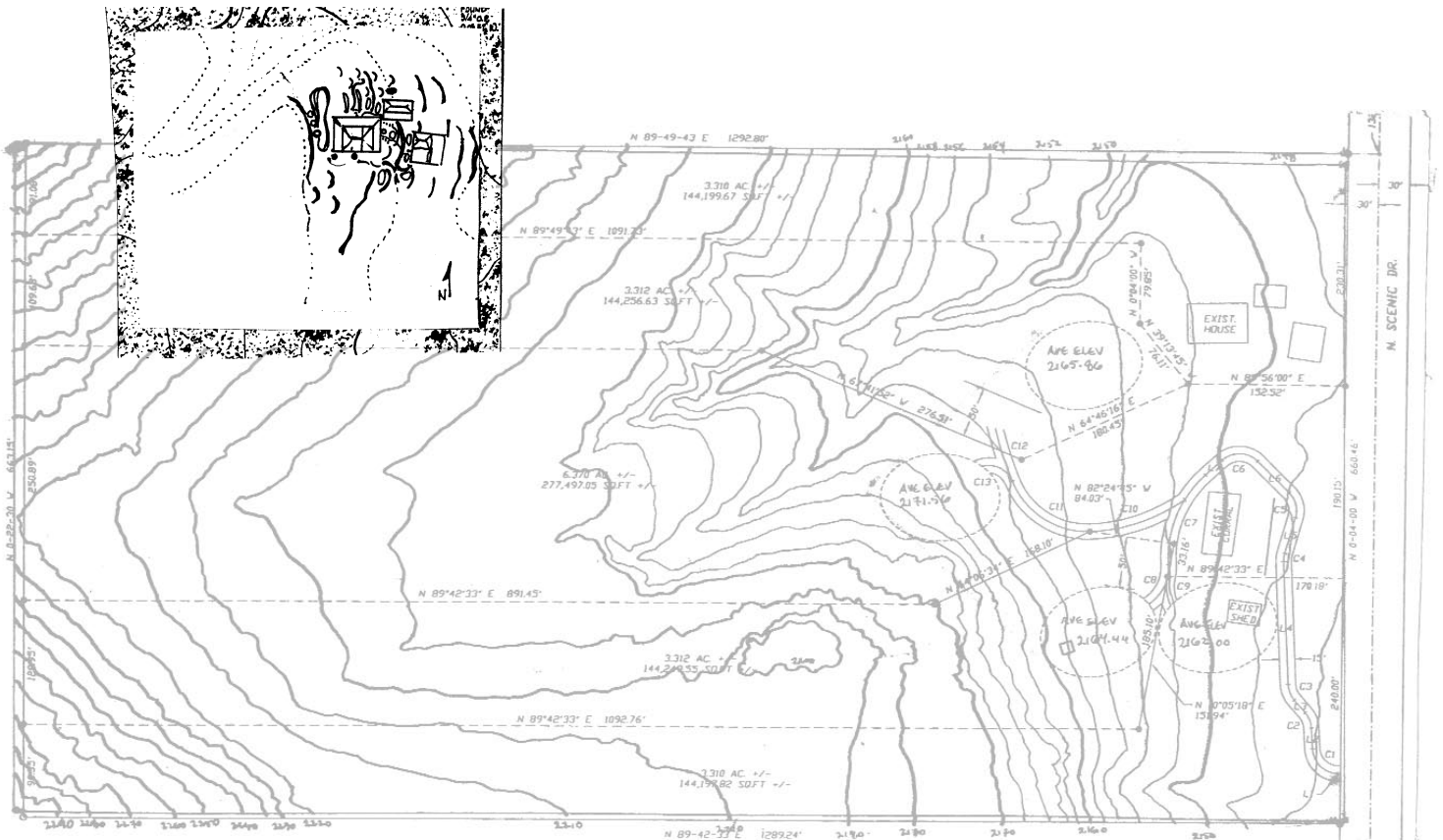


DRPC

DANCING ROCKS
PERMACULTURE
COMMUNITY
HOMEOWNERS
MANUAL

A GUIDE TO ECO-LOGICAL
COMMON SENSE LIVING
ON 20 ACRES IN THE
NORTHERN TUCSON
MOUNTAINS



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,
where rain falls, is welcomed by basin, roothair, 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 as well as opportunities
to be
with others,
where our talk is walked,
where we dream of what can be.....

