public health alliance of southern california

A Partnership for Healthy Places

Thinking Local: The Role of Health Leadership in Water Recapture

Wednesday, September 30, 2015

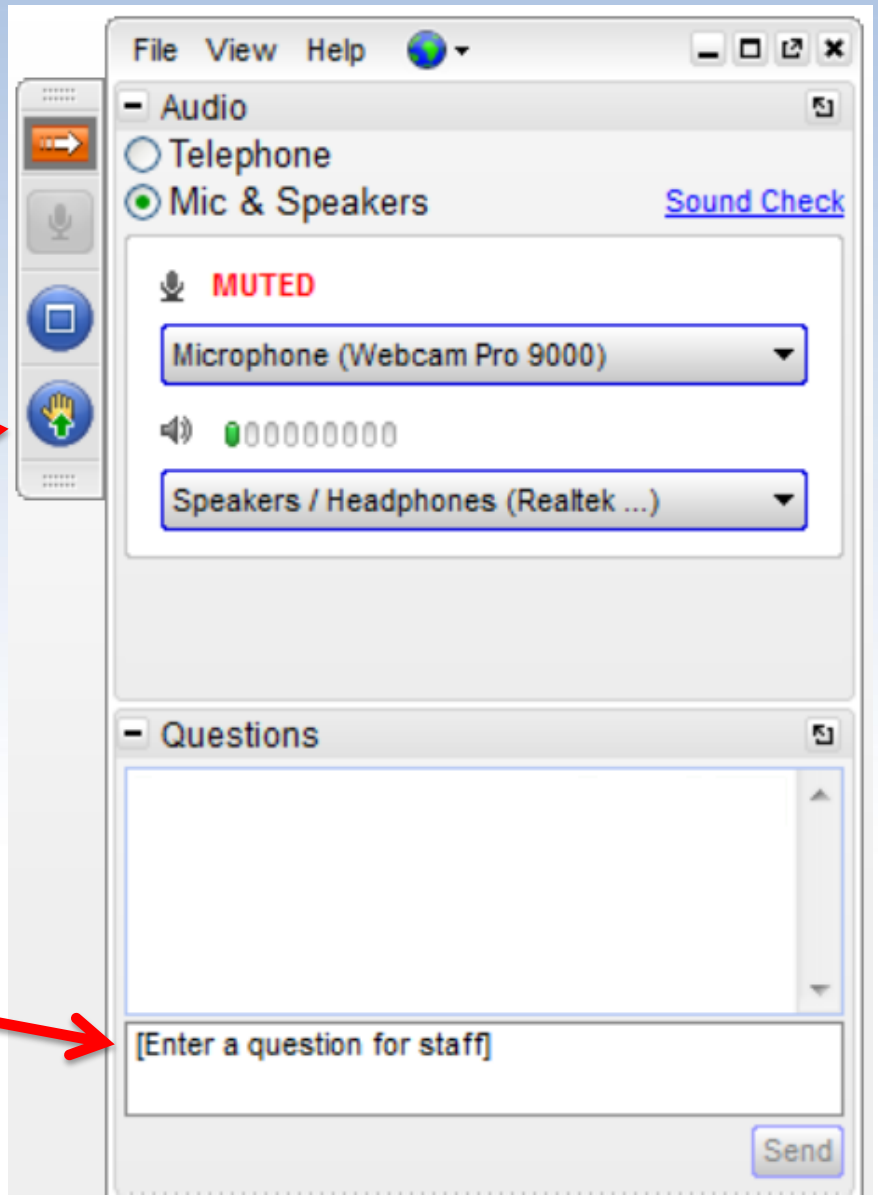
12 pm – 1 pm

Technical difficulties? Call **(855) 352-9002**

Housekeeping

Use the **Raise Hand Feature** during the discussion and Q&A, and we will take you off of mute to join the discussion.

If you have questions for the panelists or staff (including technical difficulties), please enter them throughout the presentation via the **Q&A Panel.**



Recording and Slides

Completed Webinars

Click on each webinar title for recordings, presentations, speaker bios, and additional resources.

Webinar 2—Agriculture and Drought: Implications for Food Security

July 22, 2015, 12-1 pm

> Healthy regional food systems are a foundation of healthy communities, but how can we preserve local agriculture in the face of threatened water supplies? This question forms the central theme of our webinar on agriculture and water. We will hear more about the changing face of agriculture, future threats, and the host of possible health risks of drought-related agricultural changes. We will address some concrete ways health departments can support healthy agriculture in Southern California.

Webinar 1—Drought Impacts on Disadvantaged Communities: Mitigation Strategies

June 24, 2015, 12-1 pm

> This webinar will survey the effects of the drought on disadvantaged communities, including the affordability of water for basic needs, populations without access to water and/or clean drinking water, and the economic and food security impacts in drought-stricken agricultural areas among other issues. Special attention will be paid to the multiplier effects of multiple risk factors. The webinar will address strategies and actions to mitigate the most severe public health impacts.

INTRODUCTORY WEBINAR--Water and Health 101

May 27, 2015, 12-1 pm

> This webinar will provide an overview of Southern California water sources, distribution, and use, as well as projections of what climate-related water changes we can anticipate in the future. It will provide a framework to understand the public health impacts of climate-related changes in the water cycle and discuss the role of health leaders in this rapidly changing physical and political landscape.

www.phasocal.org/WaterRecapture

Introducing our Moderator:

Dr. Tracy Delaney
Executive Director
Public Health Alliance of Southern California

Today's Agenda

- Opening and Housekeeping – *Katy Mamen*
- Welcome and Introduction – *Tracy Delaney*
- Thinking Local: the Role of Health Leadership in Water Capture - *Brad Lancaster*
- Discussion and Q&A – *Moderated by Tracy Delaney*
- Wrap-Up and Closing – *Tracy Delaney*

Introducing our Speaker:

Brad Lancaster
Co-Founder
Desert Harvesters

Thinking Local:
The Role of Health Leadership in Water Capture

by Brad Lancaster

www.HarvestingRainwater.com

www.DesertHarvesters.org

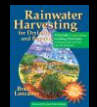
Tucson, Arizona, USA

1904

Sponge

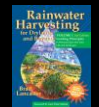
2007

Drain



Evidence of a hydrophobic society

- dehydration infrastructure



Floods that occurred every 100 years begin to occur every 10 years -

after development paves the watershed and increases the rate and volume of stormwater running off site

Distance is energy

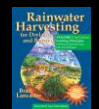
We ignore, deplete, or pollute our local waters
— then import ever more distant water

The largest consumer of electricity
(and single source producer of carbon)
in Arizona is the pumping of water

Photograph: Pete McBride on the parched Colorado River delta, by Jonathan Waterman

This landscape is irrigated with a combination of imported groundwater and surface water —both relatively high in salt. Over time such irrigation can *increase salt levels* in the soil and *decrease soil fertility*.

Irrigating with on-site **rainwater**, which has almost no salt, *reduces salt levels* in the soil and *increases soil fertility.*



The average annual rainfall in **Tucson, AZ** is 11 inches (280 mm)

Yet more *rain* falls on the surface area of Tucson
in a year of average rainfall,
than the annual consumption of Tucson's *water-utility water*

This situation **in Los Angeles, California** is as follows:

RAINFALL INCOME[9]	85	GPCD
	323	lpcd
UTILITY-WATER USE[10]	123	GPCD
	466	lpcd

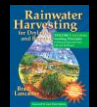
Information from One-Page Place Assessments at www.HarvestingRainwater.com

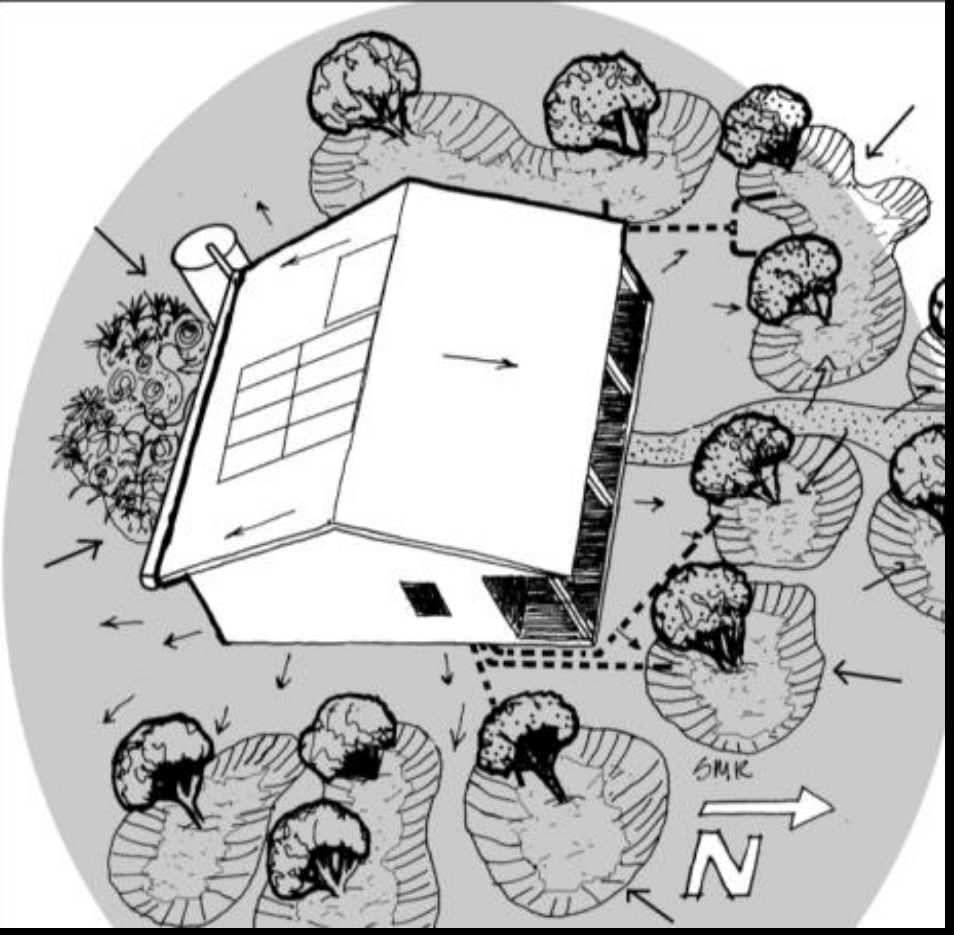
Path to Scarcity

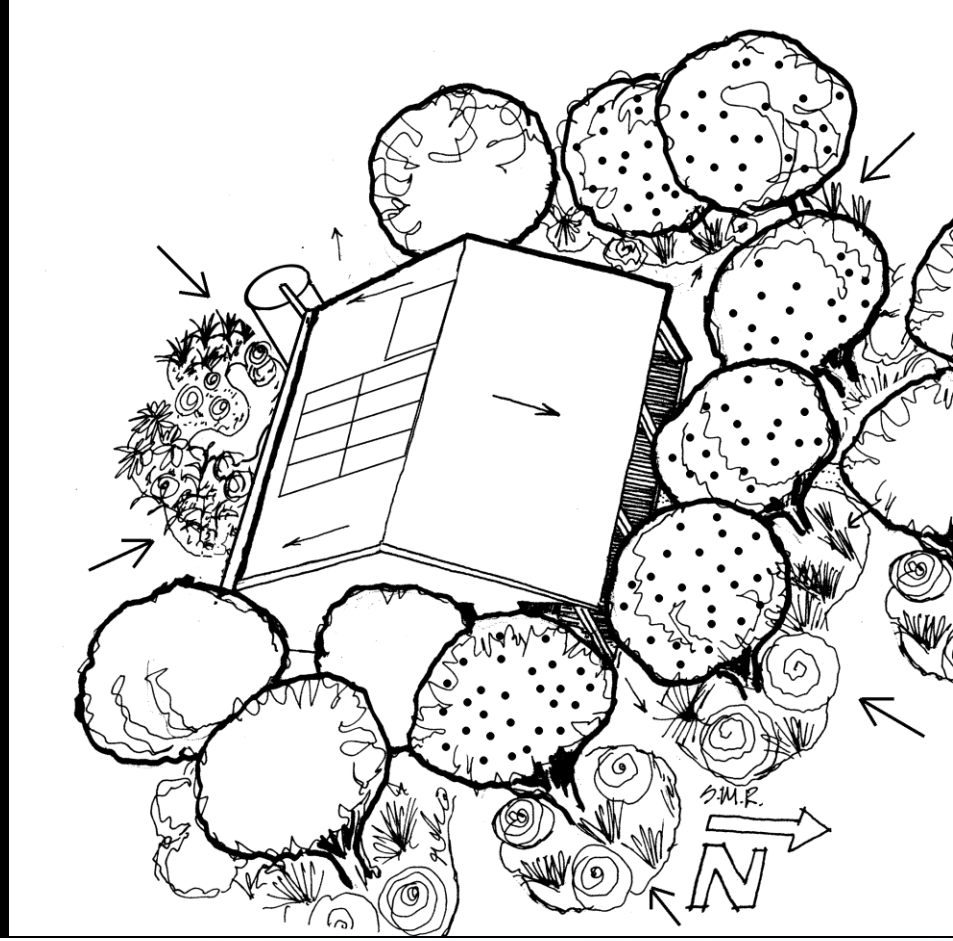
30 to 70% of household's drinking water used to irrigate landscape

Path to Abundance

- Rainwater is *primary* irrigation source
- Greywater and AC condensate are *secondary* irrigation sources
- Drinking water is only a *supplementary* irrigation source

