

The

“Holistic Habitat”

in Habitat for Humanity



A Senior Project

The UC Davis Department of Environmental Design

Elizabeth A. Bowler



Signatures

The "Holistic Habitat"
in Habitat for Humanity

A Senior Project
Presented to the Faculty of the
Landscape Architecture Program at
the University of California, Davis
in Fulfillment of the Requirement for a
Bachelor of Science Degree in
Landscape Architecture

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Abstract

The following senior project,

"The Holistic Habitat in Habitat for Humanity", aims to display how sustainable landscape strategies can grant low income peoples the realization of a better life. Through partnership with the affordable housing non-profit Habitat for Humanity, this project recognizes how affordable housing organizations can maximize their already significant influence to further meet the needs of the low income communities they serve. The project develops principles of "sustainability", concepts of affordability, and specific design elements that marry the two. It discusses strategies for food, water, and waste management that are pertinent means of eliminating hunger and poverty. In an effort to convey the ease and importance of sustainable landscape implementations, this project will apply target designs to one of Habitat for Humanity, Yolo county's build sites in Woodland, CA, scheduled for construction in

August of 2009.



Acknowledgements

Thank you so much to all of my teaches and Habitat for Humanity committee members for your unfailing support throughout this senior project and during my 4 years at UC Davis. You have all been so inspiring and I can only hope that one day I can emulate the work that you do! Thank you!

Rebecca Restrepo - Executive Director, Habitat for Humanity, Yolo County

Marcia Lynne - AmeriCorps/VISTA volunteer for Habitat for Humanity, Yolo County

Michael Rios - Assistant Professor, UC Davis

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Patsy Owens - Associate Professor, UC Davis

Mark Francis - Professor, UC Davis

And a special thanks to my fellow classmates for all the long nights and making my LDA experience one I will never forget.



Dedication

To my parents:

my mom

Thank you for being the best, most creative, most inspirational teacher I have ever had. You are my Joan Chittister and Richard Rohr~

my dad

Thank you for always being my #1 fan. Your unfailing support and faith in me has given me the unbelievable courage to shoot for the moon because regardless, I will land in the stars~

I will never forget what it has meant to be family,
Thank you for all you have done.

Love always,

Elizabeth



Inspiration

Jane Addams

was the founder of Hull House, the first settlement house in the United States, where people from every walk of life were welcomed and encouraged to foster their own creativity

my grandmother still tells me of fond memories growing up in inner city Chicago and attending Hull House where Jane Addams, worked to give her poor, Immigrant family the promise of a better life

I hope that in some small way my future work resembles the tireless and inspiring efforts of Jane Addams



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Introduction

I. THE SUSTAINABLE COMPONENT OF AFFORDABLE HOUSING

Clarifying the Sustainable Agenda

The term “sustainable”¹ connotes a variety of images, meanings, and messages in our 2009 modern day culture. On one hand, strides towards sustainability signify our important attempts to address environmental issues that increasingly threaten our planet and resuscitate a world where: “the scale and urgency of the challenges we face have no precedent”² as the founder of the Earth Policy Institute, Lester Brown contends. On the other hand, “sustainability” and its synonymous counterpart, “green”, have become idioms so symptomatic of modern consumer culture, that they no longer represent the important definitions for which they originally stood. Though once well intentioned, they are now phrases too characteristic of overpriced pop culture and trends of the mass marketed media. Commenting on the original importance of these terms but our consequent overuse of them, economist, author, and New York times writer, Thomas Friedman, states: “The final and most important sign that we are succeeding will be that the term ‘green’ blessedly disappears.”³

Though we must be vigilant of the ways we promote fad over function, we mustn’t be too hasty to dispose of the term “sustainable” all together. To date, we have not yet succeeded in employing “sustainability” to its greatest potential. I believe that advancing a sustainable agenda means more than championing environmental issues and media campaigns in stride; rather it means advocating for social justice and environmental needs simultaneously, in creative and synchronized ways.

1 “Sustainable Sites Initiative Guidelines and Performance Benchmarks-Draft 2008.” The Sustainable Sites Initiative. 2008. 10 March 2009. < <http://www.sustainablesites.orgreport/>>.

2 Brown, Lester. Plan B 3.0 Mobilizing to Save Civilization. Earth Policy Institute. W.W. Norton & Company, Inc. New York: 2008. p 287.

3 Friedman, Thomas. Hot, Flat, and Crowded. Farrar, Straus and Giroux, New York: 2008. p 355-356.



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Poverty at the Core of Sustainability

Authors of *Expanding Architecture: Design as Activism* ascertain: "For many, poverty may not seem the focus of sustainability, but in fact the very concept was founded on this concern."⁴ Many are not familiar or aware that sustainable development ever assumed the intent of originally addressing poverty. Advocacy for impoverished peoples has not been at the core of our current green revolution. author Lance Hosey, explains: "We have overlooked this crisis because most of us are not in direct contact with the poor, and empathy often depends on proximity...sustainable development requires meeting the basic needs of all and extending to all the opportunity to fulfill their aspirations for a better life...The basic needs of all: the very idea of sustainability stemmed from the recognition that poverty is the most significant problem of our time."⁵

To best understand the role of poverty in the US, it is relevant to access U.S. Census Bureau statistics for conditions in the United States. The Bureau states that: "the national poverty line for an individual is an annual income below \$10,500, approximately \$30 per day. With the official poverty rate in 2007 measuring 12.5 percent, 37.3 million people in poverty, a person has enough to survive, but just barely."⁶ Though it is easy to believe that poverty is not an issue in America and it is common to overlook fellow citizens who are just barely getting by, it is imperative to advocate for the type of lifestyle that each and every one of us deserves.

Where working towards sustainability has achieved many positive things to date, when we subscribe to it, we must also assume the responsibility that advocating for the people who live at the fringes of society are at the core of our mis-

^{4,5} Hosey, Lance. "Toward a Humane Environment: Sustainable Design and Social Justice." *Expanding Architecture: Design as Activism*. Ed. Bryan Bell and Katie Wakeford et. al. Metropolis Books, New York: 2008. p 35.

⁶ "Poverty: 2007 Highlights." U.S. Census Bureau. 26 August 2008. 10 March 2009 < <http://www.census.gov/hhes/www/poverty/poverty07/povo7hi.html> >.



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sion. “Sustainable” design can and still should be a word we choose to live by, as long as it incorporates every aspect of its important definition.

Design for the Poor, Design for All

Part of the remaining relevance of the term today has to do with its capacity to incorporate every facet of society. It is when we recognize that the green revolution is founded upon attacking poverty, we can see how society works in an interconnected and all encompassing way to recover ecosystems and social structures alike. Lee Rainwater discusses that when we first advocate for the poor, we end up advocating for everyone. He states, “In a good deal of the social planning going on today, the question of providing income for the poor is regarded as subsidiary to the provision of urban services. I would turn the priorities around the other way. It is only when the poor are disentangled from hopeless poverty that we can think creatively about providing services for all urban Americans- one kind of service, for all urban Americans”.⁷

Reiterating this point precisely, Thomas Friedman reflects on America’s role in pursuing sustainable solutions on a global scale today. He explains, “...out greening has to be a strategy not only for beating the company, army, or city next door, but also for beating poverty at our back door. Code Green has to prove that it can offer something to the very lowest rungs of the economic ladder, not just to upper-middle-class people. If all Americans can’t see out-greening as a strategy that could improve their lives, it will never generate the momentum and scale that it needs to succeed.”⁸ When we find solutions that first satisfy

⁷ Rainwater, Lee. “Determinism by the Urban Environment.” in *Housing Urban America*. Aldine Publishing Company: New York, 1982. p597-604.
⁸ Friedman, Thomas. *Hot, Flat, and Crowded*. Farrar, Straus and Giroux, New York: 2008. p 355-356.



