Dancing Rocks Permaculture Community Homeowner's Manual

A GUIDE TO ECO-LOGICAL COMMON SENSE LIVING

2011 Edition

Foreword

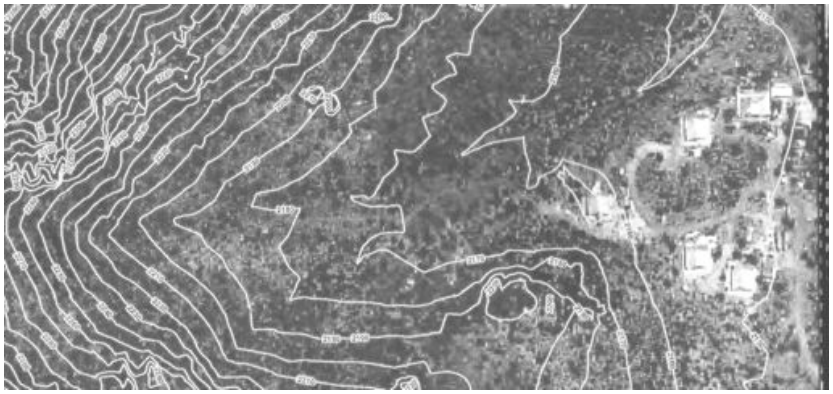
When you buy a car, you receive an owners' manual to help you safely operate, care for and maintain it. This homeowners' manual is the same idea. In addition, it is:
• a guide to living at Dancing Rocks that fully describes rights and responsibilities that are legally described in recorded CC&Rs attached to the deed of ownership at Dancing Rocks
• full of helpful hints on many topics, as well as references for further study
• access to local resources, updated periodically

You are encouraged to contribute corrections and additions for future editions.
Thanks!

The inspiration for this manual came from the Crystal Waters Village Owner's Manual and Max Lindegger's village design course in Cerrillos, NM, 1995 (attended by Barbara Rose, Brad Lancaster and others from the Sonoran Permaculture Guild).

Above: site plan with inset of original historic residence showing water harvesting earthworks.

Below: aerial map of site with ten foot contour intervals.



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Above: Looking South to Safford Peak and Saguaro National Park.

Below: The Ridge above Dancing Rocks

1: Development Policies

Dancing Rocks Permaculture Community is a small, self-governed community that engenders a high level of stewardship between people and the land based on Permaculture ethics and principles.

Permaculture is a design system and way of life grounded in ecology and ethics; a practice of integrated ecological design and living that connects many disciplines including: habitat restoration, watershed management, green building, and sustainable economic development.

The ethics of Permaculture are:
• care of earth (the following ethics naturally grow from this)
• care of people
• reduce consumption and reinvest surplus

These basic ethics guide the planning and decision making at Dancing Rocks. The goal of our community is to become more ecologically & economically stable by increasing local production of food & energy, biological diversity, and health of the land while enjoying life!

Sense of Place
Dancing Rocks is located in the northwest corner of the greater Tucson Basin at a unique edge:
• between expanding urban/suburban development and ironwood forest/critical habitat landscape linkage
• between two jurisdictions: Marana and unincorporated Pima County
• between the ancient, eroding peaks of the Tucson Mountains and the Santa Cruz river floodplain, where native people, prehistoric to present have hunted, gathered, and flood-water farmed for thousands of years

This land is sacred ground, home to ancient food-processing, dwelling and ceremonial sites, a place to nurture our spirits as we care for the land and each other, a place where nature and culture are intertwined.

References:
• Fish, Suzanne, Fish, Paul, & Madsen, J, 1992. The Marana Community in the Hohokam World, UA Press.
• Mollison, Bill, 1990. Permaculture Designer's Manual, Island Press.
• Nabhan, Gary, 1997. Cultures of Habitat, Counterpoint Press.

Biological Sensitivity
Biological research of the impact on the Sonoran Desert Bioregion has led to Pima County's Sonoran Desert Conservation Plan (SDCP). DRPC lies within critical habitat for endangered species. We are committed to sustaining and regenerating the health of all inhabitants and being a continued resource and research site. Our success as a community will be measured by the health of the land and native species as well as the human inhabitants.

Above: Saguaro Ironwood Guild

References:
• Buhner, Stephen, 2002. The Lost Language of Plants, Chelsea Green.
• Nabhan, Gary & Holdsworth, Andrew, 1999. State of the Desert Biome, Arizona-Sonora Desert Museum.
• Nabhan, Gary, et al, 2000. Desert Ironwood Primer, Arizona-Sonora Desert Museum.
• prepared for the Coalition for Sonoran Desert Protection by EcoNorthwest, 2001. "The Potential Economic Benefits of Protecting Natural Resources in the Sonoran Desert," www.sonorandesert.org

Eco-logical Design
"The aim of holistic design is to allow everything to work together harmoniously, and you know you are on the right track when you notice that your solution for one problem has accidentally solved several other problems. You decide to minimize the use of automobiles in order to conserve fossil fuels, for example, and you realize this will also reduce air pollution, encourage healthful exercise, reduce noise, conserve land by minimizing streets and parking, multiply opportunities for social contact, beautify the neighborhood and make it safe for children."

-Max Lindegger. Crystal Waters Permaculture Village, Queensland, Australia

The following Ahwahnee Principles are included in this owners' manual as a way to extend the concept to a larger community level. They can be found in "Designing Sustainable Communities; Learning from Village Homes" (see resource section). Imagine if all new housing developments were designed this way!

The Ahwahnee Principles

Preamble: Existing patterns of urban and suburban development seriously impair our quality of life. The symptoms are: more congestion and air pollution resulting from our increased dependence on automobiles, the loss of precious open space, the need for costly improvements to roads and public services, the inequitable distribution of economic resources, and the loss of a sense of community. By drawing upon the best from the past and the present, we can plan communities that will more successfully serve the needs of those who live and work within them. Such planning should adhere to certain fundamental principles.