—b. rose, resident
(thank you, John Seed)

“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.”

—Odysseas Elytis, *Open Papers*
tr. by Olga Broumas and T Begley
Copper Canyon Press
Port Townsend, WA

FOREWORD

first edition—2003

When you buy a car, you get an owner's manual to help you safely operate, care for and maintain it. Your homeowners' manual is the same idea. In addition, it is:

- a guide to living at Dancing Rocks
- a recorded document which describes rights and responsibilities of ownership at Dancing Rocks, and is a part of your deed with the land.
- full of helpful hints on many topics
- a reference for further study

This manual includes references for further study and access to local resources. You are encouraged to contribute corrections and additions for future editions.

Thanks!

—*Barbara Rose*

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).

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1: DEVELOPMENT POLICIES

Dancing Rocks Permaculture Community ("Dancing Rocks") is a small, self-governed community which engenders a high level of responsibility between people and our 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 eco-logical design and living that connects many disciplines: ecological restoration, watershed management, green building, and sustainable economic development.

The three basic ethics of permaculture are:

- care for the earth
- care for people
- reducing consumption and reinvesting surplus

These are also the basic ethics of Dancing Rocks.

The goal of our community based on permaculture principles is to become more ecologically and economically stable by increasing local production of food and energy, increasing biological diversity and health of the land... and to enjoy life while doing it!

SENSE OF PLACE

Dancing Rocks is located at a unique northwest edge of the greater Tucson Basin:

- between expanding urban/suburban development and ironwood forest/critical habitat landscape linkage
- between two jurisdictions (Marana and unincorporated Pima County)
- between the ridges of Tucson Mountains and the bottom of the watershed, where sediments and soil build up
- where prehistoric people prospered on the edge between the diversity of the uplands of the northern Tucson Mountains and the Santa Cruz river and fertile flood plains a mile away.

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:

- *Permaculture Designer's Manual*. Bill Mollison. Island Press, 1990
- *The Marana Community in the Hohokam World*, Suzanne & Paul Fish, John Madsen. UA Press, 1992.

BIOLOGICALLY SENSITIVE

In keeping with biological assessments of the Sonoran desert, the most recent body of work resulting in Pima County's Sonoran Desert Conservation Plan (SDCP), Dancing Rocks is committed to sustaining and regenerating the health of all its inhabitants, and being a continuing resource and research into what makes healthy communities. This community lies within in a federally proposed Critical Habitat Corridor for endangered species. Our success as a community will be measured by the health of the land and native species as well as the human inhabitants.

References:

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

PURPOSE OF COMMUNITY DESIGN

"The aim of wholistic 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 Lindeggar

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 Judy and Michael Corbett's "Designing Sustainable Communities; Learning from Village Homes". 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.
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

Dancing Rocks is working towards achieving these ideal community principles.

References:

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

Protecting the Integrity of Dancing Rocks

Although your property is legally yours to buy, sell, lease etc, the uses and behaviors inherent in these zones describe a more sensitive approach to ownership; stewardship is a function of ownership! In essence, we have an obligation to care for our land and its inhabitants that supercedes the right of an individual property owner.

Should you decide to sell, it is your responsibility to fully inform a potential buyer. The best way to do this might be to have a community meeting/potluck and invite the prospective resident.

First right of refusal: Residents have first option to purchase or find a buyer when a home becomes available. Listing with a realtor is not advisable at present, due to real estate laws that state whoever can pay the asking price gets the property. This may not be someone who would agree to abide by the owner's manual.

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 minimize motor noise. Community area parking, walking and bicycling keep us healthier, and increase our opportunities to hear the birds sing, the saguaro spines' song in the wind.

Pollutants to Avoid

Pollutants such as chlorine bleach; herbicides (like RoundUp); pesticides; sodium-based soaps, shampoos and cleaners; and commercial tobacco products. These substances diminish our own and our neighbors' wellbeing, and poison air, soil, graywater and groundwater. Replace these products with EM (Effective Microorganisms), vinegars, Oasis laundry and dish "soaps," Bon Ami, and hydrogen-based bleaches.