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the needs of the poor, we find solutions that benefit all of us.

Affordable Housing and Sustainability for Our Best Outcome

By implementing sustainable and regenerative design principles to Affordable Housing developments, there is a unique opportunity to integrate care for land and care for people at the very same time. We can become stewards of the land while simultaneously fueling campaigns for economic opportunity and food security for the populations who need it most. I look to Affordable Housing as a venue that has not yet achieved its potential to apply creative, sustainable solutions to the landscape that can induce the type of economic advantage that low income people need. So far this objective has alluded developers because: "...as the historian Richard Ingersoll points out, the ecology question and the social question have always been at odds in the architectural realm. Affordable housing advocates often find themselves arguing with environmental advocates instead of joining forces to promote justice for both humanity and the environment. Their mutual exclusivity is due in part to the nature of our regulatory systems." ⁹

Hopefully however, we are at the brink of a national agenda of change where leaders like Van Jones, Barack Obama's recently appointed special advisor of Green Jobs at the White House, sees that we can no longer afford a separation between environmentalism and social activism. He elucidates: "For a lot of underprivileged people, greening their homes may be the only way to keep them in their homes... And those homeowners are the most stable pillars of any neighborhood....if you don't bring America's underclass into the green movement, this movement's full potential will never be realized. We need different a 'on-

⁹ Hosey, Lance. "Toward a Humane Environment: Sustainable Design and Social Justice." *Expanding Architecture: Design as Activism*. Ed. Bryan Bell and Katie Wakeford et. al. Metropolis Books, New York: 2008. p 35.



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ramp' for people from disadvantaged communities...If we want to have a broad based environmental movement, we need more entry points.”¹⁰ One way to make sure the poor of our nation get on the on ramp, is to make our Affordable Housing Habitats as self sustaining as possible so that low income people are not reliant on the world's depleting resources. By connecting home systems to their landscapes and creating “holistic habitats”, we can achieve important results for all sectors of society, and jointly enter the highway that leads to bigger, better, and greener things.

Triple Bottom Line Design

The concept of the “triple bottom line” supports that three conditions have the potential to operate simultaneously and can lay at the foundation of incorporating sustainable efforts at the landscape level in the Affordable Housing arena. “A phrase coined by John Elkington in 1994, ‘the triple bottom line’ recognizes a link between ecological, economic, and social conditions as all relative to our survival on our planet.”¹¹ It is widely recognized and understood that Landscape Architects are skilled at acting as stewards of the environment and employing the “triple bottom line” in planning and design professions. What is less recognized however, is the Landscape Architect's critical capacity to employ their efforts and talents towards the enhancement of Affordable Housing environments.

“The Holistic Habitat in Habitat for Humanity” project advances the important objectives of the “triple bottom line” by presenting sustainable practices which can be applied to the single family home, affordable housing landscape. Through partner-

¹⁰ Friedman, Thomas. *Hot, Flat, and Crowded*. Farrar, Straus and Giroux, New York: 2008. p 338.

¹¹ Hosey, Lance. “Toward a Humane Environment: Sustainable Design and Social Justice.” *Expanding Architecture: Design as Activism*. Ed. Bryan Bell and Katie Wakeford et. al. Metropolis Books, New York: 2008. p 35.



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ship with the international organization, Habitat for Humanity, the project will specifically develop strategies for creating edible food gardens to enhance the lives of low income families. It will further suggest the application of water conservation and waste management strategies and apply them to a specific Habitat for Humanity build site in Woodland, CA. This project aims to expand upon the incredible potentials for affordable housing developments in the future.

II. PARTNERING WITH HABITAT FOR HUMANITY, YOLO COUNTY

A History of Habitat

Habitat for Humanity is a non-profit ecumenical Christian organization, leading in the of provision of affordable housing on a international scale. Founded upon the central objectives of providing simple, decent, and affordable housing for families and communities who are otherwise unable to meet the demands of stifling housing markets, Habitat for Humanity works to afford every individual the promise of a better life. To date, Habitat for Humanity has built over 300,000 homes and provided over 1.5million people around the world the opportunity to own their own homes.¹² Founded in 1976 by Millard and Linda Fuller, Habitat for Humanity is a particularly unique organization because it employs the skills and talents of a volunteer workforce which collectively operates to house fellow community members and provide equitable opportunities for everyone in the neighborhood. Requiring that families who are selected for occupancy also participate in the construction of their own homes through “sweat equity”, Habitat for Humanity stresses the importance of individual empowerment when it comes to helping

¹² “Habitat for Humanity: Fact Sheet(frequently asked questions).” Habitat for Humanity International. 2009. 29 May 2009 <<http://www.habitat.org/how/factsheet.aspx>>.



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people out of poverty. Similarly, offering extended mortgage packages that range from 7-30 years, selling these homes with no for-profit expenses added, and providing low interest loans for homeowners, Habitat for Humanity's achievements are reputable and recognizable in countless communities.¹³

Partnership for the Project

I have been granted the incredible opportunity to work with Habitat for Humanity, Yolo County to suggest how this organization can even further maximize their widespread influence through implementation of sustainable landscape strategies that can help low income people continue to defeat poverty even after they achieve housing stability. I will specifically apply a set of target practices to a projected affordable housing build planned for the summer of 2009. The site of this future build is located in Woodland, CA on the property of the Silver Springs development complex at the intersection of Farmer's Central Road and Brubaker St. The following images present a contextual orientation of Habitat for Humanity's build site in Woodland, CA where target sustainable strategies will be recommended.

¹³ "Habitat for Humanity: Fact Sheet(frequently asked questions)." Habitat for Humanity International. 2009. 29 May 2009 <<http://www.habitat.org/how/factsheet.aspx>>.



Projected Yolo County Build

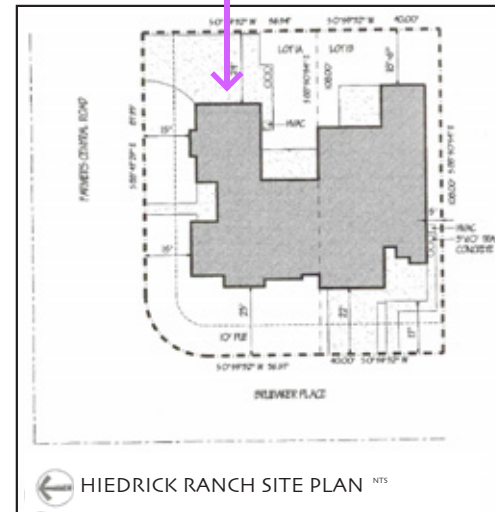
Site Location: Silver Springs Development, Heidrick Ranch in Woodland, CA



1. 1 - Site location, Woodland, CA



1. 2 - Heidrick Ranch Development



1. 3 - Proposed site plan

Target Sustainable Strategies:



1. Food Security
2. Waste Up-Cycle
3. Water Re-Use



1. Food Security

*"...the good we secure for ourselves is precarious and uncertain, is floating in mid-air, until it is secured for all of us and incorporated into our common life."
~ Jane Addams*

Edible Gardens



A. Significance

Though many people associate hunger and the plight of the poor with developing countries and the third world, the national organization, Feeding America elucidates: "In many ways, America is the land of plenty. But for 1 in 8 Americans, hunger is a reality. Many people believe that the problems associated with hunger are confined to small pockets of society, certain areas of the country, or certain neighborhoods, but the reality is much different".¹³ Though not widely recognized as an issue of immediate precedence, hunger is by no means absent in our country. Justifying that food security is problematic even in the United States, Food First and the Institute for Food & Development Policy states: "842 million people in the world are hungry. In the United States, there are 34.9 million people who go hungry or are food insecure -- an increase of 3.9 million people since 1999."¹⁴ Although food scarcity is not always on the forefront of our national agenda, the benefits of enhancing self sustaining food systems are enormous and the impacts they can have on low income peoples are great.

