tea of comfrey, stinging nettle, yarrow, dandelion and kelp

SULPHUR

Younger leaves turn yellow first,
sometimes followed by older leaves.

Amendments : Compost tea of stinging nettle and kelp
- Alfalfa hay as mulch

PHOSPHORUS

Leaf tips look burnt, followed by older leaves
turning a dark green or reddish-purple.

Amendments : Apply wood ash
- Sprinkle bone meal on soil
- Apply compost tea of chamomile, dandelion and yarrow
- Cover crop with chickweed

MAGNESIUM

Chlorosis or yellowing between leaf veins which stay green.
Leaves may have a marbled appearance.

Amendments : Short term, light spray of epsom salts
- Apply dolomite / limestone
- Apply compost tea of comfrey, dandelion, horsetail, kelp and yarrow

NUTRIENT DEFICIENCY INDICATORS

PLANTS & SOIL

POTASSIUM

Older leaves may wilt or look scorched. Inter-veinal chlorosis begins at the base, scorching inward from leaf margins.

Amendments : Apply seaweed, manure, granite dust or greensand to the soil in fall
- Apply hardwood ashes
- Apply compost tea of chamomile, stinging nettle, oak bark, yarrow, comfrey, dandelion and kelp
- Cover crop with chickweed or clover

CALCIUM

New leaves (top of plant) are distorted or irregularly shaped. Causes blossom-end rot.

Amendments : Apply compost tea of chamomile, comfrey, kelp, horsetail, stinging nettle and yarrow

MANGANESE

Yellowing occurs between the veins of young leaves. Pattern is not as distinct as with iron. Reduction in size of plant parts (leaves, shoots, fruit) generally. Dead spots or patches.

Amendments : Sprinkle dolomite/ limestone on soil
- Cover crop with chickweed.

COPPER

Leaves are dark green with necrotic (dead) spots, plant is stunted, brown areas near the leaf tips.

Amendments : Compost tea of chamomile, horsetail, comfrey, stinging nettle, yarrow and kelp
- Apply aged organic manure and compost tea

PLANTS & SOIL
NUTRIENT DEFICIENCY INDICATORS

IRON

Yellowing occurs between the veins of young leaves.

Amendments : Add bone meal or blood meal organic amendments
- Add 5 cm of compost in the spring every year

MOLYBDENUM

General yellowing of older leaves (bottom of plant). The rest of the plant is often light green. Heads can fail to form. Leaves will become thin, elongated and rippled.

Amendments : Add lime before planting
- Cover crop with clover

ZINC

Terminal leaves may be rosetted, and yellowing occurs between the veins of the new leaves.

Amendments : Apply aged organic manure
- Compost tea of kelp
- Mulch with hay

BORON

Terminal buds die, witches' brooms form. Youngest leaves may be red, bronze or scorched also small, thick or brittle. Stems stiff. Leaves highly tinted purple, brown and yellow.

Amendments : Apply household borax : 14 ml (1 tbsp) borax to 11 litres of water. This will do 3 square metres of soil. Apply two times 2-3 weeks apart
- Compost tea of kelp or mulch with cardboard

SOIL ECOLOGY
LIVING SYSTEM

Soil is life. Plants are fed by the soil. To have healthy plants we need to cultivate a healthy soil. Feed the soil and let the soil feed the plants. This means having an awareness of the soil ecology and how to best serve its needs.

Here are some of elements in healthy soil ecology:

- Primary decomposers like bacteria, fungi, millipedes, wood bugs and worms eat composting material when it is wet. They mostly eat the softer material and create deposits of rich food for other creatures to digest
- Secondary decomposers like mold mites and beetles live on the primary decomposers leaving deposits of a more dynamic food
- Tertiary decomposers like centipedes, beetles, ants, and spiders, feed on both primary and secondary decomposers yielding a third level of processed food

These three food deposits and the remaining hard organic matter combine to form complex molecules of humus which are broken down slowly, particularly when the soil is low in nutrients. Humus expands and contracts when it gets wet, aerating the soil while holding and releasing water. It is from these deposits of partially digested and broken down material that most plants feed. How plants gain their nutrients provides a greater insight into the ecological process. Plants excrete acids which break down humus and release the nutrients available to plants in the right amounts. At the same time plants secrete exudates including sugars, proteins, carbohydrates and minerals which bacteria and fungi eat. These microbial bacteria and fungi excrete antibiotics that protect plants from disease as well as acids and enzymes that help break down humus further so the plants can share in the nutrient yield. In this way a symbiotic circle is developed between plants and soil organisms. All soil micro-organisms play a diverse role in sustaining the whole ecology. For example, some bacteria secrete gums, gels and waxes that help hold the soil together, assist the absorption of water and storage of nutrients. Most of what is digested and transformed into living matter is carbon containing molecules. Carbon is the building block of organic life. Undigested materials include many soluble minerals which are held in the soil by humus and soil organisms.

LIVING SYSTEM
SOIL ECOLOGY

Healthy soil is alive, actively growing and recycling, breathing and digesting. This is the great recycling system of the Earth. One teaspoon of healthy soil contains a billion bacteria, a million fungi, and ten thousand amoebae.

Most soil organisms are either small or microscopic. The most common kinds are: bacteria, actinomycetes, fungi or molds, algae, protozoa, nematodes, roundworms, threadworms, earthworms and arthropods.

- Bacteria and micro-organisms help break up the compost
- Aerobic bacteria breathe air and break materials into a sweet smelling soil affiliated with the decomposition
- Anaerobic bacteria exist without oxygen and break materials into a smelly sludge affiliated with rot
- Fungi break down harder, ligneous material & allow bacteria to gain access to it
- Protozoa are single celled organisms including amoebas, flagellates, and ciliates. These eat bacteria and fungi, releasing nitrogen and other nutrients into the soil
- Arthropods are beetles, spiders, millipedes, centipedes and other invertebrates that break down organic material allowing bacteria and fungi easier access
- Worms digest and break down dead organic matter including rocks, releasing a high nutrient water soluble casting which contains accessible food for many creatures and plants. With gizzards in their gut, worms produce nutrient rich food which they spread through the soil while creating tunnels which aerate the ground
- Snails and slugs eat organic material and add slime to the soil that helps it hold together and retain moisture

Fungal dominant soil helps woody plants grow effectively, supports soil biology, protects from disease and pathogens, helps plants get food and water.

Bacterial dominant soil has great conditions for living organisms & decomposers and best supports annual vegetables and grains. Soils serving different functions may have different ratios of fungal to bacterial content.

SOIL ECOLOGY
LIVING SYSTEM

In the soil, balance involves three areas: chemical, physical and biological. All are related to each other.

CHEMICAL : minerals and nutrient elements used by plants to grow

BIOLOGICAL : soil organisms which decompose raw organic matter to make humus, which holds water and nutrients

PHYSICAL : the soil's texture and structure which relates to aeration and drainage

All three are tied together and are equally important for production of high quality crops.

Cation Exchange Capacity of soil is a characteristic that enables soil to hold onto essential nutrients and buffer against acidification.

Synthetic fertilizers are dangerous as they flood the soil with an over saturation of nutrient. The fertilizer that cannot be absorbed gets into the water table and can drain in concentrated forms throughout the watershed. Unbalanced soil can attract disease in plants and animals. Over fertilizing can also create a frenzy of activity by micro-organisms, giving them a burst of energy to process much of the humus and other nutrients in the soil. Although this may give a greater production in the soil for one season, it will ultimately deplete the soil of nutrients, create a dependence on fertilizers and produce an unhealthy soil ecology.

"You can replace dolomite lime with wood ash,
it is slower to shift pH but has more minerals and is readily available
(wood stoves) without needing a mine or transportation." - Robin Wheeler

"If you will stay close to nature, to its simplicity, to the small things hardly noticeable, those things can unexpectedly become great and immeasurable."
- Rainer Maria Rilke

COMPOST DESIGN
NUTRIENT CYCLING

COMPOSTS make good homes for decomposers like worms and pill bugs and the countless other aerobic creatures that live in the same habitat.

- Create conditions that are warm, dark and damp
- Promote oxygen and airflow, allowing aerobic decomposers to breathe and CO2 to escape
- Create the ideal amount of water content. Water dissolves and carries soil nutrients to plant roots, allowing decomposers to move around. The compost should be as wet as a rung out sponge, having a thin layer of moisture coating everything and making it easier for the decomposers to do their work. If it is too dry the microbes, worms and bugs will dry up or leave. If it is too wet the compost will become compacted, anaerobic and not have proper air flow. When it has good drainage and a lid with small drip holes to let a little rain in, the compost may never need additional watering
- Protect from climate : heat, cold, rain, wind, sunlight & snow using a lid.
- The decomposition process generates heat. The hotter your compost is, the faster the decomposition will take place. Turning the compost will heat it up as will adding manure or meat. A lid on the compost prevents it from losing too much heat. The more you turn a compost, the quicker it will decompose but the less nutrient it will have. Additional oxygen and access to nutrients gives the decomposers a burst of energy to consume more and process more. This results in quicker action but also uses up more nutrients in the process. If you don't turn your compost, and it is properly layered with green and brown materials, it will take longer to decompose but be richer in nutrient
- Consider adding meat and bones to "Bokashi" compost system, an aerobic fermentation process that can happen in a sealed container inside your home
- Consider adding cooked foods with oil, dairy, sugar or wheat to a pit compost
- Lime can be added to reduce acidity, help the worm's digestive system and aid in the conversion of ammonia to nitrates. This assists the activities of microorganisms by breaking down clay elements and binding sandy elements. An easy way to get lime is grinding up dried eggshells
- Adding charcoal or ash to the bottom of the compost will absorb poisonous gasses and sweeten the heap
- Done inside a greenhouse, composts can generate heat in the cold season

3 BIN SYSTEM
COMPOST DESIGN

3 BIN COMPOST

Compost can be made using three large wooden boxes, bins or simply piles on the ground. Any non-plastic containers for compost will work including hay, burlap, dirt, stone, brick and cement. The first bin is where you start your compost. The second bin holds carbon rich brown materials for layering. Third bin is what you use in composting while the first bin is left alone to decompose.

Locate the compost somewhere shaded, as this will slow down evaporation and allow the compost to remain damp. The boxes can have lids on hinges with 10 cm (1/4 inch) slats or drip holes to allow rainwater in. The sides of the boxes can have 2 cm (3/4 inch) spaces between the boards to allow air flow in to support the aerobic (oxygen loving) decomposers. Line the structure with fine mesh wiring to keep rodents out. The front of the composts can be made with a removable slat system so you can take the front off board- by-board to access the compost material easier than having to reach in from the top or remove the entire front panel. The brown storage box does not have slats to let in water or extra oxygen. Ideally the brown storage does not get too wet so it does not decompose too much before being added to the compost as the brown layer. Start the compost process by laying cardboard over the ground at the base then cover this with rocks and sticks for drainage along with wood ash to sweeten the pile. Any living plants on the ground will turn into soil and attract worms up into the system. Start with a layer of about 10 cm (4 inch) of mostly green plant waste. Then follow with a small layer of soil. This will inoculate the pile with micro-organisms. When you first start the compost you could purchase Red Wiggler worms at a pet store or gas station and add them. These worms are more prolific speeding up the compost, exponentially expanding in numbers and will tend to come closer to the surface to do their work. On top of this place a layer of about 10 cm (4 inch) of dried brown material. Biodynamic plants or preparations can be added into the layers. Continue with roughly balanced amounts of green and brown to get a heavy, rich fertilizing soil amendment. Always make sure the top layer is brown anytime you add green. For example leaves or straw should always be on the top of the pile when you open the lid. This will keep smells down, pests out and maintain the ideal dark damp environment.

VERMICULTURE
COMPOST DESIGN

VERMICULTURE WORM BIN

Attach a worm bin to the back or side of the compost to create a biologically rich 'vermicompost' for making 'worm castings'and 'compost tea'. Both of these products can be used as a soil and plant fertilizer. A vermiculture system can be built from a wood, metal, porcelain or glass sink that is raised up so a bucket can fit underneath it. Raise the sink on a wood frame and cover with a lid that has small holes in it for rain percolation. Make it high enough to fit a glass, steel or clay receptacle underneath. Surround the sink with a wood box to keep out the heat, cold and pests. Rain drips through the small holes in the lid and percolates down through the worm farm, dripping into the bucket below to form a potent liquid fertilizer. The worm compost material can be sifted monthly to yield rich worm-castings used as a top dress on gardens to fertilize soil. Simply spread the contents of the worm bin on the ground in the sun and the worms will go to the bottom, scrape off the rich fertilizer then collect the worms and put them back into the worm bin, compost and surrounding gardens.

Set up the bin with torn up newspaper and kitchen scraps including organic vegetable matter like old salad greens, carrots and potatoes (including peels), tea and coffee grounds, grass clippings, as well as biodynamic and Quick Return (QR) composting super plants (shared later in this section). Add brown material like leaves and brown grass to keep it from compacting. If you want you can add red wiggler worms from a pet store or gas station. These worms eat and reproduce vigorously while tolerating climate extremes more than native worms.

Custom fertilizers can be made by adding specific beneficial plants which may be planted around the compost. Avoid meat, citrus, dairy, onion, spicy and processed foods, fats, oils and shiny paper. Feed worms with tender greens and other nutrient rich plants. Worms often tend towards mild flavours but will eat most things. The worms can be fed up to an inch a day. Only add food as it is eaten. The smaller size chunks of wood you add, the easier the worms can consume them. If the compost begins to dry out, sprinkle it with water. Check the bucket under the worm bin semi regularly. When full, add to a watering can diluting 1 part worm juice to 10 parts water and share with your lucky plants.

MULCHING
COMPOST DESIGN

MULCHING is how nature covers the soil with leaves and organic matter. Permaculture mimics this functional design by adding mulch to cover bare soil, protect plants and add to soil stability. Mulch materials include hay, lawn clippings, green chipped organic materials, sawdust, bark mulch, wood chips, cardboard, newspaper, sugar cane, banana leaves, cloth and other biodegradable, non-toxic materials.

Mulch plays many important functions in the garden or farm

- Improves soil structure
- Provides protection for soil and soil organisms from erosion and compaction
- Retention of soil moisture, reducing evaporation and the need to water
- Keeps soil warmer in the winter and cooler in the summer
- Moderates soil temperate which is great for microbes, root growth and uptake of nutrients
- Provides carbon and nutrients to soil
- Limits weed growth, if thick enough it can prevent weed seed germination
- Reduces likelihood of diseases and rebalances soil
- Dark colored mulch enables the soil to warm up quicker leading to faster germination of plants, particularly in greenhouse or cold frame environment
- Light coloured mulch reflects light and keeps soil cooler

SHEET MULCHING

Layering newspaper, cardboard, hay, organic matter, manures, liquid fertilizer and other biodegradable materials is a great way to build new soil. This can be many feet thick and can include any organic materials. Sometimes this is referred to as 'lasagna mulching' since it includes layers of organic matter, often separated by layers of hay, cardboard or newspaper. Lower levels of thick sheet mulches sometimes contain humanure, just be careful of leaching down slopes.

HUGELKULTUR

A compost pile that can be turned into a garden while decomposing. The hugel, or mound, is made up of tougher materials like brambles, branches, woody materials and fruit pits that do not break down at the same rate as the other garden waste. Together these slow decomposing materials can be used to make a productive living compost 'mound' bed.

Choose an area to store these materials near the compost or even a place to build this bed in place. Cut existing plant growth down to just above the ground. Wet the area well to start. Lay down newspaper and cardboard. Wet this again to begin the decomposition process and attract worms. Lay down heavy peaces of wood first. Follow this with layer of lighter wood. Brambles can go next. Add some soil to kickstart the process. You could add composting super plants at this stage also.

When you are ready to plant, cover the pile with a layer of compost. Place a layer of soil on top. Plant with spike-root plants as these will help break down the wood. Jerusalem artichoke and comfrey do well here. These are also ideal beds to grow composting super plants. Hugel beds hold water and are drought resistant. They also generate heat while decomposing, making the gardens warmer in the winter for the first few years of its process. Eventually these beds will be totally broken down into garden soil.

"Information is the most portable and flexible investment we can make in our lives; it represents the knowledge, experience, ideas and experimentation of thousands of people before us."
- Bill Mollison and Reny Slay

BIODYNAMICS & QR COMPOSTING
COSMIC CONTEXT

BIODYNAMICS & QR COMPOSTING

The patterns of growth and change on our planet are influenced and patterned from the sun, moon, planets in our solar system and celestial bodies in our galaxy. Biodynamics aligns us with natural time and supports us to plant, feed and harvest according to these larger cycles.

Inspired by Biodynamics, the Quick Return 'QR' composting method was innovated by Rudolf Steiner's student Maye Emily Bruce who started the Soil Association in the UK. This was set up for people without the cows, stags and quartz crystal dust required in the traditional biodynamic systems.

Locally grown and harvested compost super plants are slow dried and powdered with mortar and pestle. Honey is rubbed into dried sugar of milk. The powder lasts forever but is recommended for use within a year. The powder can also be added to the compost or mixed with rainwater to make a liquid feed, one pinch per wine bottle of water. Let liquid feed sit for 24 hrs before adding to the compost and it lasts for one month. Store QR activator in glass in the dark. The QR method uses insulation like straw, sacking or fabric to hold in the heat and utilizes the Biodynamic Plants, some of the most powerful food-medicine plants on the planet.

A student of history, Rudolph Steiner noted that the great civilizations of the past including the Egyptians, Tibetans and Celts recognized certain power plants to have healing and nutritive qualities for people, animals, plants and soil organisms. They have high mineral content and are master medicines for all life in Earth's ecosystem. Rudolph Steiner claimed they each collected light and energy from the planets in our solar system.

BIODYNAMIC PLANTS

Incredibly, the compost plants have many different healing and nutritive qualities for people, animals, plants and soil organisms. They also have high mineral content and a long history of cultural significance. Biodynamics identifies these as some of the master medicine plants for Earth's ecology.

CHAMOMILE : Matricaria Chamomila

- Sacred herb from Egypt and Pagan traditions
- High in potash, lime, phosphorus and sulphur
- Anti-inflammatory, anti-bacterial and anti-spasmodic
- Tea has a calming effect
- Restores and heals sick plants
- Increases production of essential oils in plants growing around it
- Biodynamics notes the affinity between chamomile and calcium, it is said to help guide the calcium forces in the breakdown of natural materials

DANDELION : Leontodon Taraxacum

- Used widely in Chinese medicine and European traditions
- High in potassium, iron, phosphorus, calcium, manganese, sodium, silicic acid and choline
- The roots contain inulin
- Good for treating gall bladder, stimulates digestive glands and liver issues
- Biodynamics notes this aids in the relationship between potassium and silica, allowing plants to draw on substances and forces from the entire district in which they live

BIODYNAMICS & QR COMPOSTING

COSMIC CONTEXT

VALERIAN : Valeriana Officianalis
- Long history of medicinal use in the west
- Cats and earthworms love it
- High in potash, lime, phosphorus and sulphur
- Promotes calmness and aids sleep, nervous tension, cramping, and also lowers blood pressure
- Famous in biodynamics for imparting warmth to the compost and for having readily accessible phosphorus content

YARROW : Achillea millifolium
- Used in Chinese and Western medicine for hundreds of years
- High in iron, lime, nitrates, potash, phosphorous and sulphur
- Heals wounds, lowers fevers and blood pressure, stimulates digestion
- Biodynamics notes that its particularly good for replenishing soils

STINGING NETTLE : Urtica dioica
- Long history of medicinal use
- High in iron, magnesium, silicic acid, formic acid, carbonic acid, sodium, potassium, calcium, ammonia, and vitamins A, B and C
- Blood cleanser, treating arthritis, lowering blood sugar, and encouraging breast milk production
- Helps neighbouring plants be more resistant to disease and increases content of their essential oils
- Stimulates the formation of humus in the soil
- Raises the heat of the compost pile
- Biodynamics claims it helps keep nitrogen content in soil from evaporating and enhances vegetative growth in plants

OAK BARK : Quercus robur
- A sacred tree of the Pagan traditions
- High in potassium, lime and calcium
- Anti-inflammatory and antiseptic
- Biodynamics notes its special anti-fungal qualities in the compost
- Has a huge amount of implicate ecological connections

Alternative species of Biodynamic Plants
English Oak - Quercus robur
Sessile Oak - Quercus petrel
Stinging Nettle - Urtica lyallii
Stinging Nettle - Urtica holosericea
Stinging Nettle - Urtica angustifolia
Valerian - Valeriana sambucifolia
German Chamomile - Matricaria recutita

QR ADDITIVES

COMFREY : Symphytum officinale
- Extremely high in potash, nitrogen, potassium, magnesium, calcium and iron
- Rich in protein but with low fibrous carbon so it breaks down quickly
- Great for making compost teas
- Heals bruises, burns, sores, sprains, broken bones
- Leaves have same balanced NPK ratio as finished compost

HORSETAIL : Equisetum arvense
- High in silica
- Fungicide against mildew, rust and blackspot and discourages soil diseases
- Tea can be used to clean greenhouse
- Preventative medicinal tea for prostate in men
- Diuretic supporting kidney & bladder, strengthens bony tissue, hair and nails

HOLLYHOCK : Althea rosea - High in Iron, Soda, Potash, Phosphorus, Lime, Sulphur

BLACK WALNUT : Juglans nigra - High in Iron, Phosphorus, Potash, and Sulphur, allelopathic juglone toxin breaks down when exposed to air, water and bacteria

ALPINE STRAWBERRY : Fragaria vesca - High in Lime, Soda, and Phosphorus

YELLOW DOCK : Rumex crispus - High in Iron and Sulphur

CALENDULA : Calendula officinalis - High in Lime and Sulphur

SAGE : Salvia officinalis - High in Potash, Lime, and Soda

BLACK ELDERBERRY : Sambucus nigra or graveolens spp. - High in Iron, Potash & Soda

CHICORY : Cichorium intybus - High in Iron, Potash, Lime, and Soda

RAW HONEY
- Used for medicine for 4000 years
- Contains fructose, glucose, enzymes, sugars, gluconic acid, vitamins, minerals and amino acids
- Promotes growth of healing tissues and speeds up the healing process
- Anti-bacterial and antibiotic
- Draws in moisture from the air
- Preserves what you immerse inside it

SUGAR OF MILK
- From the whey of cow's milk by evaporation and purified by recrystallization
- Contains lactose, galactose and dextrose

QUARTZ CRYSTAL
- Absorbs and radiates light
- Enhances the effects of warmth and light on plants
- Supports photosynthesis

ROCK DUST
- Found in common road gravel
- Regenerates and remineralizes soils

MANURE
- High in bioavailable minerals and nutrients
- Taises the heat of the compost pile
- Cow, horse, sheep, goat, llama, rabbit, guinea pig, and poultry manure is commonly used in composting

TROPICAL COMPOSTING
SUPERPLANTS

Many plants that are grown as perennials in a temperate climate will grow as annuals in an arid environment, usually in the cooler months. Having a shady area for these plants to grow and plenty of water may keep them alive over the hotter months. For important plants, give them space in your wicking bed. It may be necessary to dry your home-grown plants and use as a powder in your compost, compost tea or in the garden. Dry matter may have a slightly different nutrient content. Perennial arid land plants Lucerne and Old Man saltbush between them give us N, K, Ph, Mg, Ca, S, Mn, Mo, Cl, Na, Se. Once Borage is established it is perennial and adds Ni. Stinging Nettle grow as winter weeds in arid lands adding Fe and Cu.