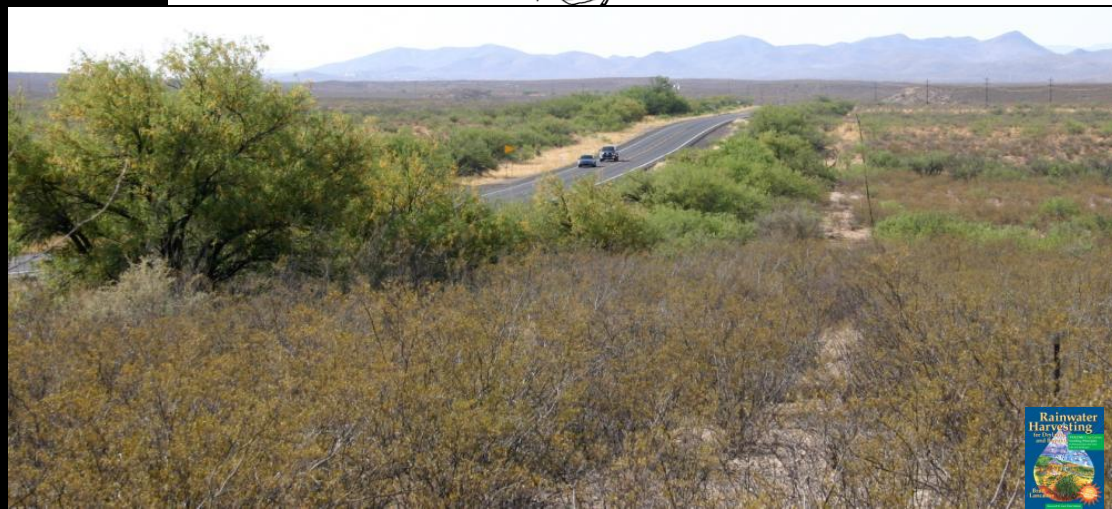






Harvest and utilize on-site water (rainwater, stormwater, greywater, condensate, etc)
as close as possible to where it falls

within the **oasis zone**
- within 30’ (9 m) of catchment surface

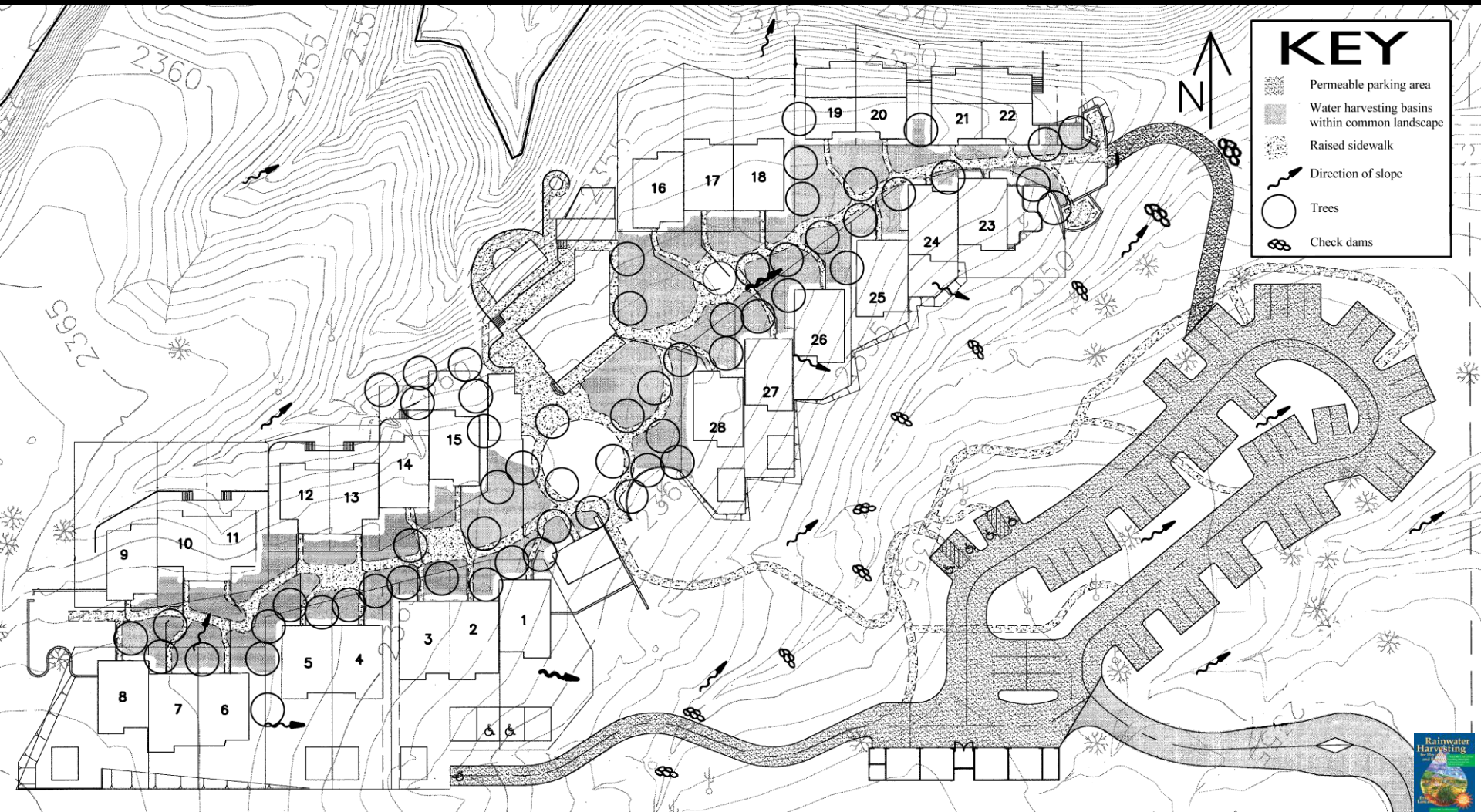


Maximize living and organic groundcover - the sponge

Before sponge:
After 2 inches (50 mm) of rain fell in less than an hour on high clay soils

After sponge: 4 inches (100 mm) of surface mulch and living pumps of vegetation. All rain now infiltrates in less than an hour

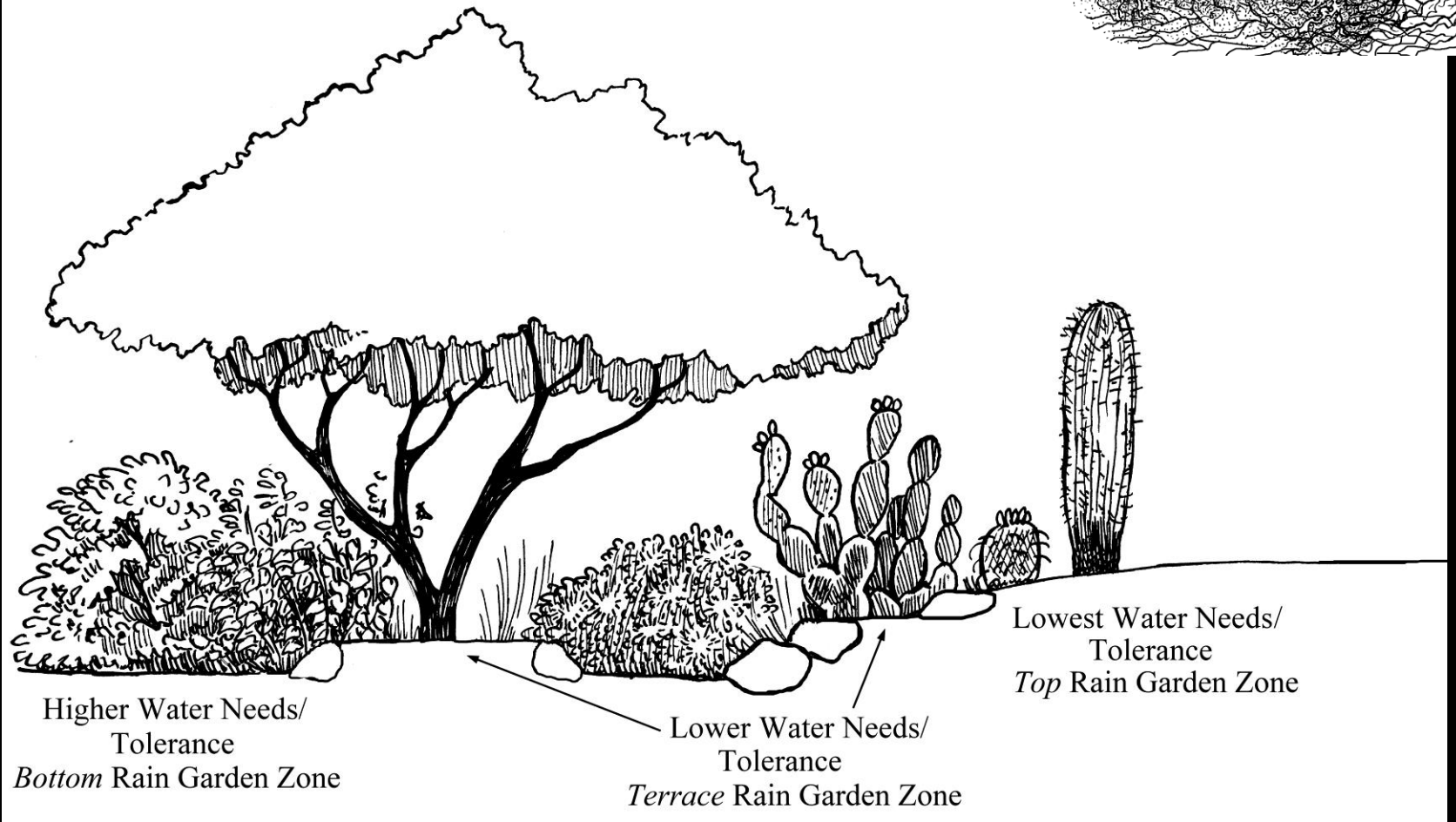
Integrated water harvesting has 10 times the flood-control capacity of a conventional flood-control system



Rain Garden Zones

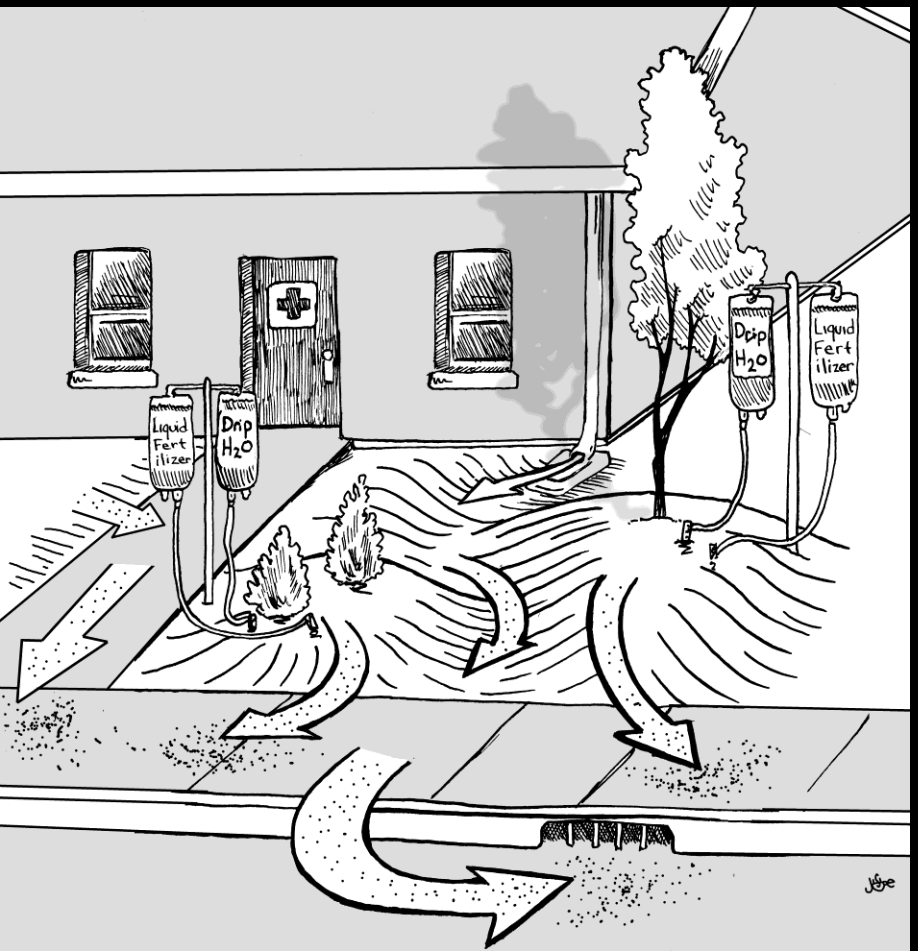
Bottom, Terrace, & Top

Lawn removal programs should incentivize harvesting topography, rather than maintaining drainage topography



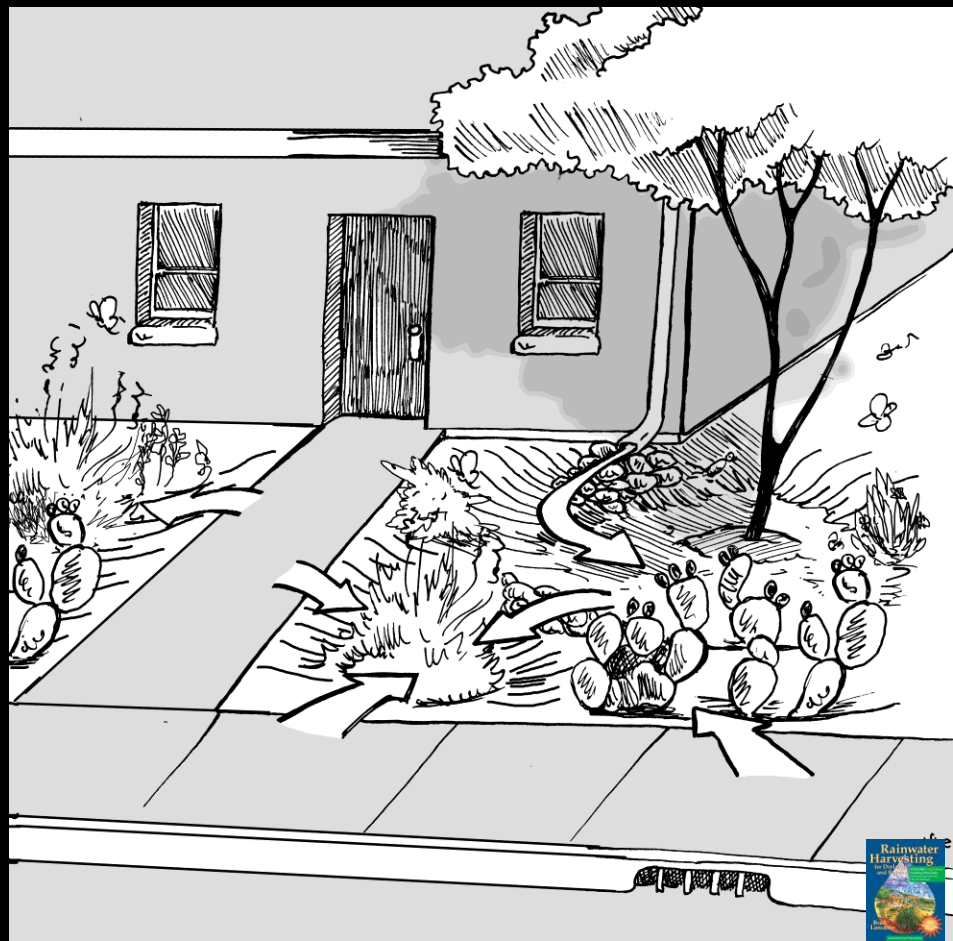
Path to *scarcity* in the landscape:

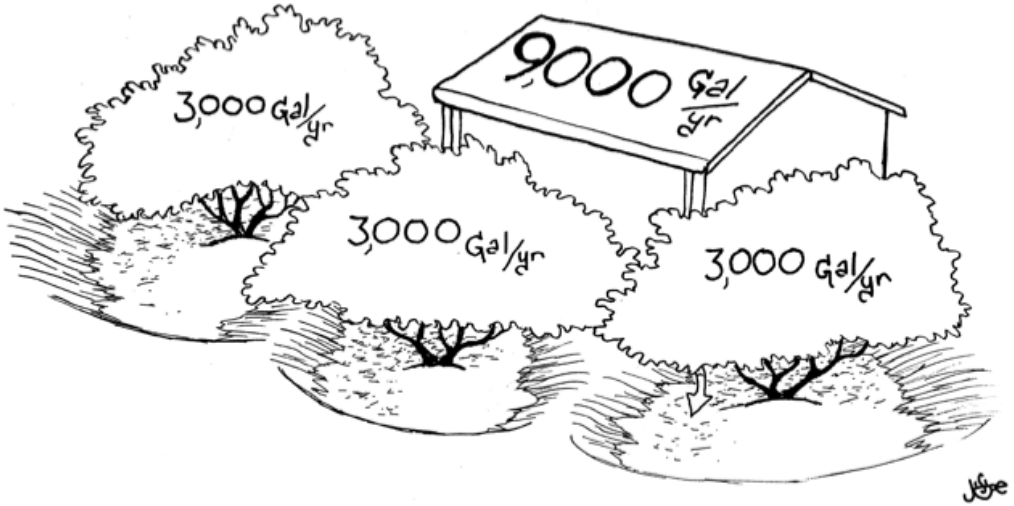
Decrease available rainfall

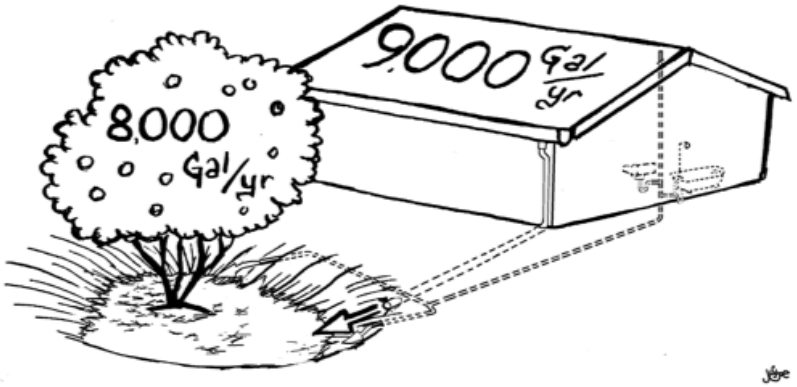


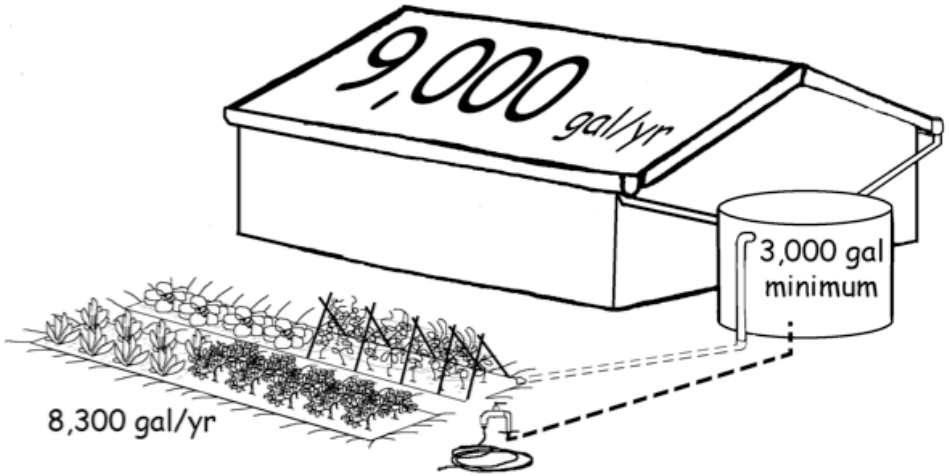
Path to *abundance* in the landscape:

Increase available rainfall



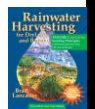


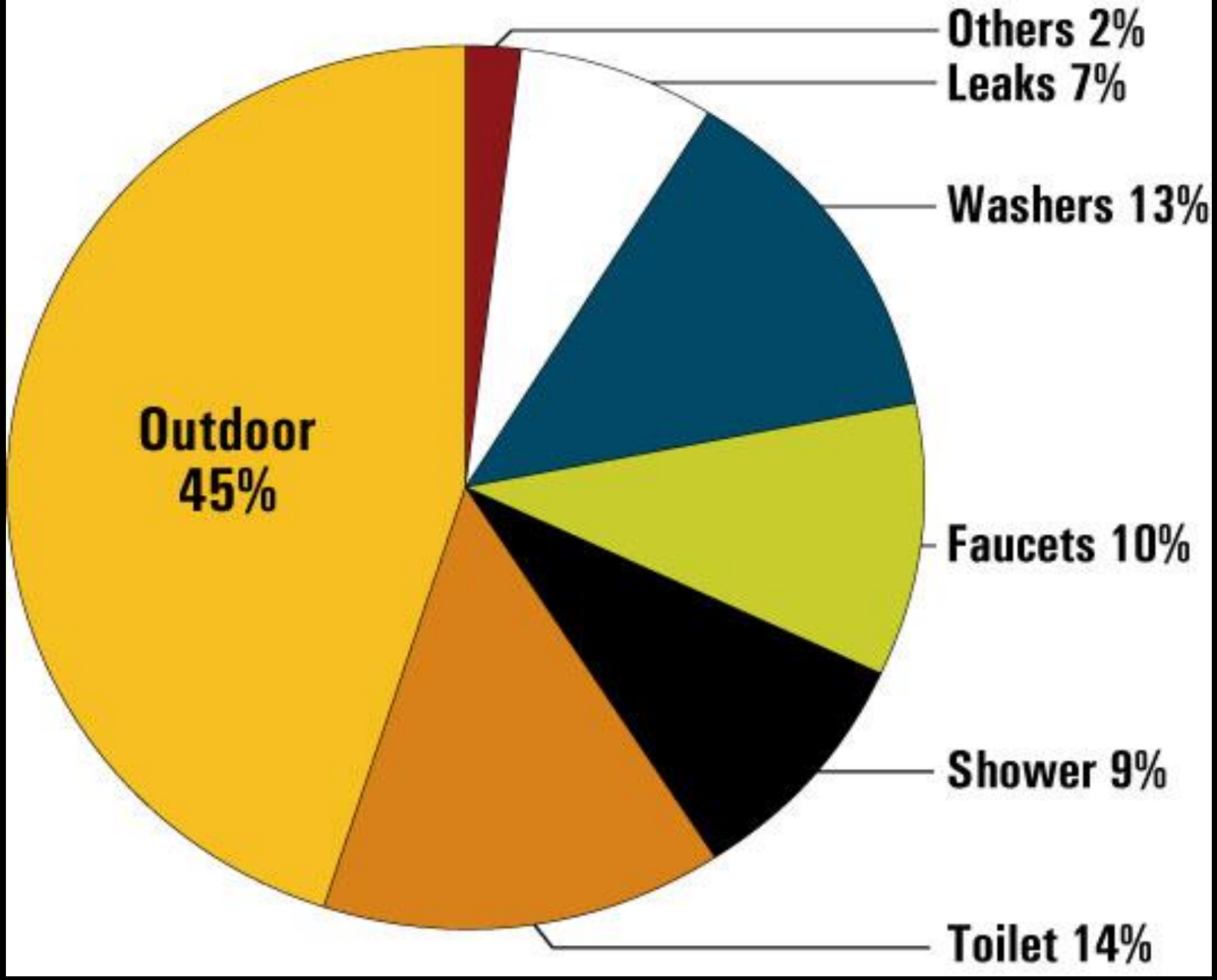




9,000 gallons of water from (1,200-ft^2 roof) equals:

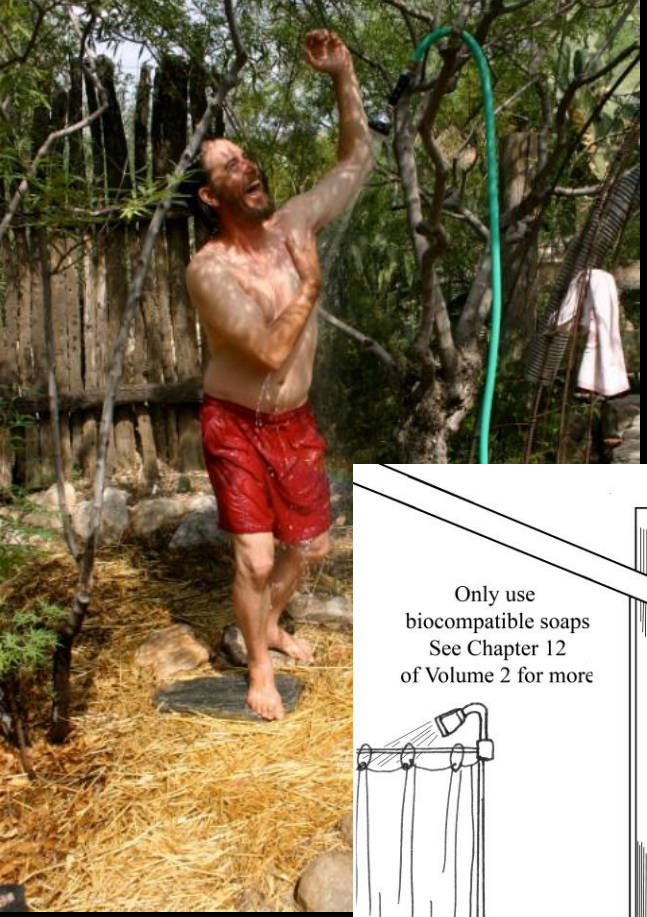
- 5,625 toilet flushes (1.6 gallons per flush)
- 750 loads of clothes washing (12 gallons per load)
- 900 five-minute showers (10 gallons per shower)





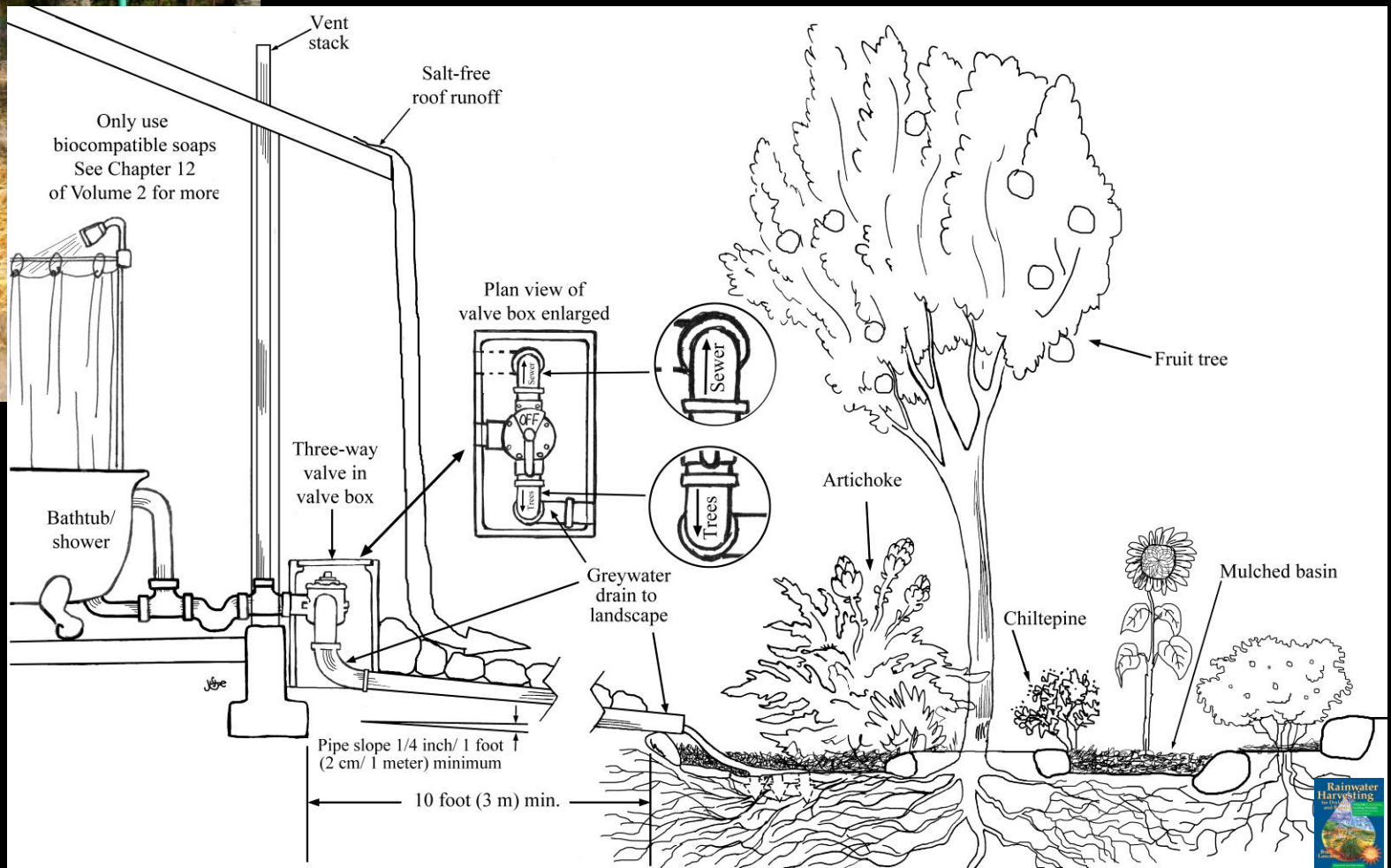
Water use in average single-family household in Tucson, AZ