B. Targeted Food Strategy: The Keyhole Garden

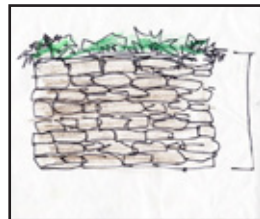
This project proposes that implementing an edible vegetable garden called a Keyhole Garden to the landscapes of affordable housing developments can be instrumental in addressing environmental concerns, while promoting health and food security for low income families. In terms of benefits to the environment, an edible keyhole garden has the capacity to regenerate

¹³ "Hunger 101: Feed Your Mind." Feeding America. 2009. 10 April 2009 < <http://feedingamerica.org/faces-of-hunger/hunger-101.aspx> >.

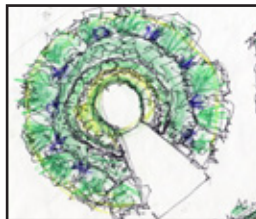
¹⁴ Manoochehri, Michael. "Hunger, Homelessness, Poverty and Healthcare: Bush and Kerry - Where Do They Stand?" Food First: Institute for Food & Development Policy. 8 February 2005. 10 April 2009 < <http://www.foodfirst.org/en/node/199> >.

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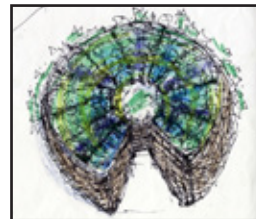
soils, recycle resources, and advocate for closed loop cycles of individual consumption. Further, application of an edible garden can lessen the many environmental impacts associated with water misuse for agriculture and pollution accrued from the mass transportation of food goods. Similarly, Keyhole Gardens can decrease grocery costs while providing nutrient rich organic vegetables. They can foster healthy eating habits and family lifestyles founded upon communal collaboration and care for the landscape.



1. 4 - Keyhole Garden sketch #1



1. 5 - Keyhole Garden sketch #2



1. 5 - Keyhole Garden sketch #3

1. Background

Keyhole gardens are raised planters beds, circular in shape, with a central path that bisects the structure and creates a keyhole shape. They are especially unique because they provide an abundance of vegetables, provide maximum use of space, and are simultaneously a visually pleasing element in the landscape. Though they are small and compact, they also have the ability to produce large yields. They are an ideal sustainable addition to the single family home landscape because of their productivity, capacity for re-use of materials, low start up costs, ease of implementation, and their potential to foster family values.¹⁵

¹⁵ Hemenway, Toby and John Todd. *Gaia's Garden: A Guide to Home-Scale Permaculture*. Chelsea Green Publishing Company. White River Junction, Vermont: 2001.

Edible Gardens

2. Yield

Recently, edible keyhole food gardens have garnered widespread visibility and support as national justice organizations work to stimulate mass campaigns for food security worldwide. In places like Lesotho, Africa where conditions of hunger and malnutrition are dire, organizations like CARE and charities like Send a Cow, have recently championed the implementation of such food gardens as a central components of their mission's work. As seen by example in Lesotho, keyhole gardens have proven highly productive and support nutritionally enhanced diets which ultimately benefit the livelihoods of many families living in poverty. Ntsie Tlali of the organization CARE reflects on the influence this garden has had on one of the families she worked with in Africa: (Mahaha's family) has three keyhole gardens and that's more than enough to supply all 10 of them with all the vegetables they need, and with some left over to sell - it's changed their lives." ¹⁶



1. 7 - Keyhole Garden in Africa #1



1. 8 - Keyhole Garden in Africa #2

¹⁶ Greste, Peter. "Lesotho gardens relieve food crisis." BBC News. 3 June 2008. 27 June 2009 <<http://news.bbc.co.uk/2/hi/africa/7432972.stm>>.

Edible Gardens



The Department for International Development further emphasizes that edible food gardens have proven highly effective in lessening hunger by stating: "Despite their small size, the gardens are highly productive: they can yield substantial amounts of nutritious vegetables, year round and regardless of rainfall patterns. Their ease of use and nutritional value mean that the gardens are strongly recommended for households weakened by AIDS." ¹⁷ If keyhole gardens can prove influential in countries suffering from malnutrition and food insecurity the most, then it is evident that these same gardens can have great potential to benefit the low income families striving to be self sustained here in the United States.

3. Cost Effectiveness

Not only are keyhole gardens highly productive, they can be built and maintained for low start up expense. Although affordable housing associations such as Habitat for Humanity strive to curb costs by selling homes with no returning profits from sale prices, with zero-interest loan financing, and by offering amenable mortgage payment programs, it is necessary to take further strides to advocate for those still stifled by everyday living expenses. A Daily Planet article by Mary Thoenke entitled, "Rent or food? Housing costs burden one in three metro families" discusses that even when rent and housing payments are "doable", other household burdens that are necessary to maintain a single family home can greatly impact a low income family's

¹⁷ "Keyhole gardens help Lesotho adjust to climate change." Department for International Development. 23 November 2007. 27 June 2009 < <http://www2.dfid.gov.uk/casestudies/files/africa/lesotho-gardens.asp>>.

Edible Gardens



ability to survive.¹⁸ Even once monthly housing payments are made, some families still do not have enough money to adequately sustain themselves. Solutions that advocate for greater food security are important ways to assure that poor families have the capacity to live comfortable lifestyles.

C. The Keyhole Garden & Habitat for Humanity

1. Material and Price Comparisons

The inexpensive start up costs and materials necessary to implement an edible keyhole garden in Woodland, CA are as follows:

| | |
|---------------------------|---------------------------------|
| Stone or "urbanite" | Donated by Sierra West Masonry |
| Composted manure (7 sqft) | Donated by UCD Dairy |
| Straw (1 bale) | \$6.00 from Haze Feed, Woodland |
| Soil | On site |
| Compost (7 sqft) | Household waste |
| sand (11 sqft) | Donated |
| Vermiculite (11 sqft) | TBD per bag |
| Oyster shells (1 box) | \$6.00 per box |
| Vegetable plants | Donation pending |

1. 9 - Keyhole Garden materials list

¹⁸ Thoenke, Mary. "Rent or food? Housing costs burden one in three metro families." Twin Cities Daily Planet News. 30 March 2009. 27 May 2009 < <http://www.tcdailyplanet.net/article/2009/03/30/housing-costs-burden-one-three-metro-families.html> >.

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For the Habitat for Humanity site in Woodland, CA costs for implementation will total less than \$12.00 due to donations from local Yolo county businesses and other Yolo county associations. For a garden that will produce vegetables during every growing season, lower grocery costs, and increase nutritional food intake, this is an extremely low input relative to the potential yields and rates of return that low income families will take advantage of.



2. Construction

The organization "City Farmer" in Vancouver, Canada undertook an edible food garden project in the winter of 2008 and documented the process providing a guideline for construction and imitation. Involved in what became a four day build to construct the encircling stone structure, the City Farmer depicts the process in the following set of photos¹⁹ :



1. 10 - Keyhole construction photo documentation from the organization "City Farmer"

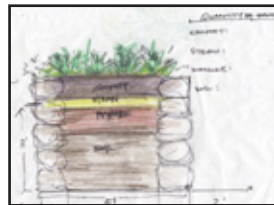
¹⁹ Levenston, Michael. "City Farmer's Keyhole Garden." City Farmer News. 2008. 10 April 2009 <<http://www.cityfarmer.info/city-farmers-keyhole-garden/#more-842>>.