Domestic Animals

Must be kept in the building envelope, and should 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. The sensitivity of this area to predation by dogs and cats is significant. Loose chickens will be thoroughly enjoyed by bobcats and coyotes! Large stock animals such as cattle and horses are not appropriate at Dancing Rocks.

Infrastructure

Driveways, building sites, paths, utilities and water supply are designed to combine a small, clustered development footprint with sites that have beauty and privacy. When revegetated after construction, if you plan additional projects within your building envelope, discuss building and planting sites with your neighbors. Do not plant shade where solar access will be diminished as plants grow tall.

Exotic and invasive plants

Such as *Rhus lancea*, buffel grass and its landscaping relatives, can escape onto neighboring land and crowd out native species. Before planting, consult the planting resources, or talk with some of the long time residents familiar with native and invasive plants.

Light Trespass

Consider reflected light from roofs and outdoor night lighting, be considerate of your neighbors. Plants can be screens for lights and reflective surfaces.

Resolving problems

If there is a problem, communicate early, before it escalates, and keep talking until it is resolved. Some resources include *Calling the Circle* by Christina Baldwin, a book describing an innovative practice for communication and conflict resolution, and Non-violent Communication, a system taught locally by Sylvia Haskvitz.

References:

- *Nontoxic & Natural* (new edition). Debra Lynn Dadd. Tarcher, 1984.
- *Better Basics for the Home*. Annie Berthold-Bond. Three Rivers Press, 1999.
- "Roundup: Just Say No!" Steve Farley. *The Composter*: newsletter of the Tucson Organic Gardeners, February, 1997.
- Effective Micro-organisms: Emrousa. www.emrousa.com.
- Oasis Laundry/Dish Liquids available at Food Conspiracy Co-op, Wild Oats, etc.
- Arizona Native Plant Society. www.aznps.org.
- International Dark-Sky Association. www.darkskies.org.
- *Calling the Circle*. Christina Baldwin. Swan & Raven, 1994.
- Center for Nonviolent Communication. Sylvia Haskvitz. (520) 572-9295. www.nvcaz.com

3: HEAT GAIN, HEAT LOSS

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

- Design your outdoor gardens and porches to encourage winter sun, summer shade and good air flow. Be sure to keep solar access 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 which 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 (fridges, stoves) in ventilated spaces to allow heat to escape in summer, Consider summer kitchens on your porch and solar oven cooking, which will make your home 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:

- *Introduction to Permaculture*. Mollison/Slay. Tagari Press, 1991.

4: SITE DRAINAGE, OPPORTUNITIES FOR WATER HARVESTING

North Safford Peak Wash drains a landscape of volcanic peaks and ridges of several square miles. Dancing Rocks is located in an east-facing 50-acre subwatershed within the North Safford Peak drainage area. The heavy, rocky, volcanic clay soils of this site are capable of holding and storing a lot of water, providing there is enough plant cover, mulch and root systems creating pathways for water. Increasing native plant cover on historically disturbed soils (from woodcutting, cattle and horses, off-road vehicles etc) is easier when the landforms create places for water to slow and spread, irrigating more area before moving downslope. Ongoing water harvesting workshops and neighborhood work parties will increase your ability to slow and spread rainfall at your site.

Your land and homesite plan developed over a 10 year period with input from many permaculture students, teachers and designers. One resident is a student of permaculture since 1992, and has lived on this land for almost 20 years. A number of water harvesting and restoration projects have taken place and will continue as a work-in-progress. Perhaps because of this work, the water table in the well at the latest sounding (summer 2002) was 18' higher than the previous sounding in 1991. In contrast, surrounding adjacent properties have all seen a marked drop in their water table levels. We will have the opportunity to improve the landscape around our dwellings while turning stormwater into a great resource (rather than a dreaded liability!) by practicing the key principles of water harvesting in section 12, water conservation.

References:

- *Rainwater Harvesting for Drylands*. Brad Lancaster. Rainsource Press, www.harvestingrainwater.com (available in 2003).
- City of Tucson, Waterharvesting Manual. Ann Phillips.

5: DESIGN FOR SOLAR ENERGY AND SOLAR COOLING

Solar energy and sensible design 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 solar resources with a solar oven, solar water heater and a solar still (all these can be made in an owner-build workshop).