PRIMARY ELEMENTS

N : NITROGEN
Lucerne, Stinging Nettle, Dandelion, Saltbush

K : POTASSIUM
Lucerne, Chamomile, Stinging Nettle, Oak bark, Dandelion, Borage, Saltbush, Watercress, Purslane

P : PHOSPHOROUS
Lucerne, Chamomile, Dandelion, Lamb's Quarter (fat hen), Saltbush

SECONDARY ELEMENTS

MG : MAGNESIUM
Lucerne, Saltbush, Purslane, Stinging Nettle, Sow Thistle, Watercress

CA : CALCIUM
Lucerne, Chamomile, Stinging Nettles, Fat Hen, Central Australian Fig (Ficus platypode), Saltbush, Cleavers, Watercress

SUPER PLANTS
TROPICAL COMPOSTING

FE : IRON
Dandelion, Stinging Nettle

B : BORON
Euphorbia spp.

MN : MANGANESE
Saltbush

CL : CHLORINE
Saltbush

CU : COPPER
Stinging Nettle, Dandelion, Legumes

ZN : ZINC
Legumes

SI : SILICON
Legumes, Borage

NI : NICKEL
Borage

CO : COBALT
Vetches

Na : SODIUM
Saltbush, Watercress

Se : SELENIUM
Saltbush

MO : MOLYBDENUM
Lucerne, Saltbush, Walnuts, Almonds, Sunflower seeds, Lentils, Bean

DESIGN FOR TREES
ELEMENT OF EARTH

EARTH FUNCTIONS

- Builds soil with biomass
- Feeds soil with captured nutrients and mulch
- Sinks carbon
- Provides habitat for countless insects, animals and plants
- Can be nitrogen fixing and bioaccumulating
- Insulates houses and structures
- Provides fuel and construction materials
- Provides food, nesting materials, medicine and tools for people and animals
- Plays a key part of forest guilds and its symbiotic community of life
- Protects from climatological factors
- Teaches people how nature works

EARTH FACTS

- Trees give back 25% of their mass as nutrient rich biomass each year
- Trees infuse 85% of rainfall with nutrient from plant cells, salts, dust, minerals and organic matter which slowly drips to the ground
- The most rot resistant trees in cool climates are osage orange, cedar, black locust, pacific yew and red mulberry
- 13 million hectares of forests are cleared annually
- On average each person uses two trees a day of wood their whole lives
- Nearly half the world's species of plants, animals and microorganisms will be destroyed or severely threatened over the next 1/4 century due to deforestation
- We are losing 137 plant, animal and insect species every single day due to deforestation
- Consumers consider supporting sustainable tree products that last at least as long as the tree takes to regrow
- Trees generally grow foliage in the spring, trunks in the summer and roots in autumn and winter

ELEMENT OF AIR
FACTS & FUNCTIONS

AIR FUNCTIONS

- Deflects, channels or blocks wind
- Collect nutrient carried by wind and rain
- Filters disease and weed seeds from wind
- Cleansed and oxygenates air
- Dehumidifies air in wet tropic climates
- Humidifies air in dry climates
- Indicates wind sectors

AIR FACTS

- A 30 meter high tree, 45 cm diameter at its base, produces 2721.5 kg of oxygen
- A single mature tree can absorb carbon dioxide at a rate of 22.7 kg / year and releases enough oxygen back into the atmosphere to support 2 human beings
- One acre of trees annually consume the amount of CO2 equivalent to that produced by driving an average car for 41,483 km (26,000 miles). That same acre of trees also produces enough oxygen for 18 people to breathe for a year
- 60% of wind is forced up over the trees, then forms and falls as Eckman spirals. Trees can cause the moisture to drop because of the upward, forced spiralling of the wind. Rain can be caused by these spirals if there is any moisture in the air

"We should not be passive workers for established destructive systems, but rather we can be investors in life."
- Bill Mollison

ELEMENT OF FIRE (LIGHT & HEAT)

FACTS & FUNCTIONS

LIGHT & HEAT FUNCTIONS

- Trees gather light for photosynthesis creating food for all life
- Forests are the great energy catch and storage systems of the Earth
- Absorb heat and cold to moderate temperature
- Create shade from summer sun

LIGHT & HEAT FACTS

- Trees trap more than 50% of the total sun's energy harvested by life on Earth
- Trees make their own food from sunlight, water, carbon dioxide and soil
- Tree leaves contain many different color pigments revealed at cooler temperatures
- The majority of tree roots are non-woody and live for a few weeks at a time
- Inserting screws or nails into a tree can cause decay and death
- Non-staked trees usually end up stronger than staked trees
- 98% of a tree is made up of six elements : carbon, hydrogen, oxygen, nitrogen, sulphur and phosphorus
- Lightning strikes the earth 100,000 times a day and up to 20% of these strikes can cause a fire
- Forest fires are part of the natural life cycle of the forest

ELEMENT OF WATER
FACTS & FUNCTIONS

WATER FUNCTIONS

- Purify water
- Cause condensation (may exceed annual rainfall)
- Slow down runoff by absorbing water and causing a drip effect
- Evaporation during hot days cools air
- Condensation during cool nights warms air
- Pump water from the soil into air with transpiration
- Transpiration causes cloud cover and rainfall
- Seed rain by putting particulate into the airstream
- Collect frost which melts to increase groundwater
- Slows snowmelt for longer release of water in spring thaw
- Biomass of trees holds nutrients and water
- Pump water out of the ground, keeping the water table from reaching the surface
- Reduce ground evaporation and erosion
- Moisture is condensed at night on trees because it is relatively cooler than the air or wind

WATER FACTS IN SOME BIOMES

- 60% of inland water comes from forest transpiration
- Trees can put more water into streams and lakes than rainfall due to capturing condensed moisture
- Ocean evaporation comes over land: 15% as rainfall, 85% as condensation
- Forests intercept 10 - 15 % of rainfall in the canopy
- Up to 40% of annual rainfall in forested areas is caused by the forest itself
- Each day a single tree can consume 380 litres of water out of the ground and discharge it into the air as oxygen and water vapour
- Trees return 75% of precipitation to the air

STRATEGIES
PLANT MORE TREES

CAUSES OF DEFORESTATION

- Logging, habitat destruction, raising of water table, climate change

STRATEGIES

- Plant more trees and maintain trees with pruning, thinning, pollarding & coppicing
- Trees to stabalize slopes, ridges and waterways
- Plant contour forests on slopes steeper than 15 degrees
- Fedges (Food Hedges) & Wildlife Corridors
- Ideally, 30% of land should be forested
- Use hedges to protect areas 5 times their height
- Food Forestry
- Windbreaks & firebreaks
- No or Low Tillage which destroys soil structure and releases carbon dioxide
- Permanent soil cover and seasonal cover crops
- **Alley (Avenue) Cropping** uses alternating beds of food, fodder, mulching plants & trees
- **Agro-Forestry** reintegrate trees and animals into agriculture
- **Syntropic Agroforestry** is a strategy utilizing the ecological succession of species, high density companion planting, permanent soil cover and strategic pruning adapted to nature's native conditions

POLYCULTURE STRATEGIES

- Plant a diversity of perennials and annuals together
- Seed several varieties of each species
- Plant early and late season varieties
- Sow seeds thickly and thin young plants for food or compost
- Rotate crops with mixed plant families and species
- Include fast-growing, shallow rooted species when getting larger plants established

POLYCULTURE STRATEGIES CONT.

- Overlap and spread out harvests
- Avoid root and light competition
- Leave some plants for seed
- Use companion planting and interplanting

CARBON CYCLE : Atmospheric carbon (eg. carbon dioxide and methane) retains heat in the atmosphere. Carbon is absorbed during photosynthesis and dissolves directly into water. Some organisms get carbon directly from the air, some through consumption of other organisms. Carbon is stored in living organisms and in the soil, it is also stored in no-longer-living material below the ocean and deep in the earth. Carbon is released back to atmosphere through respiration or composition.

NITROGEN CYCLE : Atmospheric nitrogen makes up 80% of the atmosphere. It is absorbed in nature by nitrogen fixing bacteria and lightning strikes. It is released by animal waste or any dead life forms which is converted to ammonia by bacteria. Ammonia can be converted to nitrates by other bacteria. Nitrates are converted back into nitrogen gas by still other anaerobic bacteria.

PHOSPHORUS CYCLE : Rain and weathering causes rocks release phosophate into soil and water. Plants uptake phosphorus from the soil with the help of fungi. Plants are consumed by animals. Dead plants or animals return phosphorus to the soil.

ENERGY FLOW FOOD CHAIN : Solar Energy is converted through photosynthesis by primary producers. Primary consumers, herbivores, eat plants. Secondary consumers, carnivores, consume primary consumers (and primary producers). Tertiary consumers consume secondary consumers. Decomposers break down organic matter and release nutrient into the soil. Energy is lost at each stage.

POLLINATION : Some plants are self-pollinating, others rely on insects, animals or wind to help.

NATURAL SUCCESSION
MASTER PATTERN

SUCCESSION

- Succession is a master plan for nature and the universe, a repeating pattern of birth, growth and death. Life cycles through a process of stages in its development where each successive stage is made possible by, and succeeds, the previous
- Identify the stages of succession for you and your site as design considerations
- Locate yourself and your design site in the succession process
- When and where are you in the sequence of natural succession or human negative impact?
- There is an opportunity to fast track, slow down or pause succession by intervening at the right time

Succession over 10 years from garden to forest garden

- From full sun plants to a dappled understory
- From plants climatized to weather to those who benefit from sheltered microclimates
- From highest production in lower layers to highest production in upper layers
- From needing imports of soil and mulch to being self sustaining

Succession over 1000 years from clearcut or woodland fire to ancient forest.
At each new stage, new plants join the guild.

After 1- 5 years

- Pioneering plants including annual ground covers, weeds, grasses and perennial herbs

After 5 - 20 years a new ecosystem is forming

- Including shrubs and woody plants

After 20 - 80 years comes an immature ecosystem

- Young wild trees

After 80 + years comes a mature ecosystem

- Overstory canopy drops biomass and understory diversity can drop off

After 500 + years comes an ancient ecosystem

- Stabilized forest that grows to climax by 1000 years

MASTER PATTERN
NATURAL SUCCESSION

CONVENTIONAL FARM : annual plants clearcut and harvested every year, low biomass, low diversity, non-living mineral source of nutrient, low organic matter, few microclimates, low productivity, damaged by weather, rain, wind, sun and climate. Farm stays in the very beginning stage of succession.

FOREST : perennial plants, high biomass, diversity and organic matter, many microclimates, biological source of nutrient (plants, animals and humus), complex niches, many symbiotic relationships, high productivity, enhanced by rain, wind, sun, climate.

PERMACULTURE FARM : perennial forest gardening. High productivity. Acts like a highly productive forest system of mixed perennials and annuals to gain the advantage of being in all stages of succession at once!

"Animals are the messengers of the tree, and trees the gardens of animals. Life depends upon life. All forces, all elements, all life forms are the biomass of the tree."
- Bill Mollison

DESIGN FOR ANIMALS
FACTS

Integrating wild and domestic animals brings fertility and abundance. Animals allow us to work with nature in creating effective, efficient and ethical landscapes.

ANIMAL FACTS

- More than 15,000 new species of animals are discovered each year
- 80% of the world's animal species have not been discovered yet (most are tropical insects & arachnids or oceanic life)
- 1/3 of human food is reliant on bees in some way
- Animal livestock covers 45% of the Earth's total land
- 10,117 square metres (2.5 acres) of land are used per head of cattle
- Agricultural practices in industrial scale livestock trade is the leading cause of habitat destruction, species decline and water pollution
- As many as 2.7 trillion marine animals are pulled from the ocean each year
- For every kilogram of fish caught, up to 10 kilograms of unintended marine species are caught and discarded back to the ocean as bycatch
- Using industrial agriculture:
  4050 square meters (1 1/2 acres) can produce 16,780 kg of plant-based food or 170 kg of meat

BEST PRACTICES
STRATEGIES

STRATEGIES

- Create a functional design by taking all aspects of the animal and their needs into account
- All animals must have access to good shelter. If it's too hot, cold, wet or windy for us, it's the same for them
- Ensure suitable local conditions & reduce impact to the natural ecology
- Establish the system then introduce the animals. Quarantine all new animals
- Ensure sustainable water access
- Increase onsite food production of animal feed
- Design for forage, consider welfare, needs and protection
- Research stocking rates and breeding habits
- Build appropriate fencing
- Learn how to work with manure and outputs
- Design for diversity creating a living environment for predators and beneficials
- Fencing to prevent farm animals from accessing ponds, dams and waterways
- Integrated food forestry with poultry systems
- Know where your local animal hospital or vet is located
- Chicken tractors
- Dog or llama runs around property edge for protection
- Avoid netting that will tangle birds, snakes and other friendlies
- Green belts and wild animal corridors
- Automated water and feed dispensers
- Animal shelter rainwater catchment
- Fodder plant guilds
- Fodder along fence edges
- Plant forage forests to allow animals to live outside during the daytime in the winter

Pasture Cropping : Annuals interplanted with grass
Rotational Grazing : Moving animals around
Mob Grazing : Short duration, high intensity
Ha-Has : Recessed landscape elements creating a vertical barrier without hampering view

ANIMALS FOR ALL ZONES

GRACE SOLKINSON

Design zones for animals depending on how often they will be visited, access, appropriate ways to move them to safety in an emergency and relative location to food, water, shelter and protection.

INSIDE THE HOME

Dogs, cats & other pets provide companionship and protection, eat scraps and reduce rodents. Fish tanks can provide habitat for pets or a way to raise food.

Newly hatched chicks and sick baby animals needing intensive care and a stable temperature can be kept indoors until strong enough to return outside.

GARDEN

Beneficial wild allies such as birds, frogs, toads, lizards and insects who help control pests.

Rabbits for high-nutrient garden-safe manure. Chickens to fertilize, scratch and control pest insects. Ducks to fertilize and keep down slugs and snails. Quail can be kept on a micro scale, eating garden and food scraps while providing fertilizer for compost. Poultry provide eggs. Poultry and rabbits have the potential to provide local small protein options.

An aquaculture system with fish or other aquatic animals can be included in the garden if desired.

DESIGN FOR SPACE
ANIMALS FOR ALL ZONES

FOOD FOREST
A couple pigs, goats or sheep could live comfortably in a quarter acre plot. Beneficial wild allies include snakes, bats, or predatory birds including guinea hens.

Many of the animals in the garden can be raised here on a larger scale. Geese to trim leafy weeds. Turkeys to keep down insects and fertilize the soil.

A small pond or aquaculture system could be included to introduce fish and other beneficial aquatic species.

Easy access area for an intensive care pen for birthing or sick farm animals.

FARM
Larger scale farm animals such as cattle, pigs, sheep, goats, llamas & alpacas eat surplus farm produce, trim pastures, fertilize the soil and support healthy soil and produce beneficial products such as milk, wool or protein.

Guardian animals such as maremma sheepdogs, llamas or donkeys can be kept with livestock as protectors and companions.

Horses can be kept as draft animals or as companions.

WOODLAND
Farm animals such as pigs, cattle and turkeys can be forest farmed in woodland spaces, grazing and protecting space, or used for hunting wild game.

NEEDS, FUNCTIONS
PRODUCTS AND CHARACTERISTICS

Place elements in a way that each serves the needs, and benefits from the products, of other elements. Do a needs, products, behaviors & functions, intrinsic characteristics analysis. Make a new list for every kind and breed of animal, as characteristics vary between breeds. Include for each animal :

Inputs/needs
Outputs/products
Behaviours
Intrinsic characteristics

Here is an example using chickens. This enable us to design suitable habitations with safe and weatherproof housing, roosts, nest boxes, fencing, and foraging.

CHICKEN'S NEEDS

- Shelter from wind, rain, hot sun, frost
- Shellgrit
- Protection from predators at all times
- Dry soil for dustbathing
- Clean water, air, sunshine
- Food, medicinal and high nutrient plants
- Space to roam and place to scratch and roost
- Shade and cooling in extreme summer heat
- Protection and warmth in very cold winters
- Other chickens but not too many as they become stressed in large groups
- Food storage must be rat and vermin proof
- Injured, disabled and rescued animals have additional special needs

ANIMAL SYSTEMS

TAMARA GRIFFITHS

CHICKEN'S PRODUCTS

- Company and love, eggs, feathers, meat, manure, methane & CO2

CHICKENS INHERENT CHARACTERISTICS & BEHAVIORS

- Walk
- Scratch for food
- Fly
- Roost at night
- Form flocks which have a social order
- Lay eggs
- Make noise
- Moult
- Dust bathe
- Rat plants and bugs
- Poo
- Forage
- Fight

Chickens vary with breed, heavy breeds cannot fly, lighter chickens can get over low fencing. Some are better layers, some are better at rearing broods.

NEEDS, FUNCTIONS
PRODUCTS AND CHARACTERISTICS

NEEDS, PRODUCTS, BEHAVIORS & FUNCTIONS, INTRINSIC CHARACTERISTICS FOR DUCKS

Based on Khaki Campbell Duck

DUCK'S NEEDS

- Water at least as deep as the nostrils
- Water for bathing
- Safe and fox proof night house
- Safe and fox proof day pen
- Warm clean housing in winter
- Outdoor undercover area for protection from snow
- Cool clean housing for summer
- Shade in summer, cool water
- Provide cool shelter and special treatment for days over 40° Celsius (104 F)
- Grains, pellets, greens, and love newly planted veggie seedlings
- Slugs, snails, grubs, sowbugs and worms
- Shell and grit
- Laying box
- Nesting box and pen for breeding
- Air
- Sunshine
- Other ducks
- Love
- Vet treatment when necessary

DUCK'S PRODUCTS

C02, methane, love, eggs, feathers, meat, bones, poo of varied consistency,
Poo in water equals nutrient rich water.

ANIMAL SYSTEMS

TAMARA GRIFFITHS

DUCK'S BEHAVIORS & FUNCTIONS

- Splashing
- Sweeping beak through mulch
- Feet that can squash plants
- Will denude pen area through sitting on plants and manuring
- Quacking
- Grumpy while moulting
- Friendship
- Teacher
- Hand raised ducks are very friendly
- Flying
- Fighting
- Mating (a drake needs about 5 ducks so the ducks don't get worn out. If in doubt get ducks only)
- Mating displays

DUCK'S INHERENT CHARACTERISTICS & BREED SPECIFIC BEHAVIOR

- Khaki Campbell Ducks have 3 colours: khaki, white and dark
- Prolific egg layer
- Not always good at brooding
- Highly carnivorous, loves slugs, snails, bugs, worms
- Breed is medium to light, will fly
- Intelligent
- Drakes have a curly tail
- Climate tolerant
- Good foraging
- Stay close to home. Can be good in a veggie patch if they aren't stepping on your seedlings and eating your lettuce and broccoli leaves
- Excellent foragers in a forest garden and mushroom patch (where slugs eat your mycelium and mushrooms)

ETHICS OF CARE

TAMARA GRIFFITHS

Ethics of care for the earth and care for people and all species are essential when designing for animals. Chickens can be kept in cages, given food and they still produce eggs. But this does not take the whole chicken into account.

Encourage natural behaviours of chickens and in doing so they do the work of turning soil, removing pests and adding fertiliser.

Anyone who has free ranged their chickens in an unfenced garden know that a chicken in the wrong place is destructive. A chicken in the right place is constructive and highly beneficial.

Design so that the needs of the chicken are provided by other elements and that chickens provide products for other elements. Provide and locate elements in the design to have happy chickens, minimum external inputs and no pollution.

PRINCIPLE

- Place elements in a way that each serves the needs, and accepts the products, of other elements.

COMMON PROBLEMS WITH ANIMAL SYSTEMS

- Pollution from manures on small and large scale
- Animals placed in the wrong part of the design
- Too much daily upkeep is required
- Shelter hosting non-complementary animals together.
- Noise complaints from neighbors.

INTEGRATED PEST MANAGEMENT
ETHICS OF CARE

PESTS
- Indicate that something is out of balance
- A natural part of life and may require deterring or elimination
- Aim for minimal or acceptable pest damage

CAUSES
- Monocultures
- Pesticides
- Warmer climate
- Increased humidity
- Drought
- Loss of natural habitat
- Lack of predators

INTEGRATED PEST MANAGEMENT
- Control pests by creating food and habitat for natural predators

COMMON COOL CLIMATE PESTS
- Mosquitos, aphids, mice and rats, slugs, skunks, raccoons, deer, bears, humans

COMMON COOL CLIMATE PREDATORS
- Dogs, cats, wasps, ladybugs, ducks, geese, guinea fowl, chickens, hawks, eagles, ravens and other birds, wolves, coyotes

COMMON COOL CLIMATE BENEFICIALS
- Butterflies, frogs, spiders, mason bees, hummingbirds, garter snakes, beavers

Avoid poisons or pesticides which inevitably cause collateral damage.

FODDER PLANTS FOR CHOOKS

LANCE WILDWOOD

By relocalizing your chicken feed, you can create a closed loop, saving time, energy and money while reducing your ecological footprint and feeding your chickens more nutritious food. Here are some great chicken fodder plants for the Cool Climates.