Edible Gardens



3. Maintenance (manual given to homeowners)

Upkeeping a vegetable garden requires knowledge of plant growth requirements and garden care. In order for low income families to recognize the great potential benefits Keyhole Gardens can have on their families, they will need the tools to tend to their own garden of vegetables. In an interview with Master Gardener, Pam Geisel of the statewide master gardener program, it is imperative to provide guidelines that identify growing seasons, plant yields, nutritional value of vegetables, and recommendations for general garden care.²⁰ This manual for maintenance is intended to be produced in the summer of 2009. It will include such items as the following and will elaborate on the various ways residents of the Woodland, CA Habitat for Humanity Build site can produce their own organic vegetables in ever growing season.²¹



1. 11 - Keyhole soil structure sketch



1. 12 - Keyhole sketch

| Vegetables | Nutritional Value | Amt. to plant for 4 ppl. | Distance between plants |
|---------------|---|--------------------------|-------------------------|
| Broccoli | calcium, magnesium, copper, iron, vitmin c, vitmin B6, folacin | 6-10' row | 12-18" |
| Carrots | vitamin a | 10-25' row | 2" |
| Lettuce | calcium(looseleaf & romain), iron, zinc, vitamin c, vitamin a, folacin (looseleaf), | 10-15' row each month | 12" |
| Spinach | magnesium, iron, zinc, copper, vitamin a, vitamin B6, folacin | 10-12'row | 3" |
| Peas | iron | 30-40' row | 2" |
| Tomatoes | copper | 6-10 plants | 18-36" |
| Pepper | vitamin c, vitamin a, vitamin B6 | 5-10 plants | 24" |
| Eggplant | | 4-6 plants | 18" |
| Beets | magnesium, copper, folacin | 10-15' row | 2" |
| Summer Squash | calcium, magnesium, zinc, vitamin B6folacin (summer squash) | 2-4 plants | 24" |
| Onion | | 30-40' row | 3" |

1. 13 - Keyhole plant growth requirements

²⁰ Geisel, Pam. Personal Interview. 14 May 2009.

²¹ Pittenger, Dennis R. California Master Gardener Handbook. University of California, Division of Agriculture and Natural Resources, Publication 3338. The Regents of the University of California, Oakland, CA: 2002. . 351-352.

²²"Super Nutrition Gardener: how to grow your own power charged foods." Avery Publising Group Inc. New York: 1993.



2. Waste Up-Cycle

*"We have learned to say that the good must be extended to all of society before it can be held secure by any one person or class; but we have not yet learned to add to that statement, that unless all [people] and all classes contribute to a good, we cannot even be sure that it is worth having."
~Jane Addams*

Composting



A. Targeted Waste Strategy: Compost

1. Background

Although it may seem a subtle strategy, compost is an incredibly important component that contributes to the establishment of an abundant garden. Not only does it support a sustainable closed cycle of individual use and re-use, it enhances the nutritional value of soil and amplifies any garden's productivity. Stu Campbell, author of the book, "Let it Rot!" contends that composting is one of the most fundamental natural processes that can benefit the garden: "The modern practice of composting is little more than speeding up and intensifying natural processes. That's all it is. When you come right down to it, finished compost is no more than "treated" or "predigested"-rotted-organic matter which usually has undergone a natural heating process and which is very valuable stuff to incorporate into your garden's soil"²²

Composting is the "up-cycle" of biodegradable household wastes in a process that breaks them down and eventually creates a highly nutritious matter, perfect for amending garden soil. Cox explains that: "As you embark on a soil-building program, you'll find no better source of organic matter than compost. In its finished form it contains roughly two parts nitrogen, one part, phosphorus, and one part potassium, with a pH of 7. It releases its nutrients slowly, and they aren't easily leached away by water seeping through the root zone."²³ Although the "beginning composter" may be unsure about what can and should be added to a compost pile, there are many possible additions. A variety of household wastes that are biodegradable make for excellent composting material.

²² Cambell, Stu. "Let it Rot! The Home Gardener's Guide to Composting." The Alpine Press, Vermont: 1975. p 17.

²³ Cox, Carol and John Jeavons. "The Sustainable Vegetable Garden." Ten Speed Press, Berkeley, CA: 1999. p.55- 23.

Composting

Some examples include:

- coffee wastes and grounds
- leaves, yard waste, and weeds
- vegetable/fruit skins, rinds, etc.
- sawdust
- milk (sour- whole or skim)
- ashes (from wood)
- egg shells (ground or crushed)
- flowers
- grass clippings
- peanut hulls
- pine needles²⁴



2.1 - Compost as nutrient rich soil



2.2 - Compost as the "closed-loop cycle" of re-use

2. Maintenance (manual given to homeowners)

The process for composting is simple and requires approximately 10 minutes of care about 2-3 times per week. It consists of placing the biodegradable waste into a compost bin, turning the contents of the bin regularly to facilitate aerobic processes, and managing heat and water levels. The appropriate amount of heat in a pile encourages the break down of microorganisms, yet too much heat damages insects and bacteria working to decompose the waste.²⁵ In terms of heating, Cox suggests: "You need no fancy and costly devices to gauge and record the temperature near the middle of the pile...If you have no telethermometer, stick a piece of metal pipe into the pile and leave it there for a few minutes. If you then pull out the pipe and it feels hot or warm, all is probably well"²⁶ Turning the pile more frequently, but not in excess, will help maintain a constant level of adequate heat.

^{24, 25, 26} Cox, Carol and John Jeavons. "The Sustainable Vegetable Garden." Ten Speed Press, Berkeley, CA: 1999. p.55. 99.

Composting



i. 16 - Plastic compost bin



The compost pile should have about as much water content as a wet sponge. As Cox verifies: "The amount of water you have in your compost pile is fairly critical , but you have plenty of leeway in which to work...It is as simple as this: If the moisture content is much greater than 60%, you run the risk of having an anaerobic (oxygen deficient) pile; if it is much less than 40%, organic matter will not decompose rapidly enough, because the bacteria are deprived of the moisture they need to carry on their metabolism." The ideal of course, would be to maintain a constant moisture percentage which is somewhere in this

40-60% range."²⁷ The only real labor involved in this process is turning the pile over an extended period of time until the compost is done. One can answer the question "When is compost done?" by looking for the characteristics of "Crumbly", soft, fluffy texture that is not stringy and material that is dark with a sweet, earthy smell as opposed to a rotten one.²⁸

B. Compost & Habitat for Humanity

Although the initial compost bin and a pitchfork (or similar tool like it) are necessary for turning and maintaining the pile, the only other material needed for composting is the household waste itself. For the Woodland build project, 2 compost bins will be supplied, pending donations. Similarly to the manual for vegetable garden care that is intended to be created for homeowners, a section on composting will also outline the aforementioned principles.

^{27, 28} Cox, Carol and John Jeavons. "The Sustainable Vegetable Garden." Ten Speed Press, Berkeley, CA: 1999. p.55, 99, 81, 127.



3. Water Re-Use

*“Civilization is a method of living and an attitude of equal respect for all people.”
~ Jane Addams*

Water Scarcity



A. Significance

As we progress into a future where the world's water resources are in rapid decline, it will become essential to incorporate the single family home and it's landscape into the campaign for water conservation. Not only will the home system prove an essential tool for the recycle and reuse of water in a water-scarce world, smart strategies applied to the home and landscape can benefit the low income people who will undoubtedly feel the effects of depleting resources the most. To identify the severity of this problem, Lester Brown, president of the Earth Policy Institute and recipient of a UN environmental prize for his work conveys: "Water scarcity may be the most underestimated resource issue facing the world today. As world water demand has more than tripled over the last half-century, signs of water scarcity have become commonplace. Some of the more widespread indicators are rivers running dry, wells going dry, and lakes disappearing."²⁹ Stressing this point further, the Food and Agriculture organization for the United Nations states: "By 2025, 1,800 million people will be living in countries or regions with absolute water scarcity, and two-thirds of the world population could be under stress conditions. The situation will be exacerbated as rapidly growing urban areas place heavy pressure on neighboring water resources."³⁰

Although these facts are clear to a number of environmental experts, the common citizen is much less likely to think about water scarcity on a day to day basis. The severity of this issue has not yet reached the height of urgency that is needed for

²⁹ Brown, Lester. "Water Scarcity Spreading." 15 May 2009. Earth Policy Institute, 2002 <<http://www.earthpolicy.org/Indicators/indicator7.htm>>.
³⁰ "Hot Issues: Water Scarcity." Food and Agriculture Organization of the United Nations. 2009 <<http://www.fao.org/nr/water/issues/scarcity.html>>.

