

Getting Clear on Greywater *Additional Information and Resources*

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Simple, Easy Greywater Systems

With a "Landscape Direct," "Drain Out Back," "Laundry Drum," or "Drumless Laundry" system, you can get some benefits with much less work. You'll only need a bit of the info that follows, which is geared towards higher performance greywater systems.

100+ Pages of Free Info on Greywater

<http://oasisdesign.net/greywater>

Greywater Books

<http://oasisdesign.net/catalog>

Benefits of Reusing Greywater

- Lower fresh water use
- Less strain on septic tank or treatment plant
- Highly effective purification
- Can work in sites unsuitable for a septic tank
- Less energy and chemical use
- Plant growth
- Reclamation of otherwise wasted nutrients
- Increased connection to natural cycles

Ecological Systems Design

- Following principles of ecological design always improves overall outcome, especially with greywater.
- Optimized greywater systems are the most "systems design intensive" of common green technologies—more than solar, composting toilets, edible landscaping, etc.
- There are more variables to take into account, and a change in many of these produces a bigger change in the design than is common. "*Optimizing components in isolation tends to pessimize the whole system.*"

—Paul Hawken, Amory & L. Hunter Lovins

- Start at the widest, global view of the context, get clear on goals, then zoom into the details, and forward in time. Keep an eye on the big picture.
- Ecological systems design:

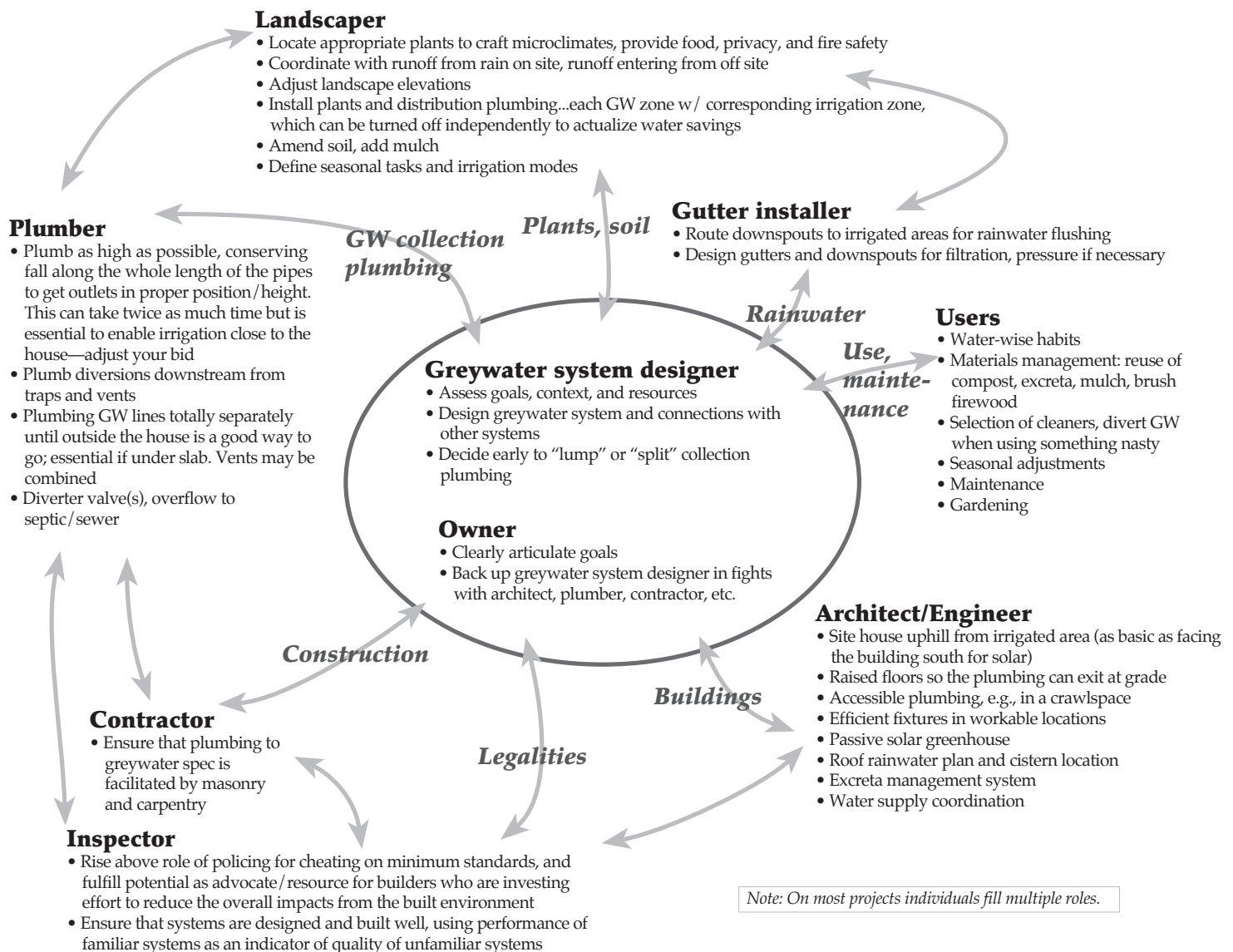
<http://oasisdesign.net/design/principles.htm>

