Local Abundance:
Making the Most of What Is Already Here

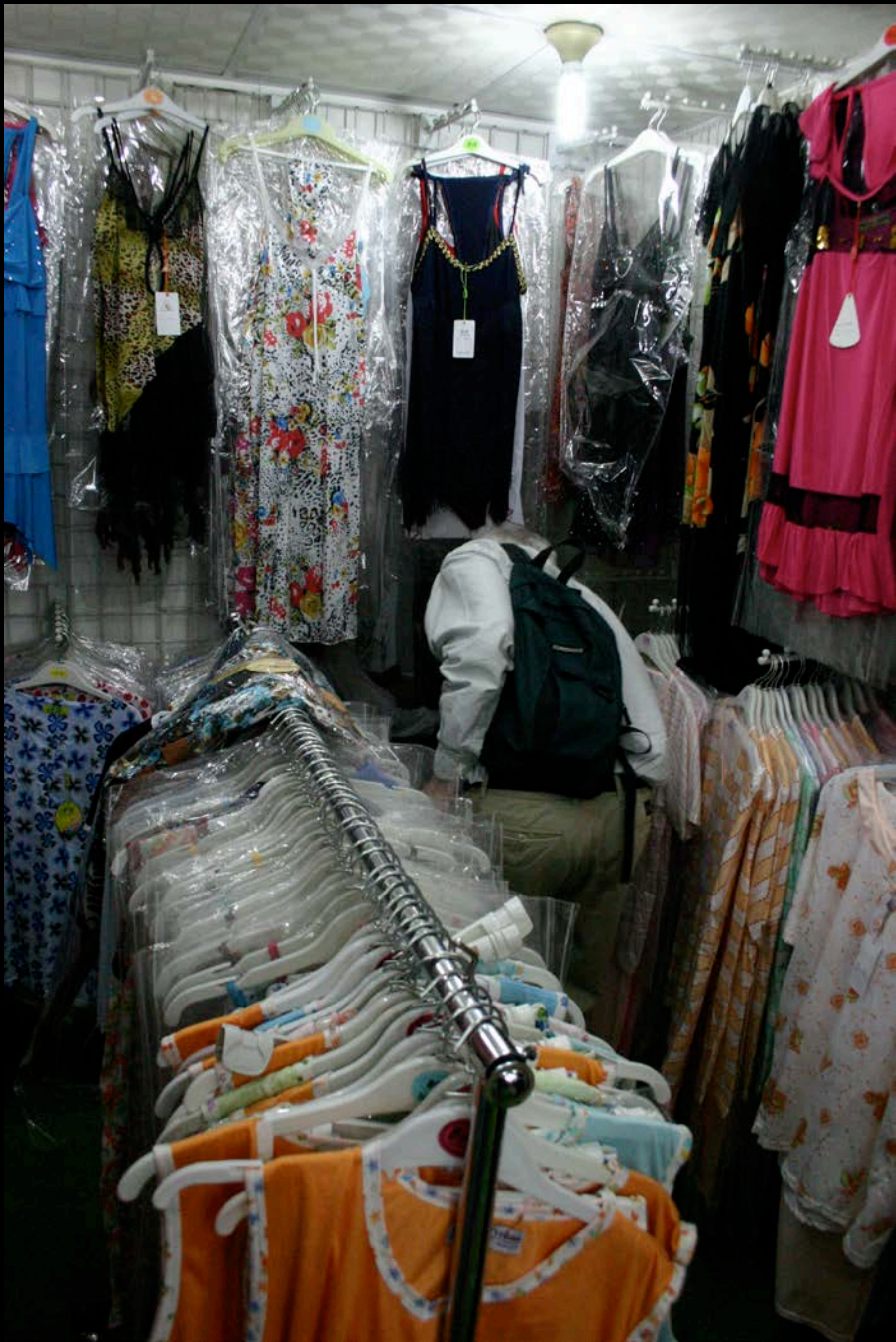
by Brad Lancaster

www.HarvestingRainwater.com

www.DesertHarvesters.org

Jeddah, Saudi Arabia
2.5 inches (63.5 mm)


HALWANI FRESH JUICE CENTER
STRAWBERRY



Ancient runoff farm
Shivta, Negev Desert, Israel
4 inches (100 mm) annual rainfall




Fig. 132. Pomegranate tree in a 500-m² plot (1967).

Net and pan runoff farm Negev Desert, Israel

4 inches (100 mm) annual precipitation

From
The Negev: Challenge of a Desert
by Michael Evenari

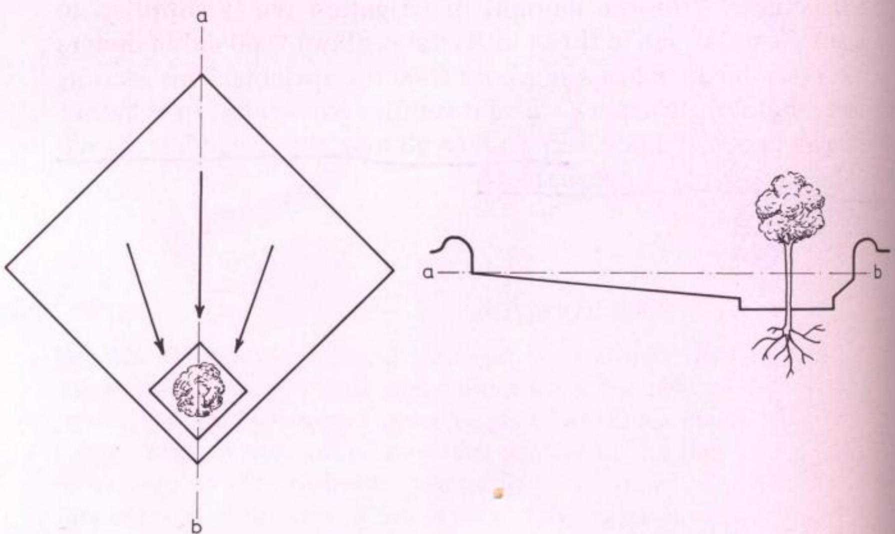


Fig. 131. Plan and cross section of a negarin plot. The arrows indicate the direction of runoff flow.

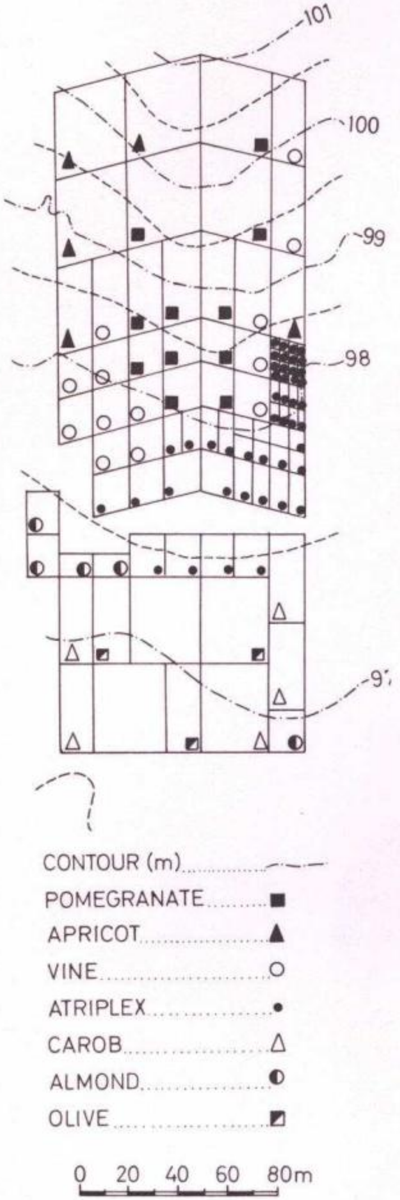


Fig. 130. Plan of negarin microcatchment plots; the largest are 1000 m² and the smallest 15.6 m² in area.

ICARDA research farm
Aleppo, Syria
12 inches (300 mm)
annual rainfall

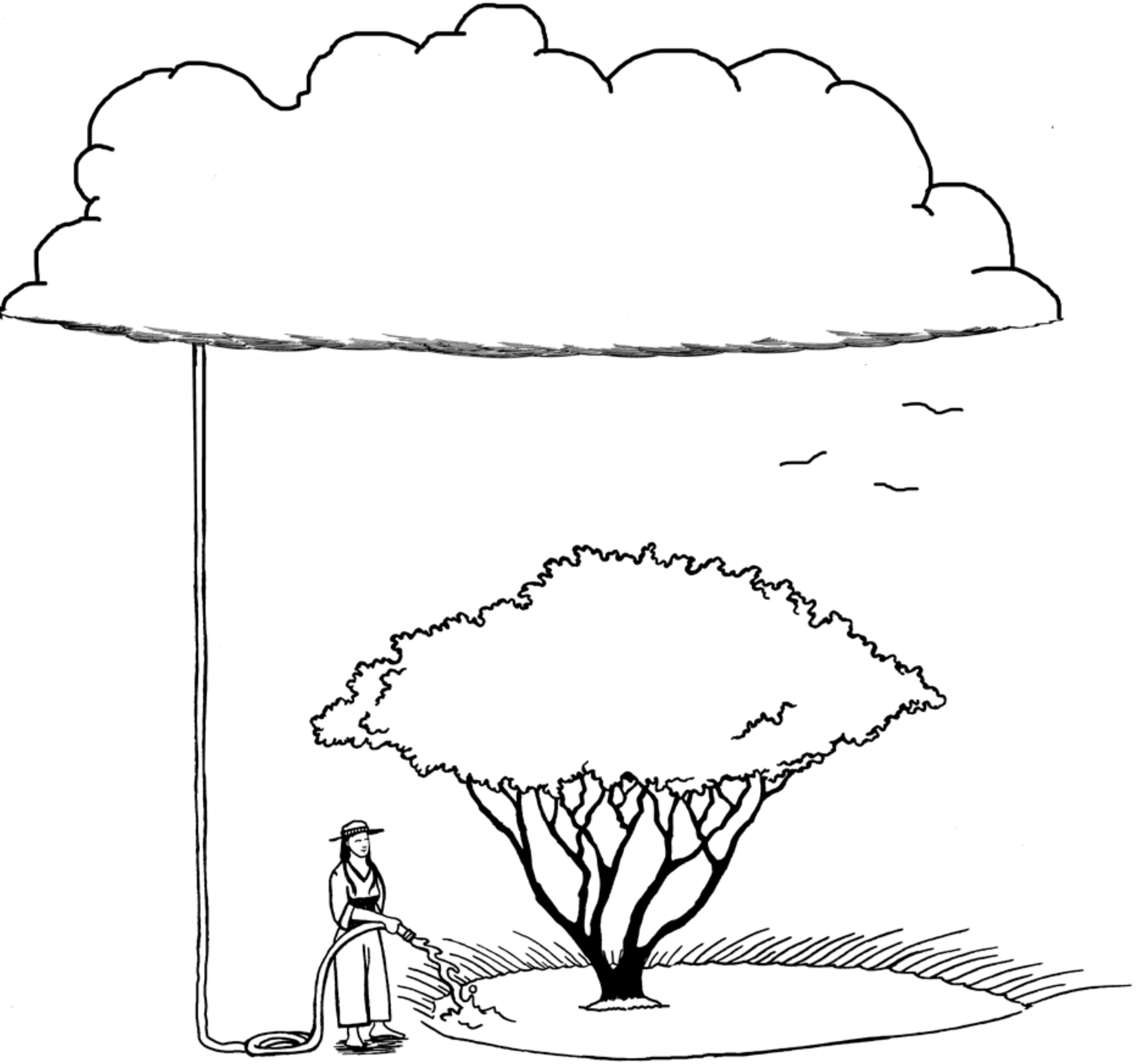
dryfarmed olives
(in boomerang berms)
and saltbush
(in net and pan berm system)