Water Scarcity



mass action to occur. As Rick Polito of the Marin Independent Journal says, "Water only enters the consciousness when there's too much or too little. Floods and severe droughts get attention. Drying creeks escape notice."³¹ Water scarcity effects us in numerous ways however; the following list pinpoints a few ways we will increasingly be impacted by depleting resources.



© S. Winterton

3.1 - Drying creek bed

- Severe drought
- Drying of our creeks, rivers, streams, and lakes
- Drastic decreases of keystone species like endangered salmon, whose decline reflects the overall health of our ecosystem
- Water level declines by pumping ground water
- Deterioration of water quality
- Increased pumping costs
- Drying up of wells
- Lowering of water table
- Land subsidence
- Increased water costs for the user³²

³¹ Polito, Rick. "Harvesting Rain for a Dry Day." Marin Independent Journal. 9 February, 2007. 15 May, 2009 < <http://www.oaecwater.org/harvesting-rain-for-a-dry-day-article>>.

³² Perlman, Howard. "Ground-water Depletion" U.S. Geology Service: U.S. Department of the Interior. 15 May 2009 <<http://ga.water.usgs.gov/edu/gwdepletion.html>>.

Water Scarcity



B. Water Re-Use & Impacts on Self Sufficiency

With the rising urgency of this issue, it is imperative that we take advantage of all cutting edge innovations that will help us find solutions to mitigate future water conditions. The single family home is such an important venue through which to approach conservation because we engage in mass consumption of water at this location each and every day. The US Department of the Interior and US Geology Service estimates that: "a single person uses 80-100 gallons of water at home per day."³³ So for a family household of 4, the homeowners could potentially use 240-400 gallons per day. That is an incredibly significant amount of water with the potential to be recycled and re-used. Appropriate water management strategies will not only protect our existing freshwater supplies (rivers, creeks, water tables, etc.) they will prevent overloads to existing sewage infrastructure and storm drains which are constantly at the whim of extreme storm events and toxic contamination.

Strategies that mitigate negative impacts to collective water resources are those that allow the individual to take advantage of

³³ Perlman, Howard. "Water Q&A: Water Use at Home." U.S. Geology Service: U.S. Department of the Interior. 15 May 2009. <http://ga.water.usgs.gov/edu/qahome.html> 13 May 2009.

Rainwater Harvesting

natural processes and rely on personal water systems.

C. Targeted Water Strategy #1: Rainwater Harvesting

1. Background

Rainwater harvesting systems allow water from home roofs to be



3.2 - Rainwater cistern at home residence in Portland, OR



3.3 - Rainwater harvesting home system

captured in storage tanks and re-used for various vital functions. Retrieval of rain water is not only safe, it is simple using this strategy. Brad Lancaster confirms that rain is safe for use because: "Rain is considered 'soft' due to the lack of calcium carbonate or magnesium in solution, and is excellent for cooking, washing and saving energy. Much of our ground and surface water is 'hard' due to the calcium and magnesium compounds that dissolve as water runs through over soil."³⁴ 6 In terms of process, rain water can be funneled into cisterns or holding tanks via connective pipes attached to the roof storm drain system which allow for water capture and manual extraction from the tanks. Irrigation systems may also be attached to these rainwater holding tanks. Brock Dolman, a leader in the grassroots campaign for grey water harvesting and an instructor at the Occidental Arts and Ecology Center for sustainable design emphasizes, "The system is simple. The rain runs off the roof and into the rain

³⁴ Lancaster, Brad. "Rainwater Harvesting for Drylands and Beyond." Rainsource Press: Tucson, AZ, 2008. p. 6.

Rainwater Harvesting

gutter. It then pours through a window screen filter into the first of the barrels. When that barrel fills, it siphons into the next...That's the beauty of "rainfall harvesting... Nobody has to be an expert on anything. And they have most of the equipment already. They're just not using it." ³⁵ This system is potentially most effective when collected water is used to irrigate the ensuing landscape because irrigation is proven to be one of the most wasteful uses of freshwater. The USGS tells us that "Irrigation withdrawals were 40 percent of total freshwater withdrawals and, when excluding thermo-electric power, 65 percent of total freshwater withdrawals" ³⁶ Rainwater harvesting is an excellent sustainable solution to mitigate water allocation.



3.4 - Rainwater barrel attached to roof storm drain



3.5- Rainwater harvesting system at the Eco House, Berkeley, CA

D. Rainwater Harvesting & Habitat for Humanity 1.Yield

In terms of water yield from Rain-water harvesting at the Woodland Site, two conditions must be considered: average precipitation rates in the given area and how much water can be caught and stored on site. At the Woodland, CA Habitat for Humanity Affordable housing site, it is evident that in January, the wettest month of the year, there are 4.51 inches of average precipitation, a drastic contrast from rainfall rates in the dry season which equal .03 inches. ³⁷ To verify

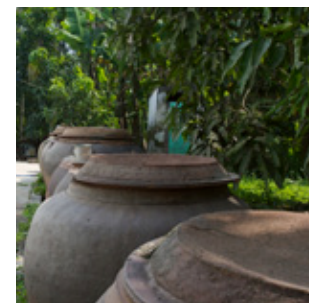
³⁵ Polito, Rick. "Harvesting rain for a dry day." The Marin Independent Journal. 9 February 2007. 25 May 2009 <http://www.marinij.com/lifestyles/ci_5195470>.

³⁶ Perlman, Howard. "Irrigation Water Use" U.S. Geology Service: U.S. Department of the Interior. 15 May 2009 <<http://ga.water.usgs.gov/edu/wuir.html>>.

³⁷ Monthly Averages for Woodland, CA. 16 May 2009. The Weather Channel. 2009, <http://www.weather.com/outlook/travel/businesstraveler/wxclimatology/monthly/graph/95695?from=tenDay_bottomnav_undeclared>.

Rainwater Harvesting

how rainfall correlates to rain barrel catchments capacity, Brock Dolman states, "tell people to think of their rainfall harvesting systems as a kind of 'savings account'. Every winter the planet gives you an allowance. People have to think about how much allowance they need. With 100 square feet of roof surfaces "for every one inch of water you'll get about 55 gallons"³⁸ Based on Dolman's expertise, in a region with 4.51 inches of precipitation, 220 gallons can be effectively caught and stored...and this is only for every 100 sq feet of roof surface.