TREES

Mulberry (16% protein)
Mountain Ash / Rowan
Holly
Oak Acorns (cracked)
Maple Tree keys
Hawthorn
Persimmon (pigs favourite)
Fruit
Privet
Creeping Raspberry and Blackberry
Grapes
Rosehips
Goji
Sea Buckthorn
Kiwi
Weeds
Purslane
Duckweed
Chickweed

FOODER GARDEN

LANCE WILDWOOD

PLANTS

Comfrey (Russian Bocking 4 is a great cultivar)
Siberian Pea Shrub
Tagasaste
Alfalfa
Day Lily
Pumpkins and Squashes
Sunflower
Kudzu
Cow Peas
Fodder beets
Turnips
Jerusalem Artichoke
Clover (White Dutch is best)
Lambs Quarters
Dandelion
Golden Dock
Kelp
Bush Clover

Perennial Grains including Rye, Sorghum, Quinoa, Amaranth.
Grains won't work well for a free range system but great for fodder feed.

MEAT

Meal Worms
Slugs (feed in small pieces at first)
Black Solider Fly Larva (42% protein, 35% fat)
Mice

DEEP ECOLOGY
JOHN SEED & JOANNA MACY

DEEP ECOLOGY

Cultivate consciousness with a larger perspective on the role and place of people in the evolutionary history of life on Earth. This is a remix of an original story told by John Seed and Joanna Macy. Here we can think about our more-than-human world from a more-than-human perspective. The intention is to inspire imagination, explore evolution, and create a legacy of planetary stewardship.

Cradled in the 12.8 billion year history of the Milky Way Galaxy, our solar system evolved from a free horizon of cosmic clouds and galactic gasses. 4.5 billion years ago our planet was formed by the force of solar winds and gravity coalescing interstellar matter, followed by a 500 million year period when the Earth began to cool. 3.8 billion years ago the world ocean of prebiotic soup was potentized by an unknown event and the miraculous first cell was borne. We all trace our genetic and epigenetic lineage to this single event, as does every cell of every living thing on Earth. Every single cell in our bodies is a direct descendent in an unbroken chain from that original cell. In this way we are energetically and physically related to all living things.

The first one celled organisms evolved into forms of photosynthesizing bacteria, creating oxygen that formed Earth's biosphere. For over 2 billion years, life on Earth was entirely microbes who survived two 10 million year ice ages. These single celled organisms branched into the ancestors of plants, fungi and animals 1.5 billion years ago. The first multicellular organisms emerged and evolved into algae 300 million years later, creating an atmosphere that killed much of the bacteria and made it possible for further developments of life. Over the following period there were three more ice ages when a Snowball Earth wiped out many prehistoric gene pools. 580 million years ago simple water creatures like flatworms, jellyfish and sponges began to inhabit the world ocean. 30 million years later came the fungi creating a new branch of being. Fish came 50 million years later, the first vertebrates to emerge from the evolutionary chain of being. 40 million years later fungi and green plants moved onto the land creating the conditions for even more diversity of life.

EARTH HISTORY
DEEP ECOLOGY

Millipedes and centipedes were amongst the first animals to travel across the land, 400 million years ago. Spiders and scorpions developed soon after and early, wingless insects like silverfish could be seen amongst the prehistoric plants. 330 million years ago the Earth's geography began to develop as a supercontinent known as Pangea, beginning a period of unbridled evolution. Insects developed wings and 2 foot long dragonflies could be seen flying through forests of ferns, moss and horsetail. During this time, seed bearing plants swept across the fertile lands, and amphibians began to emerge. 30 million years later came reptiles, some of whom evolved into the great dinosaurs over a 70 million year period. It was an age of monsters and mayhem in a vast civilization of wild animals.

175 million years ago Pangea began to split apart and the continents formed. These were populated with dinosaurs and increasingly forested landscapes. 45 million years later, pollen containing flowers began to form and beautiful new colors come to our Gardenic Earth. During this chapter, the first proto-mammals developed. 65 million years ago a huge meteor struck the Earth in an extinction level event killing most of the dinosaurs and making space for mammalian development. 10 million years later the first primates began to appear, changing into our early ancestors over a 40 million year evolutionary process. Major climatological changes on the planet saw the great rainforests recede and turn to grasslands.

Tribal Ape cultures began to develop. It was only a mere 430,000 years ago that the Neanderthal began the evolutionary ascent into modern humanity. The earliest cave paintings show humans communicating with art 35,000 years ago marking the beginning of recorded human history. This evolutionary storyline shows that our roots reach deep. To this day the first few weeks of human embryonic development is identical to the embryonic development of all animals, reptiles and fish.

We are all connected.

DESIGN FOR WATER
FACTS

FACTS

- 70% of our Earth's surface is water
  93.8% is ocean water, 2.5% is fresh water
  0.375% is accessible to humans
  0.3% of water is in lakes & ponds
  0.06% is in soil & forests, 0.03% is in rivers, 0.035% is in the atmosphere.
- Hydrologic cycle : Water moves from the ocean to clouds, returning to the earth through precipitation and condensation then flowing back to the ocean. There are many mini hydrologic cycles through tree and plant evapotranspiration
- Rain is formed over oceans from iodine particles
- Rain is formed over forests from particulate
- Sources of water in the environment: 13 percent of precipitation is rain
  86 percent of precipitation is from condensation of sea air, mists & fog
- Who uses all the water? 85% agriculture, 7.5% industry,
  7.5% domestic & residential
- ie 26% from toilet flushing, 17% from showering, 15% from taps, 22% from washing cloths, 14% by sub surface leaks and 5% from other uses
- Industry uses

62.7 litres (16.5 gallons) of water to make 1/3 litre (12 ounce) can of soda
70 litres (18 gallons) of water to grow one apple
120 litres (31 gallons) of water to make one glass of wine
7900 litres (20,86 gallons) of water to make one pair of shoes
73,700 litres (19,469 gallons) to raise a cow to 18 months of age
(Stats from www.grandforks.ca)

- In the west, 100 litres (26 gallons) of water for an average shower or average day of flushing the toilet

350 litres (92 gallons) of water is average use per person per day
(Stats from www.epa.gov)

- 1.8 million tonnes (4 billion pounds) of trash per year comes into the ocean, killing one million sea birds and 100,000 marine animals annually
- 70% of the Earth is aquatic, less than 5% has been explored
- Websites of interest **www.findaspring.com www.danielvitalis.com**

CHALLENGES
STORAGE & STRATEGIES

CHALLENGES

Polluted water is toxifying the planet and harming people. Caused by :

- Agriculture which pollutes groundwater
- Automobiles whose emissions pollute clouds
- Industry polluting air, soil and water
- Salinization caused by deforestation, rising water tables & agricultural watering
- Bottled water and cement are taking water out of the hydrologic cycle
- Erosion is a natural process that moves water, nutrients and resources. Erosion can disturb existing systems and may replenish water sources, spread nutrient and feed life. Consider reducing erosion by storing or directing water, reinforcing soil with plants or physical materials

STORAGE

- Cisterns, rain barrels, tanks, ponds, dams, swales, soil, vegetation & animals
- Roof catchment collection formula :
  1 millimetre (1/3 inch) of rainfall on 1 square meter (10.7 feet) of roof will yield 1 litre (0.2 gallons) of water
- To annualize rain yield based on rainfall figures, multiply by 0.6 to allow for losses caused by evaporation
- Metal roofs can add up to 500 litres (132 gallon) a year in water on an average 20 x 18 meter (65 x 59 foot) roof from condensation

STRATEGIES

- Native and drought resistant plant species
- Arrange plants by water needs (hydro-zoning)
- Dense planting & heavy mulching
- Replace lawns with useful ground covers and vegetation
- Use soil rich in organic matter
- Harvest rain and dew
- Hand watering or drip lines instead of sprinklers
- Low flush toilets or compost toilets, low pressure shower heads
- Use grey and black water systems

STRATEGIES
BEST PRACTICES

STRATEGIES CONT.

- Consider water your most important resource
- Design for multiple sources and reserves
- Preserve, protect and refill the aquifer
- Reduce use before trying to save enough water to fulfill your needs
- Maximize living and organic ground cover to help slow evaporation
- When rehydrating land always start at the top of the hill or watershed
- Locate water storage at the highest point on the land for gravity feed
- Locate the design site in relation to the water shed
- Think of the watershed as a water spread
- Always plan for excessive rain events and design overflow channels
- Create a community plan for water catchment
- Cheapest place to store water is in the soil, add organic matter
- Leave 15% of water storage as surface water, to help reduce risk of fire and buffer against climate change
- Do a water audit with the objective to save enough water so that you can fulfill your needs all year

Riparian Buffers : Plant areas surrounding a stream river or body of water for shade and protection.

TREATMENT

- Nature cleans water by oxygenating, vortexing, sun sterilizing, phytoremediation (plant filtration) and particulate filtration : mimic this
- Multiple types of filtration and water cleansing
- Aeration through flow forms and waterwheels
- Settling through reed beds and ponds, both anaerobic digesters and aerobic ponds
- Filtering by running water through sand, gravel or charcoal filters
- Biological cleansing with fish, bacteria, plankton or bioremediation plants

TECHNIQUES

- Store tap water in open glass bottles that allow evaporation to get rid of ammonia and chlorine
- Cleaning of creeks and riverways
- Stream and river reclamation
- Restoration of remnant ecology
- Use of macrophytes, water filtering edge species
- Rain tanks and cisterns vary in size and can be used for catching water from different sources, mainly from roofs. They should be level and raised for water pressure. When catching water from eavestroughs or downspouts, a first flush system is recommended

Roof Collection : Best is glass, photo voltaic, metal or wood shake roof.

Asphalt Roof : only for sub-irrigation or swales (not for tanks), it's high in anaerobic bacteria and petroleum products.

Galvanized Roof : Hot dripped is full of cyanide, electric process is ok but has a lot of zinc, this means water is ok for drinking but not for irrigation (plants don't like zinc). Beware of paint chips that contain heavy metals (filter chips in settling tank)

Blackwater : Pee goes down a pipe into pit full of gravel with a layer of coal and sand which is planted with bioremediating water plants. Water overflows to a pond below where wind and sun can sterilize it, then it trickles through stones downhill for oxygenation to a final pond used for irrigation and fire protection. Poop to go in pit layered with sawdust or organic matter or at the bottom of a heavy sheet mulch that is not on a slope

Ollas : Unglazed ceramic pots with a short wide neck and a wide belly used to store water. Buried in the ground next to the roots of the plant to be irrigated, with the neck extending above the soil. Filled with water and covered with a lid. Water gradually seeps into the soil

TECHNIQUES CONT.

Agro Plow or Yeomans Plow : Used for soil conditioning. Dragged along contours to cut into soil and break things up. Allows water into the soil and roots to go deeper, keeping soil aerated.

Vertical Mulch : Cut channel into soil and put in straw or mulch as mini wind break.

Wicking Beds : Efficient self contained raised bed systems for growing plants which filter and hold water in gravel below the soil. Water passively wicks up through organic matter to reach plant roots. Can be built in-ground or above ground, making them especially helpful for renters or homeowners who have limited growing space. Consist of a water proof membrane, piping or weeping tile, 9 inches of gravel and 13 inches of rich composted soil.

Flow Forms : A series of oval or figure-8 shaped containers that pour into one another from top to bottom on a slope or hill. Typically shaped in a figure eight pattern.

Curb Cuts : Used in urban settings to capture and store run off water and irrigate planted systems along roads. Create biodiversity in public urban areas and help reduce risk of flooding.

Rain Garden : Low cost, easy maintenance systems used for water capture and filtration. Typically built on the higher part of the site and connected to a downspout or grey water system. Planted with water loving and purifying species including beneficial bird and insect attractors. Should hold water for up to 24 hours for purification.

Ponds : Create biodiversity and microclimates especially when edge is maximized. Used for aquaculture, providing food and nutrient. Have water purifying plants cover up to 30% of surface area and plant edges with reeds.

Diversion Drain : Enables effective water harvesting and storage. Acts as a dependable system in emergencies. Recharges sand basins and swales. Dampens wild fires. Can be built on keyline systems or led into swales. Can be made of concrete or stone.

SWALES
TECHNIQUE

SWALE

- A level ditch on contour with a downslope berm intended for catching overland flow. Swale water infiltrates into the ground to recharge the surrounding soils, plant root systems and aquifer
- Slope swale at 1 - 3 m vertical intervals, with swales of 2 m deep, and 3 - 5 m wide
- Gentle slope of less than 15 degrees can handle swales every 3 metres
- Downhill berm can have trees on it and just below it
- Make swales smaller and closer together in dry areas or larger and further apart in wet areas
- In clay conditions put swales closer together
- In sandy soil conditions put swales further apart
- On steeper slopes consider creating a bench or terrace to trap nutrient and slow water coming into the swale
- In dry areas you can plant the swale
- In wet areas put in bench or terrace and plant the swale too
- Plant into swales starting with nitrogen fixing green cover crops and pioneers
- Small walls put into the swale can keep water contained
- Well designed swales hold water for up to three days
- Reduce mosquitoes
- Help with soil catchment and creation
- Indication of successful swale is recharged springs emerge at bottom of slope
- Website of interest www.swalecalculator.com

PRINCIPLES OF WATER

Rural : Slow, spread, sink and store

Urban : Save it, store it, use it, reuse it, clean it, release it

Geoff Lawton's Principle : Channel water along the longest path (over the most distance), traveling as slowly as possible (over the most time), rubbing up to as many things as possible (with the most passive friction), to create the most fertility. It's less about the amount of water you have than the amount of times you use it

KEYLINE DESIGN
TECHNIQUES

KEY LINE DESIGN

- Study contours to develop contour based water storage and flow systems
- Keylines are on-contour lines where the steeper and flatter parts of the land meet. Locate keylines on a contour map where the contour lines begin to get further apart. Notice the highest contour of the land that can efficiently hold water.
- Dams are built up high, protected with plantings, and water is distributed by gravity
- Allows for controlled flood irrigation
- Provides quick regeneration of soil, improving health and fertility of the landscape
- Lower dams can hold grey water and serve as aquaculture systems
- Keyline rip starts on the keyline. Key line rips are done in parallel to the first keyline rip, moving down the landscape and progressively moving off-contour.

KEY POINT

- The keypoint is the place where it is most effective to build a storage structure in terms of volume stored per unit of earth moved.
- Located in valleys of secondary streams where the slope profile changes from convex to concave.

DAMS

Key Point Dam catches water at the key points and between key lines. Used to store irrigation water.

Ridge Point Dam used for run off and pumped storage. Has limited irrigation use but often used for energy generation. Built on sub plateaus of flattened ridges below Saddle dams. Also known as horseshoe dams because it's horseshoe shaped.

Saddle Dam useful for wildlife to drink from. Storage of water high in the landscape. Used for pumped water and energy generation. Has the highest available storage capacity. Resides on saddles or hollows in skyline profiles of hills. Saddle dams are circular or oblong shaped.

Contour Dam mainly used for irrigation, aquaculture and semi arid flood flow basins. Walls are built on contour, on slopes less than 8%.

DAMS & DEW
TECHNIQUES

Check Dam is small, often temporary dam across a swale, drainage ditch or waterway. Used to regulate and direct stream flow. Not used for water storage. May have a base pipe or fixed opening to allow for more manageable water flow. May have a base opening to keep the dam free of silt.

Barrier Dam used for irrigation above main valleys and hydroelectric energy generation. Constructed across flowing or intermittent stream beds. Need ample spillways, fish ladders and careful construction.

Gabion Dam used to create flat areas where silt loads can be usefully deposited and form absorption beds in flood conditions.

Turkey Nest Dam is a flat circular dam on level ground. Useful for stock water tanks and low head irrigation. Most commonly used in flatlands.

DEW

- Droplets of water found on thin, exposed objects in the morning or evening
- In low temperature conditions dew becomes ice and is called frost
- Forms on clear nights when moist air masses deposit water on the ground
- The dew point is the temperature at which air is cooled enough to condense water, it is a calculation of relative humidity and temperature
- Provides significant moisture to plants
- The best collectors are isolated from the ground which conducts heat so they are lower temperature than the ground
- Can be captured with piles of stones or shrubs
- Use metal wire fence with plantings along the drip line
- Dew ponds or 'cloud ponds' located on hilltops and lined with chalk, lime or clay. Incorporating soot prevents earthworms from coming up and making holes. Often covered in straw to prevent cracking from sunlight, then layered with rubble and broken stone to protect the lining from the hooves of sheep or cattle drinking from it
- In modern India, dew harvesting systems are used that can harvest up to 200 litres of water a night

CLIMATE CHANGE
ENERGY CYCLES

CLIMATE CHANGE

Globally, we are still grappling with the reality that our climate is changing and that the cause of this is complex. Glaciers and regions of permafrost are melting due to increased temperatures, which has resulted in climatic changes and unpredictable weather patterns. Floods, droughts, fires, extreme weather events and changing temperatures are some of the symptoms of climate change. These changes have encouraged us to become more resourceful in our planning for the coming times.

A core inspiration for the Permaculture Movement, and the Transition Movement that came out of it, climate change is a unique challenge of our time that needs to be considered in all designs. Many small changes will help lead to big institutional changes. What can you do to help address climate change?

"The world I would like to see is a world in which my grandchildren can thrive, where they will live in local economies, feel like part of a place, and be more skilled. I would like them to live in a world where they view the climate crisis in the way we now think about the ozone crisis, as something in the past that people came together to address and is steadily becoming less and less of a threat and challenge. I would like them to see the world around flourishing and coming alive. One where the ingenuity, creativity and adaptability that created the industrial revolution in the first place becomes what defines their life as we move away from fossil fuels into something so much more beautiful, abundant and nourishing." - Rob Hopkins

ELEMENT OF WATER
FACTS & FUNCTIONS

WATER

- Soil and plants hold and transpire water, causing and regulating rainfall
- Water bodies regulate temperature by moderating the peaks of hot and cold on a daily and seasonal basis
- Distillation is water rising from ground as a vapour
- Transpiration is water evaporating from plants during the daytime
- Guttation is water lost from the leaves as droplets during the night
- Dew is caused by moist air condensing on exposed surfaces
- Frost forms by rapidly cooling moist air over land on cold, cloudless, still nights
- Fog comes from oceans and mountains, mostly in autumn and winter
- Fog forms where warm water evaporates into cool air, or where the cold earth condenses moisture from warmer air
- Water changing from ice to liquid to gas (evaporation) is accompanied by cooling
- Water changing from gas to liquid to ice (condensation) is accompanied by warming
- Humidity in air adds mass and reduces temperature changes (slows down temperature fluctuations and moderates overall temperature)

Rain is caused by

Orographic Effects : Cooling of air as it rises over mountains and hills

Cyclonic or Frontal Effects : Over-riding of cool and warm air masses

Convectional Effects : Hot air rising from oceans into cooler air

FUNCTIONS OF WATER

- Hydrate
- Universal solvent
- Carry nutrients
- Reduce temperature
- Cleanse air
- Transport (seeds, animals, minerals, bacteria)
- Shape the land
- Stabilize soil
- Provide energy & put out fires

ELEMENT OF WIND
FACTS & FUNCTIONS

WIND

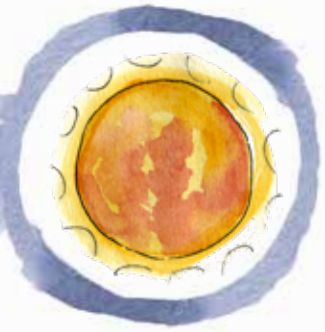
- Cool air is heavy and moves downhill
- Cool air flowing downhill that hits a barrier causes a 'cold sink'
- Cool air replaces hot air by going under it, pushing it up
- Hot air is light and moves uphill
- Hot air flowing uphill that hits a barrier causes a 'heat sink'
- Cold air flows off polar ice caps spinning low pressure systems counter clockwise in the northern hemisphere and clockwise in the southern hemisphere moving towards the equator from east to west
- Western coasts get alternating cold low pressure polar air systems with warm high pressure systems
- Monsoon wather is caused by trade winds bringing moisture off oceans, moving betwen the tropcis of Cancer and Capricorn.

FUNCTIONS OF WIND

- Transport (heat, cold, soil, sound, smells, pheromones)
- Shape the land
- Prune
- Pollenate
- Move clouds
- Evaporate water
- Provide energy
- Feed and drive fires
- Carry animals, birds and insects
- Oxygenate

ELEMENT OF FIRE (LIGHT & HEAT)

FACTS & FUNCTIONS



LIGHT & HEAT

- Air and water can transfer heat to and from solid bodies (convection)
- Heat can be transferred between solid bodies touching (conduction)
- Light is radiated back as heat from soil and water, dark surfaces and when passed through glass
- Light colored objects reflect light
- Dense objects take longer to heat up but radiate heat longer
- Light absorbed by plants for photosynthesis has a cooling effect
- White light is turned to chemical energy by plants
- Dark green and red plants absorb more light and thus cool the environment
- Light coloured leaves and bark reflect light through the forest
- Plants are a sink for carbon dioxide
- When forests are removed it can cause thermal pollution of too much light and heat
- Too much light will cause plants to dwarf
- Too little light will cause plants to become tall and straggly
- Dark colored leaves and bark turn light to heat
- Light and temperature increases as one moves from the pole to the equator

FUNCTIONS OF LIGHT & HEAT

- Heat Earth
- Melt snow
- Provide energy
- Evaporate water
- Cause wind and drive the hydrologic cycle
- Sterilize
- Stimulate chemical reactions
- Accelerate decomposition
- Make vitamin D
- Germinate

ELEMENT OF EARTH

MICROCLIMATE

On a home, garden or farm scale, subtle differences on the site can present many design opportunities including

- Affecting warming, cooling, and shading
- Placement of plants, animals systems and structures
- Potential for creating & removing heat and cool sinks
- Design home and gardens to include resiliency against extreme weather conditions and for buffering future climate variations

SLOPE

- Aspect comes from the degree the site is facing the sun and affects exposure to sun and hours of sunlight
- The steeper the slope, the faster hot air moves up it and the faster water moves down it. The steeper the slope, the faster fire travels up hill
- The higher the altitude, the lower the temperature
- Any slope more than 15 degrees should be treed, especially above the key point

SOIL AND ROCKS

- Affect absorption and evaporation of water into the environment
- Rocks capture and slowly radiate heat
- Clay soil holds more water, expands and contracts
- Sandy soil drains well and does not hold water long
- Bare, lighter coloured soils reflect light
- Darker and mulched soils absorb light and radiate heat, heating up faster

WATER BODIES

- Has a more stable temperature and makes the temperature of surrounding areas more moderate
- Provides water for beneficial animals and insects, especially predators
- Provides growing conditions for edible, medicinal and thatch plants
- Acts as a back up for crops and against fire
- Maritime climates give cool late day winds to relieve land of daytime heat

MICROCLIMATE
STRATEGIES

STRUCTURES

- Trap and store energy
- Create thermal mass
- Reflect light
- Act as a windbreak & buffer noise
- Add vertical areas for growing intensively
- For optimal angle of glazing on a greenhouse, add 15 degrees to your latitude

VEGETATION

- Absorbs heat and light
- Regulates soil temperature (warmer in winter, cooler in summer)
- Transpiration of plants will cool air in summer
- Provides habitat, windbreaks, shelterbelts, and firebelts which filter and capture nutrients, weed seed and disease from wind
- Windbreaks are effective to about 5 times their height in distance on the other side and require 40% flow through of air for success
- Germination of plants and ripening of fruits is affected by light and heat
- Biotecture uses living plants in the design of structures
- Some plants prefer morning or afternoon sun

STRATEGIES

- Modify extremes
- Catch and store energy (water, wind and light)
- Convert light into heat
- Convert light into life
- Reflect light to be absorbed by areas needing more light or heat
- Block strong climatological effects
- Protect gardens, plants and structures
- Create microclimates to increase diversity
- Site houses & gardens on heat sinks & thermal belts of high average temperature
- Choose and place appropriate animals, structures and farm elements for climate

APPROPRIATE TECHNOLOGY

MARK LAKEMAN

Align your technology to save time, energy and money while living in alignment with your values and ethics.