Community Principles

1. All planning should be in the form of complete and integrated communities containing housing, shops, work places, schools, parks, and civic facilities essential to the daily life of the residents.
2. Community size should be designed so that housing, jobs, daily needs, and other activities are within easy walking distance of each other.
3. As many activities as possible should be located within easy walking distance of transit stops.
4. A community should contain a diversity of housing types to enable citizens from a wide range of economic levels and age groups to live within its boundaries.
5. Businesses within the community should provide a range of job types for the community's residents.
6. The location and character of the community should be consistent with a larger transit network.

Above: entry drive on contour harvests water for native plants

7. The community should have a center focus that combines commercial, civic, cultural, and recreational uses.
8. The community should contain an ample supply of specialized open space in the form of squares, greens, and parks whose frequent use is encouraged through placement and design.
9. Public spaces should be designed to encourage the attention and presence of people at all hours of the day and night.
10. Each community or cluster of communities should have a well-defined edge, such as agricultural greenbelts or wildlife corridors, permanently protected from development.
11. Streets, pedestrian paths, and bike paths should contribute to a system of fully connected and interesting routes to all destinations. Their design should encourage pedestrian and bicycle

use by being small and spatially defined by buildings, trees, and lighting; and by discouraging high speed traffic.
12. Wherever possible, the natural terrain, drainage, and vegetation of the community should be preserved with superior examples contained within parks or greenbelts.
13. The community design should help conserve resources and minimize waste.
14. Communities should provide for the efficient use of water through the use of natural drainage, drought tolerant landscaping, and recycling.
15. The street orientation, the placement of buildings, and the use of shading should contribute to the energy efficiency of the community.

Source: Local Government website: www.lgc.org.

References:

• Berry, Wendell, 1987. Home Economics, Northpoint Press.
• Corbett, Judy & Michael, 2000. Designing Sustainable Communities, Island Press.
• Jackson & Svensson, 2002. Ecovillage Living—Restoring the Earth and Her People, Chelsea Green.
• McHarg, Ian, 1971. Design with Nature, American Museum of Natural History, Doubleday Press.
• Pinkwater, Daniel M, 1977. The Big Orange Splot, Scholastic.

Protecting the Health of Dancing Rocks Community
Property ownership at DRPC is in the form of private lots. You may buy, sell or lease individual lots. However, rights of ownership at DRPC differ in important ways from what are normally assumed to be "private property rights".

If you chose to live here, it means you accept that stewardship is a function of ownership at DRPC.
Included in your deed are legally binding conditions, covenants, and restrictions (CC&Rs). These were created to ensure the protection and care of the land. They must be followed by all DRPC residents.
Since the core purpose of DRPC is to create a community that sustains and regenerates its inhabitants and habitat, residents have an obligation to discontinue practices that pollute our soil, water, and air. Practices and precautionary principles follow peer-reviewed, science-based research on soil, air, and water quality in the Sonoran Bioregion.

Above: native foods harvested and prepared on site, including mesquite, palo verde, ironwood, cholla, tepary, saguaro, chiles and jujube

Should you decide to sell or lease, it is your responsibility to fully inform the potential new resident. The best way to do this is to have a community meeting/potluck and invite the prospective resident to discuss any questions or concerns. A trial period before a sale is highly recommended of a minimum of six months to one year. Residents have first option to purchase or find a buyer when a home becomes available and first right of refusal. Listing with a realtor is not advisable, due to real estate laws that state whoever can pay the asking price gets the property. We want to be sure the prospective resident agrees to abide by the guidelines of the owners' manual and CC&Rs. We are also committed to keeping our community affordable.

Above: Native foods being processed

2: Cooperation with your neighbors

Here is some specific information for residents and guests at Dancing Rocks.

Quiet
We all like it and hope to keep mechanical noise to a minimum. Community area parking, carpooling, walking and bicycling keep us healthier and increase our opportunities to hear the birds sing.

Pollutants to Avoid
Chlorine bleach; herbicides (like RoundUp); pesticides; sodium-based soaps, shampoos and cleaners; and commercial tobacco products. These substances diminish our own and our neighbors' well-being, poison air, soil, greywater and groundwater. Replace these products with EM (Effective Microorganisms), vinegars, Oasis cleaning products, Bon Ami, and hydrogen peroxide based bleaches.

Domestic Animals
Must be kept in the development envelope, and must not cause impacts to others or the habitat of native species. If you are bringing a dog or cat, consider not having another when your pet's life comes to an end. Pet's predatory actions towards native animals can be as damaging as road kill. Loose chickens will be thoroughly enjoyed by bobcats and coyotes! Large stock animals such as cattle and horses are not appropriate at Dancing Rocks, because of soil and water conservation issues.

Infrastructure
The driveways, building sites, paths, utilities easements, and water supply are part of an integrated design to combine a clustered development footprint with sites that have beauty and privacy. If you plan additional projects within your development envelope, discuss building and planting sites with your neighbors. Do not plant shade trees where solar access will be diminished as plants grow.

Above: A view of home with solar panel

Exotic and Invasive Plants
African Sumac (rhus lancia), Buffelgrass & Fountain Grass (penicidum species), and their relatives can escape onto neighboring land and crowd out native species. Before planting, consult the planting resources, or talk with a long time resident who is familiar with native and invasive plants.
Light Trespass
Avoid reflected light from roofs and outdoor night lighting, be considerate of your neighbors. Plants can screen light and reflective surfaces.

Resolving Problems
Address problems before they escalate and continue communication until they are resolved. Resources include Calling the Circle by Baldwin, C, a book describing an innovative practice for communication and conflict resolution, and Non-violent Communication (see below).