ICARDA research farm
Aleppo, Syria
12 inches (300 mm)
annual rainfall

contour catchments and contour plantings of chick peas and wheat

ICARDA research farm Aleppo, Syria

cistern




RAIN Delivery Service
To: your home
NO CHARGE
Thankyou

Distance is energy

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

The Central Arizona Canal is over 300 miles long, and pumps water up over 3,000 feet

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

Path to Scarcity

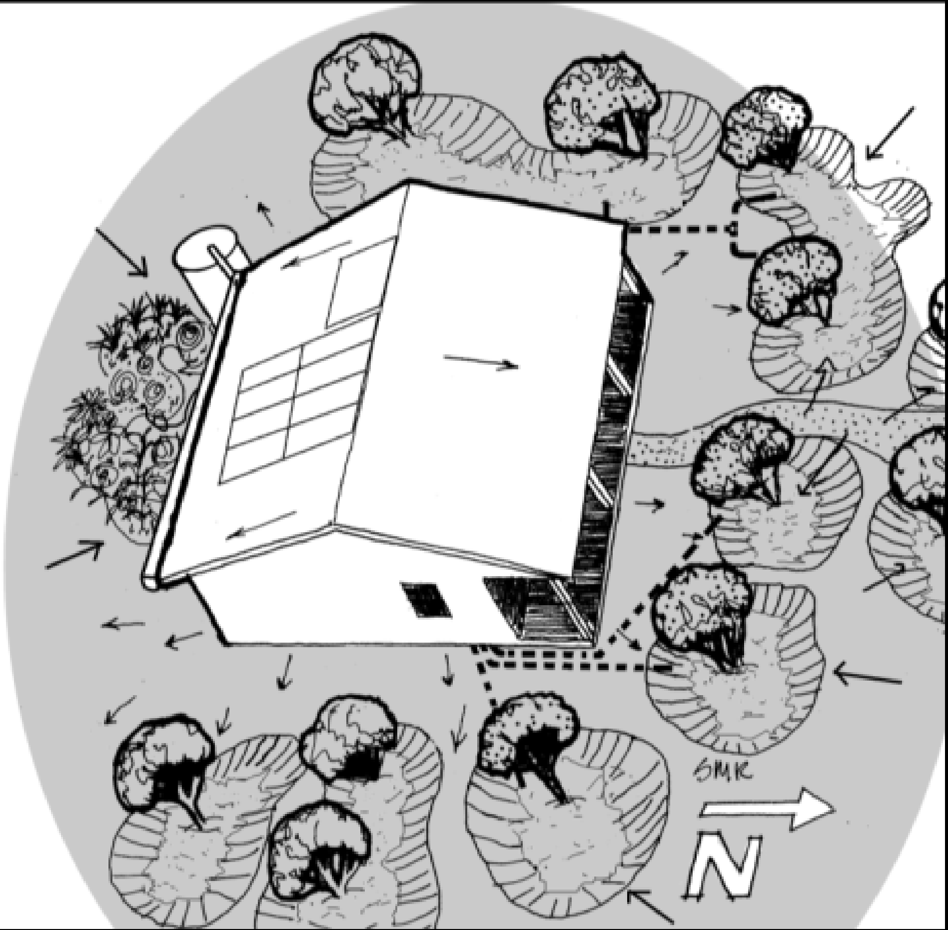
Path to Abundance

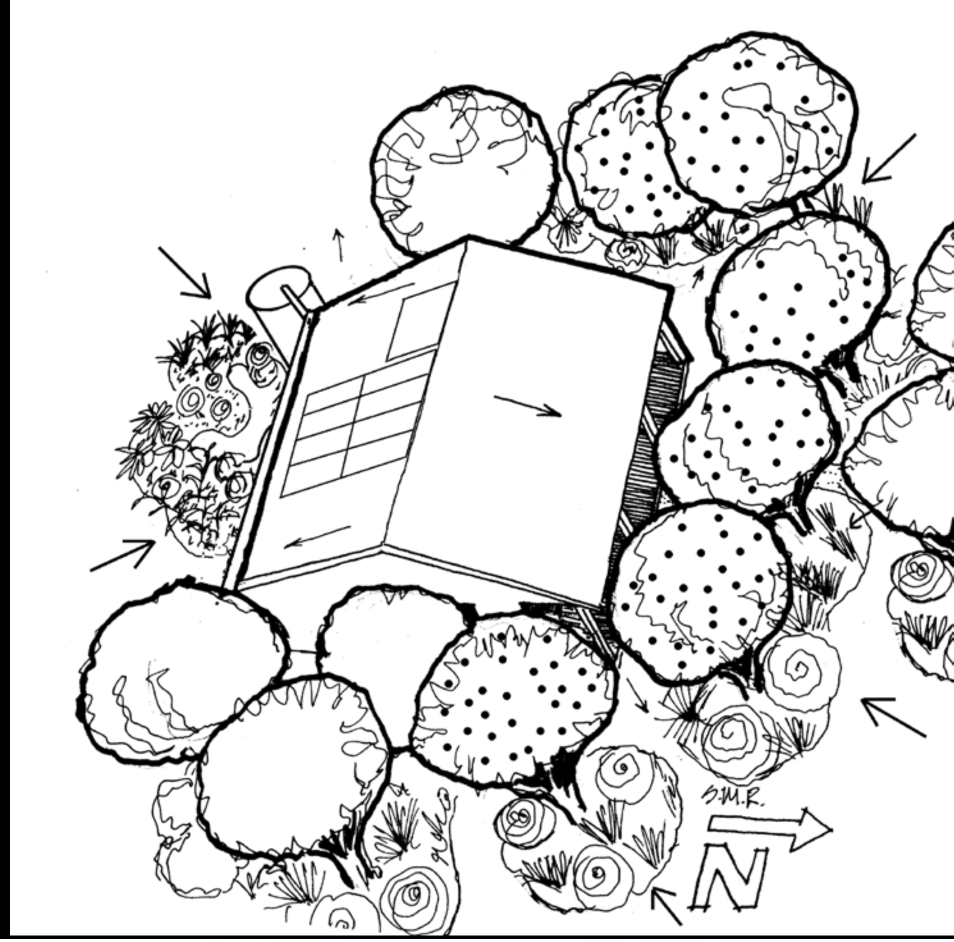
30 to 70% of household's drinking water used to irrigate landscape

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


STOP

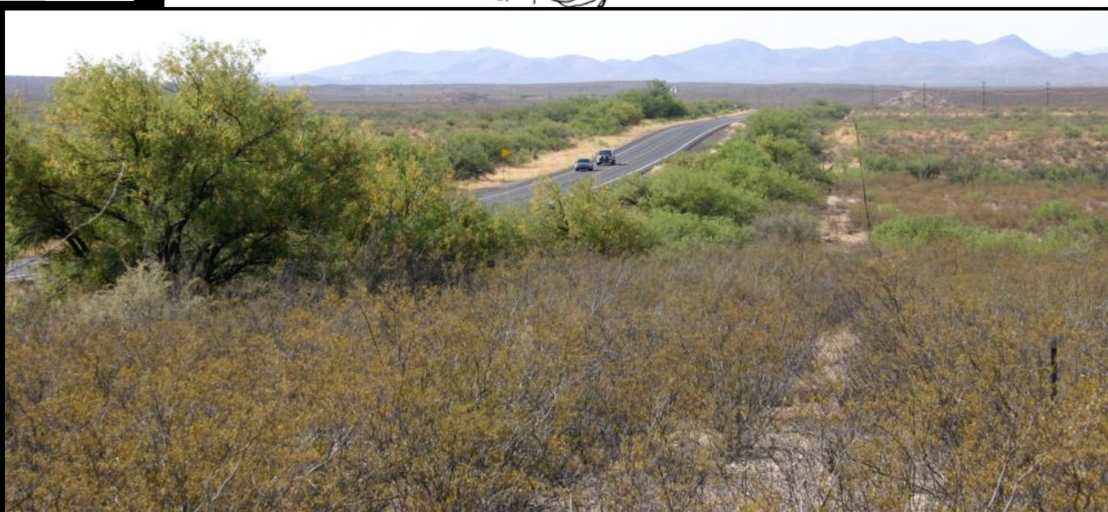
STOP

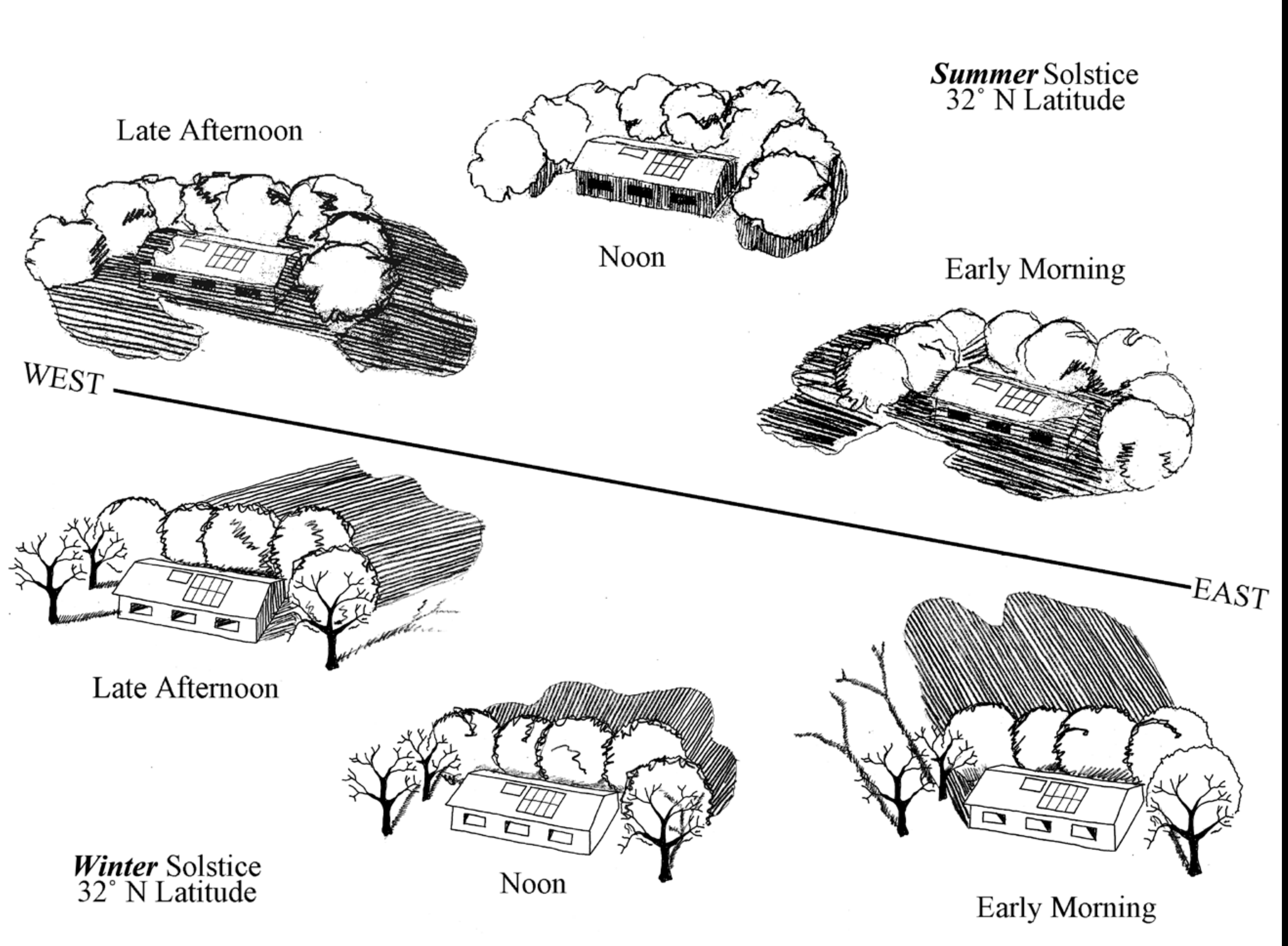




Harvest and utilize on-site water
(rainwater, stormwater, greywater, condensate, etc)
as close as possible to where it falls