3.6-10 - Rain harvesting barrels for the single home site

2. Cost Effectiveness

Rain water systems can be installed in highly affordable ways. In a phone interview with Paola Baouley, Conservation Program Director of the organization SPAWN (Salmon Protection Watershed Network) that promotes water conservation as advocacy for the protecting California's endangered salmon, she explains that all that is necessary for system installation is rainwater barrels or cisterns, storm drain piping, overflow piping, and a spicket. She verifies that rainwater pickle barrels with the capacity to hold 150 gallons of water generally cost \$40.00 and overflow piping, spickets, and fittings range around \$30.00 in

³⁸ Polito, Rick. "Harvesting rain for a dry day." The Marin Independent Journal. 9 February 2007. 25 May 2009 <http://www.marinij.com/lifestyles/ci_5195470>.z

Rainwater Harvesting

current product markets. She also states that an organization such as Habitat for Humanity could have excellent potential of getting various donated materials.³⁹



Grey Water Systems

E. Targeted Water Strategy #2: Grey Water

1. Background

Grey water itself is a combination of household water from sinks, showers/bathtubs, and washing machines. This household water makes up 50 - 80% of all water use in the residential home.⁴⁰ Though it is debatable that kitchen sink water is also a form of grey water, if intended for re-use, it must be treated with extra bioremediation through a series of various mulching beds. 'Grey Water' is very different from 'Black Water' which is considered soiled as it comes from the toilet and kitchen sink and therefore contains fecal matter, certain toxins and harmful household products. A Grey water system refers to the way in which water can be conducted from these sources inside the home and be filtered outside into mulch beds and gravel pits and then used for water applications on the surrounding landscape. The slow passage of water through

³⁹ Paola Bouley, Phone Interview, 28 May 2009.

⁴⁰ Ludwig, Art. "Greywater Central." Oasis Designs. 1997-2009. 25 May 2009 < <http://www.oasisdesign.net/greywater/index.htm> >.

Grey Water Systems

these outdoor systems not only cleans water, but makes it completely viable for re-use. ⁴¹

Grey Water systems are important sustainable strategies because they do not rely on precipitation rates and regional conditions to provide steady flows, but rather they re-use the perfectly safe water consumed in the home each and every day. Where rainwater harvesting systems are highly important, grey water systems offer better potential to provide consistent water even in the summertime. Not disposing of grey water into municipal sewage drains also keeps city systems from being overtaxed, thus preventing toxic fresh water contamination and problematic overflows. Grey Water systems further allow homeowners to take responsibility for their own water security, water bills, and water use..As described by Art Ludwig, creator of Oasis Designs, "The benefits of



4.1 - Grey water wetlands at the Eco House in Berkeley, CA

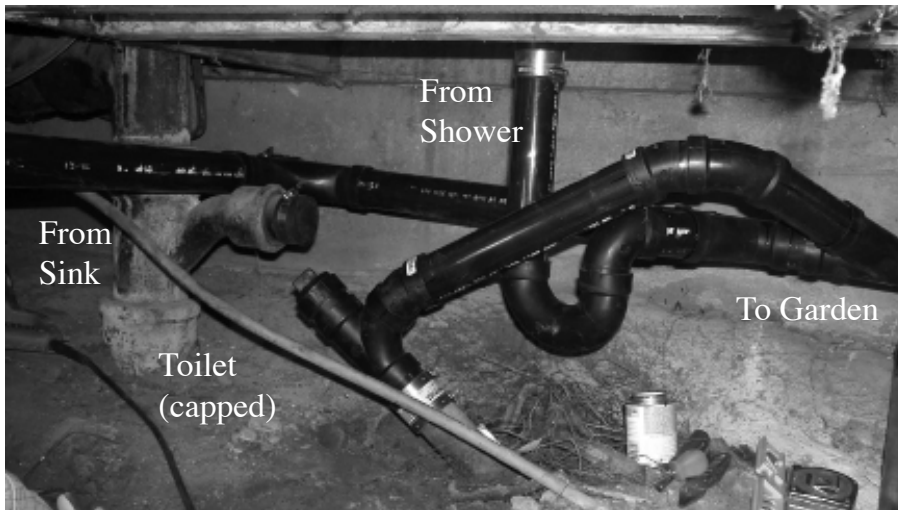


⁴¹ Ludwig, Art. "Greywater Central." Oasis Designs. 1997-2009. 25 May 2009 < <http://www.oasisdesign.net/greywater/index.htm> >.

Grey Water Systems

grey water recycling include:

- Lower fresh water use
- Less strain on failing septic tanks or treatment plants
- Grey water treatment in topsoil is highly effective
- Ability to build in areas unsuitable for conventional treatment
- Less energy and chemical use
- Groundwater recharge ⁴²



4.2 - Grey water collection plumbing system, New Mexico

- Plant growth
- Reclamation of otherwise wasted nutrients" ⁴³

The Grey water Guerillas, a grassroots grey water advocacy group out of Berkeley, CA also identifies important considerations: "No matter what kind of system you decide on, it's important to follow these basic grey water guidelines:

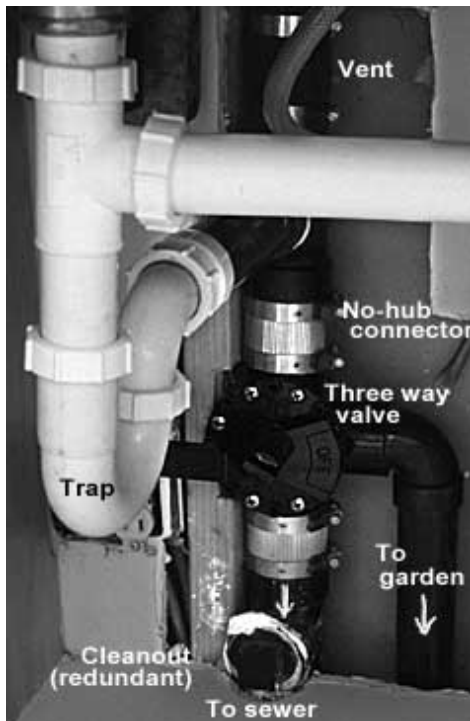
- Don't store grey water (more than 24 hours)
- Minimize contact with grey water
- Infiltrate grey water into the ground, don't allow it to pool up or run off

^{42, 43} Ludwig, Art. "Greywater Central." Oasis Designs. 1997-2009. 25 May 2009 < <http://www.oasisdesign.net/greywater/index.htm>>.

Grey Water Systems

(knowing the soil percolation rate of your soil and designing mulch basins will help with this)

- Keep your system as simple as possible, avoid pumps, avoid filters



4.3 - Grey water diverter valve under a sink

that need upkeep

- Match your plants irrigation needs with the amount of grey water they'll receive" ⁴⁴

Grey water systems can discharge water exiting the household into the following types of systems: into a swale; into a branched drain system which often ends in a mulched planted tree pit, and into a constructed wetlands system. Water conducted into a swale allows for maximum on-site retention and infiltration. A branch drain in comparison, allows water to be conducted through piping or drip systems, eventually draining in a tree pit. Further, a constructed wetlands system recreates the process of a natural wetland on a small scale for the purpose of cleaning water. The water flows into a wetland amongst a variety of suitable plants. The slow water movement through the wetland allows time to clean the water and the specific plants aid in purification. How clean the water becomes relates to how long and slow the water moves past surface contact with bacteria on gravel bits, and on the roots of water plants which fosters aerobic and anaerobic communities that act to purify the water. ⁴⁵

^{44, 45} "Recycling Water the Greywater Guerrillas' Way," The Greywater Guerrillas. 2007. 25 May 2009 <<http://www.greywaterguerrillas.com/greywater.html>>. Ludwig, Art. "Greywater Central." Oasis Designs. 1997-2009. 25 May 2009 <<http://www.oasisdesign.net/greywater/index.html>>.

Grey Water Systems



F. Grey Water & Habitat for Humanity

4. Yield

Grey Water design must always be site specific and designed in such a way to maintain all water within the site boundaries. The Woodland, CA site must first be sized for maximum grey water retention capacity. To verify how effective this system is and how much water it has the potential to re-channel and reuse, it is vital to identify how much grey water is generally consumed in the home on a weekly basis. Based on the research of Carl Lindstrom, it is also probable that a family of four uses approximately 75 gallons for laundry, 15 gallons for the dishwasher, 96 gallons for bathing, and other sources using the sink 84 gallons per week which adds up to 270 gallons per week.⁴⁶ This 270 gallons of grey water used by a family of four has the capacity to assist water re-charge year round. There are multiple other ways to identify and calculate general water use in the home which must also be in future research.