References:

• Baldwin, Christina, 1994. Calling the Circle, Swan & Raven.
• Dadd, Debra Lynn, 1984. Nontoxic & Natural (new edition), Tarcher
• Effective Micro-organisms: Emrousa, www.emrousa.com.
• Farley, Steve, February 1997. “Roundup: Just Say No!”, The Composter: newsletter of the Tucson Organic Gardeners.
• International Dark-Sky Association, www.darkskies.org.
• Oasis cleaning products are available at Food Conspiracy Co-op, Tucson Co-op Warehouse, and other natural markets.
• Sylvia Haskvitz at Center for Nonviolent Communication, (520) 572-9295, www.nvcaz.com.

3: Heat gain, heat loss

Welcome to the baked apple. We have an average of 6 months of warm to hot weather and 6 months of cool to cold weather.

Temperature extremes (low 20's to well over 100 degrees F.) can be eased by thoughtful design and planning.

Above: Southern Exposure trellis shade during hot weather

• Design your outdoor gardens and porches to encourage winter sun, summer shade and good air flow. Be sure to keep solar access open for south-facing glass doors and windows. A typical mistake to avoid is planting young species on your south aspects which turn into big species that then shade your south windows (your main heat gain) in winter.
• Encourage microclimates: plants and structures which help humidify and cool in summer and hold warmth in winter.
• Place internal sources of heat such as fridges & stoves in ventilated spaces to allow heat to escape in summer. Consider summer kitchens on your porch and solar oven cooking, which will help your home stay cooler.
• Vine trellises, trees and living ramadas can reduce temperatures around the house by more than 10 degrees. just remember to keep plantings 5-10 feet away from building foundations for termite control.

References:
• Mollison, Bill & Slay, 1991. Introduction to Permaculture, Tagari Press.

4: Design for solar energy and solar cooling

Solar energy can make electricity, heat and cool homes, cook food, heat and purify water, and provide lighting. Passive and active solar design is already incorporated into your home. You can greatly increase your energy efficiency with a solar oven and solar water heater.
• Proper building orientation and glazing provides for winter warmth and summer cool. In the ironwood forest beyond your home, young saguaros nestle on the south side under the shade of a larger "nurse" plant; in the same way your home, outdoor living areas, and gardens can make use of thoughtful orientation to the sun's path. A southern exposure with a small south overhang of roof, protected by trees, trellises, or porches on the North, East, & West will be cooler in summer and warmer in winter.
• Photovoltaic (PV) panels provide efficient use of electric power: energy for lighting, motors and household appliances. Care of these systems includes conservative energy us, regular monitoring and maintenance of stand-alone solar systems.

Above: Solar Grid-Tie installation on Barn, SEI Course, February 2007

• Active solar technology includes electricity production and solar cooling. Your solar electric system tracks changes in the angle and position of sun during the year to maximize solar energy production. You will need to become familiar with your system, adjust the tracker twice per year, and regularly check and maintain the power and cooling systems. You will reduce thousands of tons of CO2 and other pollutants by producing electricity from solar energy instead of fossil fuels.
• Become knowledgeable about your home power systems. Proper maintenance and seasonal adjustments will provide you with many years of economical clean energy.

Resources:

• Cunningham, Bill. Southwest Solar (heating, cooling, solar ovens), www.southwestsolar.com.
• Home Power Magazine, www.homepower.com.
• Technicians for Sustainability, www.tfs.com
• Solar Energy International, SEI.org
• Spring, Cari & Stage, Lisa, 1999. When the Light Comes On, Emerald Resource Solutions.

Above: Solar oven, built by a resident, cooking dinner

Scenic Drive Sector Map Legend:
Gold Cloud- *hot summer winds*
Blue Cloud- *cold winter winds*
Brown Cloud- *prevailing winds*
Small Blue Arrows- *rainfall*
Gray Arrows (arc)- *traffic, noise*
Orange Arrows (arc)- *light at night*
Green Arrows- *movement of wildlife follows wash and uplands. Note National Park on South, Silverbell/Twin Peaks on North, built-out areas on North and East.*
Yellow and Blue areas- *South and North slopes respectively*
Gray Area- *high density development*

5: Shelter
Energy efficient "eco-logical" design for homes, gardens, and outbuildings

• Passive solar orientation facilitates winter warmth and summer cooling. The sun rises and sets about 28 degrees North of due East and West at summer solstice and is 81 degrees from the south horizon (almost straight up) at noon on winter solstice. The angles are about 28 degrees south of east and west, and at about 45 degrees to your south-facing glass. Locate shelters for chickens, gardens, etc. with solar orientation in mind.
• Prevailing winds at Dancing Rocks are from the south and can be quite hot and dry in spring and fall. Trellises, hedges, and trees buffer strong winds.
• Get to know the weather patterns. Often you can't tell wind direction because the peaks west of the site make the wind turbulent as it hits the west slope and tumbles over the ridge. Winter storms often come from the north.

• Water systems include line from well and rainwater harvesting. Your metered water comes from an old well at the east side of the site. You share the benefits and responsibility for this well with your neighbors. You may choose to explore living within the water budget your roofs produce approximately 6,000-12,000 gal. per yr (estimating between 6"-12" annual rainfall on about 1500 sqf of roof). As urban development occurs, the water table continues to drop. We plan to explore the

development and integration of a catchment system in the canyon upstream in the near future.