- Good permaculture design mimics natural systems that promote health. In the ironwood forest beyond your home, young saguaros usually nestle on the south side of larger "nurse" plants, protected on the east, north and west by an arc of shade. Like these cacti, your home will be cooler in summer and warmer in winter if located in a solar arc open to the south.

- Active solar (pv panels) provide electric power, both dc and ac current, to provide efficient use of energy for lighting, motors and household appliances.
- Active solar includes electricity production and solar cooling. Because of the changes in the angle and position of the sun during the year, your pv system has trackers 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 also save thousands of tons of pollutants from dirtying the air by producing electricity from solar energy instead of fossil fuels.
- Become knowledgeable about your home power system. Proper maintenance and seasonal adjustments will provide you with many years of economical clean energy, whether you are grid-tied or stand-alone.

Resources:

- *When the Light Comes On*. Cari Spring. Emerald Resource Solutions, 1999.
- *Home Power Magazine*
- Southwest Solar. Bill Cunningham. www.southwest-solar.com
- Westwind Solar. Daniel Snyder. www.westwindsolar.com
- *Solar Today Magazine*
- *GIAM Solar Sourcebook*. Chelsea Green, 2003.
- Solar Ovens. Jill Lorenzini. 520 883-1073.
- *The Passive Solar Energy Book*. Ed Mazria.

6: SHELTER

Low Energy—Appropriate design for Humans and Animals

- **Passive solar orientation** is used for winter warmth and summer cool. The sun rises and sets over 28 degrees north of due east and west at summer solstice and is 81 degrees from the south horizon (almost straight up) at noon; at winter solstice the angles are more than 28 degrees south of east and west, and at about 45 degrees to your south-facing glass. Likewise, locate shelters for chickens, gardens, etc. with solar orientation in mind.
- **Prevailing winds** at Dancing Rocks are from the south, hot and dry in spring and fall. Trellises and trees provide buffers. Observe the weather: If you stand with the wind at your back, the weather system is generally coming from your left. However, often you can't tell wind direction because the peaks just 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** (line from well and roof run-off harvesting)
Your metered water comes from a well at the east side of the site. You share the benefits and responsibility for the well with your neighbors. At Crystal Waters, roof collection provides for each family's drinking water; the public water supply is for washing etc. At Dancing Rocks, you have the opportunity to do the same, and even may choose to explore living within the water budget your roofs produce—approx. 6,000-12,000 gal. per yr (estimating between 6"-12" annual rainfall on about 1500sf of roof).
- **Slope**
Your building 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 water run off into garden basins, to direct water away from your foundations and reticulate the water toward native vegetation downhill from your building. Utilize french drains, gabions, swales and berms, coordinate with walkways and access. See section 12 for more about water conservation.
- **Noise**
Existing noise from development east and north is amplified by the shape of the mountains west of your site. Aircraft noise from the nearby Marana airport will continue to increase with population. You can buffer off-site noise by use of plants, west walls and berms. Populating your outdoor living area with rustling trees and singing birds will help mask out urban noise pollution.
- **Vegetation**
Local native trees are mostly legumes, 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 that at mature height your south wall area stays sunny. Be sure to avoid future shade of your photovoltaic (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
Walls, bancos, roofed structures: rammed earth, adobe, cob, strawbale, papercrete, stone.
Walls/interiors: recycled metal, recycled wood, light clay, clay and gypsum plasters, lime exterior plasters, bamboo, 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 required painted metal roofs under the Hillside and Slope Ordinance, so check water quality before drinking.
Painting: many beautiful eco-logical paints, stains and finishes are available from Natural Choice 800-621-2591, and you can make your own.