COOKING

- Cook shared meals
- Choose renewable resources for fuel
- Obtain multiple functions from a heat source
- Eat canned and dried food in the winter
- Eat local and raw food
- Build a solar oven to bring food to boiling temperature then place into a hay or otherwise insulated box to continue cooking
- Grow coppicing plants to harvest and store for firewood and know where to collect smaller kindling sticks
- Rocket stoves use smaller sticks to create a high heat. Smaller sticks burn at a higher temperature, are more efficient, are more easily obtained over time from a coppice system. They are a better use of resources than larger logs

HEATING, COOLING AND LIGHTING STRUCTURES

- Practice seasonal living
- Wear a sweater and layer clothes
- Share body heat
- Follow daytime and night time light patterns
- Use candles
- Passive heating and cooling
- Insulate house
- Seal windows and repair gaps where cold air creeps in
- Use heavy curtains and pelmets or cornice boards to insulate windows
- Paint interiors with light and reflective surfaces
- Gain heat from methane generation by compost from plant matter or manure
- Generate electricity from heat (from woodstove)

STRATEGIES & TECHNIQUES
APPROPRIATE TECHNOLOGY

WATER HEATING
- Passive and solar thermal hot water heating
- Wash clothes in cold water and by hand
- Use hot water sparingly
- Keep tap turned off when not in use
- Use a washbasin for washing dishes, collect dish water and reuse
- Heat water on woodstove or rocket mass heater
- Insulate water tank and pipes
- Use a thermos to store excess boiling water after making a cup of tea

APPLIANCES
- Downsize systems
- Use hand and pedal powered technologies
- Eliminate the need for electric cold storage by using local and fresh food
- Use passive cooling and refrigeration techniques
- Use high efficiency, low tech electrical appliances
- Disconnect appliances that use phantom power
- Bicycle generator
- Research before buying

WORK AND RIGHT LIVELIHOOD
- Do work that you love
- Do work to satisfy real needs
- Support socially just practices
- Purchase local goods and services
- Work as a means to support community networks
- Participate in alternative forms of trading your time and skills
- Eliminate waste
- Work in co-operative settings
- Support regenerative systems
- Use your body and get outside
- Create a healthy work environment

APPROPRIATE TECHNOLOGY

MARK LAKEMAN

FOOD

- Think and act regionally
- Support organic and biodynamic
- Support local growers and food systems
- Join a CSA (Community Supported Agriculture)
- Join your local seed savers
- Start a community seed bank
- Shop at co-ops
- Eat a low carbon diet (more veg, less meat)
- Grow your own garden
- Raise your own animals
- Develop community gardens and orchards
- Salvage from the waste stream
- Support and develop progressive food policies
- Support or create local 'Food is Free' or 'Food not Bombs' initiatives

TRANSPORTATION

- Relocalize
- Live and work in the same area
- Walk more often
- Prioritize biking & trailers
- Use public transport
- Car share and carpool
- Prioritize train over plane
- Biological energy (biofuel, alcohol, sugar)

TRANSPORT PRIORITIES

- 20% C02 emissions are caused by transport
- Don't travel unless you have to
- Don't buy imported food if you can get it local
- Provide needed services in your community so people don't have to leave to fulfill their needs

In evaluating how to travel ecologically consider using the lowest impact transportation first.

- Walk and bike
- Bus
- Carpool
- Drive a car
- Drive a truck
- Fly

"The best way to become a permaculture actionary is to do two things at once: Stare our epoch in the face and see as many of its imperfections as you can, feel them. Then, in the same moment, realize that the other side of each challenge is another design opportunity that is available to you to grasp and express through action. Yes, human cultures have designed all of our own problems, and the flip side of each one is a missed design opportunity. We are here in this time to inhabit these conditions and to activate in response to them. I did these two things at once, and at that same moment someone said to me that "the very creative impulse of our planet is under attack, and through our choices it will or will not endure". That was just too damn much, and I haven't stopped being relentless in my active advocacy and love for our planet home ever since."

- Mark Lakeman

CLIMATE ANALOGUES
DESIGN METHOD

Find places with similar climates to your own by following lines of latitude in order to learn what might work in your area.

Climate Analogues can teach us about what may thrive on each unique site. This form of analysis suggests techniques and strategies which may help design for climate and microclimate. Research on climate analogues includes elements related to energy and water, structures and fencing, composting and soil, pests and predators, forestry and farming.

Locate **CLIMATE ANALOGUES** based on
- Levels of latitude on both sides of the equator
- Highs and lows
- Seasonal variation
- Latitude on both sides of equator
- Distance from ocean or large bodies of water
- Elevation
- Temperature
- Precipitation
- Wind
- Plant hardiness zones

CLIMATE ANALOGUE ANALYSIS
Sunshine Coast and Greater Vancouver, British Columbia, Canada
49.4° N Latitude, 123.6° W Longitude
Lower Sunshine Coast
On the Pacific Ocean protected by Vancouver Island
Sea level to 100 metres above sea level

KOPPEN-GEIGER
Maritime West Coast Maritime : Cfb to Csb in the dryer zones

DESIGN METHOD
CLIMATE ANALOGUES

ROBERTS CREEK, BC, Canada
USDA plant hardiness : 8a to 9a
Days of Rain : 167
Yearly Rain Average : 1369 mm
Days of Snow Average : 10
Yearly Snow Average : 236 cm
Temperature Range : -15 to +30
First frost : Beginning of November
Last frost : End of March

- Relatively mild winters with little snow
- Cold air from the Arctic that sweeps over the rest of Canada in winter is blocked by the Rocky Mountains.
- Pacific Ocean maritime effects make the winters less cold & summers less warm
- Fog
- Wet Winters
- Sunny Summers
- Well defined Spring and Autumn
- Moderate winds

Analogue Locations
Christchurch, New Zealand
Stanley, Tasmania
Concepcion, Chile
Sendai, Japan
Ordu, Turkey
Canterbury, England
Cardiff, Wales
Paris, France
Antwerp, Belgium
Amsterdam, Netherlands
Frankfurt, Germany

COOL CLIMATE DESIGN
CHARACTERISTICS & CHALLENGES

Part of becoming conscious global citizens is learning about how to design homes, gardens and farms in the world's climates. Consider how all climates may be present during certain days or times of year in your climate. How might strategies and techniques from other climates be adapted to help your site?

COOL CLIMATE CHARACTERISTICS

- Precipitation exceeds evaporation
- Below freezing temperatures
- Mild to warm summers and cold winters
- Most nutrient stored in the soil which has high humus content and holds a lot of water
- Streams are often acidic with tannins, saponins and humic acids

COOL CLIMATE CHALLENGES

- Exposure to fog, frost, snow, ice, hail and cold wind
- Forest fires
- Most plant growth occurs in spring and summer only
- Slugs, pests and wild animals
- Industrialization and cars create acid rain which degrades soil and water quality
- Pesticides and industrial toxins
- Loss of top soil through conventional agriculture and deforestation
- Compaction from precipitation, industrial farming and animal husbandry
- High cost of space and water heating

HOUSE & STRUCTURE TECHNIQUES

- Site houses on a mid-slope key point (on thermal belt)
- Good aspect exposure for winter sun
- Site house downhill from forest and water storage
- Good insulation of houses, pipes, and wells
- Locate pipes and build foundations for structures and fences below frost line

HOUSE & STRUCTURE TECHNIQUES CONT.

- Thermal mass foundations
- Insulate beneath foundations with frost wings
- Good drainage below and around house
- Sloped roof for rain and snow runoff
- Suntrap fedges on the upslope shade side
- Trellis vines on sun side. Deciduous trees on afternoon sun side
- Sheltered with walls, earthbanks or hedgerows on upslope side
- Double entries to houses, barns, and greenhouses
- Seal windows, doors and gaps
- In-house food preservation and storage facilities
- Wood stove or rocket stove for heating, cooking, baking, dehydrating, drying
- Bedrooms on cool side of the house
- Living areas on the sun side of the house. Attic ventilation
- Greenhouse attached to main house for heat
- Attach greenhouse to sun side and shadehouse to shade side
- Fan that can spin counter-clockwise to push cool air downward, or spin clockwise to pull cold air up
- Trombe wall facing equator, painted dark color, air gap then covered with glass
- Passive solar greenhouse : one sided, angled roof facing sun, thermal mass light coloured wall on shade side, deciduous trellis over roof, vented, could be converted into shade house
- Composts in greenhouse
- Clerestory windows above eye level to admit fresh air and deep penetrating light.
- Window curtains, eaves and windows designed to let in afternoon winter sun and block summer sun
- Setting the Roof Overhang

  Winter Solstice sun angle "A": A = 90° – (your latitude + 23.5°)

  Summer Solstice sun angle "A": A = 90° – (your latitude – 23.5°)

  Knowing this, you can use trigonometry to set your roof overhang so that you let sun in during the winter and keep it out during the summer.

GARDEN & FARM TECHNIQUES

GARDEN & FARM TECHNIQUES

- Mixed forests, hedgerows, orchards
- Food forests and farm forestry
- Fruit, nut and syrup trees with perennial berry crops
- Mushroom cultivation
- Perennial pastures and grasslands for people and animals
- Meadows, small fields and veggie plots
- Herb spirals and keyhole beds
- Integration of fedge sun traps
- Fresh water aquaculture
- Animals : bees, chickens, turkeys, ducks, geese, pheasant, quail, guinea hens, snakes, frogs, fish like trout and sturgeon, rabbits, pigs, goats, sheep, cows, horses, emu, ostrich, kangaroo, llama, bison, deer
- Rocks, stick piles and stone walls
- Covered winter garden
- Cool hardy and frost tolerant species
- Planting nitrogen fixers, bioaccumulators, spike root plants and biodynamics herbs
- Grow root crops for winter storage
- Extend growing season and modify extremes with greenhouses, glasshouses, poly-tunnels, hoop house, cold frame, hot frame, walipini, cloches and propagation frames.
- No-till gardening & heavy mulching of gardens
- Many plants that are grown as perennials in a tropical climate will grow as annuals in a temperate environment

Alley Cropping : Integrating lines of trees into croplands.

Pasture Cropping : Integrating winter growing cereal crops with summer perrenial pasture grasses.

COOL CLIMATE STRATEGIES

- Make sure cold air can flow downhill
- Keyline damming & swale systems for gravity fed irrigation & water management
- Radiation shields of white rock, trees or hedgerows facing the fire sector
- Animals with good structures near home
- Use of plant and animal guilds to address pest issues and feed the soil
- Lime soils to balance acidity
- Windbreaks and permanent forest edges to protect from wind and fire
- Native plants for windbreaks and mulch
- Include short season plant varieties
- Seasonal flooding
- Controlled burning
- Design for insulation

  U-Value : how well an insulated glass will hold in heated or cooled air.
  R-Value : how well walls, doors and roofs will hold in heated or cooled air.

COOL CLIMATE SPECIES
BULLOCKS PERMACULTURE HOMESTEAD

PLANTS OF INTEREST

Here are some cool climate species of interest from Orcas Island, Washington State, USA at the Bullocks Permaculture Homestead. One of the best sites of its kind in the world. Plant people from the cool climate could research whether any of these species might be an appropriate to their unique site and location.

America Chestnut : Castanea dentata
American Plum : Prunus americana
Autumn olive : Elaeagnus umbellata
Azolla : Azolla pinnata or filiculoides
Bladder Senna : Colutea arborescens
Black Locust : Robina pseudoacacia
Ceanothus Victoria - Ceanothus thyrsiflorus
Chilean Hazel : Gevunia avellana
Chilean Myrtle : Luma apiculata
Chinese Chestnut : Castanea mollissima
Chokeberry : Aronia melanocarpa
Common Quince : Cydonia oblonga
Cornelian or Capulin Cherry : Cornus mas
Darwin Barberry : Berberis darwinii
Desert King Fig : Ficus carica
Empress Tree : Paulownia tomentosa
English Walnut : Juglans regia

PLANTS OF INTEREST
FUNCTIONAL HEARTY SPECIES

French Broom : Genista monspessulana
Goumi : Elaeagnus multiflora
Hardy Citrus : Yuzu ichandrin
Heartnut : Juglans ailantifolia
Honey Locust : Gleditsia triacanthos
Italian Stone Pine : Pinus pinea
Kiwi Hardy : Actinidia arguta
Kiwi Fuzzy : Actinidia deliciosa
Korean Stone Pine : Pinus koraiensis
Medlar : Mespilus germanica
Monkey Puzzle : Araucaria araucana
Mulberry Black : Morus nigra
Mulberry Everbearing : Morus rubra x nigra
Mulberry White : Morus alba
Persimmon : Diospyros kaki
Russian Olive : Elaeagnus angustifolia
Sea Buckthorn : Hippophae rhamnoides
Shipova : x Sorbopyrus auricularis
Sweet Chestnut : Castanea sativa
Wild Yam : Yamaimo discorea

"Study Nature, Love Nature, stay close to Nature. It will never fail you."
- Frank Lloyd Wright

TROPICAL DESIGN
CHARACTERISTICS

TROPICAL CHARACTERISTICS

- Rampant growth and decomposition
- Most nutrient stored in trees and plants
- Soils tend to be acidic due to excessive rains leaching out nutrients

SUBCLIMATES

Wet Tropics

- River basins and wet coasts, overhead sun, equatorial
- High humidity
- Temperature 21 - 32 C (70 - 90 F) year round
- Rainfall from 152 - 328 cm (60 - 130 inches)
- Very short or no dry season, at least 60 mm (2 1/2 inches) rainfall per month
- Wet Rainforests store carbon and produce oxygen, they are the lungs of the earth

Wet-Dry Tropics

- Towards the poles of wet tropics
- Pronounced dry season with hot winters
- Low humidity during dry season, high humidity during wet season
- Temperature 21 - 38 C (70 - 100 F)
- Rainfall from 25 - 162 cm (9 - 64 inches)
- Often tree studded grasslands and savanna

Monsoon Tropics

- Seasonal reversing wind corresponds to changes in precipitation
- Less pronounced dry season
- Cooler winters and wet summers and autumns
- Temperature 13 - 38 C (55 - 100 F)
- Rainfall 102 - 1016 cm (40 - 400 inches)

CHALLENGES
DESIGN WITH CLIMATE

TROPICAL CHALLENGES

- Erosion from heavy rainfall
- Pests and tropical diseases like Malaria
- Polluted water
- Nutrient poor soils
- Flooding
- Sea level rise
- Strong winds
- Monsoon rain causes crop failures and famine
- Low rainfall in wet season reduces vegetation
- Unstable climate conditions with surprises
- Annual veggies are battered by the force of tropical rain and invaded by fungi and pests
- Overstocking and overgrazing of large herbivores (mostly cows)
- Deforestation worsens climate change
- Destruction of rainforest for palm oil (South East Asia) and for crops and animal agriculture (Amazon). Clearing method often uses massive fires

Wet and Wet-dry Tropics : heat and high rainfall leach most mobile nutrients from soils, vegetation and animals contain 80 - 90% of nutrients, rapid runoff and evaporation. Prolonged heat.

Monsoon Tropics : tsunamis, hurricanes and intense weather systems.

HOUSE & STRUCTURE TECHNIQUES

HOUSE & STRUCTURE TECHNIQUES

- Orientation to prevailing winds (not sun)
- Site home in valleys
- Site houses away from areas where mudslides are an issue & above tsunami height
- Low energy-use houses
- May be raised off the ground for air flow
- Over-shading trees, trellises and thatched (palm / grasses) roofs or metal roofs
- Houses use natural local timbers or fibres, sometimes clays
- Common building material bamboo and feather palm
- White walls and roof
- Often have no walls
- Shaded open-air kitchen separate from house
- Well insulated with passive ventilation and louvres
- Underground pipes with cool air from shaded cool sink
- Utilizing air flow that incorporates cool air formed by evapotranspiration
- Attached shade house to shade-side of house and attached greenhouse to sun-side of house. Shade house brings in cool air, sun house utilizes hot air and together they create a ventilation system
- Smoke from cooking inside can take care of mosquitos and cure thatch roofs
- Wide verandas and eaves with shade trellises
- Insect screens including screened cloakroom pre-entry
- Cellar/underground shelter
- Could include floating houses or tree houses
- Covered outdoor work, walk ways and storage spaces

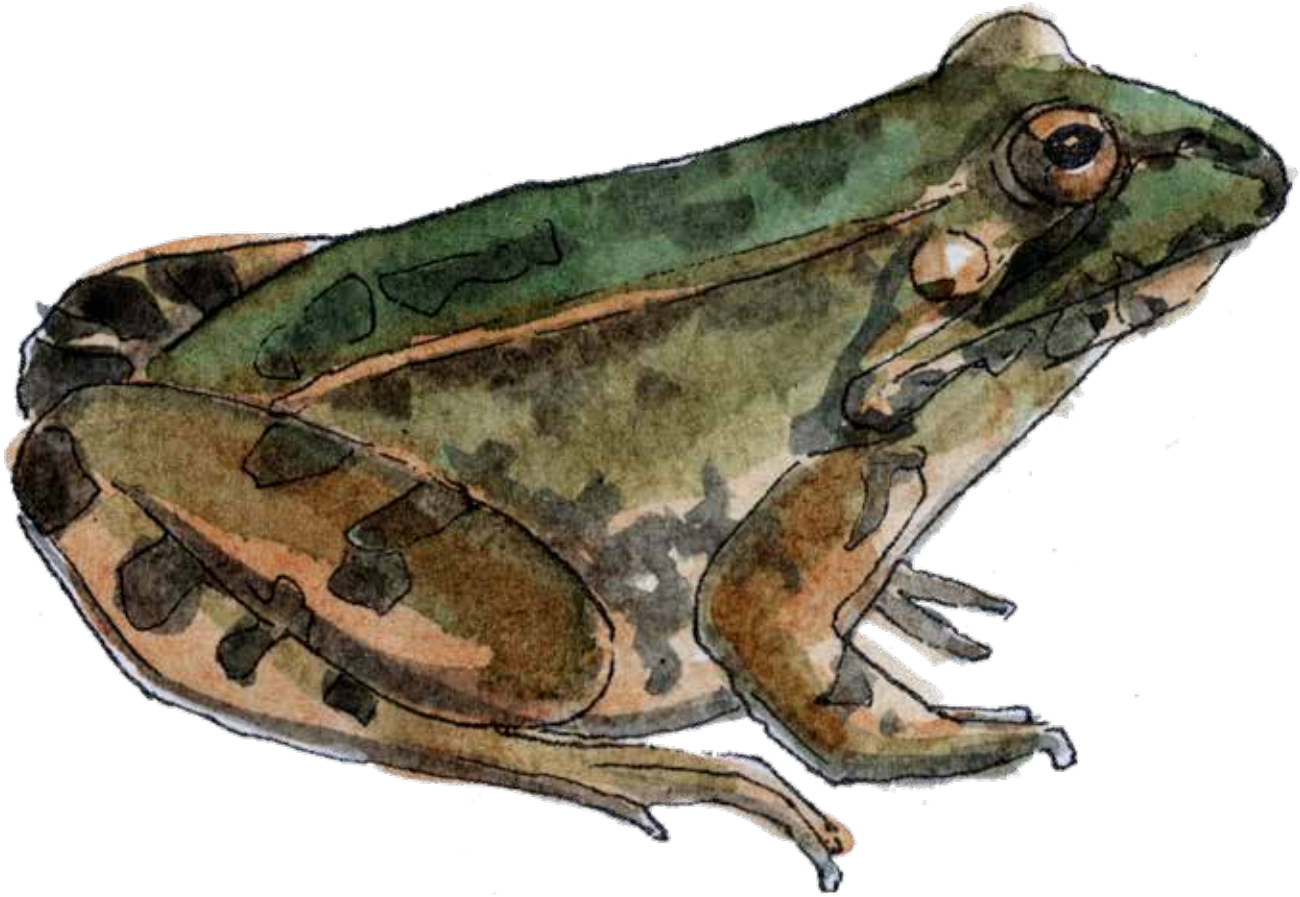
GARDEN & FARM TECHNIQUES

- Careful planting and harvesting schedule to match climate
- High diversity of species and harvests
- Consideration of pests
- No standing water
- Interplanted stacked food forest (mixed multi-story polycultural system including plants for mulch and soil building)
- Mounded beds and raised beds for drainage
- No-dig gardening & food harvested by forage
- Never plough because of rains and dry seasons
- Use of green crops, living mulches and nitrogen fixers
- Rough and heavy mulching with woody materials
- Passive on-demand hot water
- Aquaculture systems
- Focus on herbaceous perennials
- Tubers, vines, shrubs, trees for food
- Integrated succession planting
- Forests for timber, oil, sugar and thatch
- Pit composting
- Takakura compost : Indoor system using rice/corn husks (carbon) and a microorganism
- Banana circles
- Composting super plants include azola and palms
- Use of ants and termites for decomposition
- Weed barriers
- No bare soil
- Covered nursery areas to protect seedlings from high rainfall
- Terraces

Chinampas : Islands or peninsulas created by dredging high nutrient material from the bottom of pond, swamp or lake to grow water loving crops in wet environments. Often accessed by boat or narrow trail.