From Tucson Water

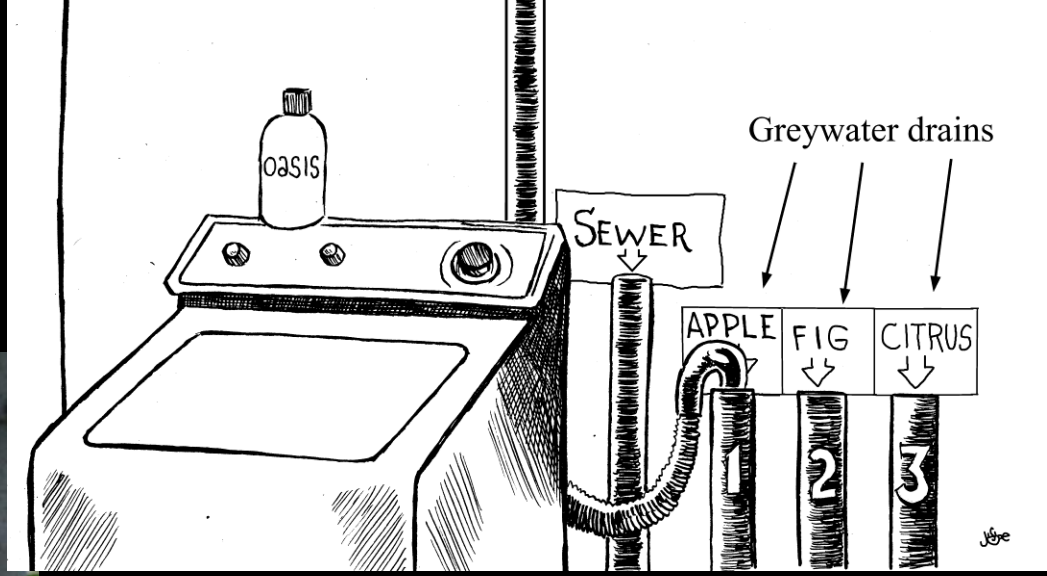


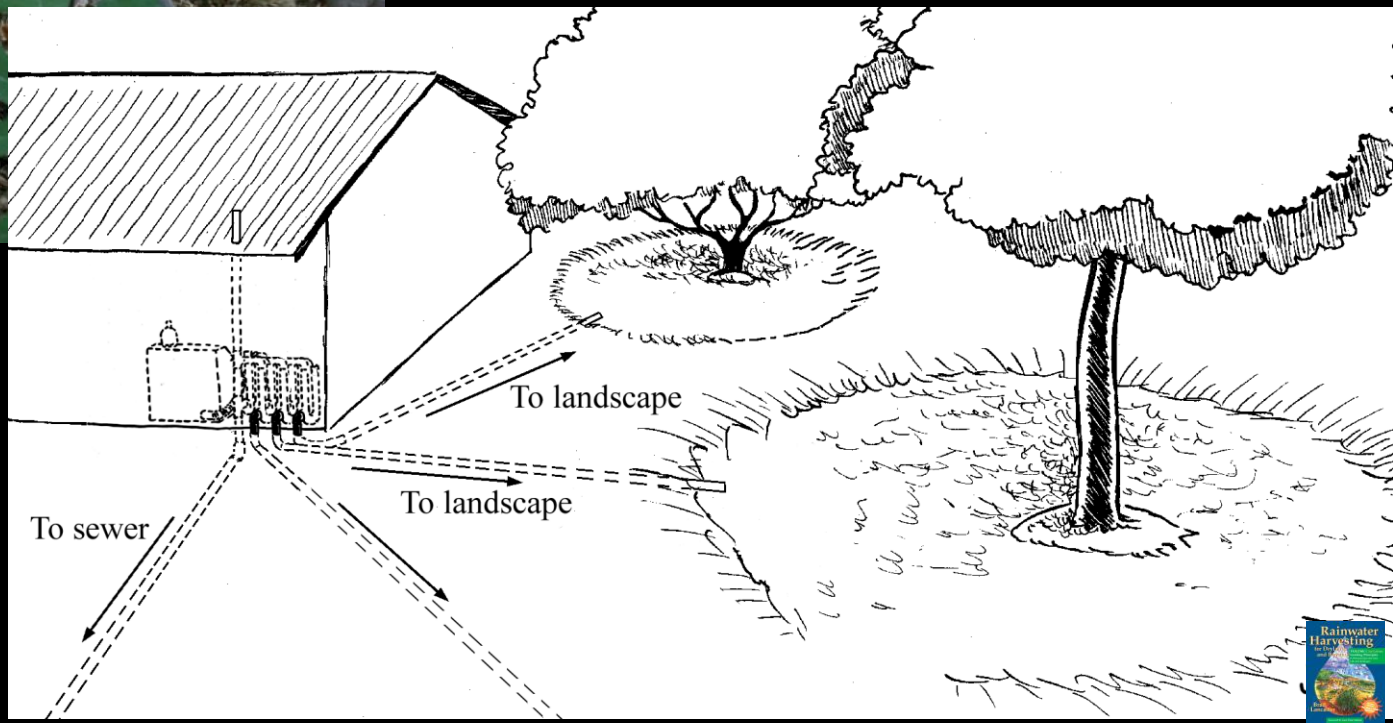
Greywater Harvesting

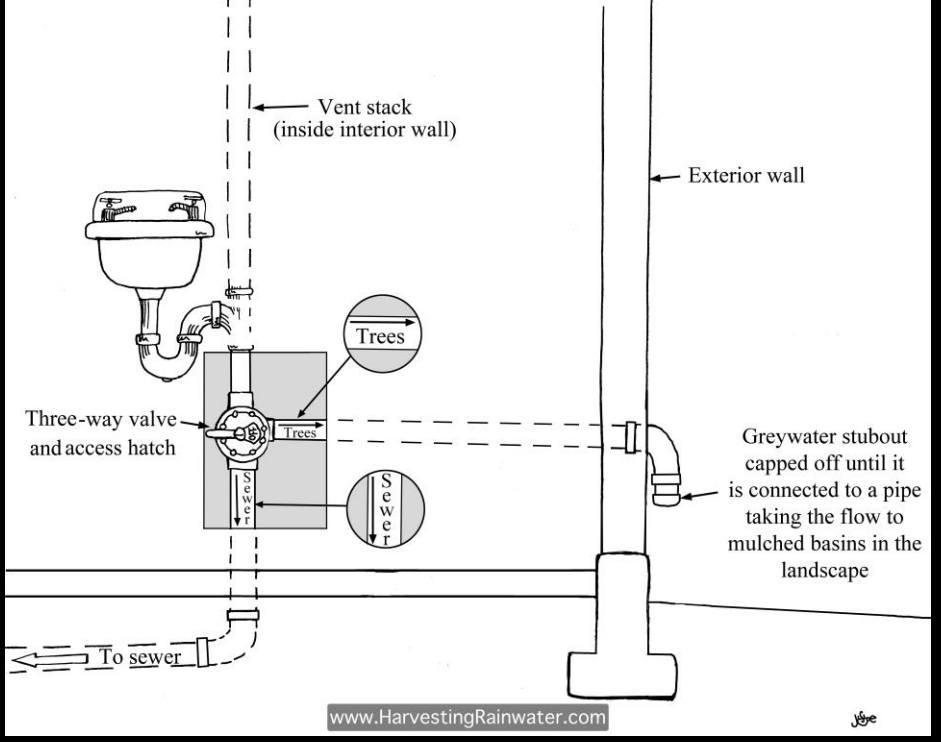
See Greywater Harvesting at
www.HarvestingRainwater.com
for more info including appropriate soaps and detergents, ordinances, & rebates

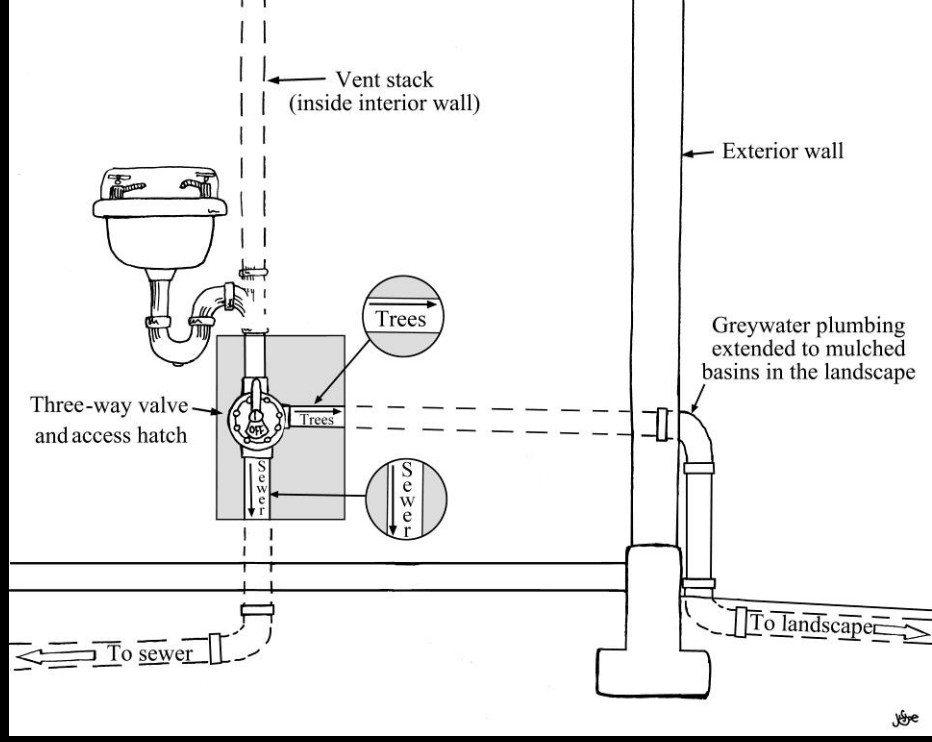


Multi-standpipe greywater diversion for washing machines









Greywater stub out and 3-way valve

plus $1,000 rebate

Scarcity

30% of household *drinking water* goes down the flush toilet

Abundance

My composted brown gold
- no drinking water used

Air-conditioning condensate harvesting

DRY CLIMATE/SEASON:

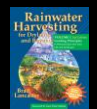
a home air conditioner can generate 0.25 gallons (1 liter) of condensate/day

a large commercial air conditioner can generate 500 gallons (1,900 liters)/day

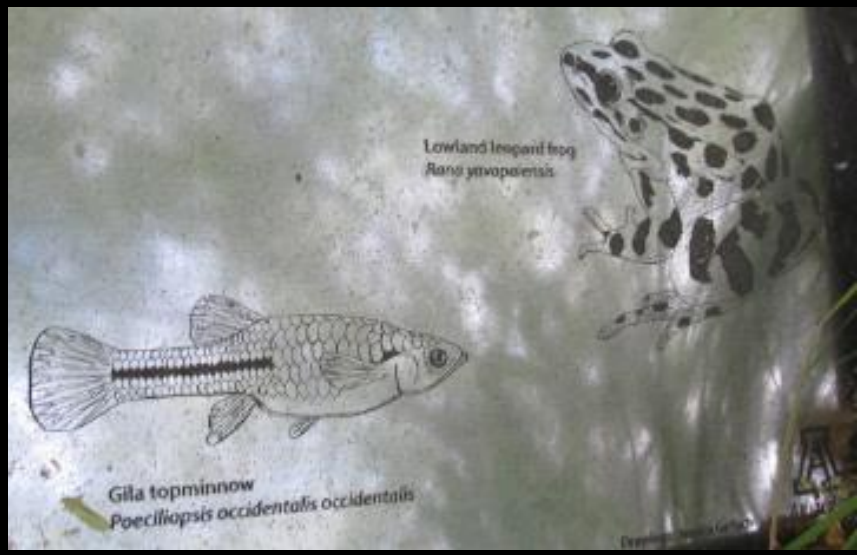
HUMID CLIMATE/SEASON:

a home air conditioner can generate 18 gallons (68 liters) of condensate/day

a large commercial air conditioner can generate 2,000 (7,500 liters) gallons



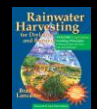
U of A College of Architecture and Landscape Architecture (CALA) Building, Tucson, AZ
www.cala.arizona.edu


Lowland leopard frog
Rana yavapaiensis
Gila topminnow
Poeciliopsis occidentalis occidentalis


Rainwater Harvesting

Dead *drainage*way to living *infiltration*way

U of A Architecture and Landscape Architecture Building, Tucson, AZ
CALA landscape tour www.cala.arizona.edu


Rainwater
Harvesting

Scarcity – heat island

10˚ F (5.5˚ C) *increase* in summer

Abundance – cool island

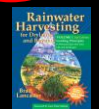
10˚ F (5.5˚ C) *decrease* in summer

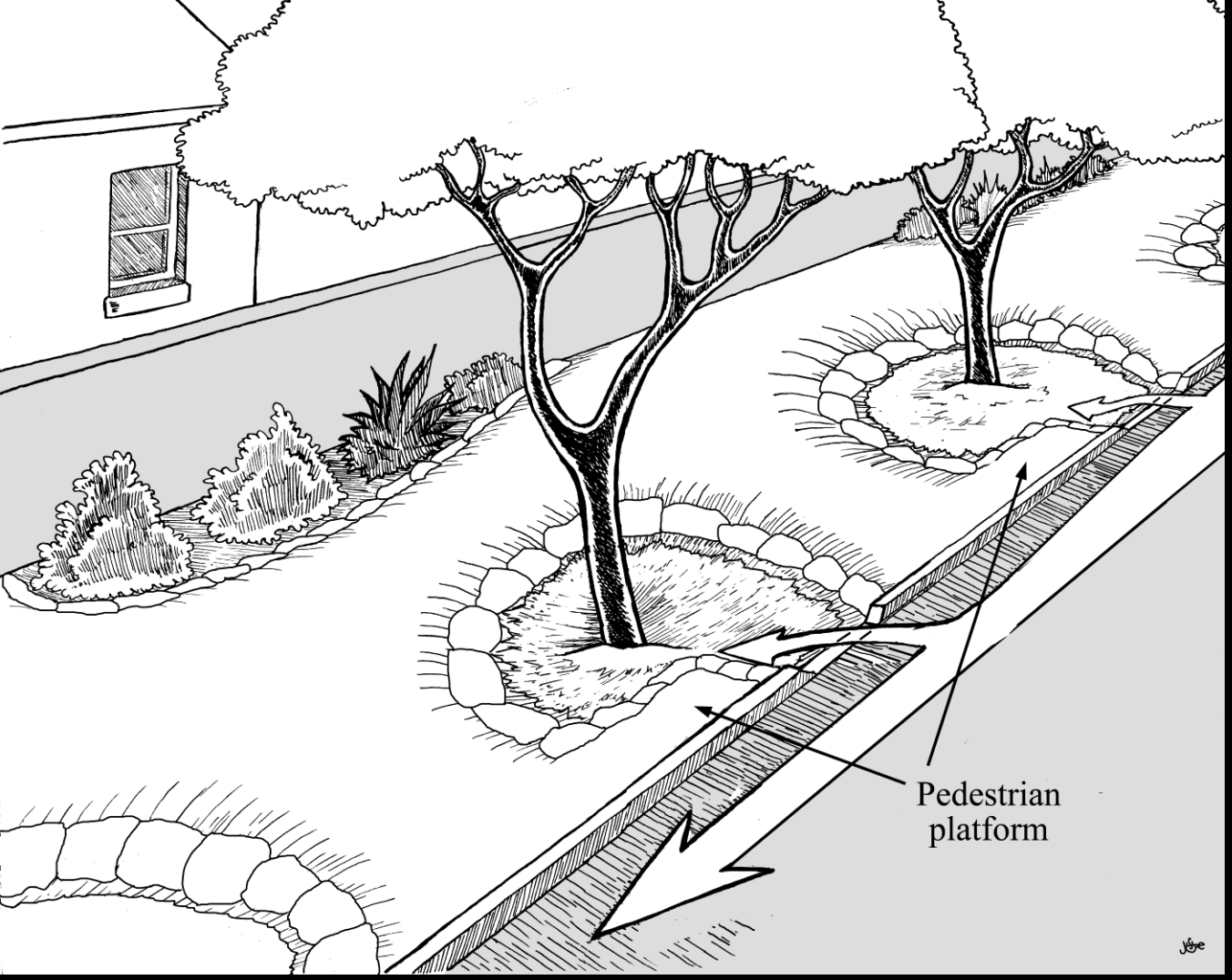
WATER

⚐4

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
AVERAGE RAINFALL (GAIN)[1]										*1906–2013*			
INCHES	3.20	3.38	2.40	1.01	0.25	0.06	0.01	0.05	0.27	0.48	1.25	2.41	14.77
mm	81.3	85.9	61.0	25.7	6.4	1.5	0.3	1.3	6.9	12.2	31.8	61.2	375.2
AVERAGE PAN EVAPORATION (POTENTIAL LOSS)[d,6]										*1948–2005*			
INCHES	3.32	3.59	4.86	6.28	7.33	8.59	10.88	10.28	7.84	5.85	3.81	3.03	75.66
mm	84.3	91.2	123.4	159.5	186.2	218.2	276.4	261.1	199.1	148.6	96.8	77.0	1,921.8

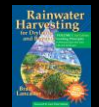
Tabled data is for Los Angeles from One-Page Place Assessements at www.HarvestingRainwater.com





For every *inch* of rainfall…

- A 10-foot wide paved street will drain 27,800 gallons of rainfall per mile
- A 20-foot wide paved street will drain 55,700 gallons of rainfall per mile
- A 30-foot wide paved street will drain 83,500 gallons of rainfall per mile