Resources:

- *Sustainable Design: A Planbook for Sonoran Desert Dwellings.* Eileen Alduenda. Tucson Institute for Sustainable Communities, 1999.
- *Our Home, Flowering Tree.* Roxanne Swentzell. Flowering Tree Permaculture Institute, NM, 1993.
- *Las Casa Que Canta.* Yampolsky. Secretaria de Educación Pública, Mexico, 1982.
- *Architecture without Architects.* Bernard Rudofsky. University of New Mexico Press (orig. pub. by Museum of Modern Art, NY, 1965), 1987.
- *Spectacular Vernacular.* Bourgeois & Pelos. Aperture, 1989.
- *Adobe—Build it Yourself.* McHenry. UA Press, 1973.
- *The Straw Bale House.* Athena & Bill Steen/David Eisenberg. Chelsea Green, 1994.
- The rammed earth House. David Easton. Chelsea Green, 1995.
- *The Natural House Book.* David Pearson. Smith & Schuster, 1989.
- Earthbuilders' Encyclopedia. Joseph Tibbets. Southwest Solar Adobe School, Albuquerque, NM, 1988.
- Sustainable Sources. www.greenbuilder.org
- Originate—Natural Building Materials Showroom. 526 N. 9th Ave. www.originatebm.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 come with higher up-front costs. In the case of rammed earth, it is the labor to construct the walls which costs more than more conventional building; the materials are from the site or locally obtained. “Embodied energy” is the complete cost of obtaining the material beyond simply its sales price; for example, the environmental costs of trucking forest products long distances, or the energy consumed roasting and pulverizing limestone, silica and iron for portland cement. Rammed earth materials have a relatively low embodied energy cost, and paying local labor supports the local economy. Rammed earth was 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 from recycled steel is durable and strong. Openings in walls provide for optimum passive solar orientation, ventilation and access. Interior finishes range from mud-plastered straw bales (providing gable-wall insulation as well) to metal frame and gypsum board, to satisfy fire codes. Floors are high-mass earth blocks. Cellulose was used to insulate the truss roofs.
- Buildings at Dancing Rocks are on footprints of about 1000sf. (884sf and 748sf interiors for models built in 2003). Guest houses, studios, etc., may be placed within the building envelope, according to county code.
- Porches and trellises are integral to the exterior walls, enabling the family to live outdoors as much as possible. They also cool the perimeter of the building to help maintain a cooler summer temperature inside. However, as perimeter shades and gardens are established, care must be taken to assure solar gain continues on the south wall for passive winter heating.
- The open floorplan provides each family the opportunity to customize interior rooms to changing needs over the years, and reduces the initial cost of building.
- At the north homesite, a 1930s historic stone well house with a 1950s addition, restored and brought up to code in 1995, shows cob (clay and straw clump) construction and natural clay plasters, which might be considered for future building projects (earth ovens, benches, shelving) and small structures. A rammed earth home and studio were built at this site in 1990–1991. Many small scale trials—and mistakes—were made here and learned from!

Resources:

- *The Cob Builders Handbook*. Becky Bee. Groundworks, PO Box 381, Murphy, OR, 97533. www.cpros.com, 1997.
- *Architecture for the Poor*. Hassan Fathy, University of Chicago Press, 1973.
- *P.C. Designers Manual*. Mollison. Island Press, 1990.
- *A Pattern Language*. Alexander et al. Oxford University Press, 1977.
- *The Rammed Earth House*. David Easton. Chelsea Green,
- *The Strawbale House*. Steen, Steen & Eisenberg. Chelsea Green, 1994.
- *The Ownerbuilt Home*. Ken Kern (out of print).
- *The Adobe Story*. P.G. McHenry. AAIA, University of New Mexico, 1996.
- *The Integral Urban House*. Olkowski et al. Sierra Club Books, 1979.
- Allesandro Vasella, "Building Biology and checklist for ecological bldg materials"
- Small House society. www.smallhousesociety.org
- *Alternative Construction: Contemporary Natural Building Materials*. Lynn Elizabeth and Cassandra Adams. John Wiley & Sons, 2000.

7: BUILDING GUIDELINES

- **Pima County Zoning**

At present, the local zoning code permits only one kitchen per SR (Suburban Ranch, minimum lot size 3.31) lot, but does permit a guest house and accessory buildings. Your building envelope is designed to accommodate permitted building within the zoning while preventing additional encroachment into designated natural conservation areas.

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)!

- **Building Envelopes**

Your building envelope is 8000 sq. ft. The lot you own is over 144,000 sq. ft. Most of this is a natural conservation area (see map in Appendix).

The initial Dancing Rocks site assessment described a legacy of deforestation, overgrazing by cattle, erosion, overdraining of wells and pothunting of prehistoric artifacts. Historians say this area, called "Cortaro" (Spanish for "to cut," *cortar*) was extensively logged beginning 250 years ago. You can see evidence of ancient cutting on many old ironwood trees around the site. While each of us will limit permitted and zoned structures to the 8000 sq. ft. envelope, developing native plant communities, habitat and water harvesting is encouraged over the whole site.