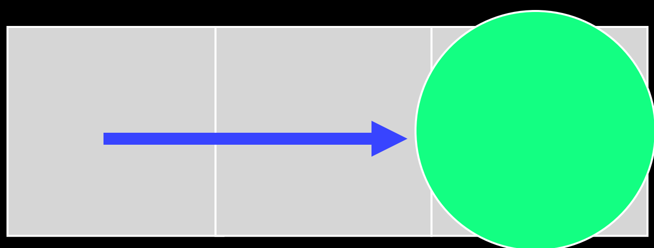
within the **oasis zone**
- within 30’ (9 m) of catchment surface



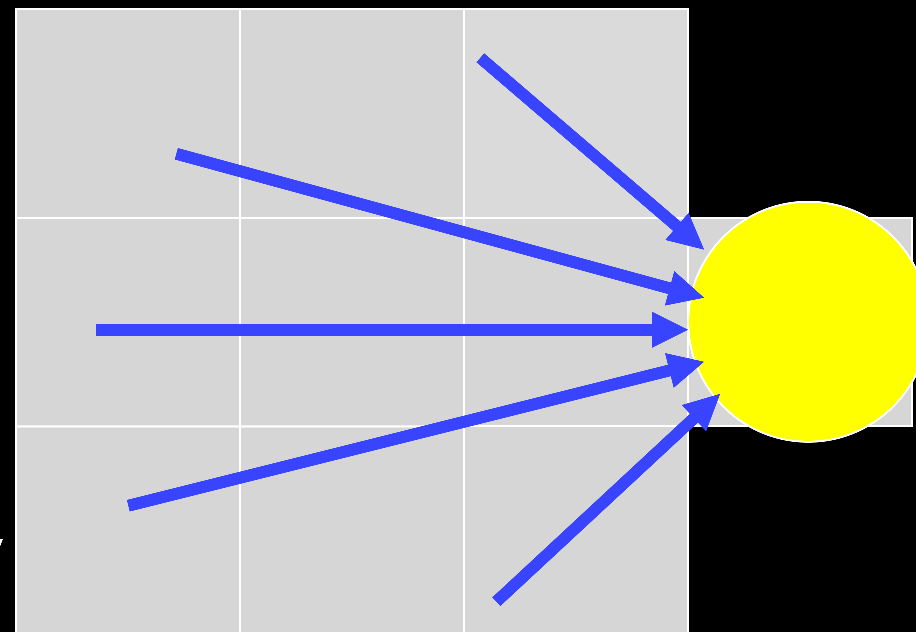


Such passive/free heating, lighting, and cooling strategies can **reduce over 50%** of household power consumption and the water that would otherwise be consumed to generate that power

Schematic plan view of catchment-area to canopy-area ratios



Sierra Vista AZ, 3:1 ratio of catchment area to tree canopy area

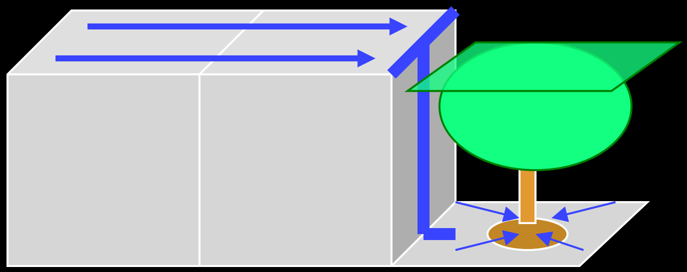


Yuma AZ, 10:1 ratio of catchment area to tree canopy area

Catchment area includes roofs; paved sidewalks, parking lots, patios & driveways; plus the land under the canopy area

Credit: Ann Audrey

Schematic side view of catchment-area to canopy-area ratio



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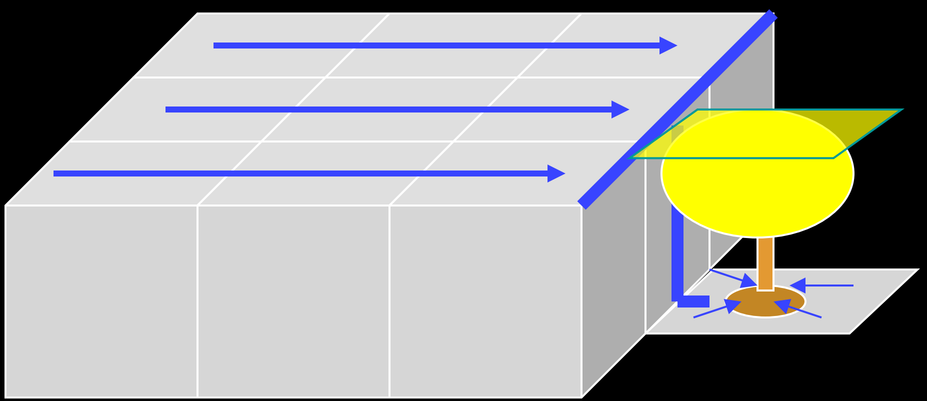

Yuma, AZ, 10:1 ratio of catchment-area to tree canopy-area

Catchment area includes roofs; paved sidewalks, parking lots, patios & driveways; plus the land under the canopy area

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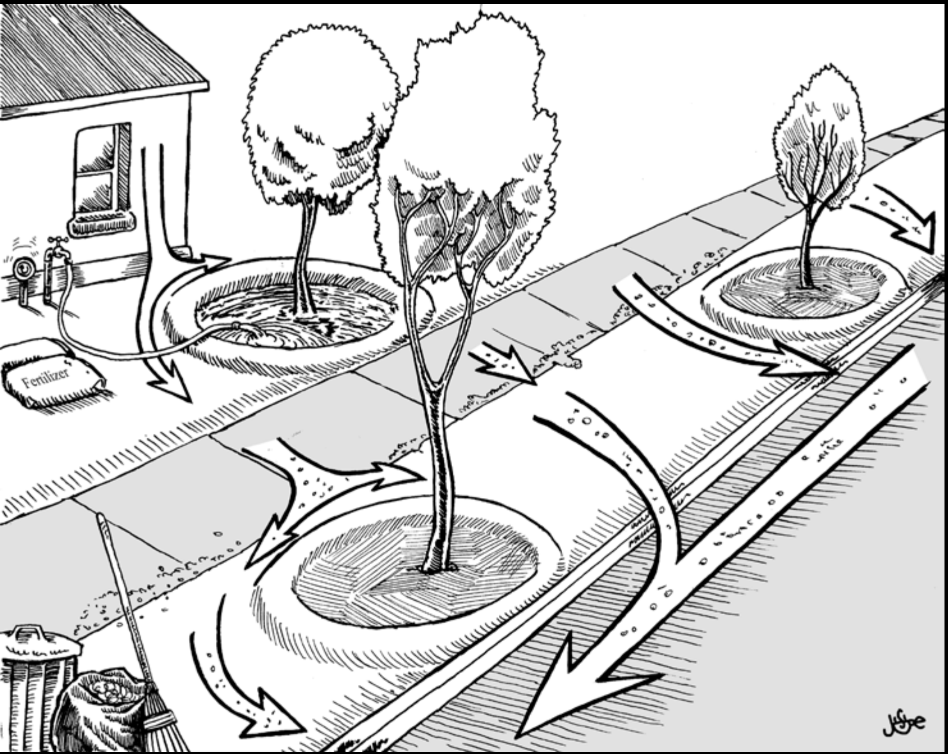
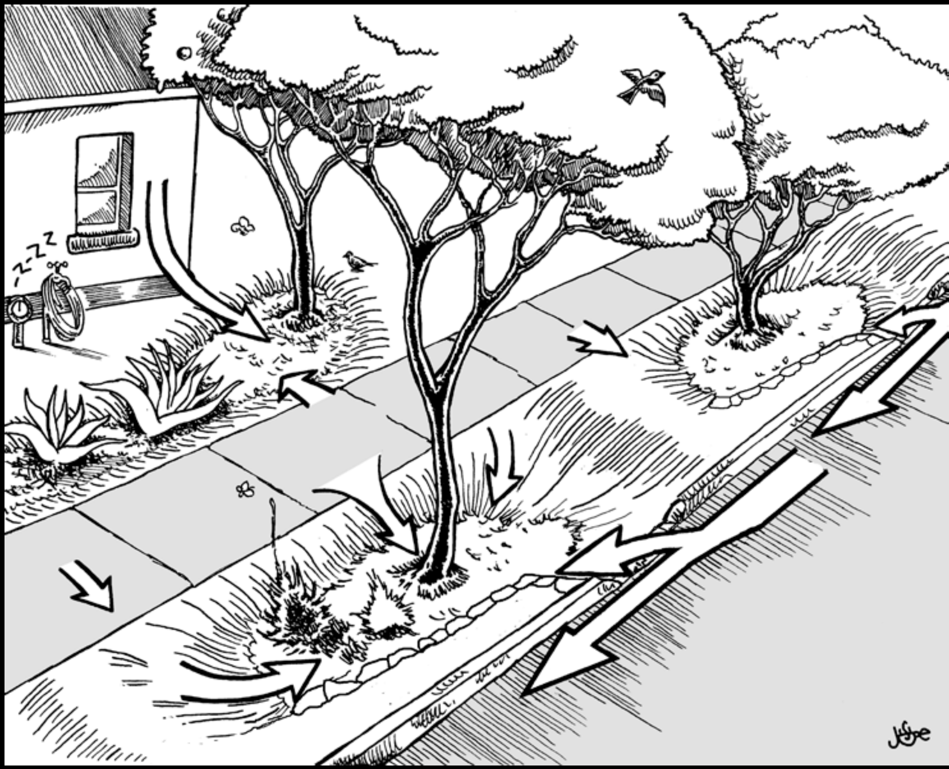
Path to Scarcity



- Turns resources into wastes
- Relies on the costly and imported
- Consumes more than it produces
- Disintegrated Drains