• **Slope**
Your development envelope slope is about 4%, with the highest elevation on the west side. When creating your gardens and outdoor living areas, take care to plan for storm water to run off into garden basins, away from your foundations, and reticulate the water toward native vegetation down-slope from your building. Utilize berms, basins, swales, and french drains, integrated into walkways and growing areas. See section 12 for more about water conservation.
• **Noise**
Noise from increasing traffic and development is amplified by the shape of the canyon West of our site. Aircraft noise from the nearby Marana airport will continue to increase with population. You can buffer off-site noise by use of plants, walls and berms. An outdoor living area alive with rustling trees and singing birds will help mask urban noise pollution.
• **Vegetation**
Most local native trees are legumes (including Ironwood, Palo Verde, Mesquite, & Acacia), nitrogen fixers which act as nurse plants, shading and fertilizing the understory. Incorporate these wherever possible on the East, West and North side. On the South, plant far enough away that your South wall area will stay sunny in the winter months. Be sure to avoid future shade of your PV panels. Rainwater Harvesting for Drylands, by Brad Lancaster, has recommendations for the best low-water use, indigenous plants within 500 foot elevation ranges and a five-mile radius.
• **Building materials** in use or recommended at Dancing Rocks for walls, bancos, roofed structures include rammed earth, adobe, cob, strawbale, papercrete, stone, lime plaster and recycled metal.
For interior or protected walls: recycled wood, light clay, clay and gypsum plasters, bamboo, and carrizo reeds.
Roofs: galvanized metal, elastomeric coatings for non-toxic water to cisterns. Spray metal roofs with mild vinegar or muriatic acid solution to remove shine, but note this reduces the life of the roof. The County Hillside and Slope Ordinance requires painted metal roofs in our area, so check water quality before drinking.
Painting: many beautiful ecological paints, stains and finishes are available and you can also make your own.

Above: Strawbale gable walls being plastered with onsite clay and plant fibers

Resources:
• Alduenda, Eileen, 1999. Sustainable Design: A Planbook for Sonoran Desert Dwellings, Tucson Institute for Sustainable Communities.
• Bourgeois & Pelos, 1989. Spectacular Vernacular, Aperture.
• Easton, David, 1995. The Rammed Earth House, Chelsea Green.
• Evans, Ianto, Smith, Michael, Smiley, Linda, 2002. The Hand- Sculpted House, Chelsea Green.
• McHenry, Paul G, 1973. Adobe—Build it Yourself, UA Press.
• Pearson, D, 1989. The Natural House Book, Smith & Schuster.
• Rudofsky, Bernard, 1987. Architecture without Architects, University of New Mexico Press.
• Steen, Athena & Bill, & Eisenberg, David, 1994. The Straw Bale House, Chelsea Green.
• Swentzell, Roxanne, 1993. Our Home, Flowering Tree, Flowering Tree Permaculture Institute, NM.
• Tibbets, Joseph, 1988. Earthbuilders' Encyclopedia, Southwest Solar Adobe School, NM.
• Yampolsky, Mariana, 1982. La Casa Que Canta, Secretaria de Educación Pública, Mexico.
• Sustainable Sources, www.greenbuilder.org.
• Originate-Natural Building Materials Showroom. 526 N. 9th Ave, www.originatenbm.com.

Existing Buildings:
Small is beautiful; living outdoors under shade is delightful.
• Homes at Dancing Rocks have been designed to incorporate both ecology and economy in design, function and materials. Alternative and green building materials often cost more up-front. Rammed earth is labor intensive to construct; however, the materials are inexpensive and obtained nearby. "Embodied energy" describes the complete cost of obtaining the material beyond simply its sales price. For example: the environmental costs of trucking forest products long distances, the energy consumed roasting and pulverizing limestone, silica and iron for portland cement.

Above: Rammed Earth and Strawbale home at Dancing Rocks

Rammed earth materials have a relatively low embodied energy cost and paying for local labor supports the local economy. Rammed earth is also chosen for its mass (2' thick walls), economy of materials (97% adobe soils, 3% portland cement) and beauty, even without any further interior or exterior plasters.

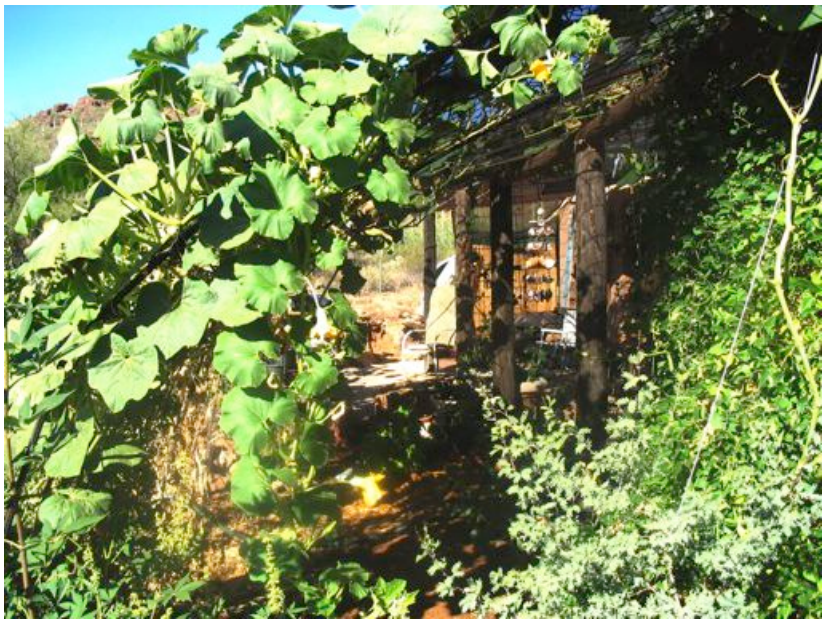
Metal framing (used in the roof trusses & interior framing) made from recycled steel is durable and strong. Openings in walls provide optimum passive solar orientation, ventilation, and access. Interior finishes range from mud-plastered straw bales (providing gable-wall insulation as well) to metal frames and gypsum board, which satisfies fire codes.
Floors are made from grouted and sealed rammed earth blocks. Cellulose was used to insulate the truss roofs. Tectum acoustic board provides a fireproof ceiling and enhances the quietness of the interior.

• Existing buildings at Dancing Rocks are on footprints of about 1000sf. (884sf and 748sf interiors for models built in 2003). Framed openings in the earth walls can be used to access future additions.