TROPICAL STRATEGIES

- Preserve trees
- River vs road transport
- Valley sites for shading
- Shelter site from climate extremes and disasters
- Water storage
- Design for drainage
- Plan for large seasonal rain periods
- Particular attention to grey water and black water processing
- Avoid plastic or metal
- Cooking with fire & smoke inside to cure the thatch roof & as insect repellant
- Terracing on slopes to hold water in landscape and for seasonal crop rotations between water crops and dry crops
- Erosion control with grass and tree plantings
- Extensive use of grass crops and forage legumes to chop and drop
- Living mulches for wet season, dry mulches for dry season
- Integrated pest management



"A true conservationist is someone who knows that the world is not given by their parents, but borrowed from their children."
- John James Audubon

TROPICAL SPECIES
ANNALIESE HORDERN

PLANTS OF INTEREST

Aibika : Abelmoschus manihot
Arrowroot : Canna edulis
Avocado : Persea americana
Bamboo : Bambusa spp.
Banana : Musa spp.
Basil : Ocimum basilicum
Bread Fruit : Artocarpus altilis
Cacao : Theobroma cacao
Cashew Nut : Anacardium occidentale
Cassava : Manihot esculenta
Chia : Salvia hispanica
Citrus Tahitian Lime : Citrus latifolia
Cherry Tomatoes : Solanum lycopersicum
Chilacayote : Cucurbita ficifolia
Chilli Bishops Crown : Capsicum baccatum
Choko : Sechium edule
Coconut Palm : Cocos nucifera
Coffee : Coffea arabica
Comfrey : Symphytum officinale
Coriander Perennial : Eryngium foetidum
Cranberry Hibiscus : Hibiscus acetosella
Ginger : Zingiber officinale
Gliricidia : Gliricidia sepium
Hemp : Cannabis sativa
Ice Cream Bean : Inga edulis
Jaboticaba : Plinia cauliflora
Jackfruit : Artocarpus heterophyllus
Katuk Sweetleaf : Sauropus androgynus

PLANTS OF INTEREST
FUNCTIONAL HEARTY SPECIES

Lemon Grass : Cymbopogon citratus
Macadamia Nut : Macadamia integrifolia
Malabar Chestnut : Castanea sativa
Mango : Mangifera indica
Moringa : Moringa oleifera
Okinawa Spinach : Gynura crepioides
Papaya : Carica papaya
Passionfruit : Passiflora edulis
Pigeon Pea : Cajanus cajan
Pineapple : Ananas comosus
Pintos Peanut : Arachis pintoi
Pumpkin Vine : Cucurbita moschata
Rosella : Hibiscus sabdariffa
Sacred Lotus : Nelumbo nucifera
Sambung Nawa : Gynura procumbens
Snake Beans : Vigna unguiculata
Sugar Cane : Saccharum officinarum
Surinam Spinach : Talinum fruticosum
Sweet Potato : Ipomea batas
Tamarillo : Solanum betaceum
Taro : Casia toral
Turmeric : Curcuma longa
Vetiver : Chrysopogon zizanioides
Winged Bean : Psophocarpus tetragonolobus
Wynn's Cassia : Chamaecrista rotundifolia

DRYLAND DESIGN
CHARACTERISTICS & CHALLENGES

DRYLAND CHARACTERISTICS

- Lack of water
- Evaporation exceeds rainfall and condensation
- Desert is rich with high nutrient biomass in suspension
- Cold arid zones have warm to hot summers and cold winters
- Hot arid zones have very hot dry summers with mild to cool winters
- Wind eroded landscapes with dunes, gibber plain, mesa, bedrock outcrops and canyons
- Biocrust or fungal-algal-lichen biological soil crust are communities of living organisms that covers the soil in the spaces between plants
- Animals are nocturnal, get water through eating succulent vegetation & have deep burrows
- Water from exotic rivers, oases, aquifers
- Irregular rainfalls over 100ml (4 inches) causes flash flooding
- Water drains to inland lakes where it hydrates dormant life in the ecosystem

DRYLAND CHALLENGES

- Aridity & extreme heat
- Episodic rain with periods of very dry years
- Desertification from human behaviour and climate change
- Loss of topsoil from lack of plant cover, over cultivation, over grazing, over harvesting of firewood
- Salinization and salting of soils by irrigation or changes to groundwater
- Lack of carbon material
- Often sandy, rocky or alkaline soils with mineral deficiencies
- Almost no topsoil
- Erosion from wind and flash flooding, winds desiccate plants, dust storms
- Poisons lingering in the soil
- Bore water is usually salty and must be tested for heavy metals, nitrates, arsenic, radioactivity and bacteria
- Wild animals & insect plagues like locusts and caterpillars

HOME & STRUCTURE TECHNIQUES

- Site houses for shade and prevailing winds, close to water
- Need for summer/day cooling and winter/night heating means incorporating techniques found in both tropical and temperate housing
- Earthships and biotecture
- Cave and cliff houses, underground, dug-outs, earth bermed
- Often built from earth due to lack of timber
- Adobe and mudbrick, superadobe and earthbag, rammed earth, stonewalls with good insulation
- Housing with high walls to keep out wind, dust and for security
- Gardens on the roof covered with deciduous vines and areas for sleeping outside on hot nights
- Interchangeable white and black colors on walls and roofs
- Shaded interior open-air courtyards with deciduous vines, gardens, water and breezeways with seating areas
- Afternoon sun wall, windowless and shaded by evergreens
- Morning sun and full sun walls partially shaded with trees and shade houses
- Small windows with blinds, slatted or latticed for shade and wind protection while retaining view
- Full sun-facing areas with windows that can be covered and insulated
- Summer/day outdoor kitchen and winter/night indoor kitchen
- Trellised vines on all walls, roofs, arbors & shade structures as solar & dust screens
- Cool underground storage and living spaces
- Passive ventilation
- Earth tunnels or pipes from below the house to draw in cool air
- Windcatchers or evaporative cooling towers
- Cool air by directing air through charcoal cooler or underground canal
- Dry composting toilets
- Low pressure showers that reuse clean water normally wasted as we get the required temperature
- Roof water collection and shade side water storage
- Underground water tanks and cisterns

HOME & STRUCTURE TECHNIQUES CONT.

- Good insulation to keep cool or heat in depending upon season and time of day
- Solar panels and windmills
- Shade side shade house and sun side sun house
- Shade house to grow herbs and greens in summer, house pond
- Shaded water for animals
- Sunhouse / greenhouse for winter heat, to catch and release solar heat, to dry food and protect it from pests completely shaded in summer with ventilation that can be opened seasonally
- Utilise evapotranspiration from plants in home
- Weather proof and pest proof
- Enough water storage tanks to capture maximum rainfalls from roofspace

PLANTS

- Plants survive using reduced transpiration, water storage, waxy surfaces, ceasing growth, are dry-deciduous or exist as seed or tubers during extended dry periods
- Edible plants often grow in microclimates created by canyons or oases
- One good year of rainfall every 4 to 20 years, sometimes longer means pattern of natural bush is spasmodic and mosaic like
- Ephemeral plants and tubers flourish after rain but quickly return to dormancy
- Large trees are long lived with deep tap roots
- Plants like cacti have shallow roots that can take up the tiniest rainfall or condensation
- Many plants condense water from fog or mists using small leaves with high surface area
- Windbreak plants are essential in desert ecosystems
- Plants are often far apart so soil must be held together with mulch or biocrust

GARDEN & FARM TECHNIQUES

- Heavy mulching on surface and sub-surface
- Shade by cloth, structures and trees
- Intensive small scale gardening
- Drip watered plantings, ollas and composting pits
- Depressed garden beds with raised edges
- Raised irrigated beds with dug out paths to allow salt to evaporate
- Micro-catchments around plantings
- Swales covered with rocks or soils & planted with hardy trees & ground covers
- Rocks for shelter, microclimate niches, habitat water runoff, condensation & retention
- Windbreaks or fences. Brush, scrub, cacti, saltbush or bramble living fences
- Multitudes of small windbreaks of sand resistant heat hearty, drought tolerant plants
- Create soak barriers across landscape with stone cages or walls (gabions & limonia)
- Extreme microclimate creation, create as much shade and shelter from drying winds as possible
- Walled gardens & interior courtyards shaded with deciduous vines in summer
- Protect young trees from strong winds using shade cloth, large tree guards
- Shade cloth structures over garden beds, on extreme days shade cloth or sheets can be laid directly over plants
- Shade and protect seedlings from sun, wind and water erosion
- Utilize vertical spaces with trellises
- Design dryland planting guilds
- Highly productive trees to have a microclimate build around it
- Arid forest garden
- Gel liners to start trees

Net and Pan : For existing orchards or individual trees on a slope, build a half sized saucer shaped berm that is level at the drip line on the downhill side of the tree. A small ditch connects overflow with diversion canals or pipes down to lower trees on a minimal angle so passage of water does not cause erosion.

GARDEN & FARM TECHNIQUES CONT.

- Encourage succession of plantings towards climax communities
- Use of hearty trees, tubers, bulbs, herbs, shrubs & deep rooting perennials
- Drought and dry tolerant species of plants and animals
- Wild foods, indigenous plants and traditional staple foods
- Plants with fibrous roots to hold soil together
- Interplanting with humus, mulch plants & ground covers & seasonal chop and drop
- Seasonal growing beds in various microclimates
- Plan for winter crops and early summer harvests
- Year round bee fodder
- Ants and termites aerate soil and compost organic matter
- Largest of swales, smallest of dams
- Check dams in erosion scoured areas and gullies tunnels
- Make use of oasis and standing water
- Use water running off rocks to grow useful tree guilds
- Animals : guinea pigs, donkeys, birds, lizards, antelope, kangaroo, wallaby, camel, quail, pigeon, duck, chickens, geese, insects
- Possible to include a small number of : goats, cattle, sheep if kept near the house and food is brought to them instead of grazing.
- Sunken, lined, wicking beds can be made in old bathtubs
- Indoor aquaponics
- Sulphur to reduce pH
- Foliar feeds
- Gravel, stone and terra cotta mulch
- Plant pioneer trees first to create shade and windbreak, movable shade houses
- Pitting and imprinting to sow plants on a broad scale
- Broadscale reseeding
- Shade protected outbuildings and maincrops
- Regenerate biocrust by removing hard hoofed animals. Lay a lattice of straw or mulch to create environment, spray soil with biocrust mixture liquid, grow biocrust in labs then transplant, use only local biocrusts harvested from where already damaged

STRATEGIES
DESIGN WITH CLIMATE

DRYLAND STRATEGIES

- Everything you do must reduce evaporation and increase condensation
- Shape land to hold organic matter, soil and water
- Recycle and reuse water while regulating use
- Planting trees in protective guilds
- Protecting existing vegetation
- Protect existing biocrust and create more where ethically possible
- Design for water catchment, storage and retention
- Capture moisture from air and harvest dew using plants with tiny leaves or "fog fences"
- Water and soil testing
- Wild crafting and hunting instead of hard hoofed herding
- Utilize exotic rivers, oases and aquifers ethically
- Store water for cooking and drinking in a cool place
- Increase water input to aquifer and rehumidify desert air with vegetation
- Use biologically cleaned wastewater
- Minimal watering of garden and farm
- Shredded bark, branches, manure, and leaf nutrient mulches
- Gravel mulch reduces erosion while catching soil, seeds and nutrient on wind
- Utilize succession starting with endemic native, drought resistant pioneer species
- No use of biocides, pesticides or fertilizers
- Utilize rain catchment and shade patterns from landscape features with contours and slope
- Prevent erosion with contour banks and tree cover
- Gather rain runoff with shaded swales, treelines, deep ripped contours, gabions, limonia, silt dams, and lines of stones
- Focus on soil building and soil feeding
- Have back up systems and a diversity of techniques
- Key focus on establishment techniques
- Small scale animals systems with rotational grazing
- Look at how many animals the land can sustain & how long it can sustain them for

PLANTS OF INTEREST

Acacia spp.
Agave : Agave americana
Aloe : Aloe barbadensis
Caper Berry : Capparis spinosa
Carob : Ceratonia siliqua
Cork Oak : Quercus suber
Date Palm : Phoenix dactylifera
Dragon Fruit : Hylocereus undatus
Fig : Ficus carica
Globe Artichoke : Cynara scolymus
Grape : Vitis spp.
Honey Locust : Gleditsia triacanthos
Lavender : Lavandula spp.
Mediterranean Cyprus : Cupressus sempervirens
Mulberry Red : Morus rubra
Mulberry White : Morus alba
Neem Tree : Azadirachta indica
Old Man Salt Bush : Atriplex nummularia
Olive : Olea europaea
Pine Nut : Pinus spp.
Pistachio Nut : Pistacia vera
Pomegranate : Punica granatum
Prickly Pear Cactus : Opuntia spp.
Tagasaste : Chamaecytisus palmensis
Tepary Bean : Phaseolus acutifolius

DRYLAND SPECIES

TAMARA GRIFFITHS

Almond : Prunus dulcis
Bush Tomato : Solanum centrale
Cardoon : Cynara cardunuculus
Canary Island Date Palm : Phoenix canariensis
Desert Lime : Citrus glauca
Emu Bush : Eremophila spp.
Holm Oak : Quercus ilex
Mirror Bush : coprosma repens
Native Plum : Santalum lanceolatum
Pigface : Carpobrotus spp.
Pride of Madeira : Echium fastuosum
Purslane : Portuluca oleracea
Quandong : Santalum acuminatum
Ruby Salt Bush : Enchylaena tomentosa
Southernwood : Artemesia abrotantum
Stone Pine : pinus pinea
Warrigal Greens / New Zealand Spinach : Tetragonia tetragonioides
Wild Orange : Capparis mitchellii
Wormwood : Artemesia absynthium

Vegetable garden, salt tolerant
Amaranth : Amaranthus caudatus
Silverbeet : Beta vulgaris subsp. vulgaris, Cicla-Group, Flavences Group
Orach : Atriplex spp.

Drylands ephemeral water holes
Common Reed : Phragmites australis
Nardoo : Marsilea spp.

DESIGN PROJECT
PRACTICAL APPLICATION

DESIGN PROJECT

Over the course of a year long permaculture mapping process, write down the many design insights and ideas that come up. Stay organized with all your ideas, collecting them in a central place. Visit many sites in similar climates to see how others are engaging the opportunities and overcoming the challenges. Once a foundational map has been established, ideally supported by at least a year of careful, documented observation, then an integral permaculture design can be visioned. The process of creating a design and implementing a design are simultaneous, happening together on the design site. Mapping continues alongside designing and implementing. All are ongoing processes that continually inform each other.

Use your base map as a foundation and add any elements you would like to see. Do a needs assessment. Utilize ethics, principles, methods and frameworks to help drive the design. Consider zones, sectors, microclimates, relative location, strategies and techniques.

The mainframe design approach begins with assessing and designing water systems, then access, then structures and finally plant and animal systems.

Your design process is an opportunity to review and apply everything you have learned with permaculture. Review your notes, flip through textbooks, watch movies, visit permaculture sites and take classes to deepen your applied understanding of permaculture and how it can inform your own unique design process. With each new design practice you become a better designer and more effective in supportings others to design. Guiding, mentoring, teaching and supporting others to design while designing your own systems and continually upgrading your design experience is the path of a permaculturalist.

PRACTICAL APPLICATION
DESIGN PROJECT

Do a practical design for something small that you could actually accomplish. This may be one small part of map or larger project. Also consider doing an ultimate permaculture design without the constraints of time, budget or resources or the pressure of thinking it will actually be implimented. What do you plan to do? When do you plan to do it? Why do you plan to do it? Share the reason and function for everything you are doing. An integral design emphasizes functionality and energy cycling with a focus on becoming increasingly efficient, effective and ethical.

Prepare a short presentation to share highlights and larger patterns of your design with others. How can your design help teach other people how they might design their own site? Consider reviewing the Teaching Manual of this book for top tips on presenting.

"The root question is: How do we get reconnected with the Earth?
Become ecologically literate in your place and your home.
Learn how to grow food.
Where is your food coming from?
Where is your water coming from and what are
your water harvesting capabilities?
Where is your waste stream going?
Learn the systems that you live in.
How can you create as resilient a system as possible
with what you have within your community?
What makes sense for you to do yourself?
What makes sense for you to engage in your greater community?
Getting active with local governments is important.
Look at what other communities you can reach out to and collaborate with.
What is the vision that you are holding?"
- Penny Livingston-Stark

SOCIAL PERMACULTURE
CONSCIOUS COMMUNICATION

Acknowledging extensive editing and contributions from Kym Chi to this section.

CONSCIOUS COMMUNICATION

- How to give and receive feedback effectively is a core to effective communication
- Listen actively, clarify, assess, speak
- Use direct communication
- Accept responsibility
- Pause before speaking
- Assume good intentions
- Attack the problem, not each other
- Be curious and test your assumptions by asking clarifying questions
- Don't take it personally
- Put yourself in the other person's shoes
- Show empathy and support
- Respond don't react, think before speaking
- Be solution minded and think cooperatively
- Look for common interests
- Speak from a loving place that considers the best interest of the collective
- Reflect back what you think you heard
- Acknowledge and affirm the person by saying comments like "I see you", " I hear you", "I know you need", "I know you feel"...
- If you are not being heard, after acknowledging the other person's words and feelings, restate your needs
- Ask for space when you need it and give space when it is requested
- Inquire about what a person needs to feel heard and seen
- Find the humour in the situation (when you can)
- Honour your emotions and find a healthy way of expressing them (singing, art, grief circle in nature etc..)
- Let people cry for as long as they need to

CONSCIOUS COMMUNICATION
STRATEGIES

CONSCIOUS COMMUNICATION CONT.

- Seek out the right tool or technique for the situation (conflict resolution cannot have a cookie cutter approach)
- Make an agreement with all parties on the techniques or tools you will use to support for your specific situation
- Take note of special needs, cultural context and different abilities in the people you are dealing with when choosing tools or techniques that you use with them
- Find a mediator or seek counselling from someone that all parties agree on
- Create a safe space for resolving conflict by asking all parties what would help make them feel comfortable during the process
- Use a talking stick to give everyone a chance to speak without being interrupted and the opportunity to be actively listened to
- When blocked or anxious about verbal communication, write a letter and then read it aloud to the person or people involved
- Dance it out. Take a long hike together. Have an intentional journey together in which the process is only one part of the bonding adventure

Take Space : all involved take an agreed upon amount of time to be alone and reflect on the situation and then come back to discuss.

3 Seeds : each person gets 3 seeds and uses one seed for each time they speak. When they run out of seeds, they are not allowed to speak anymore, unless someone else gives them a seed.

Timed Speaking : an alarm or timer is set and each person speaks for a specific amount of time. There may be multiple opportunities to speak.

Sharing Circle : create a safe space for free expression. Each person speaks for as long as they need to with no direct responses to what anyone says. Those speaking try to get to the essence or heart of what they want to say. 'Circle keepers' are there to hold space not to facilitate unless needed.

CONFLICT RESOLUTION
NVC & COMPASSIONATE COMMUNICATION

APPRECIATIVE INQUIRY

From David Cooperrider and Suresh Srivastva

- Define the topic
- Discover and appreciate the best of 'what is'. Utilize dialogue to discover 'what works'. Rediscover and remember successes, strengths and excellence for each person or situation
- Dream and imagine 'what could be'
- Design 'what should be'. Bring the 'best of what is' together with 'what could be'
- Deliver Destiny. Take action to create 'what will be'

www.appreciativeinquiry.champlain.edu

COMPASSIONATE COMMUNICATION

1. Create a container
2. Communicate
3. Reflect
4. Come to resolution
5. Celebrate success

NON-VIOLENT COMMUNICATION (NVC)

From Marshall Rosenberg

1. What do you observe? Be concrete and clear, describe the specific situation factually.
2. How are you feeling? Share real emotions and take responsibility for how you feel using 'I' statements like: 'I feel happy', 'I feel angry' or 'I feel sad'.
3. What need is not being met? Address needs not wants.
4. How could it be done differently in the future? Make a request. What would make you feel better? Example :

   'I notice that you play your music loudly late at night. When this happens I feel restless and frustrated because I need to get a good rest as I wake up early. Would it be possible for you to turn your music down after 11pm on nights when I have to be up early the next day?'

www.nonviolentcommunication.com

BUSINESS & ORGANIZATIONS
WORKING MODELS

FOR PROFIT BUSINESS
Can use permaculture ethics, principles and practices as its core operating values. Profit supports the owner to live a simple life and surplus is returned to earth care, people care and fair share.

NON-PROFIT ORGANIZATION
A registered organization with a focus on fulfilling a specific mission that benefits people.

Considerations :
- Often eligible for grant and aid opportunities
- Includes a Board of Directors
- Has bylaws that may already be set out by local government. These bylaws can be amended by the Board of Directors, often with support from a majority of the organization's membership
- Annual general meeting is open to all members
- Annual report submitted to the government who collects registration and reporting fees

REGISTERED CHARITY
A non-profit organization whose primary objectives contribute to community wellbeing and serve the common good.

Considerations :
- Can give tax receipts so donors are eligible for tax deduction
- Most access to grant-in-aid opportunities, often for larger sums of money
- Includes a Board of Directors
- Rigorous application process, annual reporting and accounting
- Cannot be affiliated with political parties

BUSINESS & ORGANIZATIONS
WORKING MODELS

SOCIAL ENTERPRISE
Businesses owned by non-profits which uses commercial strategies and marketing to care for people and the planet.

Considerations:
- Maximizes positive social, cultural & environmental impact while generating income
- Allows non-profit organizational models to be more financially sustainable
- Supports the development of a more resilient and longer term organization
- May enable expansion of programs, offerings and services including ethical job creation
- Ensure that the organization has the capacity to start up and maintain the social enterprise until it is able to support itself

CREDIT UNION
Member owned financial cooperative distributing dividends and profits to members.

Considerations :
- Offers investments and loans for local ethical projects. Has accounts and credit cards backed by truly ethical investments
- May have less services than a corporate bank chain

B-CORP
A certified business that brings benefit to society and the environment, balancing profit and purpose.

Considerations :
- Good for people, planet and profit
- Creates positive business image
- Application process requires a lot of attention

SOLE PROPRIETOR / SOLE TRADER
A registered business where one person is responsible for everything.