Path to Abundance



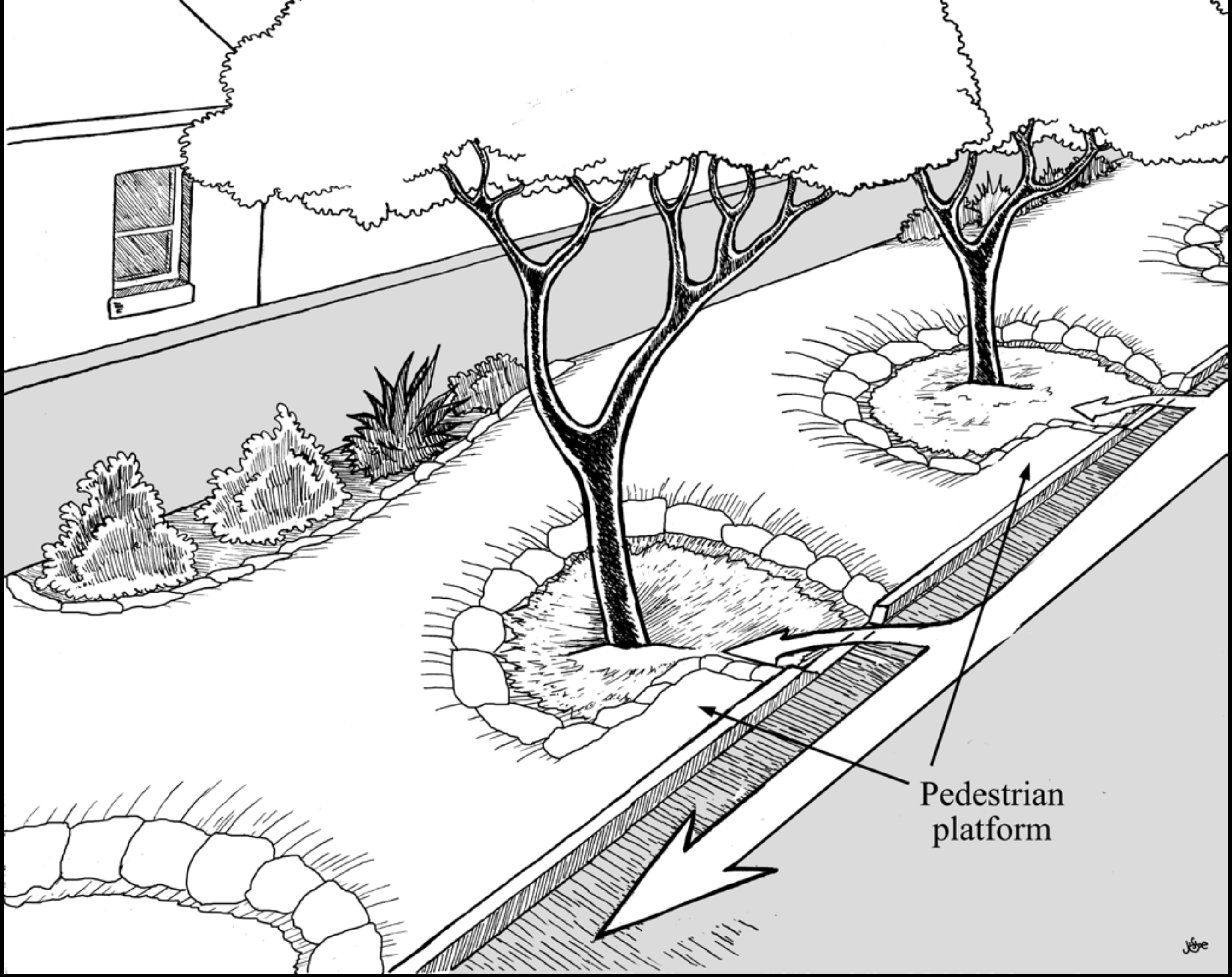
- Turns “wastes” into resources
- Relies on the free and local
- Produces more than it consumes
- Integrated Harvests

Castellana Grotte,
Puglia, Italy
25 inches (635 mm)
annual rainfall

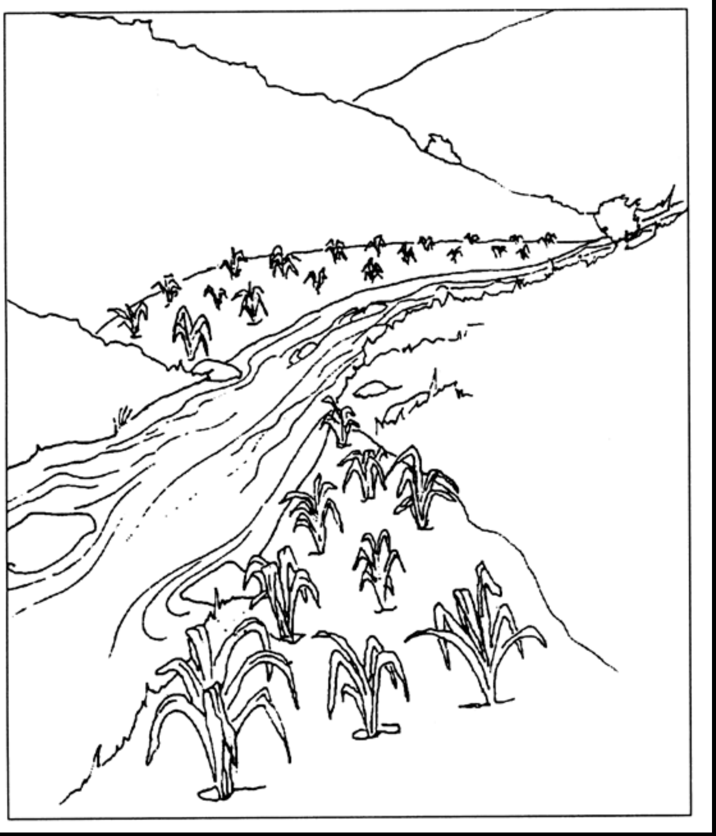
street runoff
harvesting

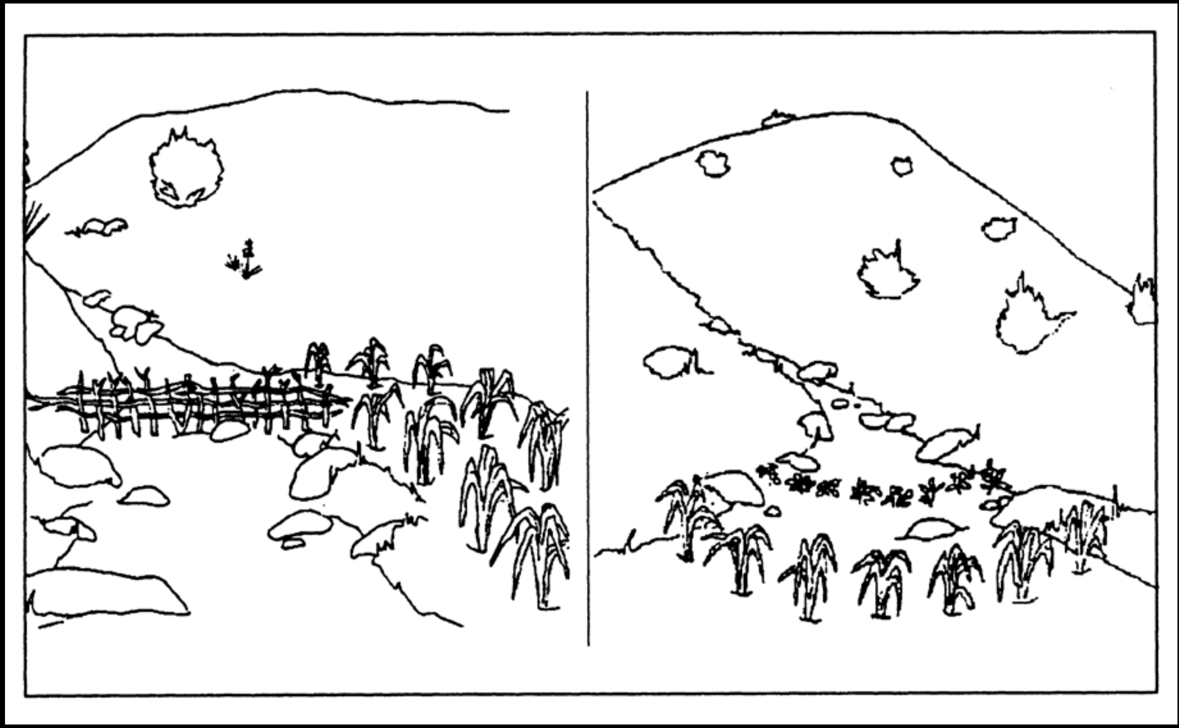

Bustaan Qaraaqa, Palestine
28 inches (700 mm) annual rainfall
Street runoff to cistern/pool

Subsurface plastic bottle irrigation, Bustaan Qaraaqa



In Tucson, AZ (receiving 11 inches [280 mm] of annual rainfall)
One mile of an average residential street drains over
ONE MILLION GALLONS of rainfall per year.
That's enough water to sustainably irrigate 400 native food trees per mile,
or one tree every 25 feet on both sides of the street - irrigated by the street.

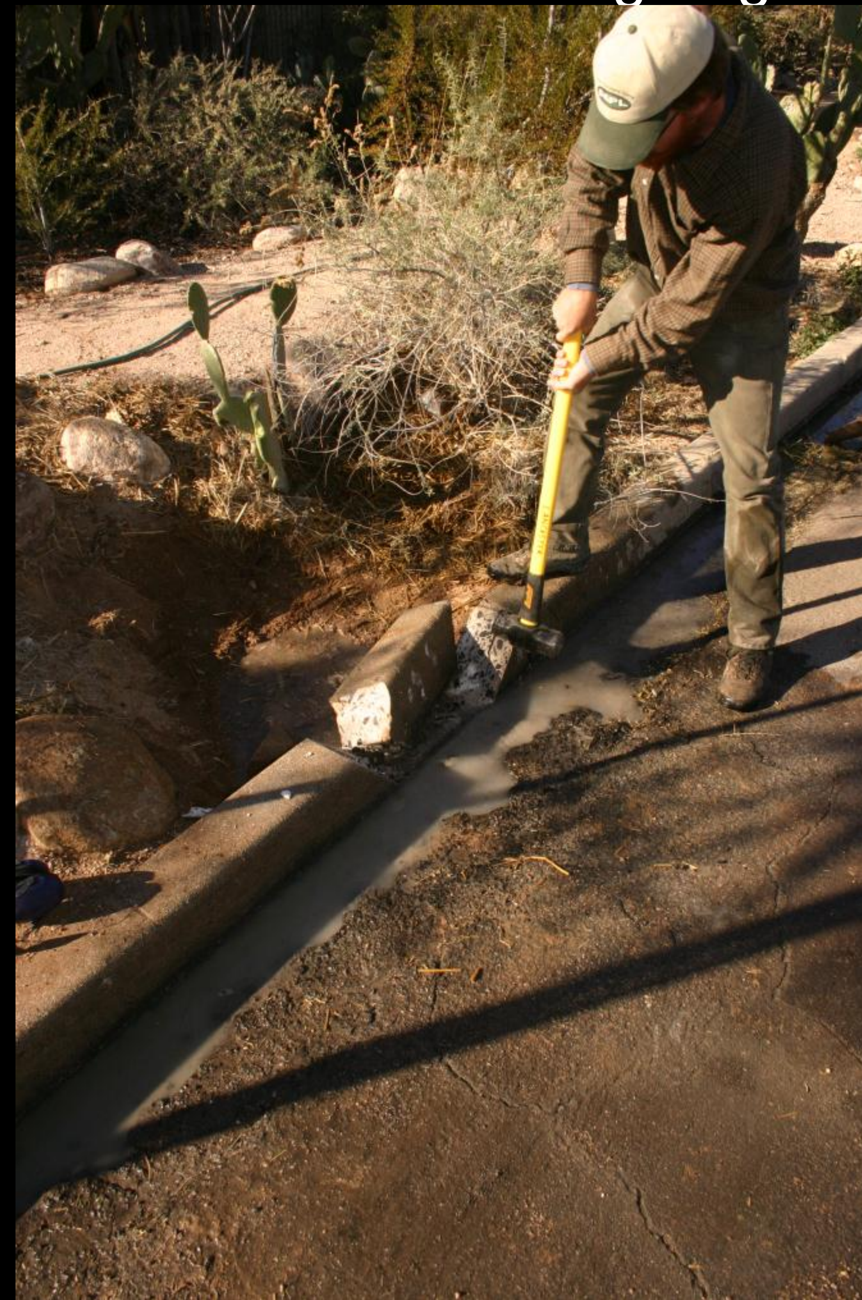




Traditional Native American water harvesting – floodplain farming and floodwater farming