• Porches and trellises are integral to the exterior walls, enabling the family to expand the living space into the outdoors. They also cool the perimeter of the building to help maintain a cooler summer temperature inside. Perimeter shades and gardens can be established on the south wall that are removable for passive winter heating.

• An open floorplan provides choices to size & arrange interior rooms with moveable screens, drapes, shelving, and storage systems as needs change over the years.

• At the North homesite, a 1930s historic stone well house with 1950's & 70's additions, was restored and brought up to code in 1995. Cob (clay and straw clump) & strawbale construction and natural clay plasters were used, which might be considered for future building projects (earth ovens, benches, shelving) and small structures. The first rammed earth home and studio were built at this site in 1990.



Above: Summer season squash vines shading adjacent porch and garden

Many small scale trials (and mistakes) were made and learned from and this was the location of the first of many permaculture courses offered at this community.

Resources:

• Alexander et al,1977. A Pattern Language, Oxford University Press.

• Bee, Becky, 1997. The Cob Builders Handbook, Groundworks, PO Box 381, Murphy, OR, 97533. www.cpros.com.

• Fathy, Hassan, 1973. Architecture for the Poor, University of Chicago Press.

• Kern, Ken. The Ownerbuilt Home (out of print).

• McHenry, Paul G, 1996. The Adobe Story, AAIA, University of New Mexico.
• Mollison, Bill, 1990. Permaulture Designers Manual, Island Press.
• Olkowski et al, 1979. The Integral Urban House, Sierra Club Books.
• Small House society, www.smallhousesociety.org.

Above: The beginning of a cob wall made with clay soil found on site

6: Building guidelines

• Pima County Zoning
Current zoning codes permit one kitchen per lot. We are zoned for Suburban Ranch (SR) minimum lot of 3.31 acres. This zoning permits a guest house and accessory buildings. Your development envelope is sized to accommodate permitted buildings while preventing encroachment into the natural conservation area. Therefore, your property has distinct zones where you, the wildlife and the larger community meet...or avoid meeting (for instance, you don't want to meet javalinas in your garden)!

• Development Envelope
Your development area is 8000 contiguous sq. ft. The lot you own is over 144,000 sq. ft., most of which is a natural conservation area (see map in Appendix). Use your development envelope for gardens, guest structures, walls and fences. The purpose of the development envelope is to limit future impact on the rest of our property. The initial Dancing Rocks site assessment research found a legacy of deforestation, overgrazing by cattle, erosion, overdrafting of wells and pothunting of prehistoric artifacts. Historians say this area, called "Cortaro" (from the Spanish word cortar, meaning "to cut"), was extensively logged beginning 250 years ago. You can see evidence of this cutting on many old Ironwood trees around the site. While each lot-holder limits the above development uses to 8000 sq. ft., native landscape restoration and water harvesting earthworks are encouraged over the whole site. Community water harvesting activities are encouraged as well.

• Community Area/ Bean Tree Farm
Homesites are located on previously disturbed areas. Homes and gardens are clustered around a central core: the community area, with a barn and native plant nursery. A major xeroriparian corridor flows through this area, supporting a large grouping

(guild) of native plants: saguaro, ironwood, prickly pear, hackberry, wolfberry, and perennial & annual herbs.
Dancing Rocks has been the site of seasonal workshops in native plants, natural building, water harvesting and permaculture since 1992. The Bean Tree Farm barn is located on a 6 acre lot which conforms with county agricultural zoning requirements.

• Natural Conservation Area (NCA)
Clustered building envelopes are surrounded by the 16 acre NCA, which is a recorded easement for protection and stewardship by the residents. Although the inner community area also includes land that is being conserved and regenerated through native plant restoration and water harvesting, the natural conservation area includes about 80% of the site, and the highest quality habitat.

• Recorded Documents & Legal Agreements
The following documents are either recorded or in the process of being recorded and will run with the deeds: Dedicated Natural Conservation Area, Homeowners Manual, Well Agreement; Conservation Easement with Pima County or other vested entity; and Conditions, Covenants, & Restrictions (CCR's). Additional bylaws may be written to protect existing residents and assure that future homeowners abide by the owners manual.
A homeowners association will be responsible for ensuring community standards and cooperation. County building and zoning ordinance changes reflect increased awareness of the need for sustainable development.

The following features complete the present planning of this site as an eco-logical community. It is hoped that with your participation, these guidelines will be improved and refined for the benefit of the entire community.

Above: A view of Scenic Drive

• Access and parking closest to Scenic Drive: A covered parking area is planned for the community east of the planned barn/nursery area, keeping dust and noise of vehicles to a minimum within the central core. As an alternative to driving to your home; park, walk, and enjoy the desert instead!
• Monthly dues for community projects, such as watershed and habitat restoration are currently $50 a month per household and may increase over time.
• Well agreement/shares: In Arizona, it is customary to create a well agreement when several families draft from a well on a different property. The Dancing Rocks agreement includes dues for repair and replacement. The water level in the well rose 18' between soundings from 1991 to 2002, while an annual drop of over one foot was common in neighboring wells, but dropped 64' between 2002 and 2007.

Care and feeding of our watershed and roof run-off should enable us to continue to have the well until large wells downstream and continued drought overdraft the water table. Water meters are installed in each home for monitoring and conservation. 25 gallons per person per day is regarded as conservative use of the well. Current annual use per person is within a 25 gallon (daily) average.

• Paths as systems for water harvesting in the broad landscape: A network of paths, swales and gabions harvest water and help facilitate habitat restoration. Building more of them provides an opportunity to work together, hold community workshops, or hire the work needed with our monthly dues. Water harvesting paths in the natural conservation area will help with restoration and erosion control.