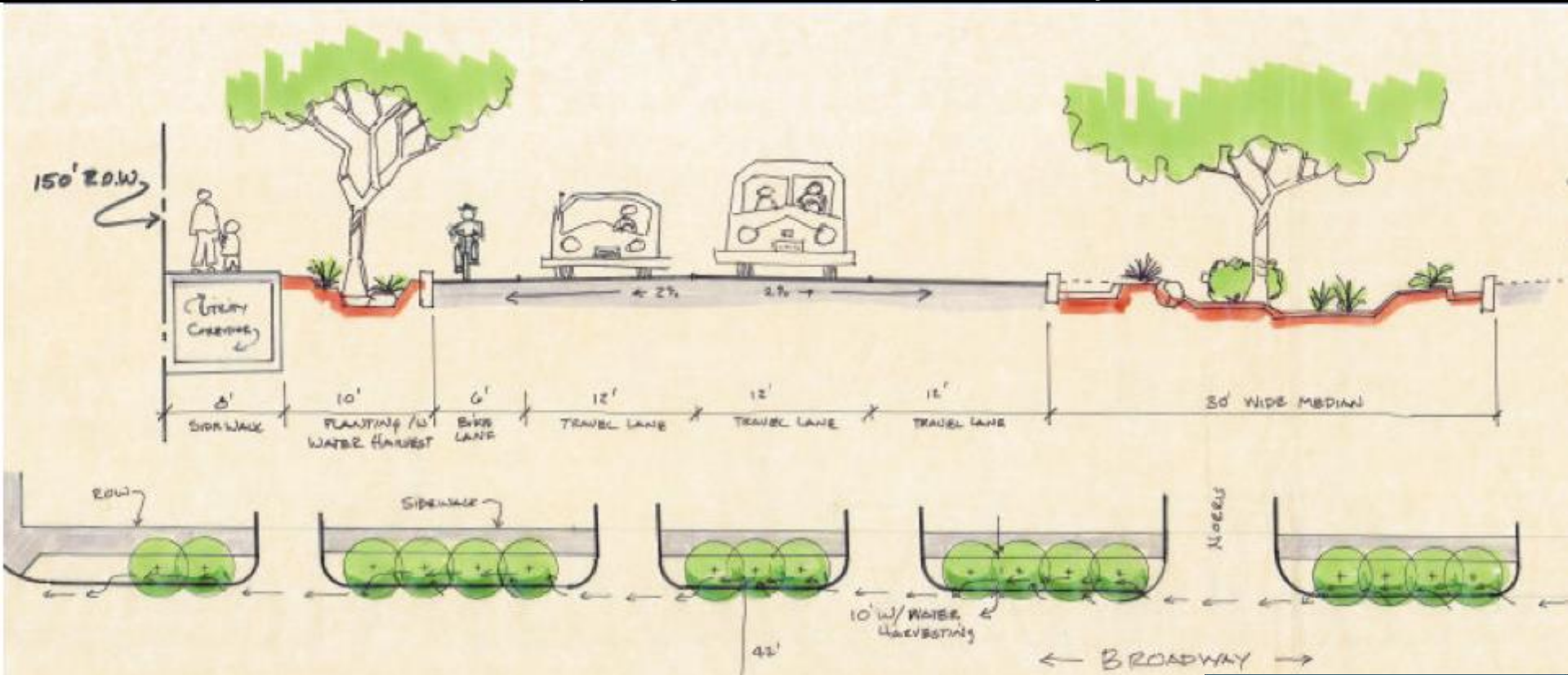
Green Streets Policy in Tucson, AZ

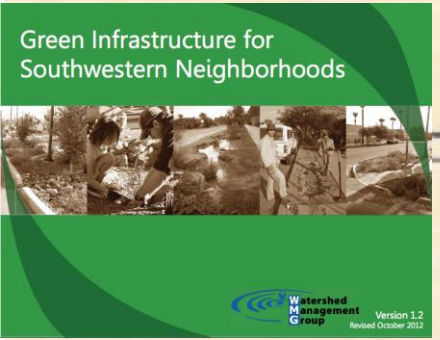
Minimum ½ -inch rainfall to be harvested in roadway or adjoining right-of-way

https://www.tucsonaz.gov/files/transportation/Green_Streets_APG_Signed_by_Director.pdf

Commercial landscape policy

At least 50% of commercial landscape irrigation needs must be met by harvested on-site rainwater





www.WatershedMG.org

Prunings from tree used as mulch to fertilize tree and increase soil moisture

12 to 14% of the city's solid waste stream is yard trimmings

Brush and Bulky transformed into *Chipped and Mulchy*

Trees associated with mulched water-harvesting earthworks…

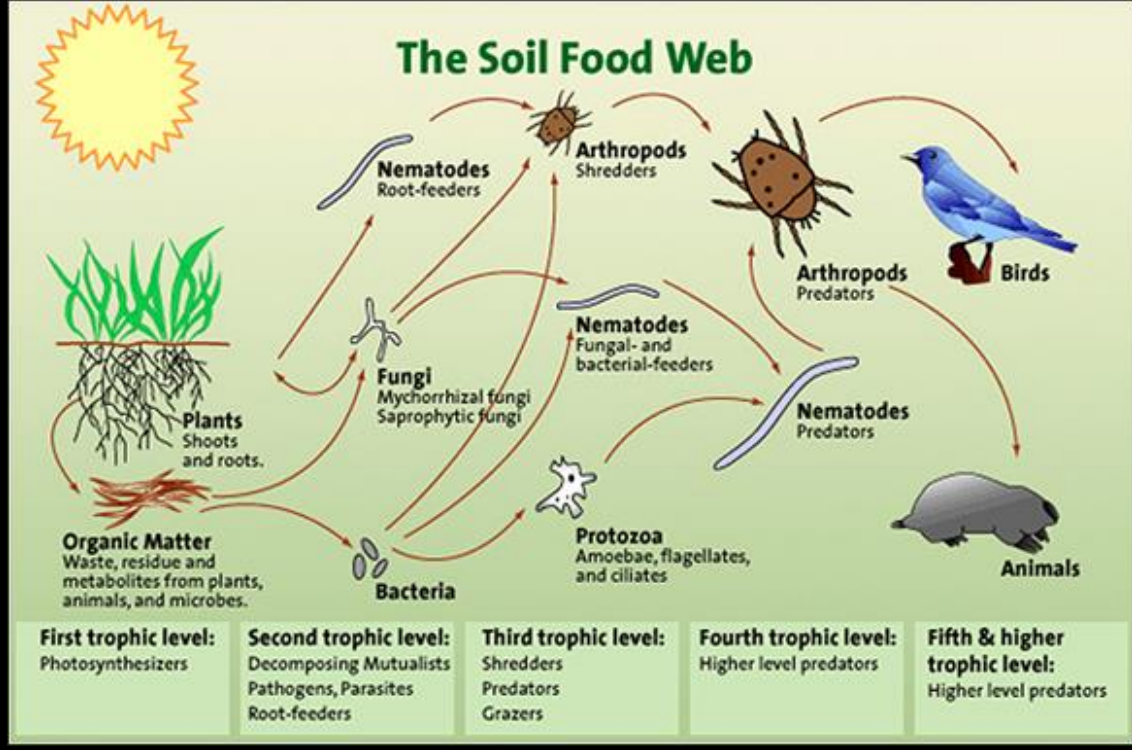
- Grow 33% larger than those without.

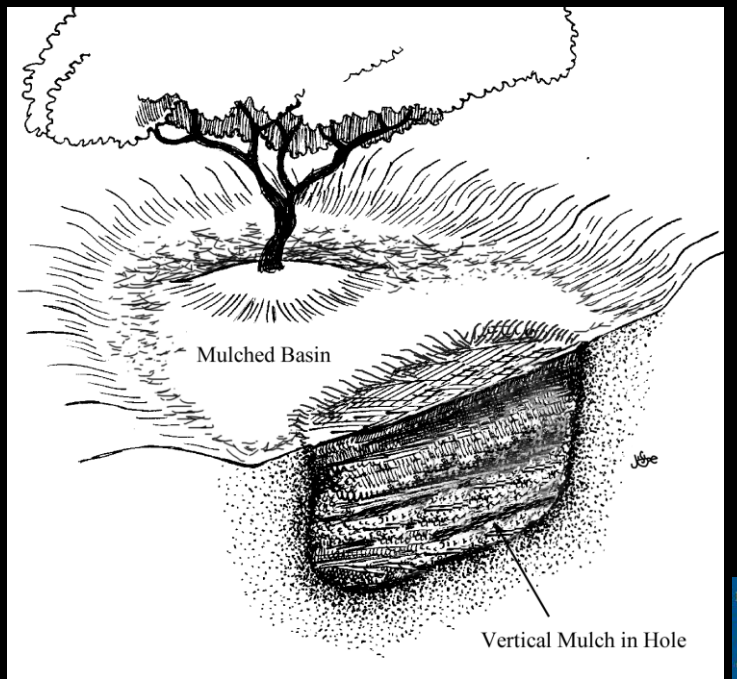
- Can more than double the trees' potential sequestration of atmospheric carbon, passive cooling, and food production

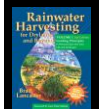
- Enable the soil itself to sequester additional carbon

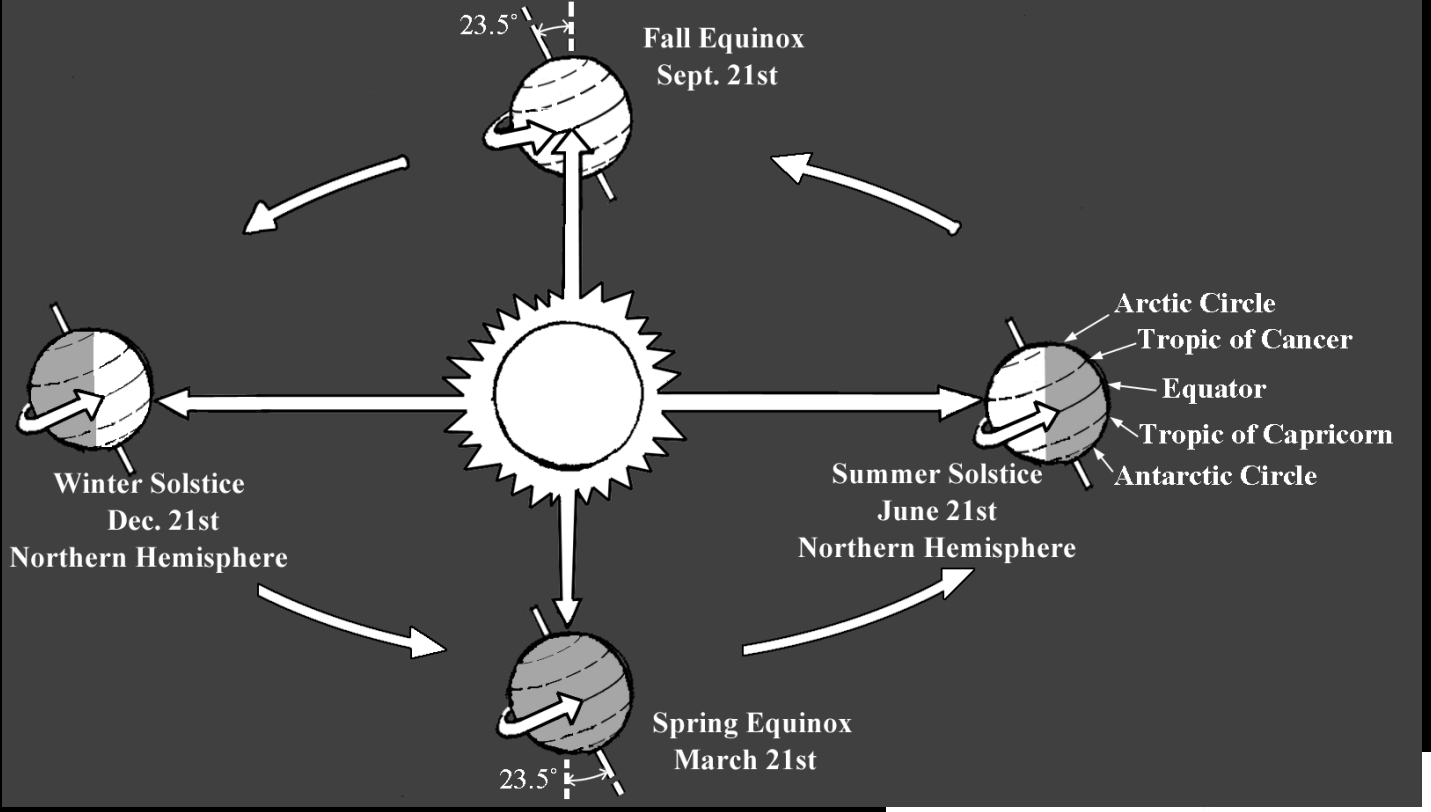
- Increase the natural pollutant-filtering/bioremediation ability of the soil mulched with organic matter to **10 times** greater than rock- or gravel-mulched soil

Mitchell Pavao-Zuckerman, PhD
Biosphere 2 & School of Natural Resources and Environment
University of Arizona mzuckerman@arizona.edu