5. Current Codes

Although this system has the potential to be highly effective, current legislation makes it difficult to obtain permits for new construction sites. Presently, not all city codes allow implementation of these systems which undoubtedly keeps their potential impact from being recognized. Based on discussion with Bob Bigelow, architect and construction manager for Habitat for Humanity's Woodland build, the city of Woodland will not allow grey water implementation on the Habitat for Humanity project scheduled for August 2009.⁴⁷ Through further dialogue with grassroots bay area leaders in the grey water arena such as

⁴⁶ Lindstrom, Carl. Greywater. Planning a New GreyWater System. 15 May, 2009. 2000 <<http://www.greywater.com/planning.htm>>.

⁴⁷ Bigelow, Bob. Personal Interview. 2 June 2009. 46

Grey Water Systems

Paola Bouley of SPAWN and representatives from the EcoHouse in Berkeley, CA say it is apparent that codes and ordinances will indeed be changing within the next 2-3 years to incorporate use of grey water strategies.⁴⁸

Paola of SPAWN, projects that California implementation guidelines will closely resemble permit conditions set by the state of Arizona. Art Ludwig, avid water advocate and creator of Oasis Designs, also attests to the importance of Arizona's codes and our need to emulate them.⁴⁹ He suggests that Arizona has succeeded in creating codes that allow three types of grey water system implementations. The first of these is a system that uses less than 400 gallons per day and when compliant with a set of regulations, can be applied without a permit. The second of these is intended for commercial, multi-family, and institutional use where systems conduct between 400-3000 gallons and require a general permit. The third application uses over 3,000 gallons of water and must be examined by a regulator before application. Although he is generally supportive of Arizona's current laws, Ludwig's central criticism is that they do not adequately provide standards of performance benchmarks and details, graphics, or construction documents for proper application. The more materials that circulate the public realm, the better, more effective, and more compliant our systems will be.⁵⁰

Although it may not be possible to employ grey water strategies immediately, it is vital to still lay out the plumbing for these systems so that once laws do pass, organizations like Habitat for Humanity will be able take advantage of rebates and conservation technology immediately. It is recommended that Habitat for Humanity, Woodland, accommodate these developments by "stubbing out" a future Grey Water system. This means that the plumbing is constructed so it dead ends into a cap



48 Bigelow, Bob. Personal Interview. 2 June 2009.

49 Paola Bouley. Phone Interview. 28 May 2009.

50 Ludwig, Art. "How to Craft the Best Grey water Rules for New Mexico." Oasis Designs. 2009. 9 June 2009 <[http://www.oasisdesign.net/grey water/law/improve/nmtestimony.htm](http://www.oasisdesign.net/grey%20water/law/improve/nmtestimony.htm)>.

Grey Water Systems

that will be able to be connected in the future. Implementing a grey water 'stub out' during construction will save cost later and allow the housing occupants to take advantage of a future grey water system with much greater ease.

Oasis Design professionals explain, "Gray water systems are rapidly evolving.

Even if no currently available gray water system meets the owners requirements, it makes sense to stub out gray water lines in anticipation that new system types will become available over the long life of the house. Lines entombed under a slab without stub outs are lost to reuse forever."⁵¹

3. Maintenance

Habitat for Humanity occupants will be provided with the following homeowner instructions and many additional information for use of their future grey water systems: For protection of ecological systems receiving grey water, homeowners must use only cleaning products which are biodegradable because biodegradable products break down into harmless particles. Gray water system users must carefully read product labels and utilize products which are biodegradable, low sodium, without phosphates, brighteners, boron, borax, enzymes or bleach. The products must have low sodium and low surfactant qualities therefore it is not advisable to use liquid fabric softeners or harsh detergents. Examples of these products include those manufactured by: Oasis, Ecover, Dr. Bronners. 7th Generation.

When washing laundry that has dirty diapers, wastewater must be diverted into the sewer system and not the Grey Water system by switching on the sewer diversion valve.⁵² Although there have been no documented cases of grey water illness,

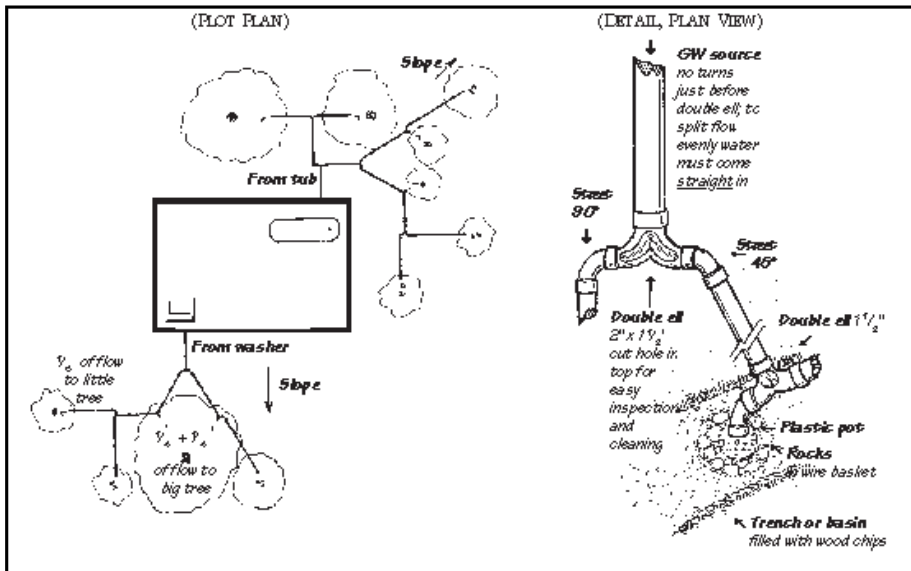


⁵¹ Ludwig, Art. "Grey water Collection Plumbing and Stub Outs." Oasis Designs. 1997-2009. 25 May 2009 < [http://www.oasisdesign.net/grey water/stubout.htm](http://www.oasisdesign.net/grey%20water/stubout.htm)>.

⁵² Martin, Christine. "Installing and Using Grey Water." The Ecology Center, Berkeley, CA. 4 June, 2009 < [http://www.ecologycenter.org/fact sheets/greywater.pdf](http://www.ecologycenter.org/fact%20sheets/greywater.pdf)>.

Grey Water Systems

for sure protection, If household occupants contract a communicable disease such as staph or hepatitis, wastewater must be diverted into the sewer system and not the Grey Water system by switching on the sewer diversion valve.⁵³ Though presently, the enormous value of grey water systems are not readily recognizable, continuous advocacy of thier importance will help make them realities and a usable strategy for organizations like Habitat for Humanity, Yolo County.



4.4 - Branched grey water drain system

⁵³ Martin, Christine. "Installing and Using Grey Water." The Ecology Center, Berkeley, CA. 4 June, 2009 < [http://www.ecologycenter.org/fact sheets/greywater.pdf](http://www.ecologycenter.org/fact%20sheets/greywater.pdf)>.