Illustrations by Roxanne Swentzell

2004 - 2005 curb cuts and street runoff harvesting began



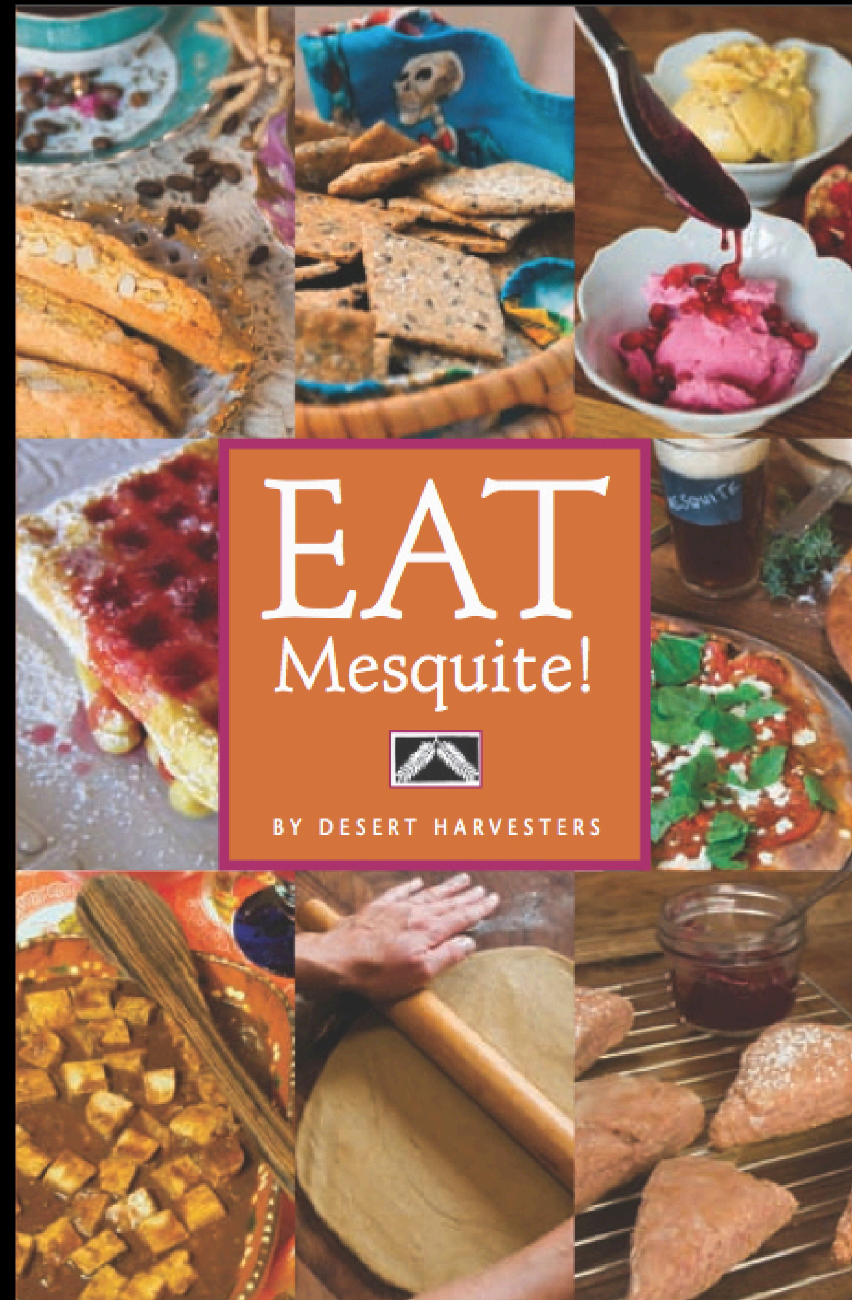
Curb core hole
4-inch (100-mm)
diameter

^ 1994

2006

>


DesertHarvesters.org



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

12 to 14% of cities’ solid waste stream is mulch

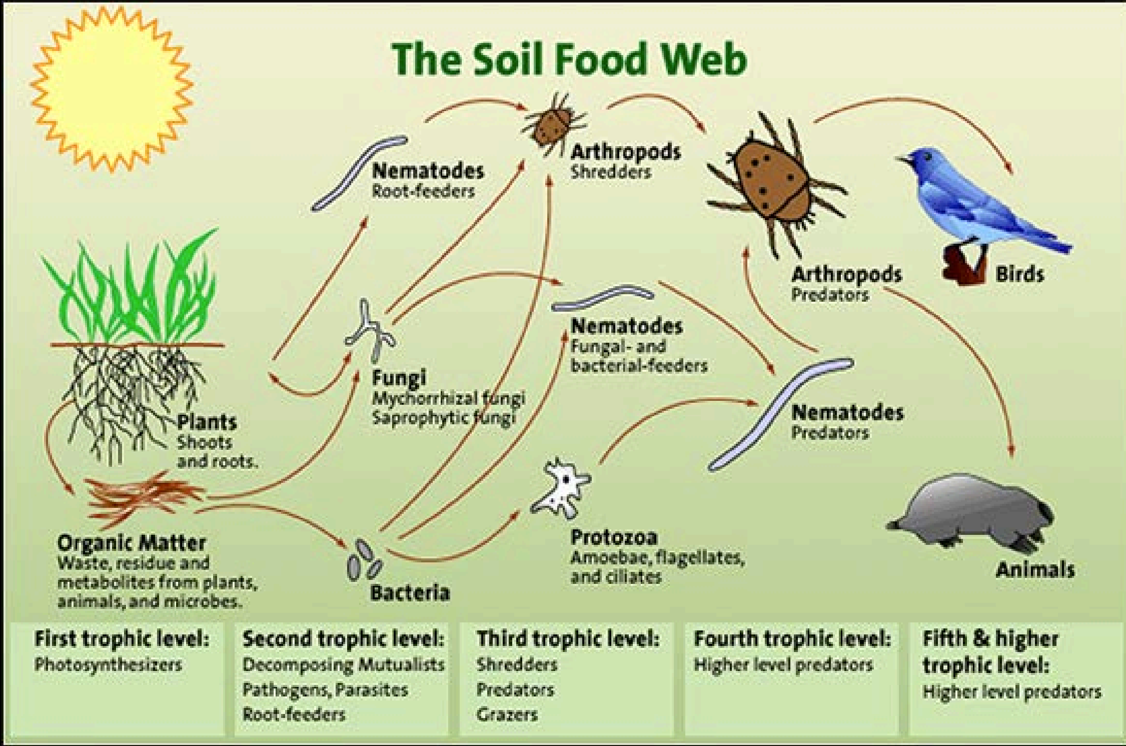
Brush and Bulky transformed into *Chipped and Mulchy*

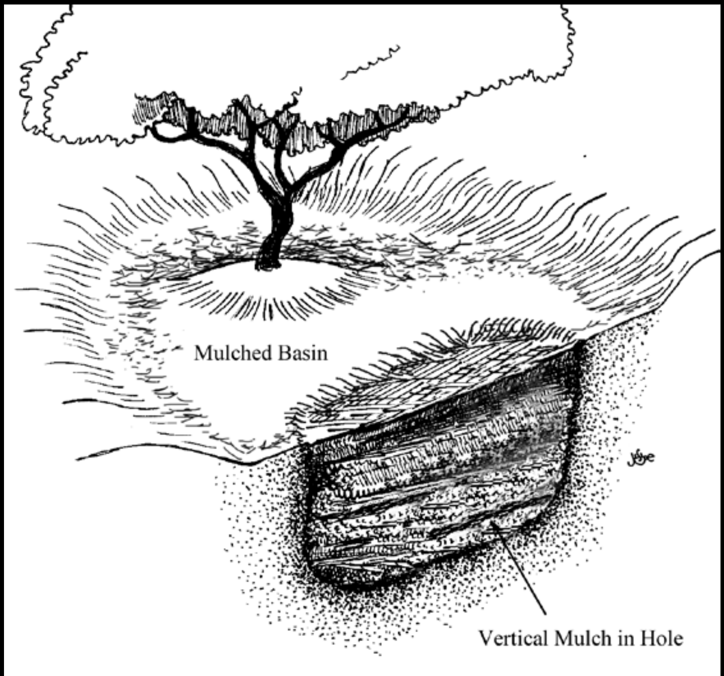
Rain gardens as living filters/harvesters

• Trees associated with mulched water-harvesting earthworks are able to grow 33% larger than those without.
This more than doubles the trees' potential sequestration of atmospheric carbon, passive cooling, and food production

• The presence of more organic matter in the soil enables the soil itself to sequester additional carbon

• The natural pollutant-filtering/bioremediation ability of the soil mulched with organic material was **ten times** greater than that of rock- or gravel-mulched soil