Considerations :
- Great for start up businesses
- Simple accounting
- No additional bank accounts required
- There may be a liability risk in that the individual and business are not separate
- Income from business added to all other income for taxation purposes

PARTNERSHIP
A registered business where responsibility is shared with one other person

Considerations :
- Trust and integrity are key since the risk is shared
- Can become complicated in cases where one or both business owners decides to leave, or if disagreements on running the business arise
- Written business agreements should be considered to lower liability and risk between partners

CORPORATION
In this structure responsibility is held by the business, not by share holders.

Considerations :
- Low risk of liability on any one person as the company is its own entity
- More complex accounting required
- A separate bank account must be acquired

CO-OPERATIVE
Business is owned by members including consumers and producers who share in profits and benefits.

Considerations :
- Usually have great ethics and working conditions due to it being partially worker owned
- All shareholders have input on decision making
- Allows for greater possibilities with multiple stakeholders and investors
- Investments may be made through time, energy or money (or all 3)
- Requires solid structure and agreements in order to be successful

WORKING BOARD OF DIRECTORS

Board members do some or all of the work of the organization. This includes administrative tasks and fundraising as well as rolling up sleeves and doing work to support the mission.

Considerations :

- Often the model used in start up organizations while increasing capacity
- Lines can become blurred between overarching organizational decisions and on-the-ground programs or initiatives which the board may not be as knowledgeable about
- Sometimes on-the-ground work can take time and focus away from overarching governance decisions, including visioning and policy development
- May invite conflicts of interest as board members are often wearing many hats
- Risk of burn-out
- Best directors are skilled at governance & big picture thinking, as well as detail & action oriented with hands-on experience getting things done on-the-ground
- Can be challenging to transition to Policy Governance model if already established as a working board

POLICY GOVERNANCE BOARD OF DIRECTORS

Founded by John Carver, this style of board defines and guides appropriate relationships between an organization's owners, stakeholders, board of directors, and executive directors.

Board has three roles; connect with ownership and stakeholders, develop governance policy (including a mission, vision and organizational goals) and ensure organizational performance.

POLICY GOVERNANCE BOARD OF DIRECTORS CONT.

Considerations :

- Provides clear differentiation between governance and management responsibilities. Separates the purpose (goals) from operations (means)
- The board's primary relationship is with the organization's 'ownership'
- Staff and volunteers (led by the executive directors) take action that supports the fulfillment of the mission, vision and goals while being held accountable through policy created by the board of directors
- May make directors more effective, reduce chance of burnout, support on-the-ground staff to take more initiative and make more of their own decisions resulting in a positive and empowering work culture

GRASSROOTS MOVEMENTS

Use collective action to affect change. Bottom-up, rather than top-down decision making

Considerations :

- Can be very collaborative, open and self organized. May not last long term
- Allows for natural evolution and flow of inspiration, ideas and action
- Lack of organization can bring challenges with issues like acquiring and storing funds, leadership, roles and responsibilities

SWARM MOVEMENTS

Swarm Movements are the collective behaviour of decentralized, self-organized systems. This is the pattern of the global permaculture movement.

TRANSITION is a movement of communities coming together to reimagine and rebuild our world, facing big challenges by starting local. Often using crowd-source solutions. Focused on reclaiming the economy, sparking entrepreneurship, reimagining work, reselling and weaving webs of connection and support. Initiated by Rob Hopkins and others www.transitionnetwork.org

WORK THAT RECONNECTS is a movement started by Joanna Macy for helping people discover and experience their innate connections with each other and the self-healing powers of the web of life, transforming despair and overwhelm into inspired, collaborative action. www.workthatreconnects.org

The purpose of authority or government is to help fulfill the needs of the local human and ecological community. Good government supports decisions being made that reflect the needs and values of the community and allocates resources that allow those decisions to be applied.

Permaculture Design identifies a series of methods for group decision making.

CONSENSUS DECISION MAKING

Values

- Inclusive
- Participatory
- Collaborative
- Agreement seeking
- Cooperative

Key Benefits

- Inclusive decisions
- Increased buy-in for implementation
- Strengthens group relationships

Challenges

- Requires training of all participants to be effective
- Often more time consuming than other decision making methods

CONSENSUS
GOVERNANCE

Process
Facilitator is impartial and does not participate in the decision making process, they only drive it.

1. Discussion
2. Proposal
3. Vote : Consent, consent with concern, or block
4. If yes, consensus achieved

If the vote is no

5. Concerns are raised
6. Modification of proposal
7. Vote : Consent, consent with concern, or block

If blocked go back to step 5

Keys to Success

- Shared values and clear mission, vision, aims
- Compassionate communication
- Trust in collective wisdom

QUAKER-BASED CONSENSUS

- Values silence and active listening
- Encourages concise, relevant contributions to decision making process
- Concerns and information are shared until everyone is clear
- Ideas, solutions and decisions are associated with the group, no names are recorded
- Dissenting perspectives are integrated into the final decision
- Emphasizes that objections which block or lengthen process are only to be done when absolutely necessary
- Process continues until full consensus has been reached, no matter how long that takes

SOCIOCRACY

Acknowledging foundation contributions to earlier versions of the governance section spanning the next 3 spreads from Keala Young. This was taken to another level with significant upgrades from Erin Young

Sociocracy uses a whole-systems approach for co-leadership in organisational design, decision-making and governance. It enables the people of an organisation to govern as an organic whole by distributing power and giving everyone a consent-based voice in their area of expertise. Sociocracy means the power is vested to the 'socius'; that being people with a social relationship eg. associates, companions, colleagues.

Values

- Effectiveness : collective aims at all levels guide actions and decisions with an empirical, pattern-based approach, allowing for course correction and adaptability
- Transparency : perspectives of all team members are called upon to determine how to do their work, providing more information for better decisions. Direct access to policy documents and records is given to all
- Equivalence : individuals function as peers in deciding how to accomplish collective aims. Accountability is held by a team as a whole

Governing Principles

- Consent: Consent occurs when there are no objections about a policy decision. Objections provide valuable information and help a team make better decisions. They must be explainable, and be directly relevant to collective aims. They are not a veto or block
- Circle organization : Circles (aka teams, departments) are semi-autonomous, self-governing groups. Each has specific aims and the responsibility to direct, operate and measure its own processes
- Double Linking : An appointed representative of each circle and the operational leader participates as full members in the higher-level circle. This increases the integrity of information transfer with active feedback loops

DYNAMIC GOVERNANCE
SOCIOCRACY

Key Benefits

- A hierarchy of perspective and scope is established, rather than a hierarchy of people with power over others
- Power is distributed and held collectively
- Roles are elected with collective consent. This does not involve volunteering in or out
- A Lead-Do-Measure approach is woven into every aspect, helping to 'steer' the organisation
- Leadership and responsibility is cultivated amongst all members of an organisation

Challenges

- People must adjust to actively participating and taking responsibility for decision-making and the effectiveness of their team
- Additional tools to support empowered communication can be required
- Requires training of all participants to be effective
- Requires efficient and timely communication and facilitation

Sociocracy Process

It is important to note that sociocracy involves governance design along with a decision-making process. The steps for processing a proposal using consent decision-making are detailed below. Other processes in the sociocracy methodology include: elections for roles, broader brainstorming through picture-forming and proposal generation, and meeting agenda preparation and use.

The following process applies to policy decisions, those that determine how a team does its work together. Operational decisions are led by those with responsibility for the task at hand, directed by collectively agreed policies. Proposals are shared before the meeting so people can prepare ahead of time.

Processing a Proposal

Step 1 - Policy proposal is presented to circle meeting

Step 2 - Clarifying Questions Round. In turn, circle members ask relevant questions to help understand the proposal and how it addresses circle aims

Step 3 - Reactions Round. Responses to the proposal are provided in turn, with the focus on presenting information or reasoning why this proposal does or doesn't work. This can include suggestions to improve the policy to better address circle aims

Step 4 - Modify Proposal. The facilitator synthesises information gathered through rounds, and amends the proposal as appropriate

Step 5 - Consent Round. 'Do you have any objections to this policy proposal?' is asked of each member. Objections are heard and resolved where possible. Consent occurs in the absence of objections. Where objections are unresolvable during the meeting, the proposal is paused and developed further. This is a facilitated approach, where circle members speak one at a time in a round

DYNAMIC GOVERNANCE
SOCIOCRACY

Where cross-talk occurs, ie. speaking out of turn, the facilitator intervenes to maintain appropriate process.
The facilitator also participates in decision-making as a full circle member.
Circle members consent to using the sociocracy process and share the facilitator and secretary roles. This spreads the skillset and contributes to greater understanding of what's involved.
To maintain effectiveness, contributions from members within policy meetings must be relevant to the agenda item and hold consideration for how policies align with the organisational mission, vision and aims.

Keys to Success

- Effective and equivalent decision-making utilizes the philosophy: 'good enough for now, safe enough to try'
- 'Circle domain' identifies tasks of specific responsibility to a team. This provides decision-making guardrails and avoids authority overlap between circles
- Objections are welcomed and must be reasoned in relation to circle/team aims to inform and evolve proposals
- All policies are time-bound and measured in review, keeping them alive and relevant

Learn more at **www.dynamicgroups.com.au** & **www.erinyoung.net**

OPEN SPACE TECHNOLOGY
COMMUNITY BUILDING

OPEN SPACE TECHNOLOGY

A creative way for hosting meetings, conferences, and community building events. There is a specific purpose, but no formal agenda beyond the overall theme.

Guiding Principles

1. Whoever comes are the right people
2. Whenever it starts is the right time
3. Wherever it is, is the right place
4. Whatever happens is the only thing that could have, be prepared to be surprised!
5. When it's over, it's over
6. The law of 2 feet : At any time, anyone can use their two feet and go to a different discussion

Process

1. Opening Circle : The whole group decides on what topics will be discussed. After a brainstorm of topics, the group chooses the most relevant ones to be the focus of the discussions
2. Facilitator explains principle of open space technology
3. There are multiple unfacilitated conversations are happening at the same time based on the chosen topics
4. Closing Circle : comment and reflection

Learn more at **www.openspaceworld.org**

WORLD CAFE
COMMUNITY BUILDING

WORLD CAFE

A method for creating collaborative dialogue around questions that matter.
A process of having multiple connected conversations at the same time which share collective knowledge and shape the future.

Guiding Principles

1. Set the Context : Have a purpose. What is the reason for bringing everyone together?
2. Create Hospitable Space : Host somewhere safe, comfortable & encourages creativity
3. Explore Questions that Matter : Use questions that are relevant to the group
4. Encourage Everyone's Contribution : Invite active participation
5. Connect Diverse Perspectives : Allow for movement between tables to diversify thoughts, knowledge and ideas
6. Listen Together for Patterns & Insights : Encourage people to actively listen to others. Document highlights of the conversation to help see emerging patterns
7. Share Collective Discoveries : Present harvests to the larger group

Process

- Seat up to 5 people at tables or in conversation groups
- Set up at least three rounds of conversation, approximately 20 minutes each
- Engage questions. You may use the same question multiple rounds of conversation. Alternatively you can pose different questions in each round, to build on and deepen the exploration
- Encourage participants to write, doodle & draw key ideas on provided paper
- Upon completing the initial round of conversation, you may ask one person to remain at the table as a "table host" for the next round, while the others travel to another table
- For the last round, people can return to their first table to synthesize their discoveries, or they may travel to a new table
- After at least three rounds of conversation, initiate a period of sharing discoveries and insights to the whole group

Learn more at **www.theworldcafe.com**

ETHICAL ECONOMY
COMMUNITY EXCHANGE

A relocalized permaculture economy addresses the needs of the local human and ecological community ethically. By providing for more of our own needs locally, we can reduce the need to earn as much money, have more time to pursue our creative projects and family life while co-creating a thriving community based economy. Methods of exchange outside of the formal economy are meant to be complimentary to it. Local economies build trust amongst community members and create resiliency.

WAYS TO MEET OUR NEEDS

- Not spending
- Many small incomes
- Saving
- Income substitution
- Receive surplus
- Make your own stuff
- Upcycle
- Reduce energy needs and inputs of goods
- Spread your risk
- Diversify
- Use by-products
- Minimize maintenance
- Always have a back up
- Increase natural resources

RESOURCES AND NEEDS INVENTORY : Identify local resources including skills of people. Redesign, re-train and cross-train to fill in the gaps.

SLOW MONEY

- Long term profits with slow return on investment
- Community and environmental benefit is seen as an important part of the profit
- Relocalized, ethical investment

COMMUNITY EXCHANGE
ETHICAL ECONOMICS

RIGHT-LIVELIHOOD
- Making a living doing activities that support & benefit human & ecological communities

RESILIENCE
- The ability of a community to provide for its own goods, services and needs locally as well as adapt, recover and respond to any kind of crisis or disaster

GREEN DIRECTORY
- An inventory of the resources in a local community
- Ethical buyer's guide to support people to become conscious consumers
- Shows openings for new businesses, goods or services that may be needed
- If produced annually it can show how the community is progressing

GLEANING
- Gathering unused or left-over food and resources

SLOW FOOD
- Local, seasonal and artisanal
- Includes traditional techniques and cultural preservation
- Cooking on demand, convivial eating (slowly), locavore
- Encourages social interactions

BIOREGIONALISM

A political, cultural, and ecological system based on naturally defined areas called bioregions. Bioregions are defined through physical and environmental features, including watershed boundaries as well as soil and terrain characteristics. Bioregionalism suggests that the determination of a bioregion is also a cultural phenomenon, and emphasizes local populations, knowledge, and solutions. What are the natural resources, goods and services offered in your region? How can these create a local identity, culture and economy?

ETHICAL ECONOMY
COMMUNITY EXCHANGE

INFORMAL ECONOMY

- Barter, Trade or Swap
- **Work Parties** : Groups of 5 or more alternating working between their properties
- **Craigslist-like** : Online listing of goods and services offered for free or sale
- **Skills Bank** : A registry of who does what in your neighbourhood

SEMI-FORMAL ECONOMY

- **Time Bank** : Hour for hour exchange of services
- **L.E.T.S.** : Local Employment & Trading System which involves creating our own money

NEW ECONOMY

- Create a pattern literate community with local control of money flow and use of conscious local trading currencies
- Investing in things that are needed in the real economy
- Real economies simply solve the needs of the local community
- Divestment : withdrawing money from unethical investments

GREEN / ETHICAL ECONOMICS : Considers all environmental and social costs associated with a product, service or development

CRADLE TO CRADLE ECONOMICS : Considers the real costs of extraction, processing, production, distribution, use and reuse or disposal of goods and services

HUI

- Informal Loan Club which pool money or resources
- Contributors present business plans that address real need in the community
- Invested in businesses that fulfill fundamental functions of the community
- Contributors paid back in money or goods and services or by getting a loan from a future Hui gathering. From the community for the community

PERMANOMICS
BRUNO VERNIER

KOMBIT

- Community collective of people coming together to pool resources, products, food, skills or labour
- Participants get a shared return for their investment
- Engenders community engagement and co-operation

RECIPROCITY

The most simple direct sort of transaction where goods or services of equal value are traded. It can range from 'direct barter' (both sides exchange at the same time) to a 'gift' in exchange for an expectation or obligation to return the favour at an unspecified future time.

PAY IT FORWARD

A civilized and often enlightened form of reciprocity involving a 'gift' exchanged for an expectation or obligation to eventually return the favour to a third party who belongs to the circle the original participants both belong to (multi-generational family, local community, people with similar hardships, all of humanity). This builds community long term.

MUTUAL CREDIT

A very useful type of 'Pay It Forward' accounting. In a modern 'barter exchange', 'timebank' or 'community currency system', the return obligation is quantified as 'mutual credit' which involves a whole community of people, not just the two parties involved in a reciprocal arrangement. This builds community (short-term) and if setup at the municipal or regional government level, it becomes a powerful complementary currency that helps entire populations greatly when the national currency is in short supply by keeping the mutual credit currency flowing locally, keeping local jobs and businesses alive.

CROWDFUNDING

Raising small amounts of money from many people by pre-orders that fund production.

PERMANOMICS

BRUNO VERNIER

Permaculture works on everything and at every level, including invisible structures like money.

Money is a Permaculture Sector.

We can design and redesign new or existing money systems.

Money is a multitasking word linking three distinct functions:

1. **Capital** (a type of Energy Storage)
2. **Currency** (actual trading flow using metaphorical tokens)
3. **Accounting** (transparency about what happened)

- All the people who use a particular currency form a community
- All currencies are community currencies

Each currency is assigned a mission within the circle of its users. The Canadian dollar's job is to strengthen national identity and encourage stakeholders to work hard to increase (GNP) Gross National Product. If that mission is not aligned with the values of your permaculture project, either use more appropriate currencies and/or subvert the national currency to be a better fit.

Permaculture Currency Expert Bruno Vernier contributed this section. You can see an accompanying slideshow and learn more at **www.permametrics.org**

BASIC CURRENCY DESIGN
PERMANOMICS

CURRENCY DESIGN

- Currency connects community by matching needs (requests) with goods and services (offers)
- Identify all the stakeholders who could use the currency
- Find and engage one or more matchmakers, people who connect goods and services to those who seek them. Matchmakers identify needs and collect requests while promoting offers of goods and services
- Constantly update a catalog of requests and offers
- Determine which metaphorical token to use as the currency
- Be transparent and accountable
- Respect gifts. Never monetize real gift economies, and allow natural transition to real gift economy
- Use currency with consent, no compulsion for people to trade
- No interest gained from saving money
- If everyone stops using the currency, let it be. Celebrate all the transactions that happened. These transactions made all the participants wealthier and that wealth has not gone away. Note, if wealth is stored in the currency itself, like national currency or bitcoin, you will have to keep the currency alive and ever growing larger
- Community currency supports local business an encourages ethical business practices
- Goods and services travel in the opposite direction of the money that purchases them
- Transmogrify capital as needed to get a project done

Whenever a project needs something :

- First, check the capital inventory. It might be available
- Second, let your stakeholders know what is requested. Reach out to intersecting community circles
- Third, consider trading some project capital for national currency in order to buy what is needed
- Fourth, consider co-creating an appropriate currency to match needs with offers

It is liberating to know that projects can get done without national currency.

CURRENCY SPECTRUM

Bernard Lietaerd shared in his book *The Mystery of Money* that currencies can be organized in a spectrum running between Yin and Yang.

(YIN) MONEY

Exemplified by local Community Currency :

- Based on generating social capital
- Tends to lose value over time
- Short term, frequently recollected and reissued
- Works well in times of abundance, cooperation, mutual-credit and trust
- Complimentary currency, usually co-existing with yang money
- Has negative interest (Demurrage)
- Shares wealth with everyone
- Recirculates wealth in the local community, benefiting relationships
- Supports long term thinking and profit
- Made of ordinary materials
- Community trade benefits relationships

- Trust
- Sign curve
- Gift
- Co-operation
- Appropriate
- Abundance
- Mutual credit
- Material
- Social capital

- Activates the archetype of the Lover & Great Mother

BASIC CURRENCY DESIGN
PERMANOMICS

(YANG) MONEY

Exemplified by National Currency :

- Based on generating financial capital
- Store of value
- Highly durable and long lasting
- Works well in times of scarcity, competition, debt and fear
- Operates as a monopoly with only one currency dominating
- Earns interest
- Concentrates wealth in the hands of the elite
- Tends to leave the local community, extracting wealth
- Supports short term thinking and profit
- Made of scarce metals
- Long distance trade outside the community

- Fear
- Exponential curve
- Tax
- Competition
- Efficient
- Scarcity
- Debt
- Abstract
- Financial capital

- Activates the archetype of the Sovereign, Warrior & Magician

Seek a good balance of both Yin and Yang currencies.
Design for appropriate currency diversity.

PERMANOMICS
BRUNO VERNIER

CREATIVE REPURPOSING OF NATIONAL CURRENCY

- Carbon credits & other forms of compensation for social and environmental costs
- Cultivate circular steady-state economics, where population and capital grow at the same rate
- Universal Basic Income and Georgism (taxing land rather than labour)
- New Green Deal proposes lowering fossil fuel consumption and greenhouse gas emissions while providing new jobs in clean energy industries. Retrofit society to renewable zero-emission power, digitize power grid, upgrading buildings for energy efficiency, electric transportation, job training and new economic development
- Form a new economy with microloans, covestments and crowdfunding
- Second-hand trade with thrift shops, craigslist & exchanges of used goods
- Support ethical green investments
- Provide new jobs offering right livelihood
- Train a new generation of competent, confident, connected and caring people who have integral character, cope well, contribute positively and are responsibly in control
- Cultivate long-term, low-interest investment
- Capture and cycle national currency to irrigate projects like water in swales

CRYPTO CURRENCY

A very clever mathematical (software programming) technique that is attracting a lot of interest, creativity, classic gambling-style speculation and awesome revolutionary predictions. Every currency (crypto or not) is best described by the totality of all the transactions that are made with it. Before Crypto, it was simply not practical nor safe except on tiny scales to keep instant track of all transactions. Crypto attaches a copy of the entire database of transactions to every transaction. With near-instant access to the entire growing dataset of past transactions, a whole new set of clever solutions to a wide array of thorny, still unresolved, social and financial problems become imaginable. Some solutions are now at the early stages of experimentation; the first one being Bitcoin (2009).

8 FORMS OF CAPITAL
REFRAMING ECONOMICS

Ethan Roland and Greg Landua identified 8 different types of valuable resources which they call Capital **www.regenterprise.com**

FINANCIAL CAPITAL : Often used to purchase other forms of capital. This may be the least effective way to gain valuable resources.

SOCIAL CAPITAL : Relationships. Influence and connections.
Who are your team, clients and stakeholders? What do they offer and bring and offer? What do they request and receive?

MATERIAL CAPITAL : Stuff and things. Buildings, land and objects.
What objects do you have access to? Can you do an inventory?

FINANCIAL CAPITAL : Money and finance. How much currency do you have? How much currency can you earn, raise or borrow?

LIVING CAPITAL : Earth's living creatures, soil and water.
Where can you benefit from the goods and services of nature's biodiverse ecosystems?

INTELLECTUAL CAPITAL : Information and knowledge. What access do you have to formal or informal education?

EXPERIENTIAL CAPITAL : Skills. Practical doing. What skills and experiences does your team have?

SPIRITUAL CAPITAL : Connection to self and universe.
How can you create experiences of beauty and connection to share with others? What is the quality of your decision making process?