- **Community Area**

Because of previous habitat destruction, it became important that the homesites be located where clearing had already taken place in the past, and the homes are clustered to reduce further impacts. This led to a pattern of homesites and gardens surrounding a central core (the community area) with an eventual barn and native plant nursery. Dancing Rocks will continue to be the site of seasonal workshops in native plants, natural building, water harvesting and permaculture, as it has been since 1992. The lot planned for this use is the 6-acre site at the center of the arc of homesites.

- **Natural Conservation Area (NCA)**

The building envelopes are surrounded by the 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**

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.

- **BYLAWS**

Additional bylaws may be written to protect existing residents and assure that future homeowners abide by the owners manual.

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.

- **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, at present, \$50/mo. per household.
- **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, and plans for solar power as budget allows and pump ages. The water level in the well has risen 18' between soundings in 1991 and 2002, while an annual drop of over one foot is common in neighboring wells. Care and feeding of our watershed and roof run-off should enable us to continue to have the well, as long as large wells downstream in Marana don't overdraft the water table. Water meters will be installed in each home for monitoring and conservation.
- **Paths as systems for water harvesting in the broad landscape.** A network of paths, swales and gabions will harvest water and help facilitate habitat restoration. This will be an opportunity to work together, hold community workshops, or hire the work done with our monthly dues.
- **Future barn & nursery, community events, common facilities.** Originally, a community laundry and kitchen was planned, but current zoning codes do not permit the extra kitchen. One supportive zoning official has suggested that the community could request a variance in the future if needed.
- **Future cooperative ownership of agricultural facilities.** Because of zoning restrictions, there was no simple way to plan for community-owned facilities. The primary owner/designer, who holds the large central lot, has planned for permitted use of a barn and native plant nursery as privately owned agricultural facilities. If these facilities benefit residents of the community, we will explore a way to describe this cooperative structure consistent with local zoning codes.
- **Other Conservation Planning Strategies.**
Safe Harbors, Sonoran Desert Conservation Plan (SDCP), Local environmental ordinances
 Safe Harbors is a federal program to create conservation and stewardship in designated areas where habitat corridors are in need of restoration. Dancing Rocks is exploring participating in the safe harbors program. SDCP is a county wide conservation planning tool and federal "take" permit for endangered species. Dancing Rocks is involved through one resident's participation on the SDCP steering committee as a representative for SaPWET, Safford Peak Watershed Education Team. It is in our best interests to support these and other environmental and social justice efforts.

Resources:

- Coalition for Sonoran Desert Protection. www.sonorandesert.org.
- Women for Sustainable Technologies. www.w4st.org.
- Local Government Commission. www.lgc.org.
- Development Center for Appropriate Technologies. www.dcat.net.

8: MINIMIZING BUILDING/DEVELOPMENT COSTS

- Start small
- Use simple designs
- 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 tools and equipment with friends
- Build for outdoor living
- Downsize to what you really need.
- During landscaping/restoration, work with your neighbors to get the work done and enjoy it more, order or grow out plants together.
- Reduce the cost of heating and cooling by design—the homes at Dancing Rocks will heat and cool for virtually pennies per day.

9: AVOIDING STRUCTURAL DAMAGE

- **Water:** keep 5'–10' away from building foundations (cisterns, basins, hose bibbs, etc.)
- **Sun:** no exposed wood
- **Wind:** Tree falls—position house far enough 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:** homes have been engineered to exceed standards for Earthquake zone 2. The Tucson basin is apparently due for an earthquake—think about your items on shelves.
- **Truss system/floors:** refer to plans when considering additions, be sure to evaluate new loads of walls, heavy shelves, structural additions.
- **Termites:** attracted by water and wood. Check interior wood in contact with floors periodically.

10: KEEPING DESERT CRITTERS OUT OF OUR HOMES

If you feed them they will come... so don't!