Sustainable Implementations & Design

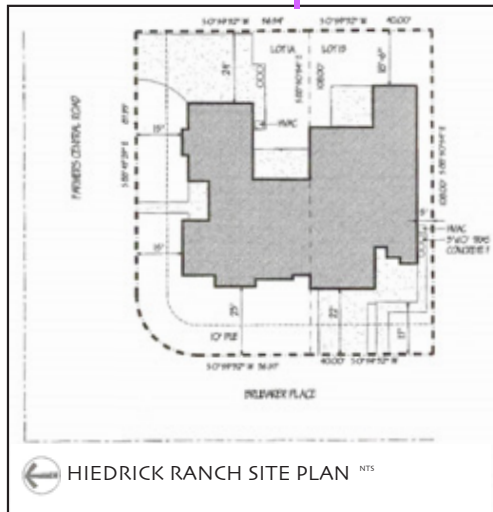
"Nothing could be worse than the fear that one had given up too soon, and left one unexpended effort that might have saved the world"

Jane Addams

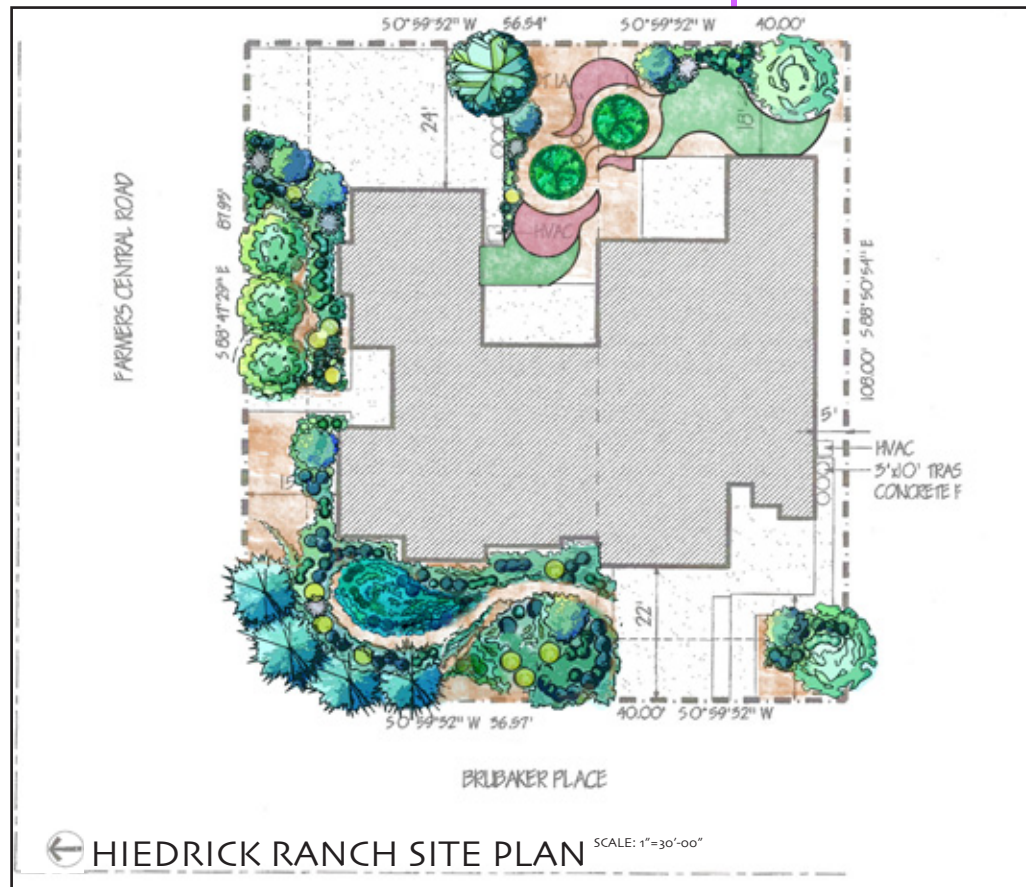


Sustainable Implementations & Design

Site Location: Silver Springs Development, Heidrick Ranch in Woodland, CA



5.1- Site plan



5.2 - Proposed plan

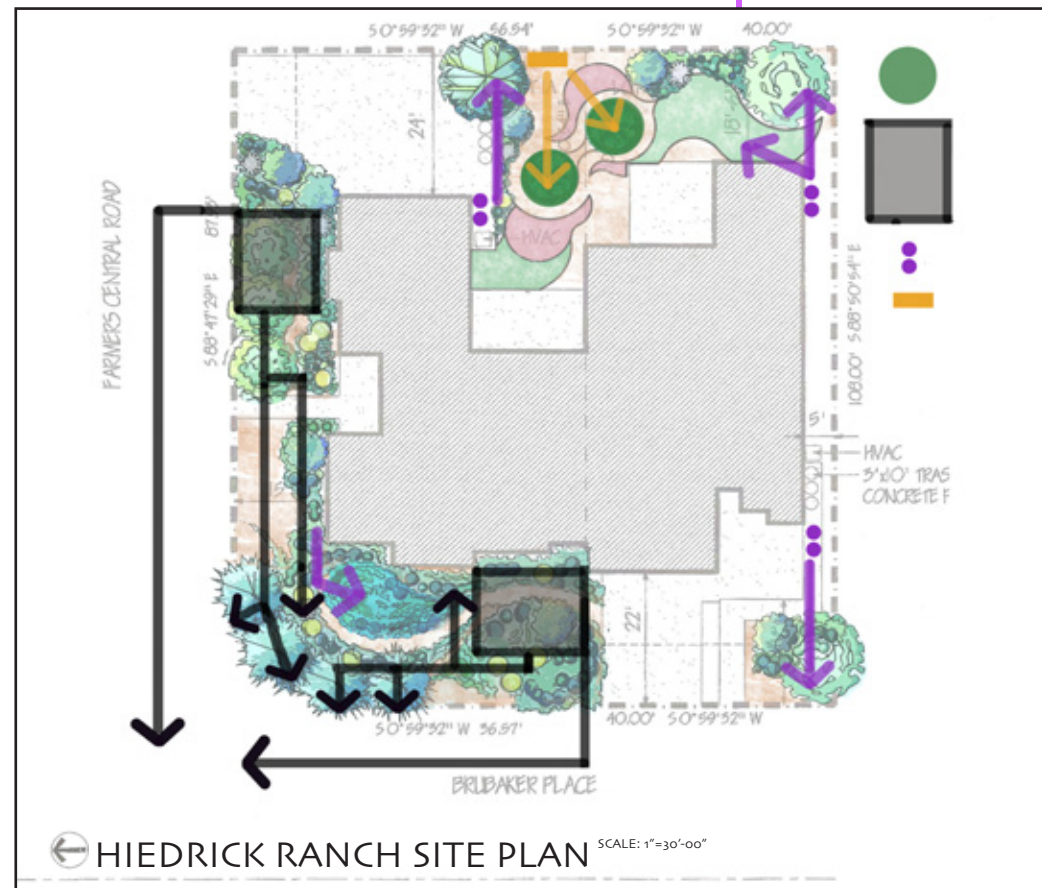


Sustainable Implementations & Design

Site Location: Silver Springs Development, Heidrick Ranch in Woodland, CA



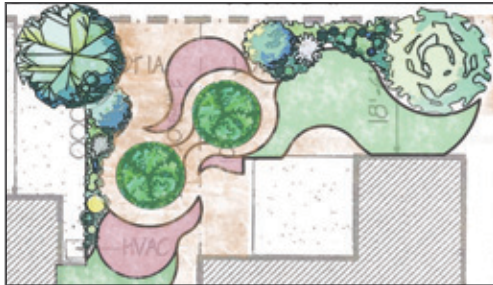
5.3 - Proposed plan



5.4 - Proposed "sustainable strategy" plan



Sustainable Implementations & Design



5.3 - Backyard design (nts)



5.4-6 - Backyard design perspectives





Conclusion

Where the aforementioned strategies are not overtly novel or innovative amongst sustainable planning and design professionals, when applied to the realm of affordable housing, they have the remarkable potential to serve both environmental and social causes in unprecedented ways. Because low income communities are at the greatest risk of losing resources and being bypassed in movements to find cutting edge solutions, it is not just the role of social advocates, but the role of designers and planners as well, to aid in community design that affects us all. Following in the footsteps of organizations like Habitat for Humanity, there is a remarkable opportunity to transform the future of affordable housing developments by successfully employing the landscape. When we recognize the fundamental definition of sustainable development, we can work to enhance social structures and environmental conditions alike.

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