• Barn & nursery, community events, expanded common facilities: Originally, a community laundry and kitchen was planned, but current zoning codes do not permit the extra kitchen. One supportive zoning official suggested that the community request a variance in the future if needed. Present approved uses include natural food and plant preparation, storage, water harvesting & permaculture classes and workshops.

• Future cooperative ownership of agricultural facilities: Because of county zoning restrictions, there was no simple way to plan for community-owned facilities. The original property owner/designer, who holds the large central lot, is building the barn and native plant nursery as privately owned agricultural/ educational facilities. If use of these facilities benefit residents of the community, we will explore a way to support this cooperative use consistent with local zoning codes.

• Other conservation planning strategies and collaborations: Sonoran Desert Conservation Plan (SDCP) is a Pima County conservation planning tool and federal "take" permit for endangered species. Dancing Rocks is involved through membership on the SDCP steering committee.

SaPWET, Safford Peak Watershed Education Team, is a neighborhood action group which has received grants for watershed restoration activities. SaPWET is currently collaborating with the town of Marana on a Scenic Drive watershed restoration project.

Above: Scenic Drive Watershed Restoration Project in conjunction with the town of Marana and SaPWET, installing a gabion. July 2005.

Resources:

• Coalition for Sonoran Desert Protection, www.sonorandesert.org..

• Development Center for Appropriate Technologies, www.dcat.net.

• Sustainable Tucson, www.sustainabletucson.org.

7: Minimizing building/development costs

• Start small
• Downsize to what you really need
• Use local building methods & materials integrated with innovative, energy conscious design
• Build core first (essential living, cooking, washing areas)
• Build it yourself or trade your skills
• Scrounge good used or "seconds" materials
• Purchase in bulk, rent and share tools
• Build for outdoor living
• During landscaping/restoration, work with your neighbors to get the work done and enjoy it more, order or grow out plants.

8: Avoiding structural damage

• Water: keep all plantings, cisterns, and hose bibs 5'–10' away from building foundations. 10' is better and provides usable living space around the building.
• Sun: exposed wood is high maintenance and will degrade quickly in this climate. It is best to use wood indoors.
• Wind: tree falls—position buildings away from tall trees, don't trim desert trees into "lollipops," let their lower branches protect them from high winds. Design trellis and shade structures for high winds.
• Earthquakes: existing homes have been engineered to exceed standards for Earthquake zone 2, the Tucson basin is apparently due for an earthquake—think about items on shelves.
• Roof truss system/floors: refer to plans when considering additions. Be sure to evaluate new loads of walls, heavy shelves, and structural additions.
• Termites: attracted by water and wood. Periodically check all interior wood (including furniture) where it meets the floor. Check plumbing periodically for leaks; in addition to water damage such as mold and rotting, moisture draws termites.

Above: Arial view of kitchen

9: Keeping desert critters out of our homes If you feed them they will come... so don't!

• Water + soil + organic material = great termite habitat. Keep planted areas away from your home. Patios and broad walk-

ways make home maintenance easier and direct storm water run-off to densely vegetated basins.

• In drought times, lush rain-watered gardens look mighty good to squirrels, birds, rabbits, javalina and deer. Be thoughtful and realistic about garden design and placement. Grow some native edible plants in open garden areas, animals will eat this instead of your protected edible plants.

• Packrats like to nest in messy project piles, under car hoods (they love to chew wires) and in prickly pear cacti. Provide for their habitat and their natural predators- hawks, owls, bobcats, coyotes, snakes- beyond the perimeter of your development envelope.

• Venomous insects and arachnids: learn their preferred habitats and make room for them away from your living spaces. Tidy porches inhibit spiders and scorpions. Check your shoes to avoid scorpion stings, spider bites, and injuring beneficial insects.

• Reptiles: during the hot season when these critters are active, look before you leap. Many native species of lizard consume insects. King snakes are wonderful for rodent and rattlesnake patrol. All large snakes, including rattlesnakes, eat rodents. If you come across a rattlesnake in your development envelope, please notify one of the long term residents for relocation. Rattlesnakes are appreciated and protected on this site.

Do not use pesticides or fungicides; they negatively affect all of us for years to come. Instead, explore non-toxic means to outsmart "pests." Learn what they like and provide it away from your living space.

Resources:

- Arbico, Gardeners' Supply, www.arbico.com
- Effective Micro-organisms (EMRO), .
- Dadd, Debra Lynn, Nontoxic and Natural.
- Organic Gardening magazine.
- A Natural History of the Sonoran Desert, Arizona-Sonora Desert Museum Press.

Above: Outdoor seating area made private by garden trellis and native vegetation

10: Privacy

To increase privacy between dwellings, use drought tolerant native trees, shrubs, vines, trellises, cisterns, and garden walls.

Respect your neighbor's quiet and privacy and discuss changes that may affect your neighbors view or sound.

11: Water conservation

• Well water from a 295' well drilled in the 1950's is pumped into a 2,500 gallon HDPE tank, then pumped to your home, via PEX pipe. The average Tucsonan uses over 125 gallons per day (gpd) for indoor and outdoor use. Our goal is 25 gpd per person from the well, with harvested rainwater and greywater providing irrigation of drylands adapted gardens.

Above: Rainwater collection workshop

• Your roof run-off is guttered to culvert cisterns which have a storage capacity of about 1,800 gallons. They overflow via 3" pipes into your perimeter gardens below the level of your porches, then run off into native plant basins slightly downgrade from that.

Slowing and infiltrating stormwater is the core of Dancing Rocks' master plan for restoration and stewardship of the watershed. 1" of rainwater off your roof is about 935 gallons of water.

• Kitchen Greywater: all of the water from your fixtures is used again for irrigation of gardens just off the porches. You have a separate kitchen drain with a grease trap for your south garden, as permitted by Arizona Department of Environmental Quality. We recommend that even with the grease trap you use a fine screen in your drain, compost all food waste, refrain from putting fats down the drain, and clean and check systems often. Using Effective Microorganisms (EM) in your compost bucket and wiping off greasy plates with waste paper first (it will compost) will make higher quality greywater for your kitchen/herb gardens. Your humanure toilet system will easily compost dense, difficult material such as grease and meat.