- Water + termites + organic material = great habitat. Make sure it's at least 5-10' from your home. Patios and broad walkways make home maintenance easier and can direct rainwater run-off to densely vegetated basins.
- Packrats, we hear, make mighty good eatin' and like to nest in messy project piles, under car hoods (they love to chew wires), prickly pear plants.... encourage prickly pear plants, and the natural predators of rodents: hawks, owls, bobcats, coyotes, snakes
- Scorpions, spiders, centipedes, snakes: Learn their preferred habitats and make room away from your living spaces.
- In drought times, our lush veggies and rain-watered gardens look mighty good to squirrels, birds, rabbits, javalina and deer. Be thoughtful and realistic about garden design and placement.
- King snakes (or is it gopher?) are wonderful for rodent and rattlesnake patrol.
- Tidy porches inhibit spiders and scorpions. During the hot season when these critters are active, look before you leap.

Please do not use pesticides or fungicides; they affect all of us for years to come. Instead explore non-toxic means to outsmart “pests.” Learn what they like and provide it far from your living space.

Resources:

- Arbico, Gardeners' Supply, Effective Micro-organisms (EMRO). www.arbico.com
- *Nontoxic and Natural*. Debra Lynn Dadd.
- *Organic Gardening* magazine

11: PRIVACY

To increase privacy between dwellings, use native trees, shrubs, vines, and drought tolerant plants. Rainwater harvesting off your roof and site can provide abundant irrigation for privacy screen planting. Respect your neighbor's privacy and discuss changes that may affect your neighbors view or sound.

12: WATER CONSERVATION

- Well water from a 295' well drilled in the 1950s is pumped up from about 146' to flow into your home, via PEX pipe. The average Tucsonan uses over 100 gpd (gallons per day) for everything; in Phoenix the use is 200+ gpd. Our goal is 25 gpd or less, with harvested rainwater and graywater providing for arid lands gardens.
- Your roof run-off is guttered to culvert cisterns which have a storage capacity of about 1,200 gallons. They overflow via 3" internal pipes into your perimeter gardens below the level of your porches, and in turn run off into native plant basins slightly downgrade from that. This reticulation, slowing and spreading stormwater, is the core of Dancing Rocks' master plan for restoration and stewardship of this watershed. The pattern of slowing, spreading infiltrating begins at

home for new residents, and is practiced on the entire site as time and resources permit. 1" of rain water off your roof is about 625 gallons for every 1000sf of roof.

- Gray water systems: 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 small screen in your drain, compost all food waste, and refrain from putting oils and greases down the drain. Using Effective Microorganisms (EM) in your compost bucket and wiping off greasy plates with waste paper first (EM can compost) will make higher quality gray water for your kitchen/herb gardens.
- For sinks, showers and tubs: Use low-flow fixtures as required by county building code for conservation, remember to be very conscientious about what you put down your drain. Proper maintenance—we have had good success following the Oasis recipes for making inexpensive and wonderful shampoo and body wash, adding a bit of essential oil for a good smell, if desired. Use EM, and/or Bon Ami, vinegar, and hydrogen peroxide to clean bath and sink areas well. Wire mesh baskets in the drain retain hair for inclusion in your compost. There are rock-filled plant pots sunk into the soil at the end of the graywater line which are easy to inspect and clean out periodically.

Resources:

- Oasis manuals, graywater for homeowners and contractors.
- *Graywater and Your Detergent*. Tucson Water.
- Effective Microorganisms (EM), www.emrousa.com.

- 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 Hoover Dam at the bottom!
- Where possible, use existing topography to create multiple small subwatersheds at your site to collect water.
- Where natural topography isn't sufficient, create multiple subwatersheds by altering land slope.

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 stormwater.
- Water stored in the soil should be in locations where it supports vegetation!
- Create a more porous soil which 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 safely out.
- 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.

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 rainfall for these.
- Rainfall 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:

- www.harvestingrainwater.com. Brad Lancaster.
- *City of Tucson Water Harvesting Manual*. Ann Phillips
- *Water for Every Farm*. Yeomans & Yeomans, 1993.
- *Living Water*. Callum Coates.
- *Water Follies*. Robert Glennon, Island Press, 2002.