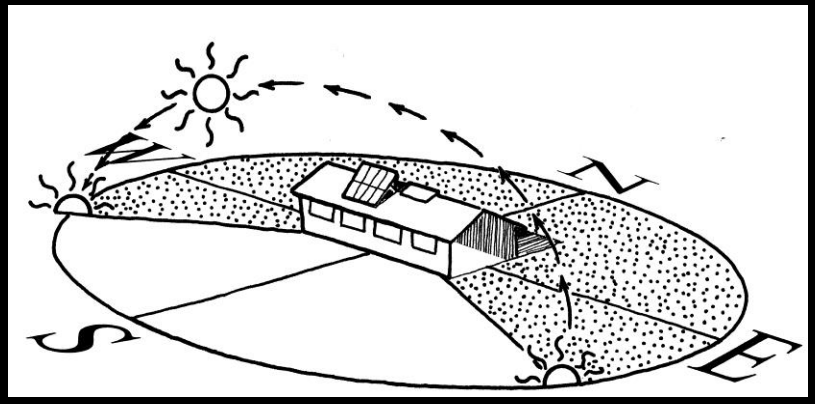


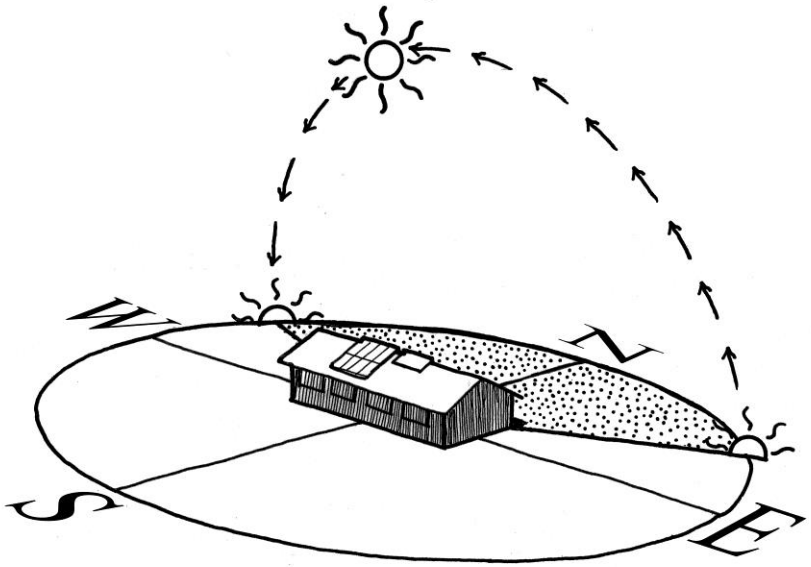


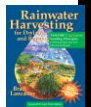
Integrating with the Sun and more

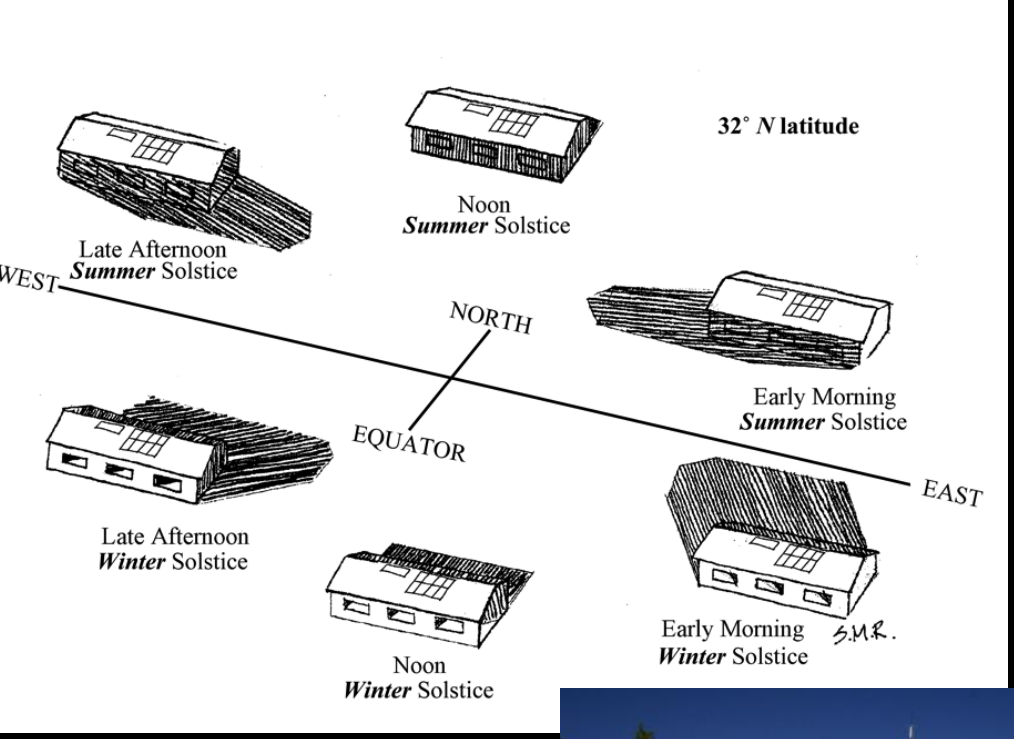
using

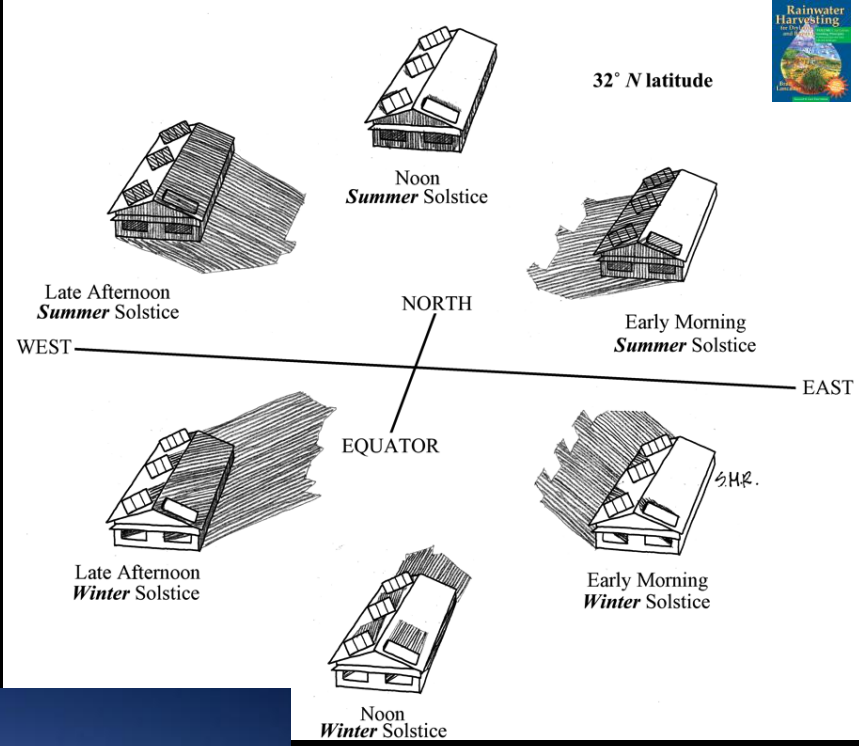
Seven Integrated Design Patterns







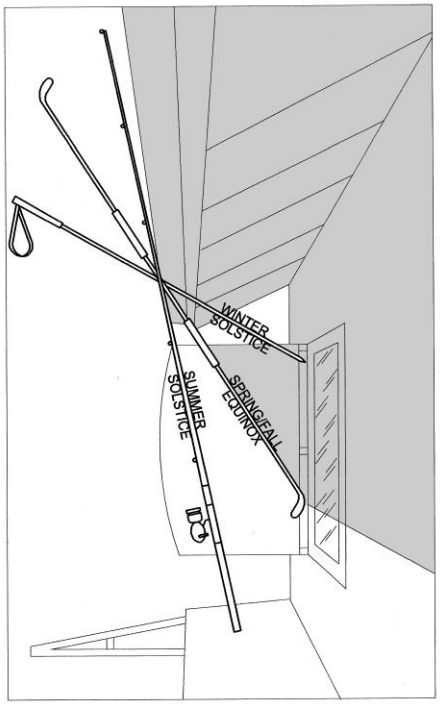




Integrated Design Pattern One:

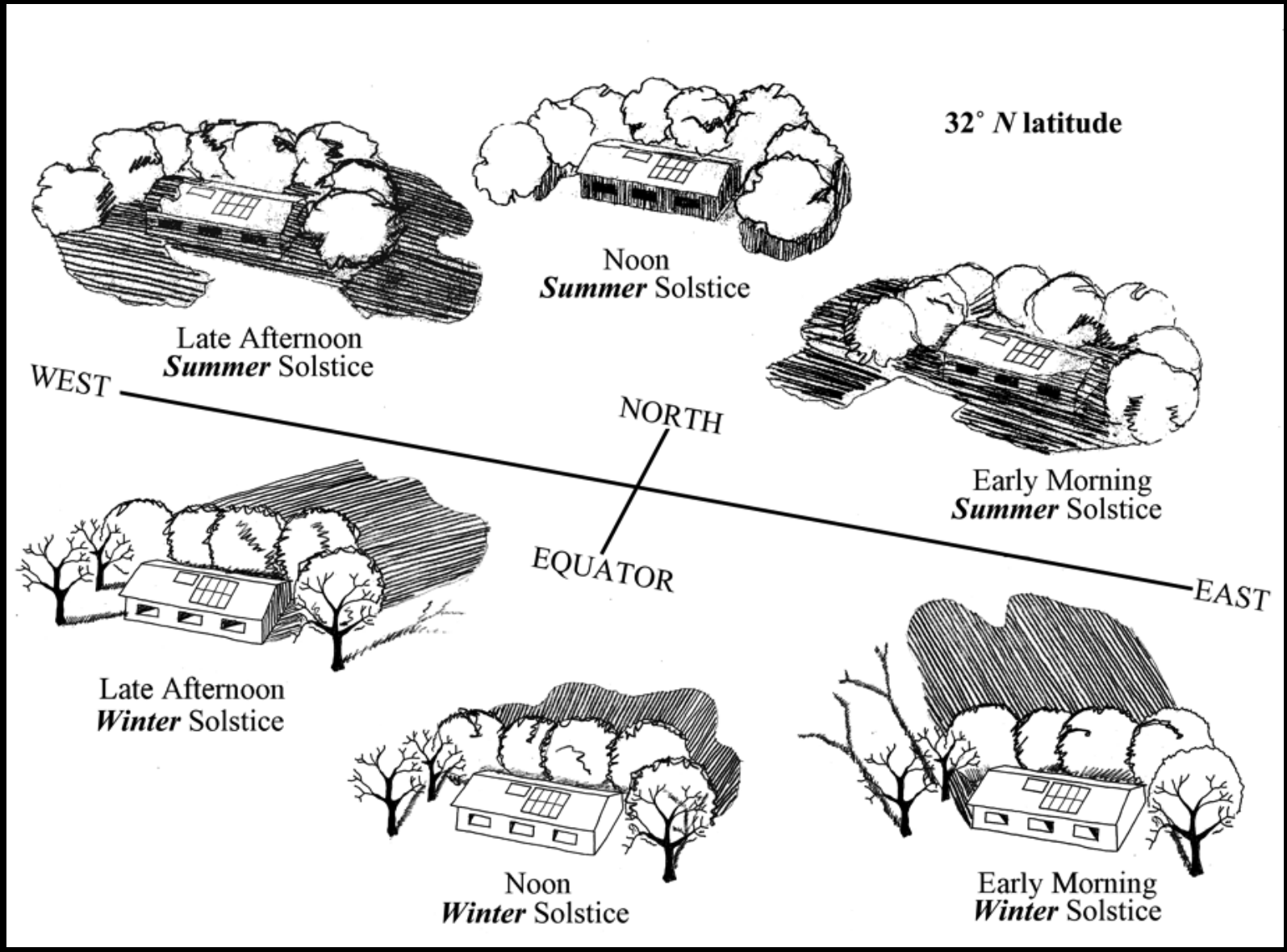
Orienting Buildings and Landscapes to the Sun

SUN	⚐2	MAR 21	JUN 21	SEP 21	DEC 21
LATITUDE 34.1°	DEGREES N or S of DUE EAST THE SUN RISES[3]	0°	29°N	0°	28°S
	DEGREES N or S of DUE WEST THE SUN SETS[3]	0°	29°N	0°	28°S
	SOLAR-NOON ALTITUDE ANGLE (ABOVE HORIZON)[a,3,4]	56°	79°	56°	33°



Integrated Design Pattern Two:

Designing Roof Overhangs and Awnings to Optimize Winter Sun and Summer Shade

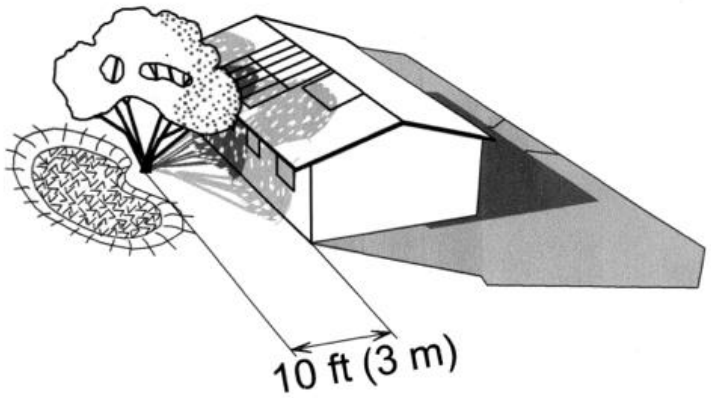


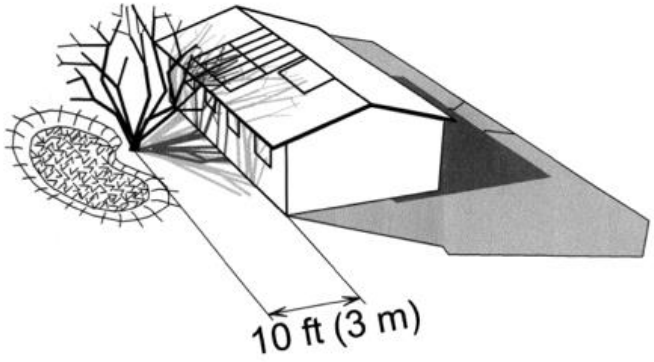
Integrated Design Pattern Three:

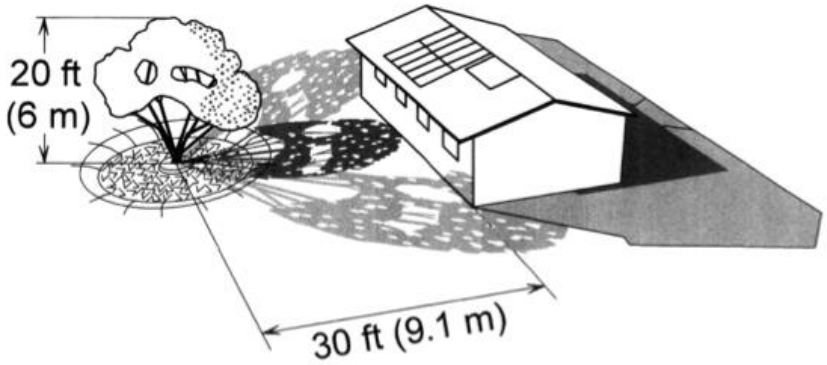
Solar Arcs

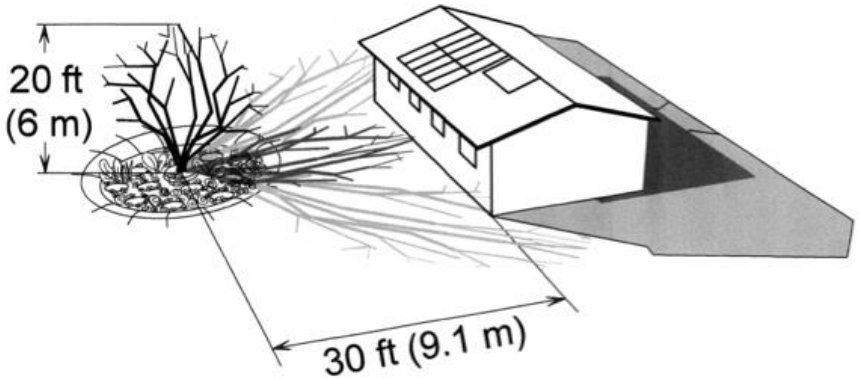
	MAR 21	JUN 21	SEP 21	DEC 21
DEGREES N or S of DUE EAST THE SUN RISES[3]	0°	29°N	0°	28°S
DEGREES N or S of DUE WEST THE SUN SETS[3]	0°	29°N	0°	28°S
SOLAR-NOON ALTITUDE ANGLE (ABOVE HORIZON)[a,3,4]	56°	79°	56°	33°

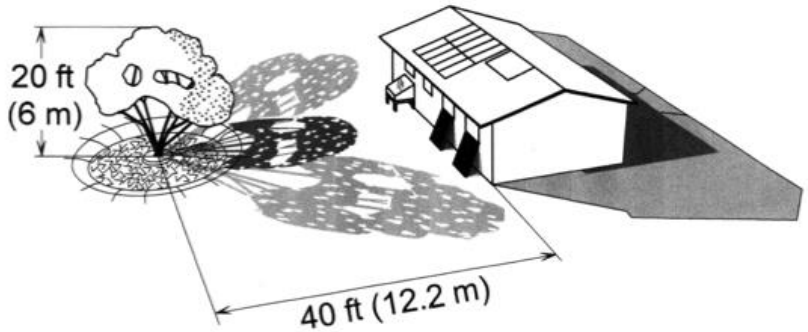
Integrated Design Pattern Five: Maintaining Winter Sun Access