CULTURAL CAPITAL : Shared community practices, rites, rituals, traditions and beliefs. What heritage and larger cultures are you a part of? What kind of micro-culture are you creating in your home, workplace and community?

Since this material was developed, permaculture teachers keep identifying more forms of capital including **HEALTH & WELLNESS CAPITAL.**

LAND FOR THE LANDLESS

LARRY SANTOYO

There are many opportunities to have land to grow food for everyone. Here are alternatives including simply getting the right to use the property without ownership. Land is a resource not a commodity. Everyone has the right to land access for housing and food.

OXFAM MODEL : Listings of who has land they will let people farm in exchange for food or rent, and who seeks land to farm on.

CITY FARM OR COMMUNITY GARDENS : land in the city, often marginal, which is dedicated to allowing people to grow their own food and/or food for market.

CITY AS FARM : Locate feral fruit trees and any food on public land. Harvests from private land whose owners want to share with the community.

COMMUNITY SUPPORTED FARM : A producer-consumer co-op run by, and for, families and people who want to farm in exchange for a share of the food produced.

COMMUNITY SUPPORTED AGRICULTURE (CSA) : Local people pay up front at a reduced rate for a yearly supply of food, supporting farmers when they need it and taking on some of the risks.

EMPLOYEE SUPPORTED AGRICULTURE (ESA) : Part of employee's wages go to supporting a farm run and employees get some of the food produced in exchange.

NEIGHBOURHOOD SUPPORTED AGRICULTURE : Spin farming of private and public land, turning lawns or parks into productive gardens and farms.

LAND TRUSTS : Land set aside privately or by the government which can never be resold and only used for farming to preserve cultural heritage.

URBAN DESIGN
ROSEMARY MORROW

URBAN DESIGN

STRATEGIES

- Minimum intrusion into the natural state
- Maximum variety of land use and activities
- As closed a system as possible
- Optimum balance between population and resources
- Public transit to reduce car traffic
- Communal open spaces, gardens and commons
- Co-housing communities with shared facilities

Each city to confine its impacts and draw its resources from its own bioregion. View city as ecosystem.

EIGHT PRINCIPLES FOR CITY REGENERATION

- Protect natural and cultural features
- Let topography and rural countryside define the urban form
- Ensure development enhances environmental health
- Intensify and diversify development
- Maintain rural traditions
- Work with nature
- Education for watershed consciousness
- Reduce car dependency

SUBURBAN DESIGN
ROSEMARY MORROW

SUBURBAN DESIGN

OBJECTIVES
- Abundant, Restored, Beautiful

STRATEGIES
- Co-operation
- Small clean industries
- Independence
- Work-nets
- Group planning

GOALS
- Harvesting resources (dumps, unused food)
- Total waste recycling and all renewable energy
- All water harvested and cleaned
- Get animals and insects back
- Have fun
- Cultivate agriburbia

VILLAGE DESIGN
ROSEMARY MORROW

VILLAGE AND NEIGHBOURHOOD DESIGN

STRATEGIES

- Farms and woodlands surround settlements
- Woodland protected roads and rivers
- Maximize freedom for individuals
- Distributed energy supply (energy, food, gardens, water at every house)
- Site houses and neighbourhoods in clearings for protection
- Create opportunities for responsibility, learning and income
- Ecological controls shared with everyone responsible to help clean and save water, build soil and protect the area from predators
- Aim for a self-sufficient, decentralized, independent neighbourhood, village or town

GOALS

- Dispersed ecosystems
- Shared resources
- Local economy, markets, products
- Local transportation
- Long-term forests
- Wildlife corridors & foliage covered walkways
- Open space
- Minimized waste

COMMUNITY DESIGN

MARK LAKEMAN

The following Placemaking Section features teachings from Mark Lakeman and is partially sourced from City Repair's : Placemaking Guidebook
Creative Community Building in the Public Right of Way
Order the book and learn more **www.cityrepair.org**

Placemaking is the act of creating a shared vision based on a community's needs and assets, culture and history, local climate and topography. It is as much about psychological ownership and reclamation of space as it is about physically building healthier places. As the process of co-creating a community place progresses, people develop deeper relationships and more momentum to create together because they have discovered a way to directly change the world in which they live. Placemaking is based on the belief that everyone is a designer and a good design should serve social and cultural development.

Intersection repair is the citizen-led transformation of a street intersection into a public square. It transforms spaces used only for transportation into places for community gathering and relationship building.

The City Repair facilitates the creation of public gathering places and events that invite connection between people and places. City Repair supports the redesign of neighbourhoods to be more community-oriented, ecologically sustainable and beautiful. This organized group action educates and inspires communities as well as individuals to creatively transform the places where they live, taking active, direct roles to regenerate neighbourhoods. At the heart of this work is the relocalization of culture, economy and decision making through community participation. City Repair facilitates artistic and ecologically-oriented placemaking with projects that honour the interconnection between human communities and the natural world.

COMMUNITY BUILDING: GETTING TO KNOW YOUR NEIGHBOURS

At the heart of Placemaking is human relationships. Open up meaningful relationships with your neighbours and community:

- Say hello and introduce yourself to your neighbours when you see them around
- Start conversations with your neighbours
- Learn more by asking neighbours who they already know and what has happened in the past
- Make greeting cards and invitations to mail to neighbours you don't see around
- Build phone and email trees to enable communication between your neighbours
- Set up a community kiosk to post information and facilitate communication
- Ask neighbours what kind of community they want to live in and what they might like to see that could be built to improve the place
- Learn about what events, gatherings and classes are offered by your neighbours or in your community and attend some of them
- Reach out to your neighbours and offer to help them in small ways or give them extra fruits, vegetables, herbs or eggs from your garden
- Invite your neighbours to tea or take a walk around the neighbourhood to talk about who they are and share a bit about yourself
- Create public spaces to meet in and enable direct connections
- Collect pets names and make a pet map
- Set up a skill or tool sharing network, plant share, game night or play group
- Host potlucks
- Offer a workshop for a relevant skill like bike safety, street trees, weed ID, intersection repair or tool sharing
- Create an asset map for your neighbourhood including the strengths and resources available. Include people's names and their skills as well as communal structures, natural resources, institutions, businesses, organizations, physical or invisible structures that could be resources for the community
- Develop a walking and biking tour for your neighbourhood
- Set up a community garden
- Create a neighbourhood or street newsletter
- Set up formal neighbourhood meetings about community issues and projects
- Produce free events, celebrations, games, block parties, actions and intersection repair projects that include your neighbours

Community is built best through using our bodies together, sweating, singing songs, handing things to each other & carrying things. As we create together, it reflects us all.

OUTREACH AND INVOLVEMENT

- Start documenting as much of your process as possible
- Set up a community garden and garden collectively
- Set up a seed bank and seed saving network
- Form a core group to help guide the process and projects
- Build partnerships with local people, businesses, organizations, schools, and government groups
- Deepen dialogues about possibilities and create a collective decision making process
- Observe the design space and openly brainstorm possibilities
- Involve as many neighbours in a collective visioning process
- Talk to people who did not attend meetings to allow them still to be involved
- Form a core group (neighbourhood association) of those wanting to dedicate more time and support the block or neighbourhood in its creation and maintenance
- Create a flexible plan for schedules and goals regarding meet ups, doing design charrettes, work parties, maintenance plans and organizational structure including time, energy, supplies and costs estimates
- Develop a specific vision and mission statement
- Co-create goals that are relatively easy to achieve to build group momentum and empower the process
- Facilitate lots of opportunities for feedback
- Include local government in the process of finalizing the design
- Be sure to note any bylaws, codes or other guidelines
- Begin fundraising if needed
- Consider getting signed support from all directly adjacent neighbours as well as 80 % of the neighbours within two blocks of the site (one person per household)
- Make a green community map of your neighbourhood including boundaries, pathways, gathering places, signs, monuments, sites of interest and social centres

OUTREACH AND INVOLVEMENT CONT.

- Create publicity to share the inspiration and encourage others to do similar projects
- Celebrate accomplishments with a block party or social
- Reflect on the process
- Steward the new community place
- Keep the momentum going with socials, events and new community initiatives
- Set up a book club, phone tree or email list
- Write down a list of volunteers and participants
- Develop a walking/biking tour for the neighbourhood including sites of interest
- Co-create a neighbourhood map including gates, pathways, defining features, signs, places, monuments, and centers
- Make the magic happen

"The secret of change is to focus all of your energy,
not on fighting the old, but on building the new"
- Socrates

"We must turn all our resources to repairing the natural world,
and train everyone to help."
- Bill Mollison

"We cannot wait around anymore for resources and permission before we can start. The revolution we seek has to be based on actions we can take wherever we are with whatever we have right now."
- Mark Lakeman

INTERSECTION REPAIR ELEMENTS

MARK LAKEMAN

INTERSECTION REPAIR ARCHETYPES

- Transform street intersections into public squares
- Public art installation
- Traffic circle
- Library
- Free box
- Cafe
- Tea house (mobile or fixed)
- Community gardens
- Cob oven
- Sitting area + cob benches
- Tool lending library
- Mural
- Information kiosk / communication station
- Multi-use space
- Farm gate stand
- Produce sharing station
- Sidewalk chalk dispensary
- Chalk board
- Bike rack
- Bike path
- Table
- Signage
- Lighting
- Water feature
- Garbage / recycling station / compost (if properly maintained)
- Stage
- Pathways
- Mandala
- Pocket park
- Food forest
- Nature strip

INTERSECTION REPAIR ARCHETYPES CONT.

- Bulletins to information and communicate about current events
- Tile mosaic
- Cool stuff made from cob, rammed earth, strawbale, cordwood or earthbags
- Mushroom logs
- Greenhouse
- Chicken run
- Greywater system
- Healing garden
- Compost station
- Worm farm
- Skate park
- Bioswales
- Ecological art by gutters and downpipes
- Planter box
- Grass couch
- Fruit and nut trees
- Native food shrubs and perennials
- Interpretative map
- Community green map
- Tea garden
- Green roofs
- Solar fountain
- Outdoor classroom
- Benches, tables and unconventional seating areas
- Depave areas for gardens or gathering places
- Establish a bike or car share co-op
- Block party
- Babysitting networks
- Co-op gardening / spin farming
- Happy and connected neighbours

PLACEMAKING FUNCTIONS

MARK LAKEMAN

PLACEMAKING FUNCTIONS

- Builds community
- Reclaims public spaces
- Turns spaces into places
- Creates ecologically sustainable, community-centred neighbourhoods
- Allows people to meet freely without having to spend more
- Greens the local neighbourhood
- Addresses social and environmental concerns
- Habitat building for animals and birds
- Creates beauty
- Slows down traffic
- Encourages other neighbourhood projects
- Reduces crime
- Increases property value
- Brings neighbours together
- Re-indigenizes our cities, towns and villages
- Helps people get to know neighbours
- Initiates a community design process
- Promotes biking and walking
- Supports reskilling and skill building
- Addresses social isolation
- Attracts families and conscious people to the neighbourhood
- Creates community resilience
- Increases communication and interaction between neighbours
- Inspires participation and cooperation in community issues and projects
- Cultivates neighbourhood identity, culture and economy
- Creates connections between local schools, businesses, organizations, government and neighbours
- Is super fun

RESILIENT MOVEMENTS
COMMUNITY DESIGN

Jan Semenza introduces two important concepts around Placemaking:
- Develops Community Capacity which is defined as "characteristics of communities that affect their ability to identify, mobilize and address social and public health problems"
- Builds Social Capital "The norms and social relations embedded in the social structure of society that enable people to coordinate action to achieve desired goals"

What is Resilience?
- a characteristic of natural systems
- the ability to maintain a dynamic balance in the face of disruption

TRANSITION : Initiated by Rob Hopkins, a movement of people and communities starting local and using crowd-source solutions to nuture a caring culture and a healthy natural environment. Encourages entrepreneurship, reskilling and the relocalization of goods, services and energy. www.transitionnetwork.org

PLANNING FOR REAL : A community engagement process supporting groups to develop an action plan for change. www.planningforreal.org.uk

WORK THAT RECONNECTS : A movement initiated by Joanna Macy that helps people connect with themselves, each other and nature to transform despair and overwhelm into inspired, collaborative action. www.workthatreconnects.org

"Diversity relates to the number of elements that comprise a certain system, be they people, species, businesses, institutions or sources of food... A more modular structure means that the parts of a system can more effectively self-organize in the event of shock... Tightness of Feedback refers to how quickly and strongly the consequences of a change in one part of the system are felt and responded to in other parts"
- Rob Hopkins

CULTURAL EMERGENCE

LOOBY MACNAMARA

CHALLENGE & AWAKEN PHASE

Practices

- Awareness of Culture
- Sensing Systems
- Pattern Disruption
- Thinking Differently
- Wise Wording
- Self & Collective Responsibility
- Levelling Privilege
- Challenging Mindsets

MOVE & INVIGORATE PHASE

Practices

- Manifest through Design and Action
- Growing in Effectiveness
- Building Resilience
- Visioning
- Engaging Imagination
- Naming & Reframing
- Offering & Requesting Reflections
- Collaboration and Co-creation

NOURISH AND EMPOWER PHASE

Practices

- Connection Practices
- Growing Ropes
- Surfacing Gifts & Creative Expression
- Self-Care
- Supporting Emotions to Flow
- Listening
- Appreciate & Celebrate
- Building Trust
- Peace Making

CULTURAL EMERGENCE is a toolkit designed by Looby Macnamara and collaborators to support the emergence of a peaceful, regenerative culture for ourselves, our communities and future generations. Includes phases, practices and principles for enhanced connection. See her book *Cultural Emergence : A Toolkit for Transforming Ourselves & the World* **www.loobymacnamara.com**

PRINCIPLES OF CULTURAL EMERGENCE

- Your Body Knows
- Honour the Wisdom Within
- Tend to your own Personal Culture
- Be in Courage
- Give Encouragement
- Receive Encouragement
- Use the Intelligence of Co-operating Hearts
- Anyone Can Raise the Vibration
- Emergence Happens in Relationship
- Many Minds are Better than One
- Weave Unity
- Respond to Life
- Be Attentive to Timing
- Be Attentive to Shifts, Openings & Opportunities
- Synchronize with Natural Patterns
- Trust the Process
- Step into the Unknown
- Use Emergence to Support Emergence
- Plan then Flow
- Leave Space for Emergence
- Move the Tools
- Presence in the Process
- Make Progress Visible
- Work to Completion
- Beauty in Completion
- Come into the Light
- Discover Abundance
- Embrace Potential
- Allow for the Possibility of the Seemingly Impossible

DESIGN FOR RESILIENCE

ROSEMARY MORROW & KYM CHI

Drawn from the extraordinary work and courses of Rosemary Morrow, a core mentor for all the editors of this book. This section is from Rosemary Morrow and her Resilience Planning class of 2015 at the Sustainability Centre including Kym Chi, Dana Wilson, Annaliese Hordern, Chris Walker, Susie Lees & Ben Walter

WHAT IS RESILIENCE?

- Creating trust and building community
- Sustaining ourselves, each other and the planet
- Having support systems in place with back-ups
- Being adaptable in changing times & thinking preventatively
- Design that buffers from extreme weather events and human induced emergencies
- Using whatever you have, wherever you are, to take action

WHAT IS DISASTER?

- Something that effects the entire community and requires a community response
- Disaster is surprising, dramatic, life changing, and often has long-term consequences

STEPS TO RESILIENCE
STAGES & STRATEGIES

STEPS TO RESILIENCE
Emergency prevention, preparedness and response.

Stage 1 Awareness

Goals : Build community and community trust
Steps : Come together, create a disaster profile for your local area

Stage 2 Prepare & Network

Goals : Continue to build community, have equity in contribution, build resilience, learn the needs of the local area and its vulnerabilities
Steps : Asset mapping, prevention and preparation

Stage 3 Endure

Goals : Be coherent and forward looking, seek models and indicators for regeneration, vision with long term thinking, replace what was with what could be
Steps : Respond

Stage 4 Regenerate

Goals : Work together to make it better than it was
Strengthen areas of vulnerability
Steps : Renew and reflect

DESIGN FOR RESILIENCE

ROSEMARY MORROW & KYM CHI

COMMUNITY BUILDING

- The community has the knowledge, skills and resources needed to create true resilience
- How would you get a community to start developing solutions and actions for disaster?
- What steps are needed to take disaster training to your community and council?
- **E.A.S.E.** : Engage, Acknowledge, Share and Earn trust

DISASTER PROFILE

Reviewing the history of disasters in an area helps us to see the patterns of events over time and their impacts. This enables us to plan and prepare better for the future and create preventative measures. When creating a profile we research and document :

- Type of disaster
- Cause (human or nature)
- Frequency & time to onset
- Duration and recovery time
- Scope and degree of destruction
- Controllability and predictability
- Secondary disasters
- Indicators
- Risk assessment
- Resources

NEEDS AND ASSET MAPPING

Observe and document :

- Skills and resources you have
- Skills and resources available in your community
- Gaps or needs in your local area
- Demographics of your area with acute attention to children, seniors and those with special needs

LONG TERM PLANNING
RESILIENCY

PREVENTION AND LONG TERM PLANNING

How can permaculture help?

One of the key functions of permaculture design is creating resilience. Looking at your disaster profile, create a design with prevention in mind that considers :

- Water catchment, treatment, storage and overflow
- Soil health
- Regeneration of the landscape
- Protection from fire, wind, flood, drought, animal, pest, toxin and disease
- Food and medicine supply
- Needs of the community and economy
- Back-ups for all systems. When possible, back-ups for your back-ups

KEY NOTES

- The Earth's conditions must be met before we can be self sufficient
- Self sufficiency is only achieved when the community's needs are met
- Observe patterns to details. Pay attention to what is happening globally and how it effects us locally
- Watershed management in rural areas is a must

ACTIONS TO BUILD RESILIENCY

- Work at a street or community level
- Work with groups
- Create a local directory of skills and distribute
- Plan big, include your whole community with nodes and networks that can connect and reach everyone when needed
- Build local food networks
- Train the trainers to bring resilience into every level of life and education
- Host events and workshops that build trust, develop skills and strengthen networks
- Promote community resiliency at community events and festivals

DESIGN FOR RESILIENCE

ROSEMARY MORROW & KYM CHI

During the permaculture mapping process, do a risk assessment for different types of disasters so that you can implement proper techniques into your design process. Some strategies inspired by the foundational work of David Holmgren :

DROUGHT

- Plant and preserve trees and other vegetation
- Keep soil densely covered with plantings and mulch
- Capture and store water in the highest place in the landscape possible
- Refill the aquifer by slowing, spreading, sinking and storing water onsite through multiple means
  Examples include : rain barrels, cisterns, ponds, swales, keyline design or other earthworks, wicking beds, rain gardens and curb cuts
- Ensure large surface area, especially of plants for water and dew catchment
- Share, be efficient, conserve and have a conservation mentality. Implement water conservation techniques into your daily life. Examples include; 4 minute showers, weights in the toilet tank or low flow toilets, buckets in the shower, drip irrigation, use of grey water in the garden
- Relocalization drastically lowers water consumption
- Create a community-wide plan for drought management

FLOOD

- Plant and preserve trees and other vegetation, especially on slopes
- Keep soil densely covered with plantings and mulch to avoid erosion and runoff
- Create densely planted earth berms in high risk water areas, like nearby rivers and lakes
- Note the patterns of seasonal rainfall and 100, 500 and 1000 year events and install enough water storage to hold the maximum recorded amount of rainfall
- Always plan for an overflow route & manage that overflow water as a resource. Don't try to catch it all at the bottom. Ensure that overflow will not negatively impact neighbouring areas
- In urban areas, plant on boulevards, use curb cuts, green roundabouts, permeable pavement and rain gardens to slow, sink, catch, store and clean before reaching storm drains
- When possible site houses & structures mid slope with water diversion around home
- If close to oceans, large bodies of water, or on the floodplain, raise structures off of ground
- Create a community wide plan for water management

FIRE

- Note that fire is often a secondary disaster to drought
- Plant drought tolerant and fire resistant species, especially around designated fire defensible spaces and on steep slopes. Cool Climate examples include; Douglas Fir, Big Leaf Maple, Alder, Hawthorn, Crab Apple, Oregon Grape, Salal, Service Berry, Red Flowering Currant, Uva Ursi (Kinnikinnick), Yarrow, Echinacea, Fireweed, Lavender, Lupine, Sage, Wild Strawberry, Seedum, Creeping Thyme
- Hydrate the landscape by slowing, spreading, sinking and storing water onsite through multiple means. Techniques especially efficient at doing this are: keyline design, swales, ponds and other in-ground irrigation, planting and preserving trees. Infrequent deep watering to whole garden during dry periods
- Raintanks, cisterns and ponds also used for fire fighting (design for gravity feed to create water pressure)
- Mulch to retain water. Use fire retardant or resistant mulches like seaweed, gravel or living mulch. If using straw, leaves or wood, ensure that it is kept moist
- Keep gutters clean and free of debris
- Keep woodpiles and building materials away from living and working areas
- Reduce or remove old, hollow or weak trees, brush, deadfall and other combustible materials. Mow and mulch grass. As an alternative to burning, rake dry plant matter and leaf litter into contour ridges which catch run-off water to speed up their decomposition
- Seal gaps in doors & windows to avoid hot ash from entering during fire season
- Try to use fire resistant building materials for structures like cob, brick, plaster, terracotta (roofing), metal (roofing and gutters)
- Use double or triple paned windows and reflective window coverings to avoid radiant heat through windows from heating buildings
- Minimal windows on south (northern hemisphere) or north (southern hemisphere) and west sides of structures
- Cooling from shade house on shade side of house
- Avoid use of dark roof surfaces where radiation can cause expansion buckling and preheating of combustible framing
- Ensure fireplaces have damper. Install and maintain spark arrestor on chimney
- Reflect sunlight away from materials that have a fire risk
- Use steel posts or hardwood for fencing
- Work out a check list for actions to be taken on extreme fire risk days and know what to do when a bushfire approaches
- Build an underground root cellar that can also double as a fire shelter
- Avoid stores of flammable materials
- Create a community wide plan for fire management.
- Have a bug out kit (away kit) prepared for piece of mind

DESIGN FOR RESILIENCE
ROSEMARY MORROW

PREPARATION

- Short term needs & priorities
- Visible Structures
- Use checklists for supplies and evacuation plan

SUPPLIES

- Community contact list highlighting children, seniors and those with special needs
- Evacuation bag (backpack for everyone)
- Radio or walkie talkie. If possible, a phone with solar charger for communications
- Food : 6 week supply = 16 kg - 30 kg (35 - 66 pounds) / person / month
- Water : 6 week supply = 3 L (6 pints) of water / person / day
- Water filter or cleaning tablets and water bottle
- First aid
- Flashlights with battery back up and candles with waterproof matches
- Identification and medical information in a waterproof ziplock bag
- Cooking supplies
- Energy, heat and light
- Blankets
- Tools and hardware
- Tarps and ropes
- Tents if possible
- Notebook and pencil
- Compass, topographic map, signals
- Building supplies
- Seeds for regeneration
- If possible, resources like permaculture texts, wild skills and ID books

DESIGN FOR RESILIENCE

ROSEMARY MORROW

INVISIBLE STRUCTURES

Create teams & consider :

- Communications
- First Aid
- Transportation
- Cooking, food storage and preservation
- Shelter and building
- Waste and sanitation
- Energy
- Water
- Counselling, conflict resolution and vibe watcher
- Safety
- Childcare and activities
- Care for elderly
- Response to people in panic
- Education and training

STAY OR EVACUATE?