13: ENERGY CONSUMPTION/ EFFICIENCY

Many passive and active systems have been designed into homes at Dancing Rocks—passive solar design, photovoltaic electric power, solar evaporative coolers, fresh air/ventilation, good insulation and mass, insulated thermal windows and doors. You will undoubtedly modify and improve your home's performance and comfort as you live in it and make subtle changes over time. These may include:

- Water heating is Rinnal tankless on-demand gas heaters. These will become back-up heaters as solar batch water heaters are added—simple and inexpensive to build and use. Residents may choose to build or purchase solar heaters.
- Klos windows and exterior glass shading in hot weather—control heat before it enters the building.
- Direct current (DC) wiring for cooler motors —more efficient than AC.
- Solar ovens keep heat outside in summer, reduce energy use, and cook excellently!
- Wood stoves for cloudy weeks burn twigs and trimmings.
- Green shade: living trees provide shade and evapotranspiration, cooling the house perimeter by 10+ degrees.
- Trellis structures can be open to winter sun, and covered with shade cloth or vines in hot weather.
- Solar clothes dryers (clotheslines!) are permitted—electric and gas dryers are not appropriate at Dancing Rocks.
- Grid-tied homes at Dancing Rocks earn kilowatt-hour credits on their Tucson Electric Power bills for power produced by solar. Stand-alone homes have no electric bill.

Resources:

- Southwest Solar. Bill Cunningham. www.southwest-solar.com
- University of Arizona Environmental Research Lab, 626-3322

14: COMPOSTING, RECYCLING, REDUCING “WASTE”

Consider modeling your composting system like that of a healthy forest. Leaf fall, animal manures, etc, decompose on the surface, pulled down by insects and rain. Permaculture folk often tuck compost materials under top layers of mulched basin gardens. This eliminates flies, smells and the work of turning and watering a compost pile. Combined with your graywater systems, building garden soils is easier. You just have to find a way to share your bounty with hungry desert dwellers like javalina, deer, squirrels and birds!

- Utilize biologically active cultures such as EM (Effective Microorganisms) in graywater and garden areas to inoculate the soil with beneficial micro-organisms.
- Recycling: first reduce, then re-use, then recycle.
- Carpool and coordinate trips.

- Participate in Community Supported Agriculture (CSAs), native food harvesting and preserving to reduce transportation and support the local economy, as well as enjoy delicious, high quality food.
- Compost toilets are essentially the same as compost piles, but greater care and longer times are required to compost humanure. Consult your owner's manual for instructions.

Resources:

- *The Humanure Handbook*. Joseph Jenkins. Chelsea Green, 1999.
- *The Toilet Papers*. Sim Van Der Ryn. Capra Press, 1978.
- Tucson Organic Gardeners, (520) 670-9158.

15: FIRE, EARTHQUAKES AND DROUGHT

Many climate scientists think we're in for a dry cycle in this Sonoran Bioregion, with possibilities of extreme droughts, violent storms and unpredictable weather, in a larger pattern of global warming. Other than good design and building for fire and drought and storms, there is little we can do but live conscientiously, educate ourselves and model successes in our community. We hope that our small efforts, along with thousands of other local and global ecovillages, sustainable community developments and conservation/restoration projects, will bring about shifts in favor of earth care and people care—stewarding and sharing the bounty of this beautiful planet.

Resources:

- *The Flywire House: A Case Study in Design Against Bushfire*. David Holmgren. Nascimanere Pty Ltd., Crystal Waters PC Village, 1993.

MORE RESOURCES:

Many of the books and resources mentioned in this document are available in the Dancing Rocks library.

- *Turbulent Mirror*. Briggs & Peat. Harper & Row, 1989.
- *Hope, Human & Wild*. McKibben. Hungry Mind Press, 1995.
- *The Dream of the Earth*. Thomas Berry. Sierra Club Books, 1988.
- *Natural Capitalism: Creating the Next Industrial Revolution*. Paul Hawken, et al. Little, Brown, 1999.
- *Secret Knowledge of H₂O*. Craig Child, Sasquatch Press, 2002.
- www.permaculture.net
- www.sonoranpermaculture.org
- www.greenbuilder.com/dawn
- www.emrousa.com
- www.dcat.net
- www.regenesisgroup.com
- Safford Peak Watershed Education Team, 744-3426

The enormous challenges we face worldwide today can seem daunting. Being a good neighbor to all living systems begins 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.

NOTES:

“I will act as though what I do
makes a difference.”
— William James