• For sinks, showers and tubs: be very conscientious about what you put down your drain, as it waters the garden.
We have had good success following the Oasis recipes for making inexpensive shampoo and body wash, adding a bit of essential oil if desired. Use EM, Bon Ami, vinegar, and hydrogen peroxide to clean bath and sink areas well. Wire mesh baskets in the drain retain hair, which can be added to your humanure compost.

• Ultra-low flow fixtures are required for all uses, and must be inspected and maintained regularly for leaks and efficiency.

Resources:
• EM Effective Microorganisms, www.emrousa.com.
• Lancaster, Brad, 2006. Rainwater Harvesting for Drylands Vol. 1 and II, Rainsource Press; www.harvestingrainwater.com
• Ludwig, Art, 2006. Create an Oasis with Greywater (5th edition), Oasis Design Publishing.

Storm water conservation guidelines:

• Create multiple subwatersheds

Water is easier to manage at many small points than at one large point. Start at the source; don't build a Hoover Dam at the bottom! Where possible, use existing topography to create multiple small subwatersheds at your site to collect water. Work with natural topography, slope and existing native vegetation when altering land.

• Spread and infiltrate the water

The least expensive place to store water is in the soil. Channelized, silt-laden water has erosive power, so spread the water out at intervals to slow its flow and allow sediments to drop out of suspension. Water that is spread out over soil has more places to infiltrate into the soil. The more water that infiltrates the soil, the less has to be managed as surface storm water. Water stored in the soil should be in locations where it supports vegetation! Create more porous soil that has increased water-retaining capacity (zymogenic).

• Prepare for overflow

In the desert southwest, there can be very heavy localized rains that cause extreme flooding. Water harvesting structures that receive water from moderate to large catchment areas need to allow excess water to flow out safely. Overflow devices include cistern overflow lines, spillways on swales, french drains, etc. Overflow devices need to be sized to handle extreme events and "armored" (e.g. lined with rock) to prevent erosion. Overflow devices need to be maintained. Turn overflow into a resource by directing it to more vegetation.

Above: Intern digging water harvesting swale

•Mulch to reduce evaporation

Much of the water that sinks into soil is quickly evaporated in the hot season. A layer of mulch will reduce evaporation, leaving the water in the soil where its available to support plants. Mulch can be a thick layer of organic material (bark, compost, straw), or inorganic material (rock, gravel). Organic mulches help build soil as they decompose, and may need to be renewed periodically. Plants that drop their leaves help build organic

mulches for themselves, but may still need additional mulch. If rock is already present at a site this might be a good source for inorganic mulches.

• Put rainwater to beneficial use

Think of the ways you use water at your site, and figure out how you can use harvested rain for these. Rainwater is low in salts compared to groundwater. Plants grow better with rainwater than with groundwater- there is more fixable nitrogen available. Rainwater stored in soil is ideal for supporting plants. Rainwater stored in tanks can be used to water plants, and for evaporative coolers, clothes washing, etc. Expect phenomenal growth with your good waterharvesting techniques.

• Start small and adjust your systems as needed- it's best to try out ideas on a small scale first, then adjust them as you see how they function when it rains. Take the lessons you learn from small scale trials into larger scale systems when you are ready. Inspect and maintain your systems regularly and especially after big rains. Keep records of rainfall in your area, install rain gauge where you'll be sure to check it.

Resources:

• Rose, Barbara, 2006. Scenic Drive Pilot Project: A Model for Waterharvesting and Watershed Restoration & Education.
• Lancaster, Brad, www.harvestingrainwater.com.
• Phillips, Ann. *City of Tucson Water Harvesting Manual*.
• Glennon, Robert, 2002. *Water Follies,* Island Press.

12: Energy conservation/efficiency

Simple and sophisticated systems have been combined in homes at Dancing Rocks: passive and active (photovoltaic)

Above: Waterharvesting swale around a pomegranate tree

power, solar evaporative coolers, fresh air ventilation, good insulation and mass, thermal windows and doors. Over time, you will undoubtedly modify and improve your home's performance and comfort as you live in it, and learn to "sail the ship".

Sensible additions:

•Solar Water heating- Rinnai tankless on-demand propane gas heaters can become back-up heaters as solar batch water heaters are added. Solar water heaters are simple and inexpensive to build, or they can be purchased.

• Klos windows and exterior glass shading in hot weather deflect heat from the building.

• Direct current (DC) wiring is used for cooler motors as it is more efficient than alternative current.

• Solar ovens keep heat outside in summer, reduce energy use, and cook excellently!
• Wood stoves are used for cooking when it is overcast, fueled by twigs and trimmings.
• Trees provide shade and evapotranspiration, cooling the house perimeter by 10+ degrees on the east, north, and west.
• Trellis structures can be open to winter sun, and covered with shadecloth or vines in hot weather.
• Solar clothes dryers (clotheslines!) are ecologically superior to electric or gas dryers. Horizontal axis washing machines use low energy, less water and spin-dry so well that clothes line dry in record time.
• Grid-tied homes at Dancing Rocks earn kilowatt-hour credits from Tucson Electric Power. DRPC homes often operate on less electric power than they provide, meaning residents rarely pay more than the monthly service charge.
Stand-alone homes have no monthly electric bill. Hybrid systems combining grid-tie with battery backup are being researched by DRPC residents for possible future improvement.