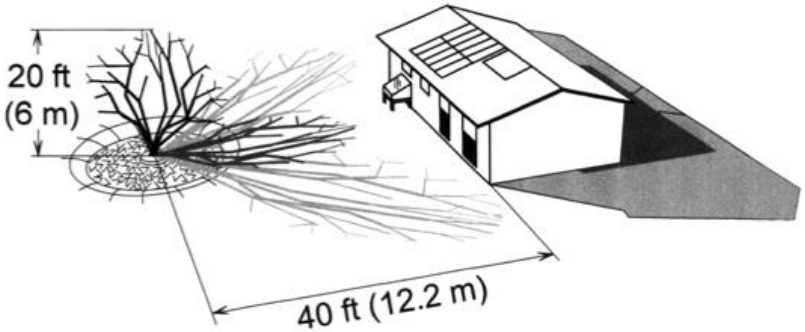




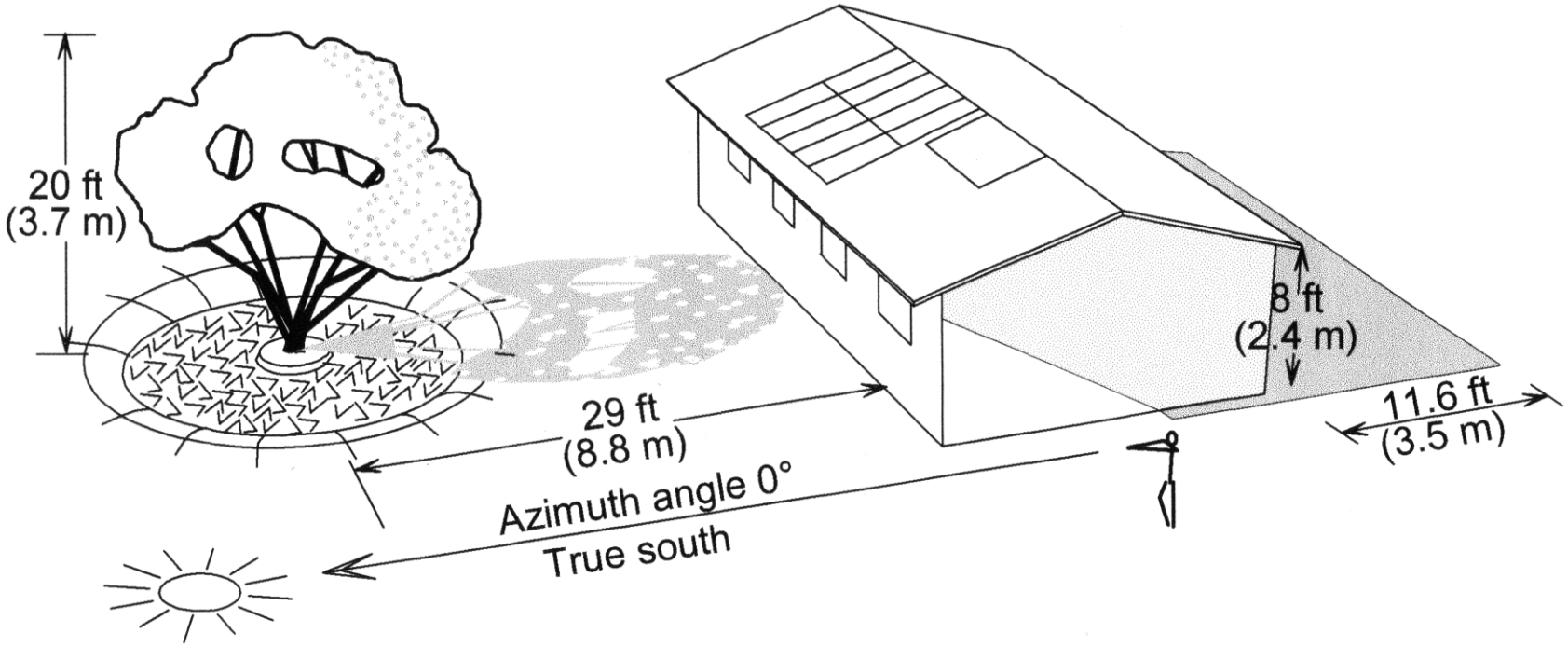




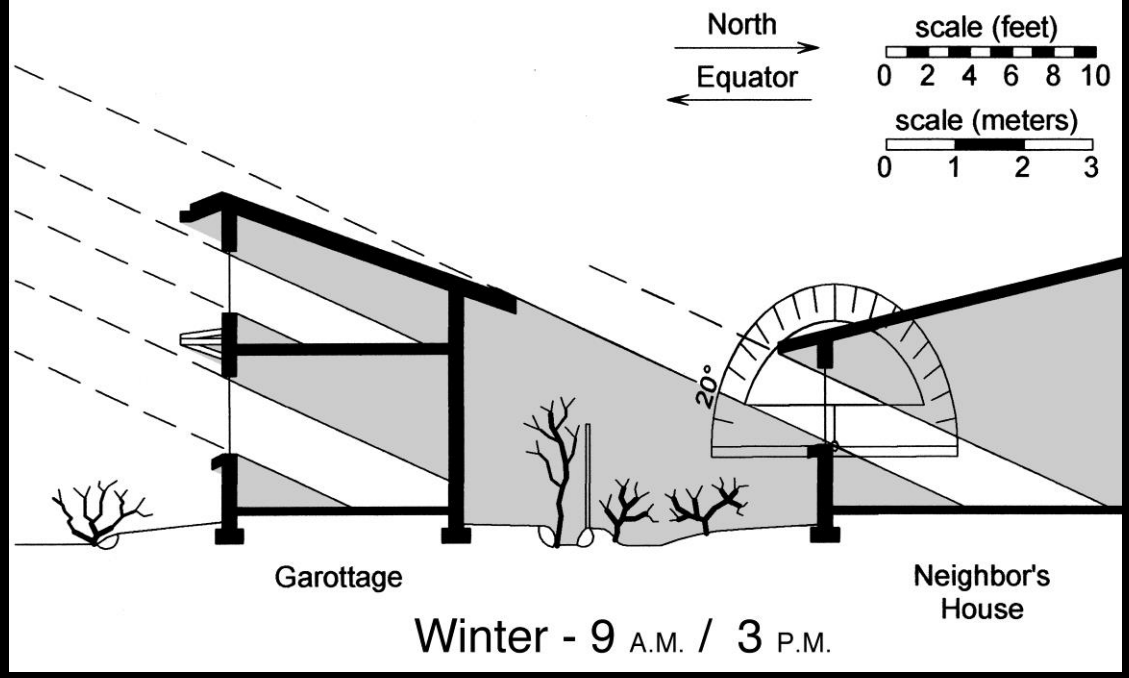




Maintaining *winter* sun access at noon

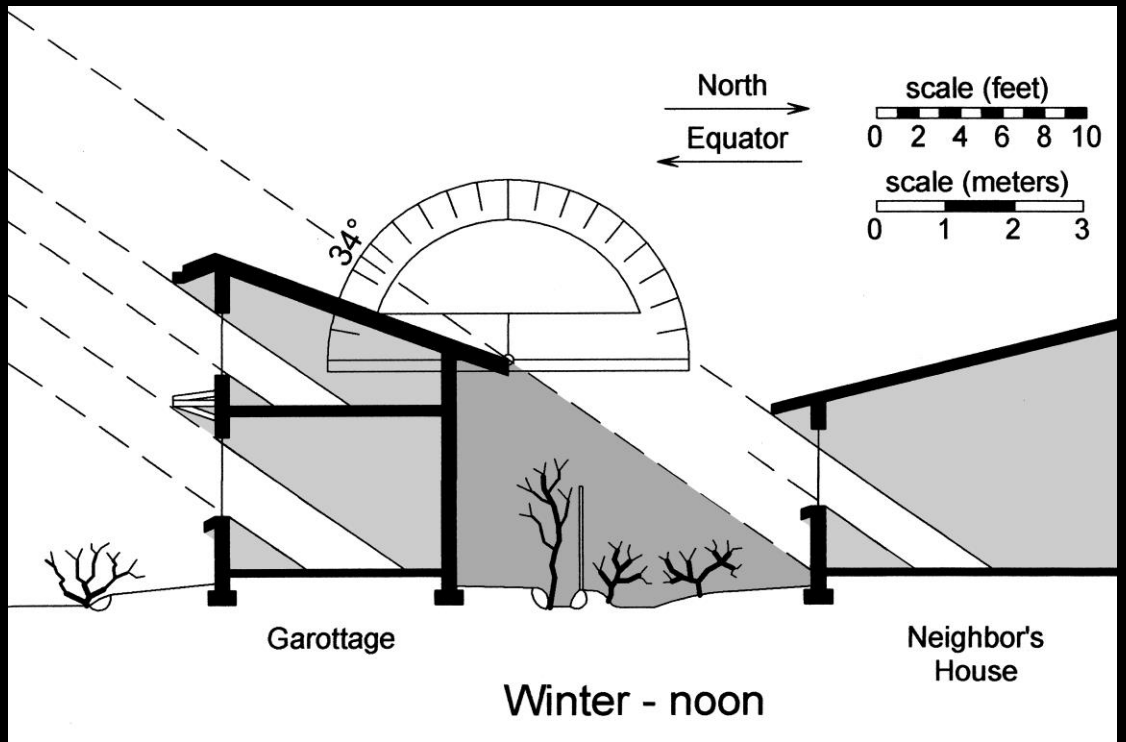


SOLAR-NOON WINTER-SOLSTICE SHADOW RATIO[b]	1 : 1.57

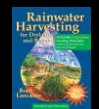


Solar Rights

Search “Solar Easements and Solar Rights” at www.HarvestingRainwater.com



and make sure you do *not* choose the wrong winter-sun-facing windows that would block out the warmth from the sun




Rainwater
Harvesting

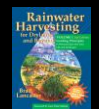
1994


STOP

Rainwater
Harvesting

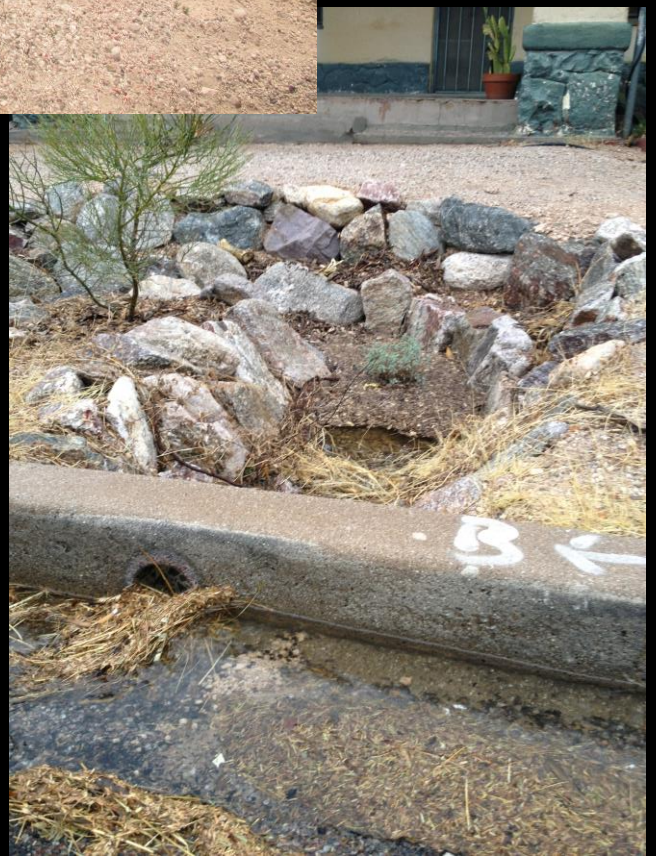
2004 - 2005 curb cuts and street runoff harvesting began
For more see
http://www.harvestingrainwater.com/street-runoff-harvesting/

Curb cuts legalized in 2007
$50 permit



Curb core hole
4-inch (100-mm) diameter

For more info see
http://www.harvestingrainwater.com/street-runoff-harvesting/



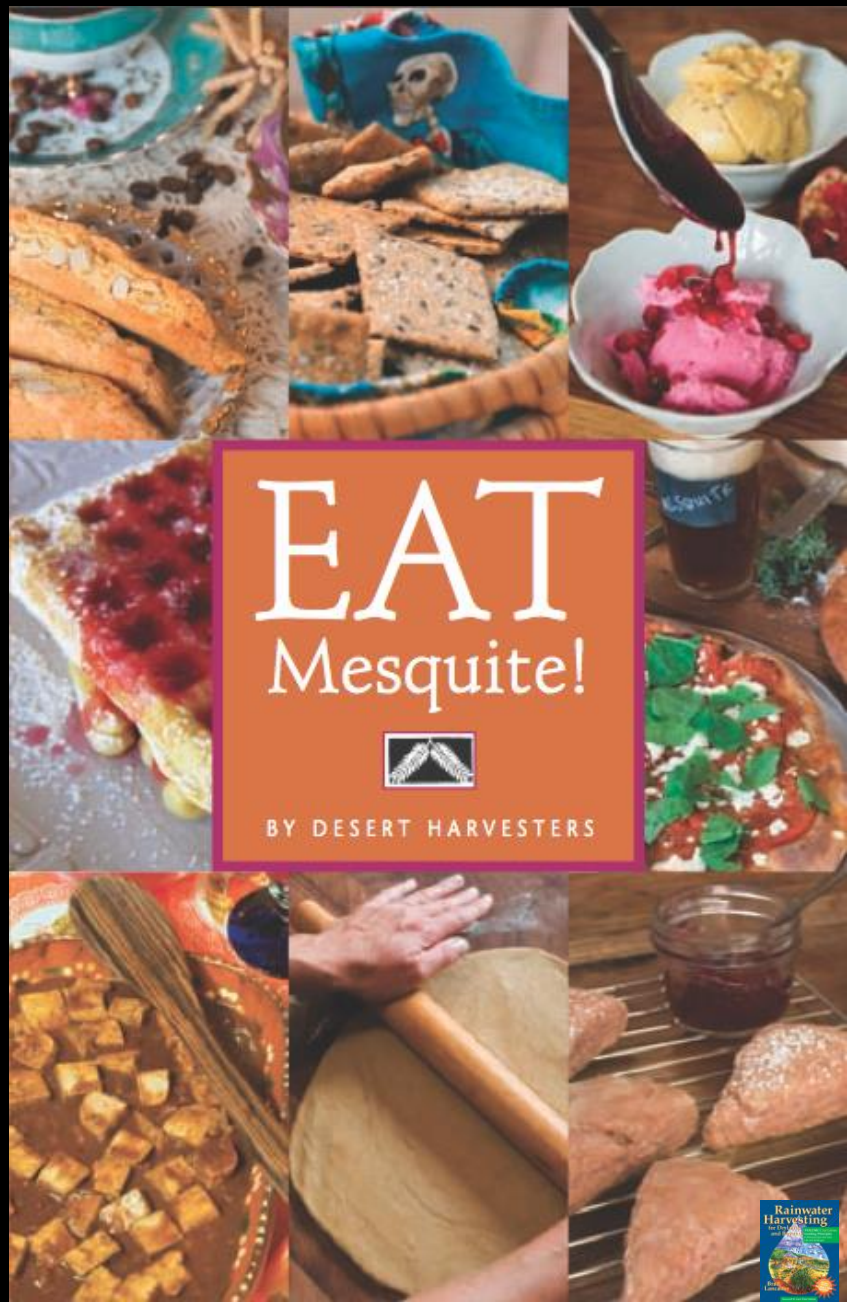
^ 1994

2006 >


BEFORE
This photo was taken in 1994, prior to the 1996 planting of rain and trees in the public right-of-
way adjoining the property at 813 N 9th Avenue. The asphalt driveway had just been removed. All
of the current vegetation has been irrigated solely with passively harvested rainwater a
runoff. All prunings and leaf-drop are reused as mulch in the basins beneath the p
More information is available at HarvestingRainwater.com and DesertHarvesters
Rainwater
Harvesting