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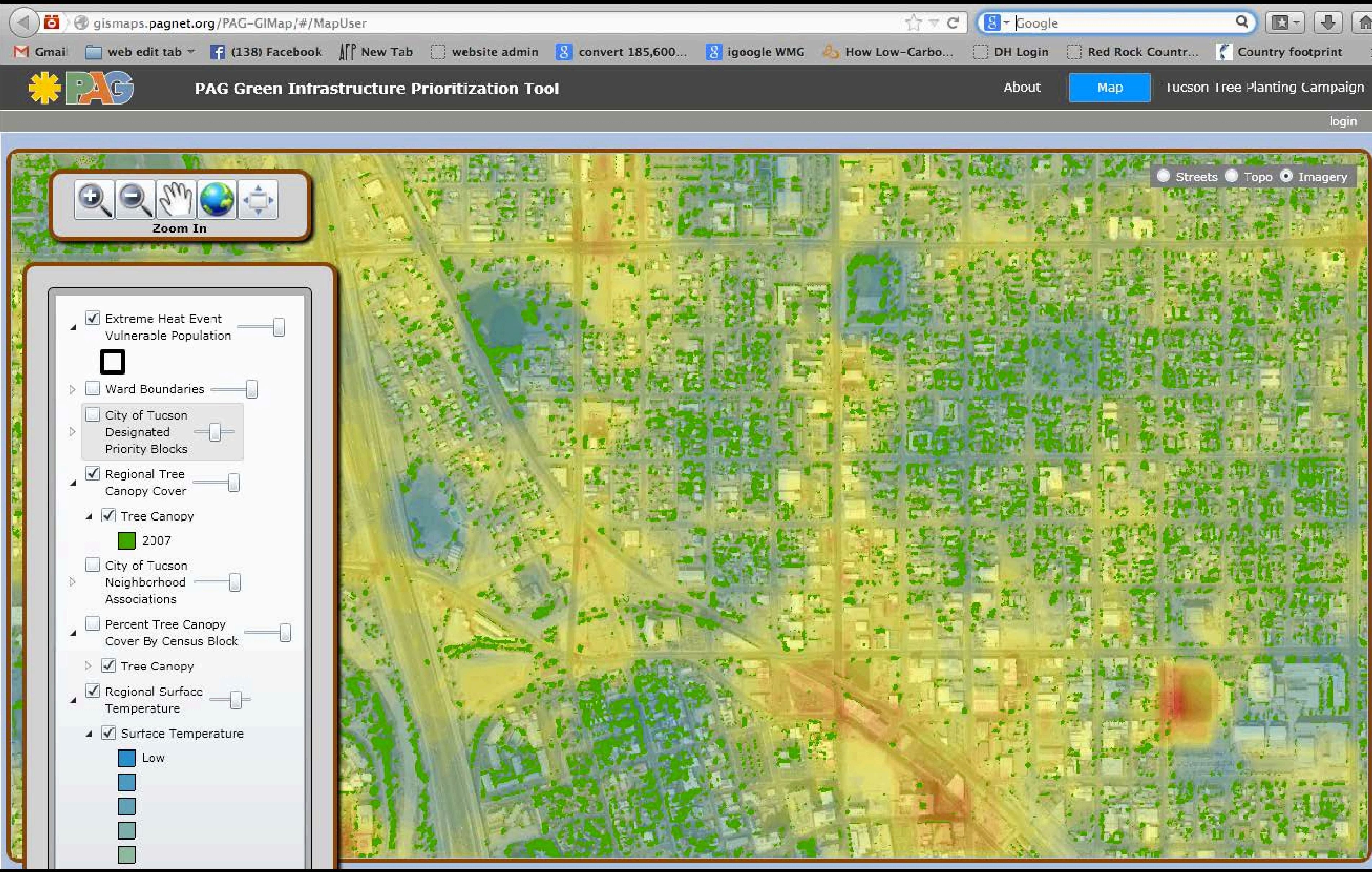
Scarcity – heat island

Abundance – cool island

WATER ⚐4

AVERAGE RAINFALL (GAIN)[1] 1894 – 2008	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	**ANNUAL**
INCHES	0.88	0.83	0.75	0.39	0.18	0.26	2.06	2.15	1.15	0.74	0.77	0.96	11.12
mm	22.4	21.1	19.1	9.9	4.6	6.6	52.3	54.6	29.2	18.8	19.6	24.4	282.4
AVERAGE PAN EVAPORATION (POTENTIAL LOSS)[d,7] 1894 – 2005													
INCHES	3.25	4.57	6.95	9.88	12.87	14.91	13.17	11.65	10.35	7.81	4.73	3.37	103.51
mm	82.6	116.1	176.5	251.0	326.9	378.7	334.5	295.9	262.9	198.4	120.1	85.6	2,629.2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Google
Gmail
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New Tab
website admin
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DH Login
Red Rock Countr...
Country footprint
PAG Green Infrastructure Prioritization Tool
About
Map
Tucson Tree Planting Campaign
login
Zoom In
Streets
Topo
Imagery
Extreme Heat Event Vulnerable Population
Ward Boundaries
City of Tucson Designated Priority Blocks
Regional Tree Canopy Cover
Tree Canopy
2007
City of Tucson Neighborhood Associations
Percent Tree Canopy Cover By Census Block
Tree Canopy
Regional Surface Temperature
Surface Temperature
Low

Dunbar/Spring neighborhood surface area is:

43% impervious cover (rooftops and pavement) + 17.8% bare earth = 60.8% of the neighborhood

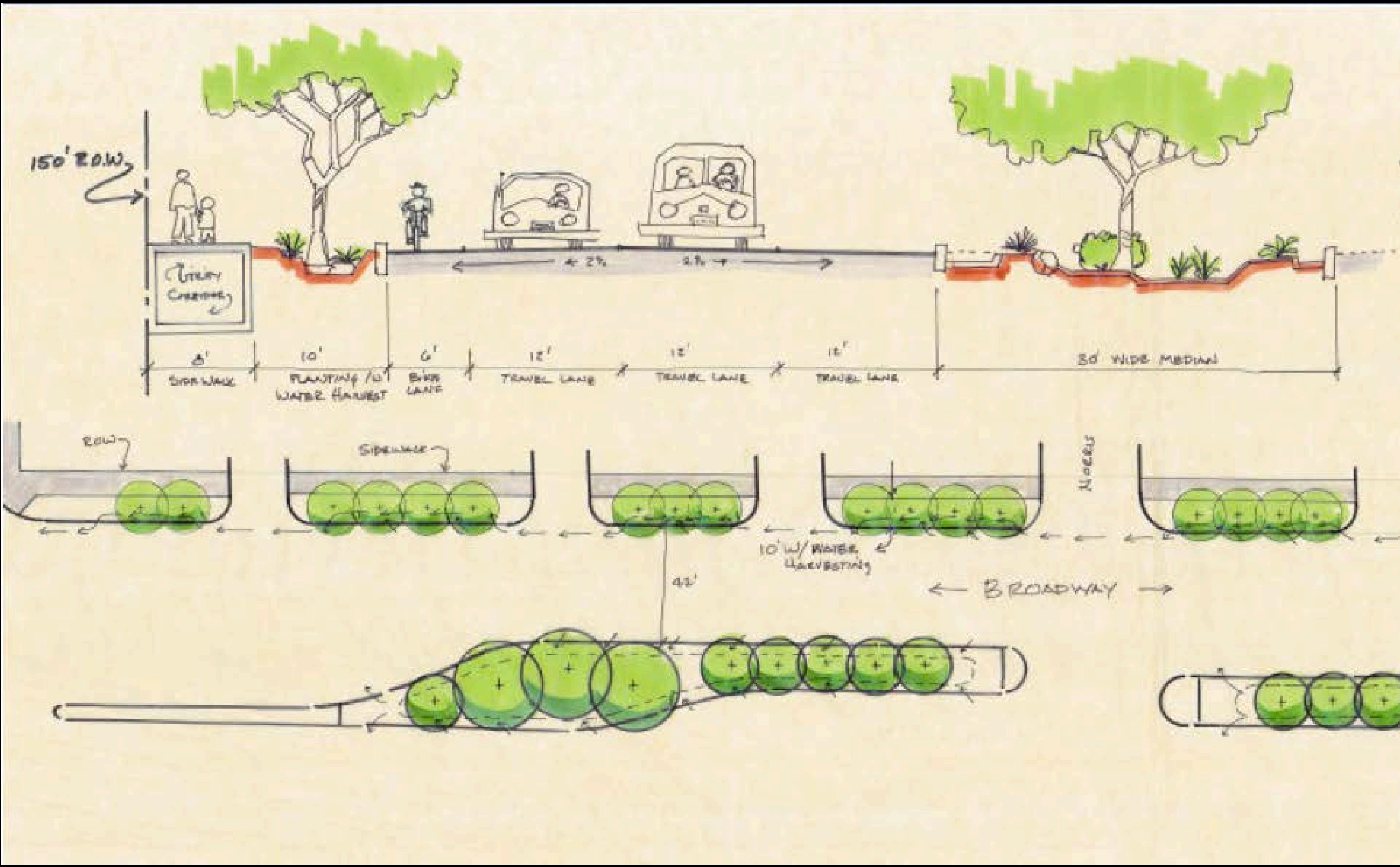
Currently just 12% is under tree canopy

2011 data from PAG & RFCD

Green Streets Policy in Tucson, AZ

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

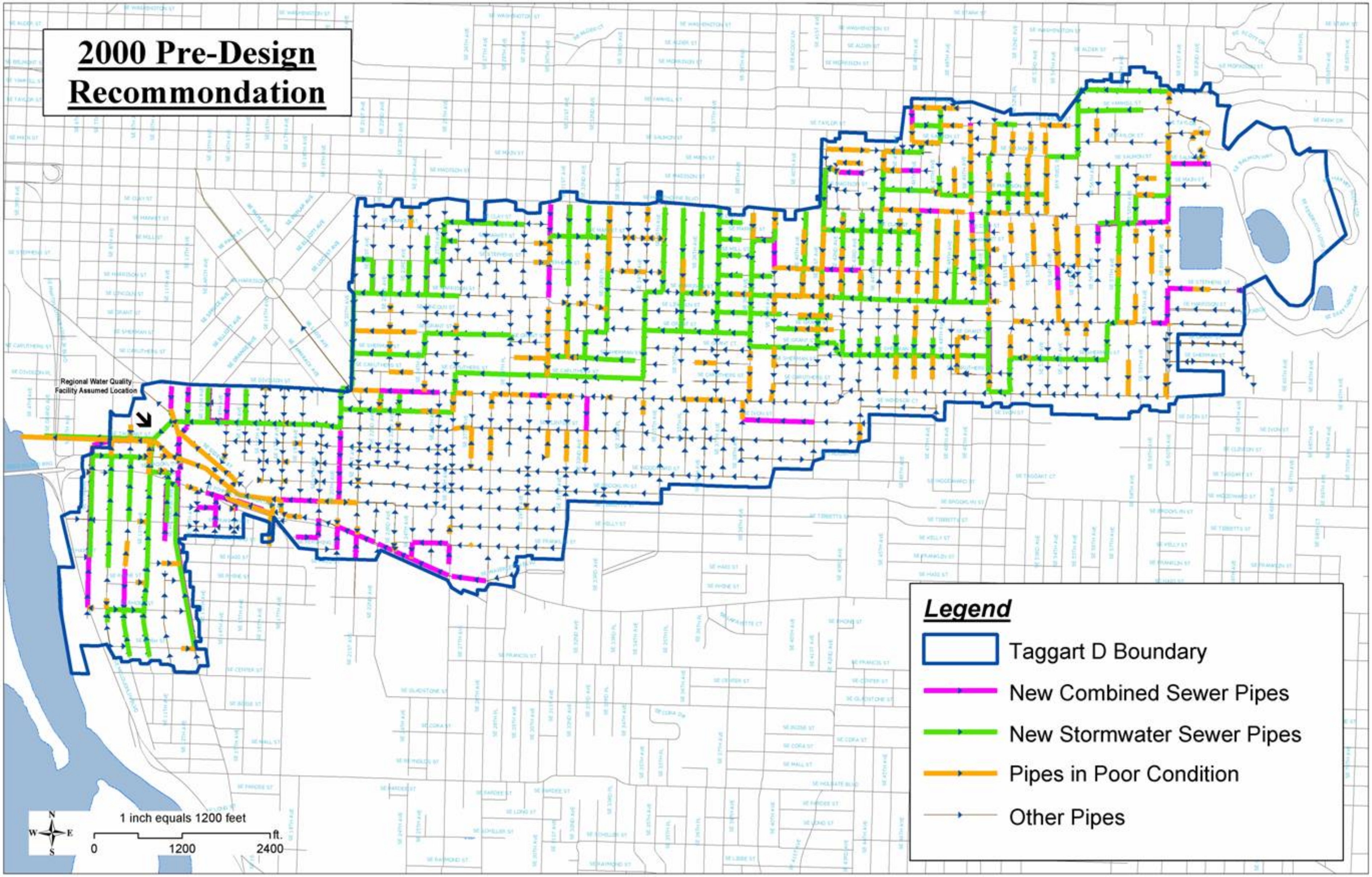
http://www.mayorrothschild.com/2013/05/29/tucson-to-capture-stormwater-for-irrigation-of-roadway-vegetation/