Resources:
• Cunningham, Bill. Southwest Solar, 520.885.7925, www.southwest-solar.com.
• Spring, Cari & Stage, Lisa. *When The Light Goes On.*

13: Composting, recycling, reducing "waste"
• Think of your composting system as a healthy forest floor.
• Leaves, annuals, animal manures, and other organic matter form a mulch layer which decomposes as it ages, aided by microbes, insects, and rain.
• We have found humanure composting to be the simplest, safest, most user friendly method for transforming weeds, kitchen scraps, and toilet materials into pathogen free, rich compost.
• Utilize biologically active cultures such as EM (Effective Microorganisms) and compost in graywater and garden areas to inoculate the soil with beneficial micro-organisms.

Above: Intern emptying buckets of humanure into the compost pile

• Compost toilet contents are layered with sawdust, emptied into larger compost bins as needed. The process is similar to that of a compost pile but no turning of the pile is necessary. The initial high temperatures (120-140℉), and up to a year for complete composting, produces pathogen free, biologically active compost.

• Recycling: first reduce, then re-use, then recycle.
• Carpool and coordinate trips.
• Join a Community Supported Agriculture farm (CSA), harvest and preserve native foods to reduce transportation and support the local economy, as well as enjoy delicious, high quality food.

Resources:
• Jenkins, Joseph, 1999. *The Humanure Handbook*, Chelsea Green.
• Van Der Ryn, Sim, 1978. *The Toilet Papers,* Capra Press.
• Steinfeld, Carol, 2004. *Liquid Gold.*

14: Fire, earthquakes and drought

• Our community is located in the low desert of an urbanizing region. Our biggest fire dangers are caused by humans: untended open fires, barbecues, stored chemicals, and cans of fuel. Neighborhood removal of Buffel grass along roadsides & on individual property drastically reduces fire risks.
• Climate scientists think the Sonoran bioregion is due for a dry cycle, with possibilities of extreme droughts, violent storms and unpredictable weather, in a larger pattern of global warming.
• Other than designing and building to avoid natural disaster, such as staying away from flood plains, there is much we can do to live conscientiously, educate ourselves, and advocate for alternatives in our community.

We hope that our small efforts, along with those of thousands of ecovillages, green developments, and conservation/restoration projects worldwide will bring about shifts in favor of earth care, people care, and equitably sharing the bounty of this beautiful planet.

Resources:
• Holmgren, David, 1993. *The Flywire House: A Case Study in Design Against Bushfire*, Nascimanere Pty Ltd.
• www.buffelgrass.org

Above: Native pollinators thrive on Passion Vine plantings in the garden.

15: Bean Tree Farm

Bean Tree Farm and Lodge, founded in 2008, expands our non-profit educational activities and provides incentives for diverse cultural/agricultural cottage industries arising from Permaculture ethics and practice. We offer seasonal workshops with native food/feasts, herb craft, earthbuilding/sculpting, music/instrument making, in the larger context of earth care and conservation. Bean Tree Farm's name (made famous many years before by the fine author and farmer Barbara Kingsolver in "The Bean Trees") raises awareness that virtually all native Sonoran Desert trees and many large shrubs are legumes. These plants fix nitrogen for understory species, provide all who harvest with delicious and nutritious foods, grow and thrive without tilling or irrigation; beyond a little low-tech rainwater harvesting and mulching.

Bean Tree Farm is not a conventional farm and does not grow row crops, although residents maintain small household intensive organic vegetable gardens and fruit trees like figs, pomegranates, jujubes and citrus. We harvest and prepare seeds, fruits and herbs of the native perennial forest that has grown here for centuries, collecting the seasons' changing bounties of tree legumes, sweet cactus fruits and pads, berries and herbs. Farm products are provided to the community for workshop feasts, catering engagements and special events.

Bean Tree Farm provides hands on learning opportunities focused in permaculture and sustainable living practices. Students, WWOOFers, and volunteers from near and far, participate in the many educational experiences at Bean Tree Farm.

Opposite: harvesting cholla buds; a native foods potluck

The enormous challenges we face worldwide today can seem daunting. Being a good neighbor to all living systems begin in our backyards, and is empowering and positive. The more small models of integrating human and natural systems we create, the less impact our lifestyles will have on the rest of the world's people and places.

Additional Resources:

• Berry, Thomas, 1988. *The Dream of the Earth,* Sierra Club Books
• Childs, Craig, 2002. *Secret Knowledge of Water,* Sasquatch Press.
• Giono, John, 1985. *The Man Who Planted Trees,* Chelsea Green.
• McKibben, Bill, 1995. *Hope, Human & Wild,* Hungry Mind Press.
• Nabhan, Gary, 2004. *Cross Pollinations,* Milkweed Editions.
• Narby, Jeremy, 2005. *Intelligence in Nature,* Tarcher/Penguin.
• Stamets, Paul, 2005. *Mycelium Running,* 10 Speed Press.
• www.dcat.net.
• www.desertharvesters.org.
• www.greenbuilder.com/dawn
• www.permaculture.net.
• www.regenesisgroup.com.
• www.sonoranpermaculture.org.
• Safford Peak Watershed Education Team, 744-3426

The vision is this place,
ancient with Ironwood, Saguaro,
deep red volcano flows cooled to rocks,
dancing rocks
weathering down to clay, building up soil
growing this place, growing us
rocks dancing
where water, soil, plants, people and all life lives.
Here rain falls, is welcomed by basin, root hair, cistern,
fifty acres to the ridge, upper watershed of North Safford Peak Wash
here we create and regenerate health for our families,
the land we are nested in;
here we create peace and quiet,
time to be with others,
here our talk is walked,
here we dream of what can be.....

Barbara Rose (thank you, John Seed, Joanna Macy and others!)

"And yet from what is to what could be you cross a bridge that takes you, no more, no less, from Hell to Paradise. And more bizarre: a Paradise composed of the exact same material as Hell. The only difference is our perception of the material's arrangement—more easily understood by imagining it applied to ethical and emotional architectures—yet it's enough to pinpoint the immeasurable difference."

Odysseus Elytis, trans. Broumas/Begley, Copper Canyon Press.