Rainwater
Harvesting

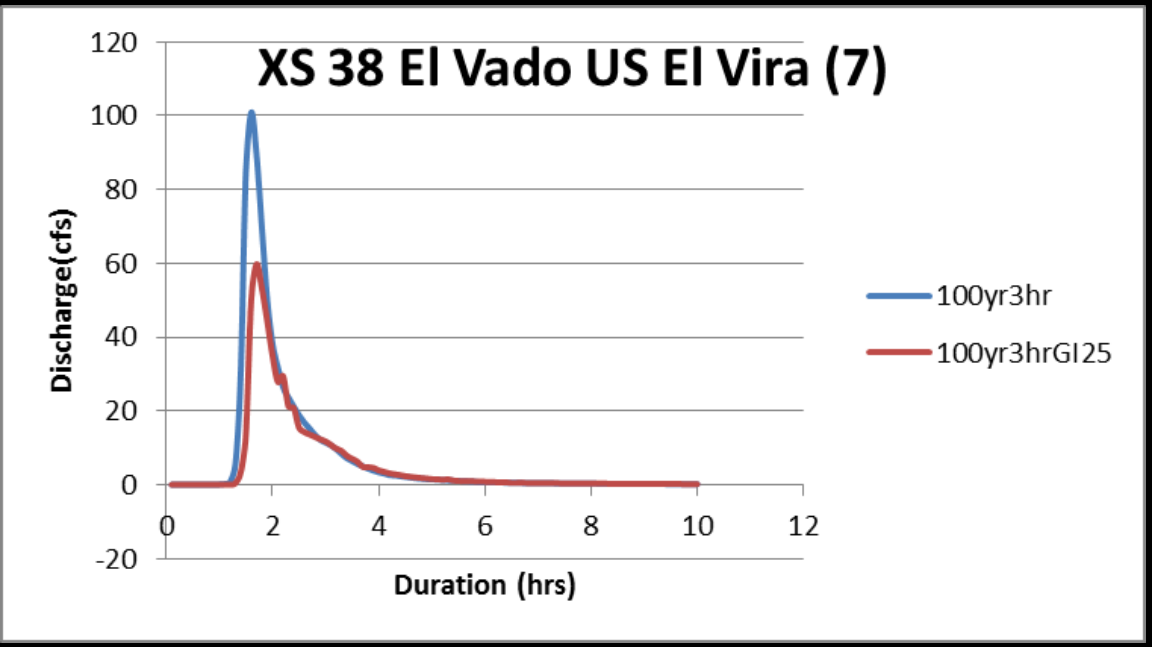
www.DesertHarvesters.org

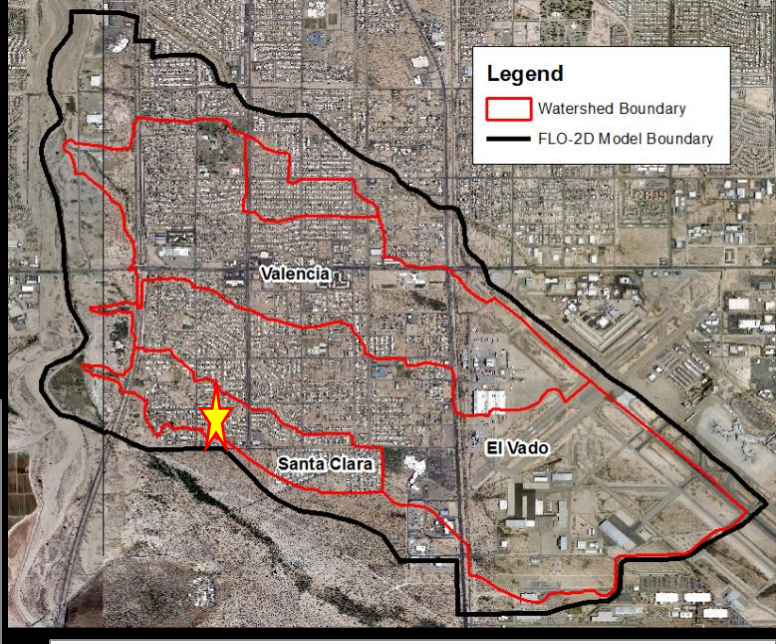


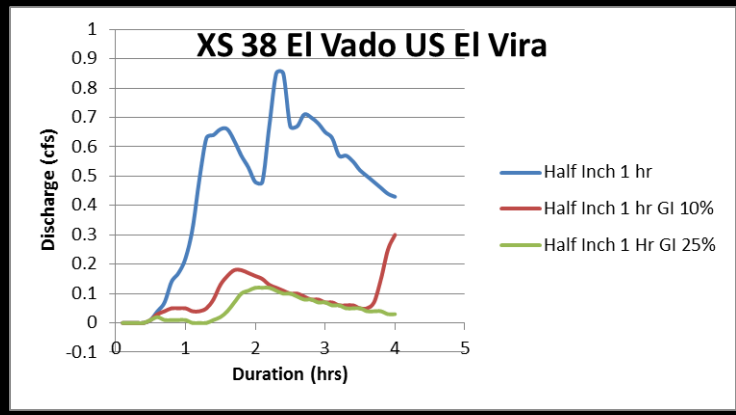
Lost Sonoran Sucker fish and water-harvesting Horned Lizard sculpture by Joseph Lupiani in a water-harvesting traffic-calming chicane

Green Infrastructure installed in 25% of the available unpaved areas of 30-acre El Vado watershed resulted in:

- 40% peak flow reduction
- Over 25% reduction in volume of flow







Solving Flooding Challenges with Green Stormwater Infrastructure in the Airport Wash Area

PIMA COUNTY FLOOD CONTROL

CITY OF TUCSON

WMG

Residential Rain Garden & Street Harvesting Benefit/Cost Ratio Initial Results

Benefit/Cost Ratio:	**$4.4 / $1**	**$2.9 / $1**
Direct benefits only:	**$3.1 / $1**	**$1.9 / $1**

PIMA COUNTY FLOOD CONTROL

CITY OF TUCSON

WMG

Green Streets
Benefit/Cost Ratio Initial Results

Model representation

Benefit/Cost Ratio: $2.1 / $1

Direct Value Only: $1.5 / $1

Parking Lots and In-Street Features: Bustin' Up Asphalt

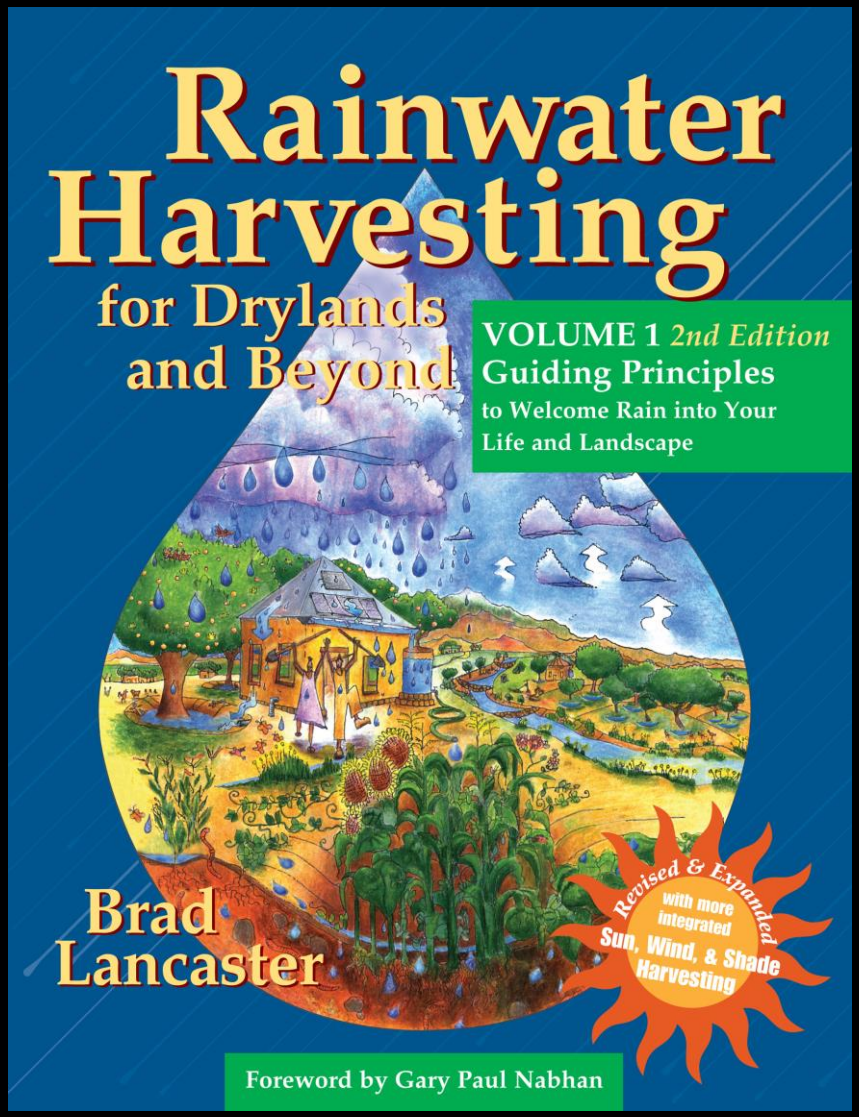
Model representation

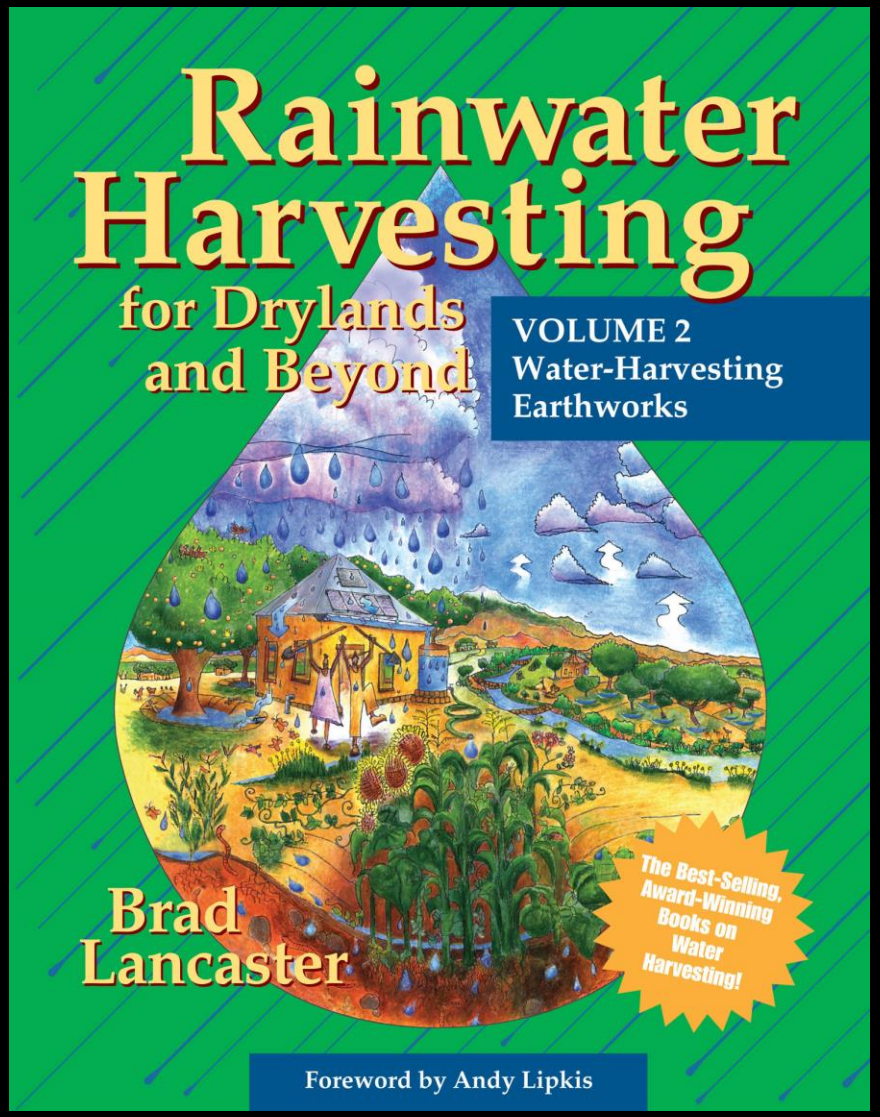
Benefit/Cost Ratio: **$0.5 / $1**

PIMA COUNTY FLOOD CONTROL

CITY OF TUCSON

WMG





www.HarvestingRainwater.com

Policy Recommendations

What is the overall desired effect?
A question to ask to ensure we are on the right track, and that we are thinking of the big picture at the same time we look at the details.

I propose the desired effect is to generate policy and actions that simultaneously enhance the health of the ecological systems upon which we all depend as they also enhance the health of all our citizens.

To that aim, let's make it more convenient and joyous for the public to do the right thing by legalizing and incentivizing (rebates, classes/guiding information, policy, ordinances, & demonstration sites at public facilities, schools, plant nurseries, and hardware stores) best actions and evolution.

Sun & Shade Harvesting Policy Recommendations

• **Maintain Solar Rights and Solar Easements**
Search “Solar Rights and Solar Easements” at www.SunandShadeHarvesting.com

• **Incentivize and mandate ideal solar orientation of buildings and landscapes** for free, passive heating and cooling

• Every community should have ideal south-/equator-facing **window to overhang length guidelines**/requirements to maximize summer shading and winter sun access/heating/lighting.
See pages 99 to 106 of *Rainwater Harvesting for Drylands and Beyond, Volume 1, 2nd Edition*.

• Ensure all window manufacturers **carry ideal windows for passive solar heating and cooling**, and that window suppliers are aware of these and inform the public on their use. Currently, most low-E windows available on the market do NOT allow for passive winter heating.
See pages 104 to 105 of *Rainwater Harvesting for Drylands and Beyond, Volume 1, 2nd Edition*.

• Educate designers, planners, and landscapers on **ideal tree placement for passive summer cooling AND passive winter heating**
See pages 106 to 117 of of *Rainwater Harvesting for Drylands and Beyond, Volume 1, 2nd Edition*.

Rainwater Harvesting Policy Recommendations

• Increase required tree canopy in the built environment.
• Ensure hardscape drains to planting areas to irrigate the trees for free.
• Use recycled on-site organic material mulch rather than gravel or rock as a groundcover to increase the life, bioremediation ability, and sponge-effect of the soil.

• Tucson Green Streets Policy mandating ½-inch rainstorms' worth of water harvesting in street medians and public right-of-way landscapes
https://www.tucsonaz.gov/files/transportation/Green_Streets_APG_Signed_by_Director.pdf

• Legalize and incentivize retrofit street curb cuts and curb cores
http://www.harvestingrainwater.com/street-runoff-harvesting/

• All turf removal programs, must create basin-like, passive rainwater-harvesting topography (rain gardens), before putting in new vegetation. That way the *landscape itself* can harvest and store more water.

• Incentivize use of larger rainwater tanks sized to capture most of the water coming off a roof area in a typical storm. The capacity of rain barrels is too small
• Mandate all new homes install rainwater harvesting tank system for outdoor faucets, laundry, and toilet as is the law in the major cities of Australia such as Brisbane

• Delineate our political and property boundaries by watershed boundaries
http://www.harvestingrainwater.com/2011/09/22/watershed-maps-are-community-maps/

Greywater Harvesting / Wastes to Resources Policy Recommendations

What is the most dangerous thing we can do to greywater?
Turn it into blackwater.

• Mandate greywater-harvesting stub-outs in new home construction allowing for inexpensive gravity-fed reuse of the greywater in the landscape.
http://www.harvestingrainwater.com/greywater-harvesting/greywater-collection-plumbing-and-stub-outs/

http://oaec.org/our-work/projects-and-partnerships/ca-decentralized-water-policy-council/

• Offer greywater-harvesting rebates with educational classes on best practices
https://www.tucsonaz.gov/water/gray-water

• Educate public on correct soaps and detergents to use with greywater systems.
http://www.harvestingrainwater.com/greywater-harvesting/greywater-compatible-soaps-and-detergents/

• Incentivize soap and detergent manufacturers to produce truly greywater-compatible soaps and detergents. Currently, most biodegradeable soaps are not appropriate for greywater use because they contain to many soil and plant harming salts.

• Legalize use of compost toilets, including affordable site-built options.
http://www.recodenow.org/portfolio/legalized-site-built-composting-toilets/

Group Discussion

- Scaling up for multi-family/high density?
  - University example
  - Greywater – to central system or 1st floor (for outside), "bucket, chuck it" for second/top floors
- Visible systems
- Street runoff/pollutants? – don't plant leafy greens, woody perennials okay
- How policies passed?
  - Find allies in gov. departments, citizens – population demand, shift political will
  - Meet multiple needs – integrated approach (crime reduction, food security

Thank You to our Speaker!

Brad Lancaster
Co-Founder
Desert Harvesters

WATER:
A Critical Public Health Issue

What is our role?

Upcoming Webinars:

- October 28 (12 – 1 pm):
  Tapping New Opportunities for Water and Health: Greening Jobs and Water Infrastructure of Multiple Health Outcomes

- November 18 (12 – 1 pm):
  High Opportunity Levers for Water and Health: Resources, Policy and Next Steps

http://phasocal.org/water-initiative/webinar-series-public-health-leadership/

Water and Health Webinar Series

- Water Crisis Strategies for Public Health Leaders
- Water, Drought and Environmental Health
- Drought, Climate and the Food We Eat (Nutrition)

http://phasocal.org/water-initiative/webinar-series-public-health-leadership/

Thinking Local: The Role of Health Leadership in Water Recapture

Thank you for joining the conversation!

The **recording** and **slides** will be available shortly at www.phasocal.org/WaterRecapture

Questions?
Contact Katy Mamen
Water Initiative Coordinator
kmamen@phasocal.org
(707) 239-8879