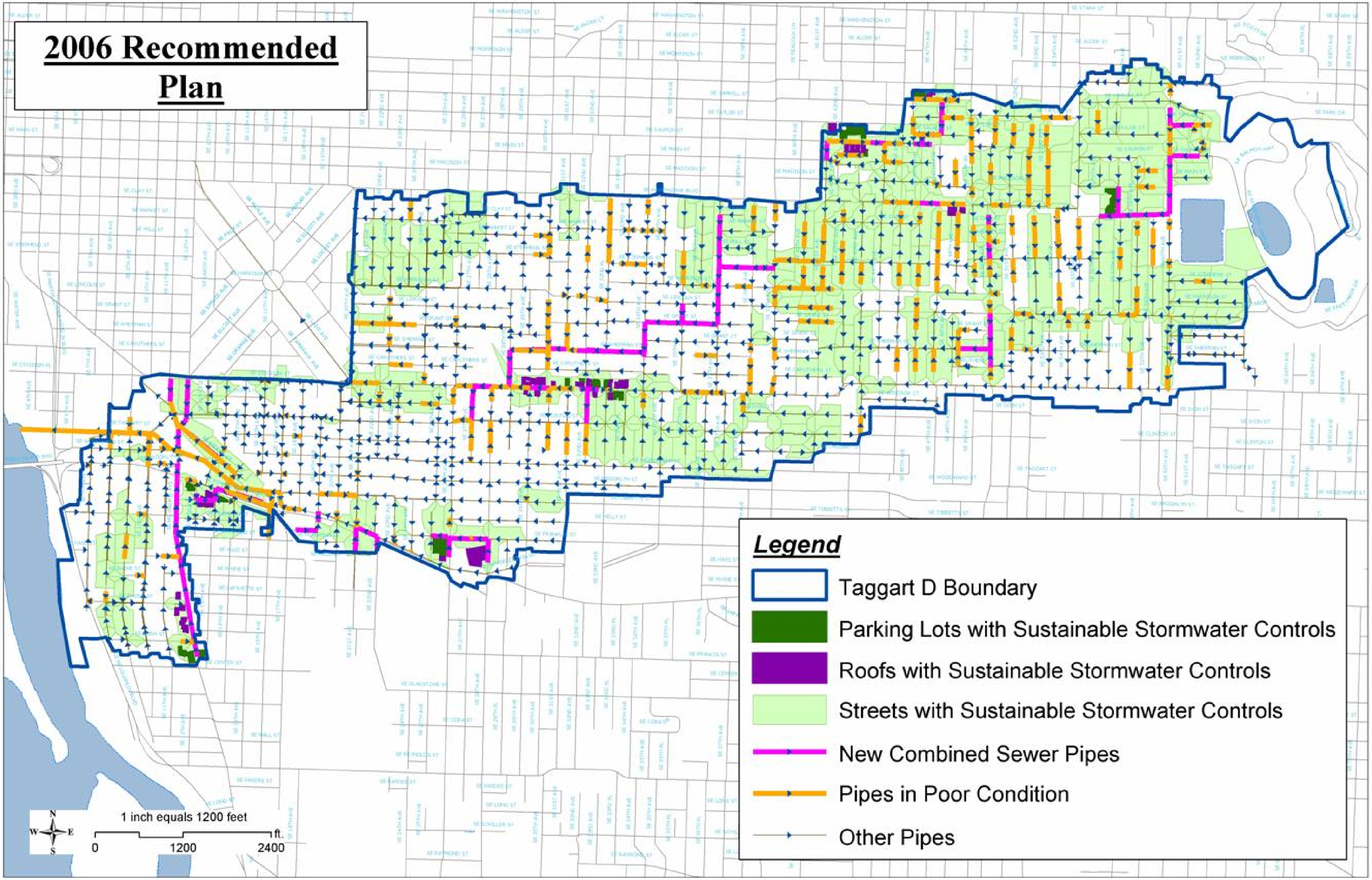
Green Streets Portland, Oregon

36 inches (914 mm) annual rainfall

City is divided up into subwatersheds, and those of highest need are identified. Combined Sewer Overflows are the typical problem



Conventional drainage design cost $144 million



Plan with sustainable stormwater strategies cost $86 million.

$58 million savings due to the reduction of needed pipe replacement

Dunbar/Spring neighborhood intersection repair, 2006

Reduce Paving and Make It Permeable



9TH AVE
STOP
DRIVING
4-WAY
KEEP
RIGHT


© Ron Niebrugge / WildNatureImages.com


MOUNTAINS
santa cruz river

The neighborhood now annually harvests over
660,000 gallons (2 acre feet) of stormwater
in the public right-of-way within 10 water-harvesting
traffic circles, 33 chicanes, and 85 street-side
basins fed by 50 curb cuts and 35 cores

But we could, and need to, increase that harvest
by at least 30 times

Before chicane ^

After chicane >

Lost
Sonoran Sucker fish
and water-harvesting
Horned Lizard sculpture

by Joseph Lupiani
in a water-harvesting
traffic-calming chicane

Lost
Sonoran Sucker fish
and water-harvesting
Horned Lizard sculpture

by Joseph Lupiani
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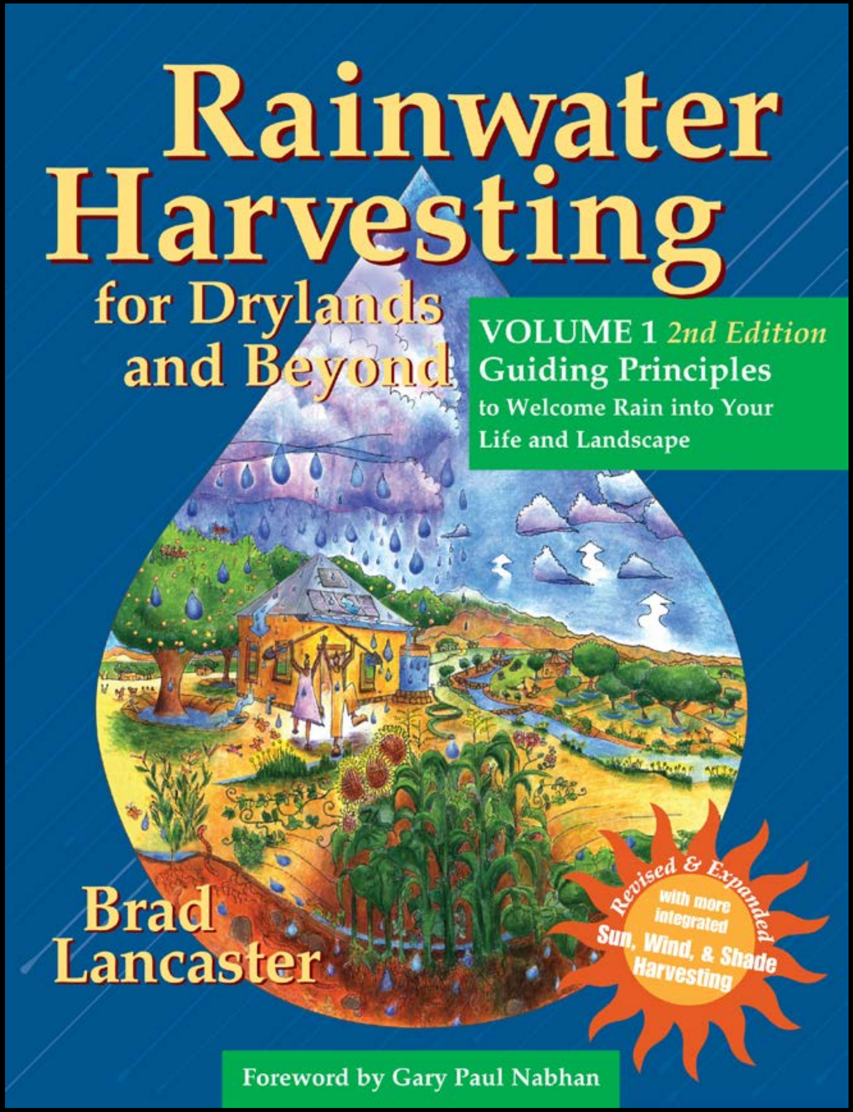
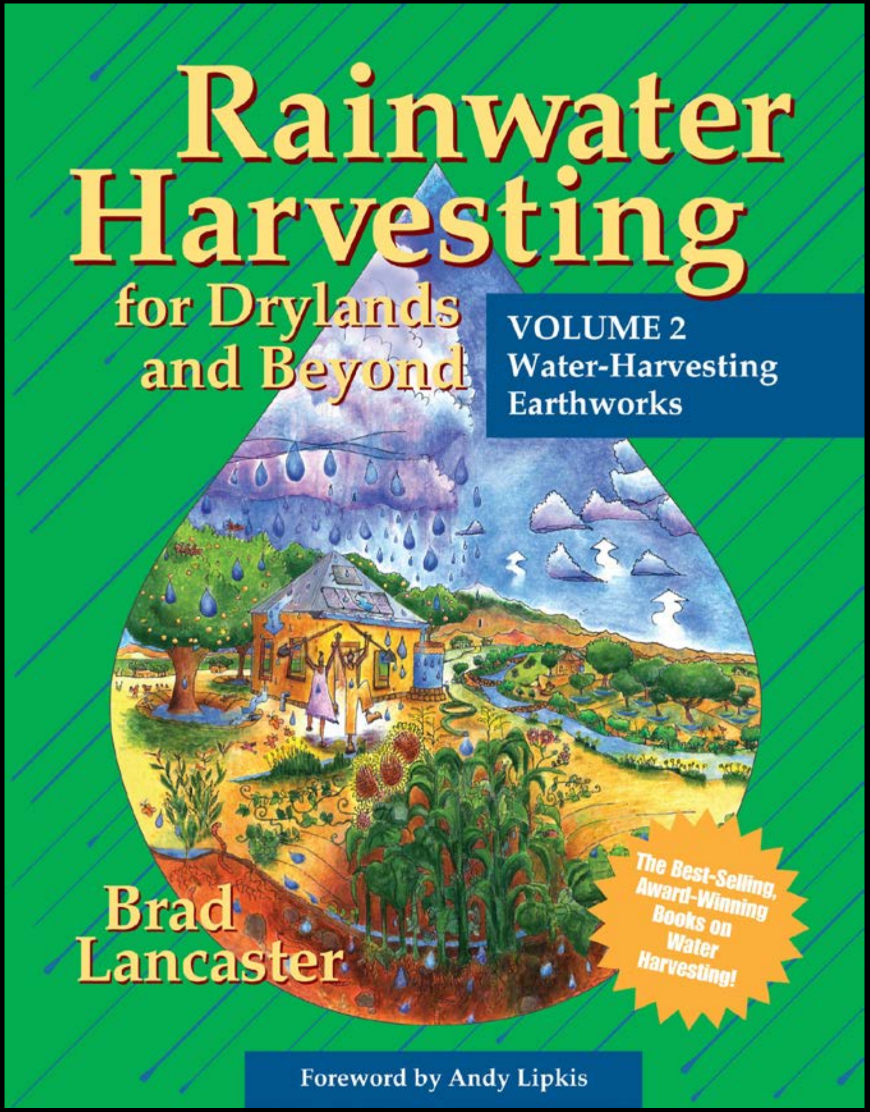
RAINFALL INCOME[e]	231	GPCD
	874	lpcd
UTILITY-WATER USE[10]	112	GPCD
	424	lpcd

What is the story of your place?