Stay

- How can you create a refuge?
- What actions will be required?
- Consider communications for fire, flood, pandemic, nuclear and storm

Evacuate

- When will you evacuate?
- How long might you have to evacuate for?
- Who will have to go? Where will you go? What will you take?
- What will you leave? How will you communicate?

PREVENTION STRATEGIES

ROSEMARY MORROW

RESPONSE DURING A DISASTER

Action

- What are you doing?
- What are the priorities?
- What are the roles and responsibilities?
- Make sure you are including everyone
- Have activities for people to do

Supplies

- Kits for evacuating or staying
- Checklists
- Appropriate technology

Feedback

- How is it working?
- Vibe watch and conflict resolution
- People care and self care

Assessment

- What are the gaps? What are the challenges?

Recovery

- Ensure that the disaster is over
- Deploy small team to assess and report back
- Address priorities like injuries, illnesses and unsafe structures
- Open and clear access for emergency vehicles
- Consider security, warm and dry bedding, antiseptic, hot water when possible, sanitation, equal distribution of supplies, hygiene and clear access
- Check on those in need

REGENERATE
Be transparent and as public as possible about the disaster so that more resources will be available to you.

Meet and decide :
- Priorities
- Roles and responsibilities
- How to make it better than before
- How to redesign and rebuild with prevention and resiliency in mind
- What resources are available?
- Where can you attain donations?
- Where can you contribute?

REFLECT
- Encourage talking about what happened and share feelings
- Review what went well with the plan, what didn't work and what you would do differently?

FUTURE SCENARIOS
From the work of David Holmgren

Techno-Explosion : Relies on continual energy and resources and continual population growth. Often connected with a space faring civilization that colonizes other planets.

Techno-Stability : Relies on achievement of steady state economy based on widespread use of renewable energies and green technologies.

Energy Descent : Relies on reduction of resource and energy use in a powered down and radically relocalized civilization. A permaculture future.

Collapse : Predicts a systematic failure of industrial society and ecological collapse.

DESIGN FOR REFUGEES

ROSEMARY MORROW & TAMARA GRIFFITHS

This section is drawn from the extraordinary work of Rosemary Morrow, a profound mentor for all the editors of this book. Assembled and edited by Tamara Griffiths.

CAUSES OF DISPLACEMENT OF PEOPLE : War, revolution, political threat, religious threat, cultural genocide, racial genocide, ethnic cleansing, rising sea level, drought, famine, natural disaster, human made disaster, climate change causing long term rainfall patterns to change, desertification, pollution, resettlement due to pressure on land, exodus to cities, mining and industrial destruction of the environment people use for living and growing food, politics and policies, forced work places and military service.

ETHICS : The lands which refugees are resettled on must be able to become sustainable in species diversity, soil improvement, water and conventional usage. Well managed ecological systems give maximum opportunity for responsible development and use.

PRINCIPLES : Pay attention and work with only two resources : Land and People. Healthy communities can use resources sparingly and replenish common land with water, biodiversity and soil.

PROBLEMS IN REFUGEE CAMPS TO DESIGN FOR

- The nature of being a refugee means to have no belongings or capital
- Lack of Planning : Refugee camps often spring up with no planning due to the urgency of what people are fleeing. Often a group of people camp once they find safely and aid or state organizations come to them and food distribution is begun. Later come fences and restrictive laws
- Reliance : Set up with complete reliance on imported food, water, energy and resources making them completely unsustainable
- Economy : Since they do not generate goods or services for trade, they often have no industry, agriculture or generative economy

DESIGN FOR REFUGEE CAMPS

ROSEMARY MORROW

PROBLEMS IN REFUGEE CAMPS TO DESIGN FOR

- Ideology : Refugee camps are designed to be temporary, short-term solutions. This leads to a belief that permanent structures on the site are not necessary or a waste of money. Most of these camps are not short term though, people spend many years in camps waiting to return home or seek asylum in another country. Many refugees spend more than 10 years in a refugee camp
- Poor camp management : No cohesive management plan, competing organizations, NGOs and government plus desires of actual refugees. Lack of realistic objectives. No forward planning or framework for decision making. Refugee community often excluded from decision making with no control over situation. Decisions may be made by hierarchical structures that do not include refugees
- Political management by host state : Refugees are often not allowed to leave the camp or detention area. Legal status can be dubious and they are often given no voice in local government. May be excluded from local and state economy. May have blocks to gaining employment in the local community
- Water : Contaminated water sources, no water infrastructure, no running water, UNHCR recommends 20 L (5 gallons) per person per day. Many refugee camps fail to meet this standard
- Food : Poor food, lack of fresh food, contaminated food, food with calories but no nutrients leads to chronic malnutrition. Harvesting wood for cooking food denudes the area of trees
- Sanitation : Poor planning and infrastructure for human waste
- Health : Squalid housing without places to wash body or clothes. Poor sanitary conditions lead to epidemics of preventable diseases like diarrhea, cholera, typhoid and dysentery. Smoke inhalation from cooking inside housing. Lack of medical infrastructure and medicines. High rate of child mortality. High rate of maternal morbidity

DESIGN FOR REFUGEE CAMPS

DESIGN FOR PEOPLE

PROBLEMS IN REFUGEE CAMPS TO DESIGN FOR CONT.

- Mental health : Affected by trauma and PTSD that led to their displacement and by the camp life. The placement of camps away from society means that the longer someone stays in a camp, the more isolated they may become Employability skills may be devalued. Increased risks of mental health problems arise under such conditions
- Education : Lack of access to education, lack of buildings and materials for education, lack of desire by the host state to educate refugees
- Housing : Temporary housing like tents and tarps exposes people to extreme temperatures, rain, wind, snow. May be no electricity
- Safety : No ability to lock a tent means occupants are never fully safe from criminal intrusion. Often inadequate policing means crimes go unpunished
- Waste : Poor infrastructure for rubbish. Waste dumps
- Land : Usually marginal land, isolated, difficult to farm. No capital for roads, dams, fences, shelter, water infrastructure, community buildings. No design for water, orchards, food growing etc.
- Camp design : Layout is usually a grid pattern and not set up to harvest energy and buffer climate
- People : May feel like they have no real control over their lives
- Title : Ownership of resettlement land is ill defined often leaving refugees with no ownership or long term security. Land and structures in such situations may not be cared for and may require attention

By the time permaculture comes to a refugee camp it has usually been established for some time. We need to set up an entirely new system – from management to on-the-ground design. Issues faced by refugees after resettlement in new country include : language differences, unemployment even after several years, poor education, illness, PTSD and other mental illness, racism in host country, poor treatment by host government, held in detention camps.

Learn more and see some successful permaculture design contributions to refugee camps here: www.borgenproject.org/refugee-camps-temporary-solutions

DESIGN FOR SPECIAL NEEDS

ANNALIESE HORDERN & MARTIN SCHMEIG

This section was provided by Annaliese Hordern and Martin Schmeig

GENERAL DESIGN

- Consider access and function when placing elements

ACCESS

- Design so everybody can access on both right and left side
- Use large buttons or switches
- Gate latches : functional and automated
- Doors open from accessing an easy use use button or are motion activated
- Electrical plugs are located with accessibility and appropriate placement
- Pathways with building code maximum grades for wheelchair access : flat, 2.5 cm x 30.5 cm grade (1 inch : 1 foot grade)

STRUCTURES

- Hand rails and areas to lean up against
- Thermostat tuned to a comfortable temperature which turns on when entering room
- Lights turn on automatically when the room is entered

TOOLS

- Light weight design for tools and materials
- Daily use tools that telescope out to provide greater reach and extender poles on hand tools to improve ability to do tasks that may otherwise be impossible

FIRE

- Have a clear emergency fire strategy with reenactment training and instructions posted in a common area
- Maps of access including exit escape routes and emergency response equipment
- Space for emergency vehicles to access and turn around in. Check with the regional fire department the size requirements of the largest service vehicles

DESIGN FOR ACCESS
STRATEGIES

PATHWAYS
- Harder surfaces
- Avoid soft edges or moat style edges

WATERING SYSTEMS
- Automated with drip hoses
- Watering wands with easy trigger
- Accessibility of water taps

VEGETATION
- Low maintenance gardens and vegetative zones
- Ground covers and succulents to keep the weeds down
- Blossoms at the right height for admiration, viewing and smelling
- Scented gardens
- Touch gardens
- Gardens at height people can reach and interact with
- Container gardens, raised beds, vertical walls & biotecture

SIGNS
- Larger sized font for easy readability
- Braille

WILD ANIMALS
- Proximity alarms to scare off predators. Dog companion for protection

NATURE ACCESS
- Water front gardens that access nature
- Raised pathways into the forest. Include turnaround areas or space for 2 chairs to pass each other
- Platform that looks into inspiring landscape

DESIGNERS CHECKLIST
LAND ASSESSMENT

A permaculture design certification will support people to use Permaculture Design in their own life and work. This skillset can be applied as a consultant and designer for others to help upgrade a site, workspace, development, business, project, process, relationship, garden, farm or land base. Design and consultation includes site visit and analysis. Here is an example checklist for a site visit and analysis focussed on a land base. Modify or remix it to apply for your unique needs.

When you do a site analysis, depending upon the time accorded, you can work alone or with your clients to acquire specific information and answer design questions. Sometimes this analysis will lead to you doing a design, other times it will just be used as a consultation for the owners of the land. Either way it will be a huge help. Charge sustaining rates for this high level offering.

Here are some things you may want to consider in your design consultation and site visits. Some of these answers could be prepared by a client before the site visit. This could also serve as a property checklist when purchasing land.

MAPS

- Acquire all existing maps (regional district, blueprints, google maps, google earth, etc.)
- Create a map of the property oriented to the north
- Learn about zones, codes, easements, recycling / waste pick up, neighbours, plants and animals in the community, invisible structures and invisible sectors
- Find out about the different local resources (goods and services, allies and supporters)
- Seek out public land and parks, walking and biking trails, public transit and community centres

LAND ASSESSMENT
DESIGNERS CHECKLIST

HISTORY OF THE LAND

- Traditional patterns of plant use, agriculture and hunting
- Recent history of the land since it was first developed from unmanaged land
- Research knowledge through elders in the neighbourhood, libraries, public records and historical organizations

FEATURES

- Landforms (major rocks, hills, elevation shifts, landmarks)
- Permanent buildings
- Roads and trails
- Fences
- Structures
- Topography, slope and aspect
- Views
- Location of plants, animals, insects, fungi and soil organisms as well as their food sources and habitat
- Access ways, roads and paths

FLORA

- Gardens
- Forests
- Lawns
- Functional plants
- Wildlife corridors
- Endemic remnant plant communities

FAUNA

- Birds and mammals
- Reptiles and amphibians
- Fish and insects

DESIGNERS CHECKLIST
LAND ASSESSMENT

WATER

- Running water (rivers, streams, brooks)
- Aquaculture
- Salinity and pH
- Oxygen levels
- Seasonal temperature ranges
- Drainage patterns
- Supply : aquifers, springs, ponds, wells, tanks, cisterns, barrels
- Assess placement in watershed and upper catchment potential

ELEMENTS

- Note all elements, tools, resources or functional objects on the land
- Find the locations of any utility lines like electricity, hydro, phone etc

SOIL

- Salinity and pH
- Nutrient content
- Basic makeup (sand, humus, stone, minerals)
- Depth of hardpan or parent rock

CLIMATE

- Patterns of sun and shade
- Wind direction and speed range
- Seasonal sunrise and sunset times
- Seasonal rainfall
- Seasonal temperature range
- Frost free period
- Zone analysis
- Sector analysis
- Microclimates with distinct temperatures, moisture, soil and exposure to weather

LAND ASSESSMENT
DESIGNERS CHECKLIST

DESIGN GOALS

- What new elements are wanted by the land stewards?
- What already existing elements are not wanted by the land stewards?
- What functions do the land stewards want fulfilled?
- How can the land be organized to save energy? generate surplus?

Collaborate with the client to :

- Create beautiful documentation
- Outline the entire process of design, discovery, and application
- Create learning opportunities
- Stay organized with what has been done and what the plan is
- Media can cater to the client's personal style and usability

CLIENT INTERVIEW

- Discover needs and wants
- Create the initial relationship between you and client
- Set clear expectations including a financial agreement about payment
- Establish channels of communication
- Build confidence and authority
- Learn about the already existing relationships
- Discuss budget including for ongoing maintenance schedules
- Create statement of intent
- Learn what resources are already available (or are needed)
- Match complexity of plan and amount of upkeep needed with the available time, resources and lifestyle
- Listen and read between the lines for what clients need and what they have the time, resources and inspiration to actually do
- Keep in regular touch with client
- Send checklists and questions to client ahead of time
- Ensure a clear understanding of client's budgets and timelines and create appropriate project phasing

DESIGN PROJECT
COMMUNITY GREEN MAP

Permaculture is a journey to become increasingly conscious. Mapping starts with the closest locations of all five zones beyond the home (garden, food forest, farm, woodland, ancient growth). The next level of mapping includes identifying resources and opportunities at locations in your bioregion. These include places of natural beauty, organic farms, ethical businesses offering goods and services, cultural centers and sacred sites.

What skills and resources do the neighbours and those in the local community offer?
What local organic products are available in the local community?
What services are available through local family run businesses or co-ops?
Where are the parks, hikes and accessible wild spaces?
Where are locations for growing food or creating culture?
Who are allies or potential allies?
What are the obstacles to doing permaculture in the region?
What are easy victories in bringing permaculture into public spaces and to the greater community?

Where can you fulfil your needs for items not produced at home?

Zone 1 : Annual veggies and herbs
Zone 2 : Perennial food, medicine and spices
Zone 3 : Wool, leather, nuts, fruits, perennials, dyes
Zone 4 : Timber, lumber, fuel, tool supplies, wild game, mushrooms, wildcrafted herbs

COMMUNITY GREEN MAP
DESIGN PROJECT

A **COMMUNITY GREEN MAP** is an open project you can do in any way you wish, but here are some suggestions for what you might consider :

- Observe the local infrastructure, economy & resources, centers for the arts, shelter, community gathering places, health, education, transport, essential services and government
- Ask locals for further information
- Collaborate with others
- Consider a nested energy descent plan as a model. Many scenarios may emerge that support you to create resilience. This work could include reading *Retrosuburbia* by David Holmgren and the *Transition Handbook* by Rob Hopkins
- Assess Strengths, Weaknesses, Opportunities and Threats (SWOT) in your Community
- Do a rough hand drawn map of your community or use a premade map for ease
- Mark out the zones including parks, farms and forests
- Look at the sectors including where water, power and essential services come from
- Locate conscious stores, farmers markets, farm gates, co-ops and community supported agriculture opportunities
- Consider your ability to relocalize and power down
- This could include an energy descent action plan, a design for disaster, a community currency or a phased plan for radical relocalization

POST-PDC PATHWAYS
NEXT LEVEL

NEXT STEPS

People completing PDCs (Permaculture Design Certificates) come from all walks of life, ages and backgrounds, they have four things in common :

- Concerned about the state of the world including nature and society
- Tend to have an above-average understanding of the predicaments we face
- Proactive people who like to get things done
- Eager to start doing something with what they have learned but do not necessarily have a plan or vision of what this may look like

What comes after a Permaculture Design Certificate will be hugely influenced by :

- Vision and goals
- Skills and experience
- Current assets and liabilities
- Community landscape
- Opportunity

VISIONS AND GOALS

What do you want for the world, your community, your household, your life?
What do the world, your community, your household and you need?
You may have a vision or goal to :

- Use permaculture in your life and household with no further goals for now beyond improving yourself
- Become a permaculture actionary. Beyond planning, you could support people to implement and actually build the structures for the projects they dream
- Become a permaculture activist. Promote permaculture in your community and engage people so they can learn and apply its principles by starting on-the-ground projects
- Taking a permaculture design teacher training
- Become a permaculture teacher. Teach permaculture and eventually facilitate advanced programs and teacher trainings

Becoming a Permaculture Consultant and Designer who helps others to visualize and implement projects in their lives and communities. What type of consultant might you be? You may coach for personal development, be a career coach for Right Livelihood, or coach people on creating self-reliant systems such as edible gardens or alternative energy systems. Discovering what your dreams are will guide next steps.

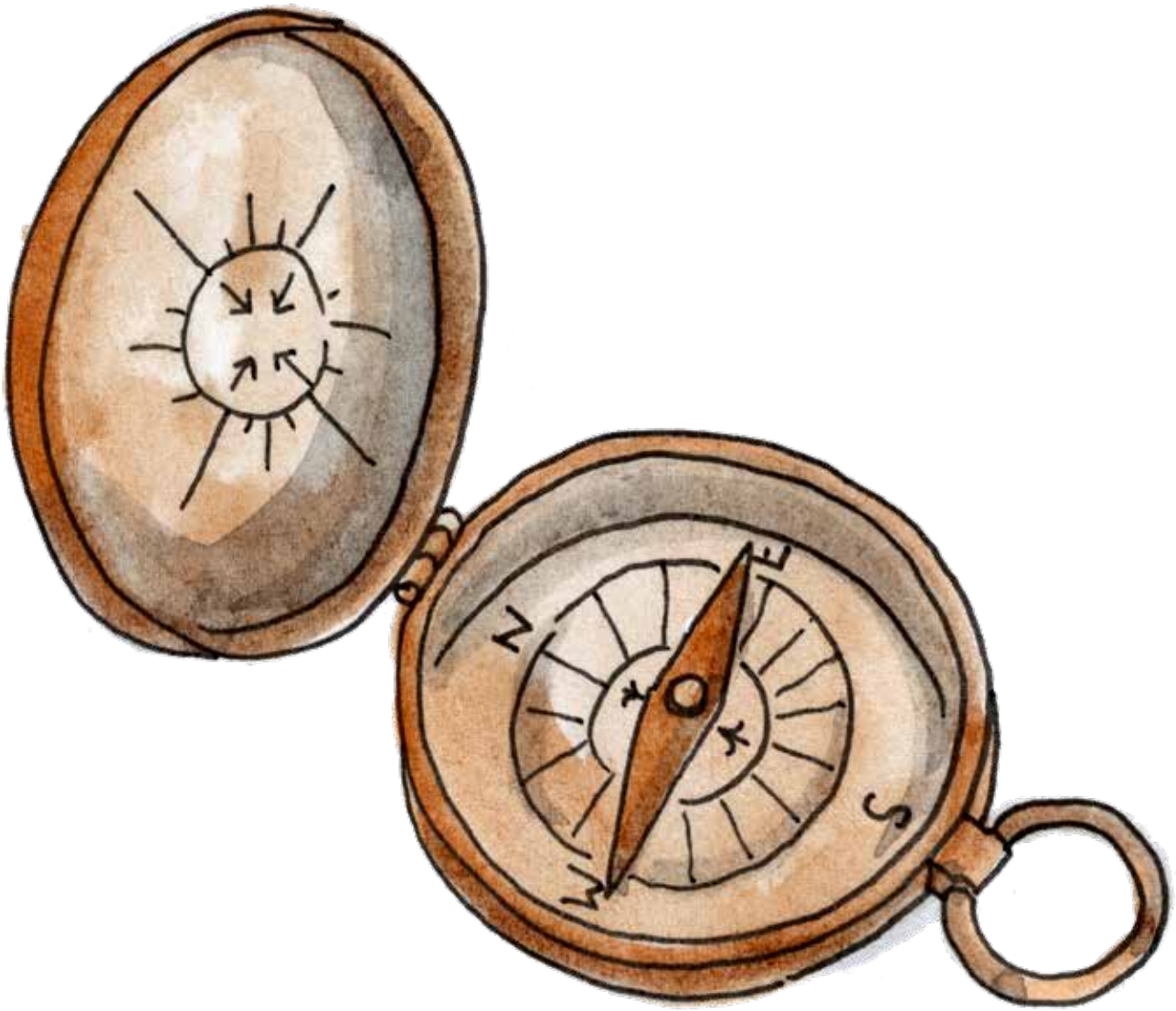
ASSETS AND LIABILITIES

- Do a personal asset assessment, what are your skills? talents? gifts?
- Make a resume
- Do you have dependents?
- Does your family support your permaculture dreams?
- Are you emotionally and spiritually strong enough to change your life right now?
- Can you overcome financial challenges?
- Do you have debts and bills to pay?
- Are there other people depending on your current income?
- Can you overcome health challenges?
- Are you healthy enough, both physically and emotionally, to embark on this new adventure?
- Access to land to start a garden, or time to plan and implement the next level of your life design can help with starting and maintaining momentum
- Liabilities and challenges may slow you down. You may need to be more creative with how you work with what you have

DIPLOMA

Do two or more years of work applying permaculture in any way to your life, and livelihood by doing designs and documenting work.
Research the possibility of a Diploma including these Institutional offerings:
Permaculture Association **www.permaculture.org.uk/diploma**
Permaculture Institute **www.permaculture.org/diploma**
Permaculture Australia **www.permacultureaustralia.org.au/permaculture-education**
Permaculture Institute North America **www.pina.in/diplomas**

Apply permaculture and its ethics to your life in any way you are inspired to.
May the permaculture path help you save time, energy and money while living a meaningful life in alignment with your values.



"If you want to change the world,
start at your back doorstep."
- Bill Mollison