What is your role in that story?





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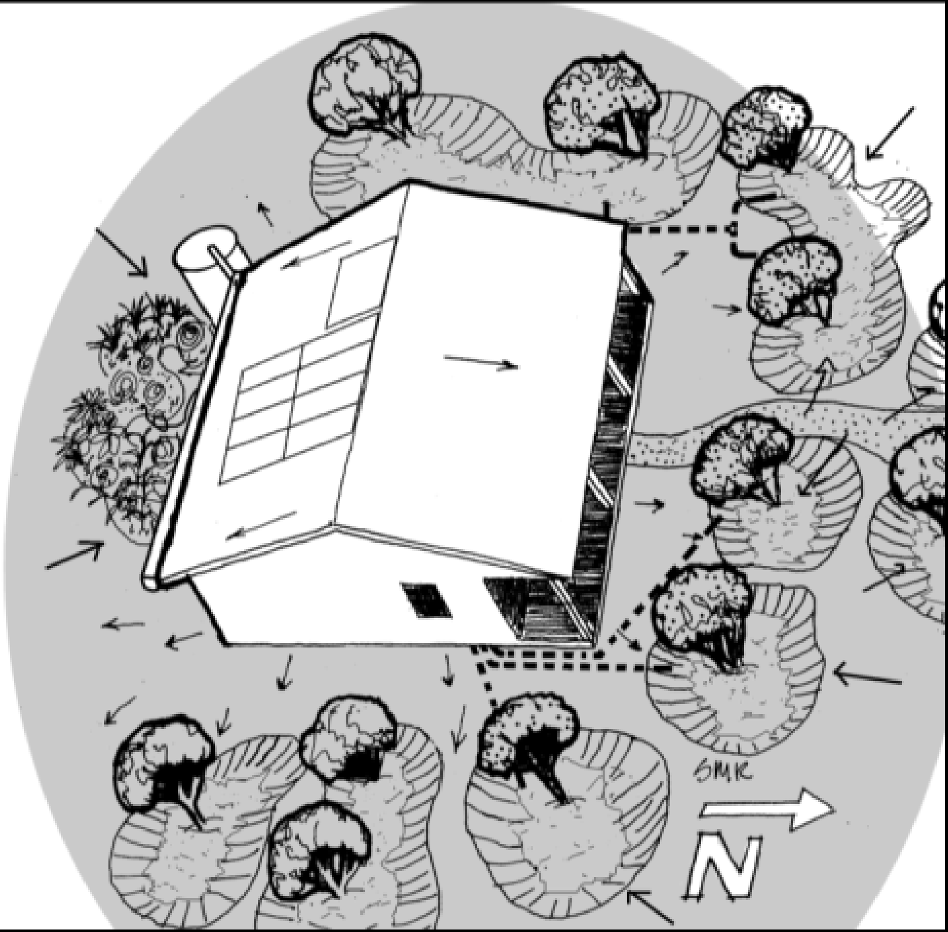
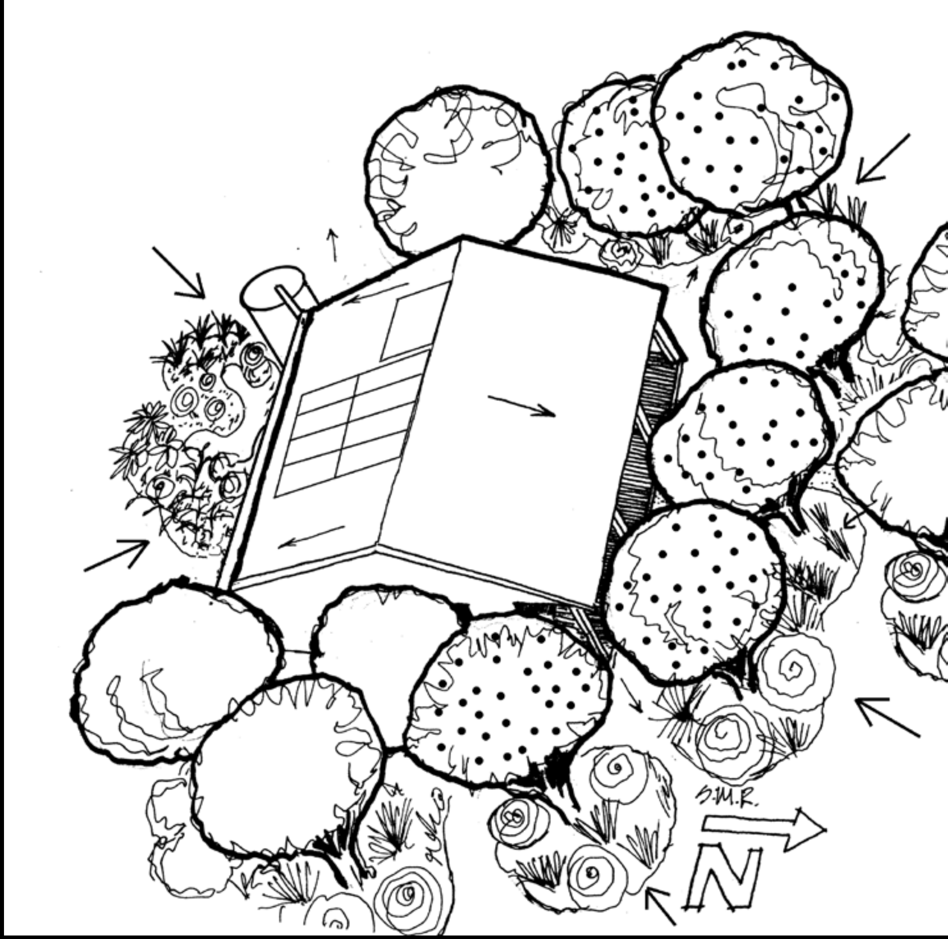
Road bosque guild
a catchment- / hardscape-vegetation relationship





Harvest and utilize 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

Tucson, Arizona
and the Santa Cruz river

1904

2007

< 1996
Planting

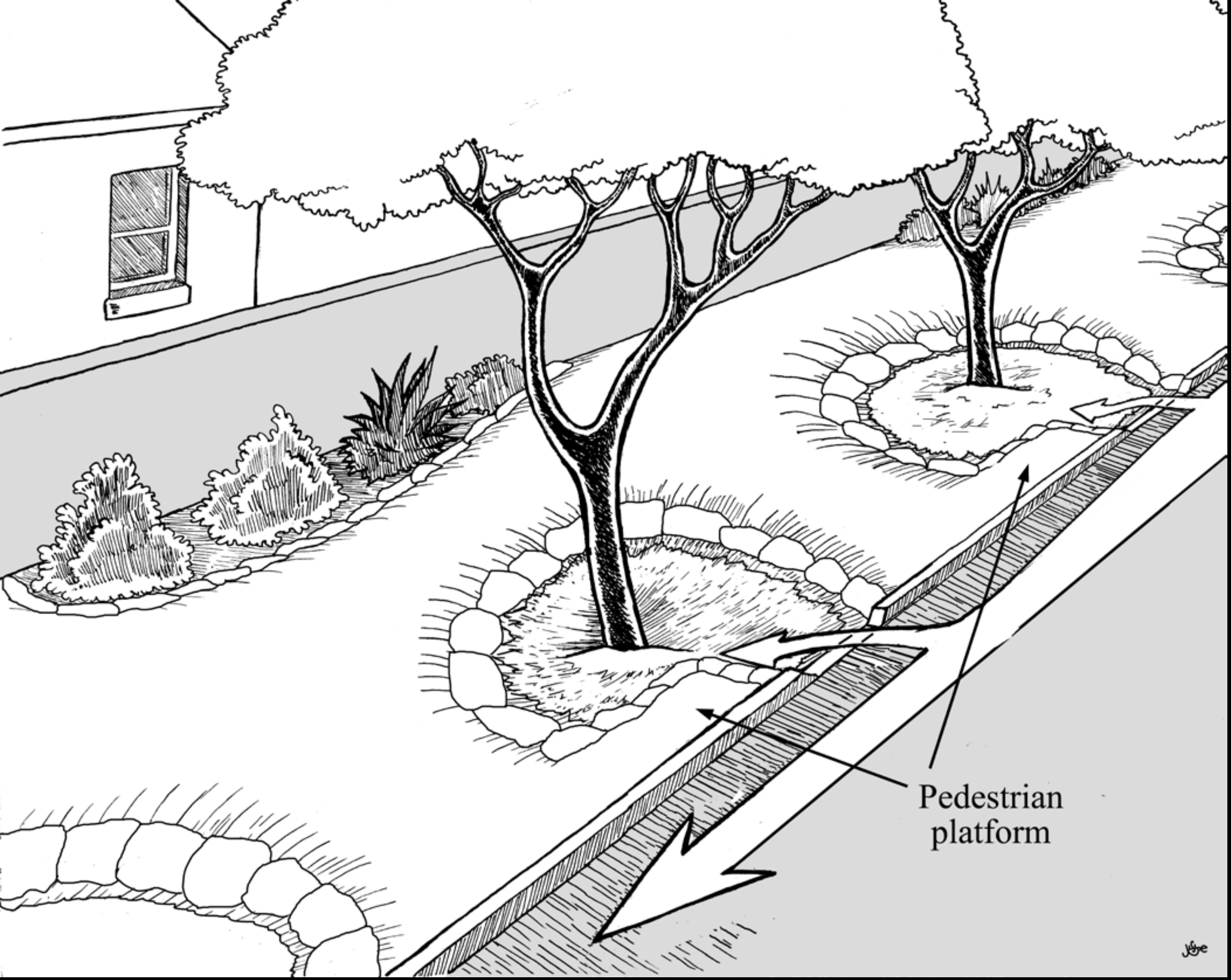
2006 >
Harvesting

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

Dead *drainage*way to living *infiltration*way

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



My neighborhood street receives over 1 million gallons of rainfall per mile per year

That is enough rain to passively irrigate 400 native food-producing trees per mile spaced every 25 feet on both sides of the street

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