Greywater System Checklists

<http://oasisdesign.net/greywater/stubout.htm>

<http://oasisdesign.net/design/consult/checklist.htm>

Greywater System Design Coordination



Note: On most projects individuals fill multiple roles.

Water supply

Greywater system design starts with the characteristics of the water supply system.

The most ecological water supply relies:

- Primarily on rainwater
- Secondarily on reused water
- Lastly on surface or groundwater

<http://oasisdesign.net/water/storage>

Guidelines for relating well with the natural water cycle

- 1) **Leave as much as possible of the work to nature**—*The more humans intervene, the more likely the overall system will get thrown out of whack*
- 2) **Improve several problems with one design; include comprehensive as well as specialist perspectives**—*Much bigger improvement from improving connections between systems than from improving systems themselves*
- 3) **Divert a small amount of water**
- 4) **Divert just after natural purification, so little or no additional treatment is needed**—*Springs, rainwater harvesting, wells, sand filtration*
- 5) **Divert from an elevation above the use point, or as little below as possible, so less energy is needed for pumping**—*Low pressure plumbing*
- 6) **Use water efficiently**—*REDUCE comes before reuse in the hierarchy of ecological materials management*
Always consider efficient fixtures before looking to reuse water from them
Sequence uses so water cascades from those uses which require the cleanest water to those which tolerate the dirtiest
Use ultra-efficient fixtures, eg., wood burning bathtub, eco luxury bathing chamber
- 7) **Add used water and nutrients back into the natural water cycle just before natural purification**—*Greywater systems, composting toilets, branched drain septic systems, compost, mulch, firewood...*
- 8) **Absorb all runoff**—*Permeable surfaces, vegetation cover, mulch, basins and swales*
- 9) **Rigorously confine incompatible materials (motor oil, solvents) to their own industrial cycles**—*Add to water only a moderate quantity of substances which biodegrade into plant nutri-*

ents or non-toxins and nothing else

Six factors for good natural purification of water or wastewater

Observing engineered and wild water systems, clearly we're best off doing it as much like nature as possible. Here are design principles for ecological water treatment:

- 1) **Plenty of contact time**—*The longer the water is in contact with beneficial bacteria and plant roots, the better. To increase contact time, reduce the flow rate and or increase area.*
- 2) **Plenty of micro surface contact**—*The more micro surface with beneficial bacteria growing on it the better, and the more plant roots, the better. Loamy soil has thousands of times more surface area than gravel. Avoid bulk flow; percolation is millions of times better for treatment.*
- 3) **Moisture, oxygen and nutrient levels which support growth/survival of roots and bacteria**—*If the system is totally dry long enough for the bacteria and roots to die, then gets spike loading, then is dry again, the treatment won't be as good.*
If the soil is saturated (no air) for more than 24 hours, the dissolved oxygen will be consumed.
- 4) **Apply wastewater as close as possible to the soil surface, without causing an unsanitary condition on the surface**—*The top of the soil has a purification capacity thousands of times greater than three feet down, because there is more life at the surface.*
- 5) **Appropriate plants as nutrient sinks**—*You don't have to worry about the bacteria—if the conditions are right, one will turn into trillions.*
However, it is generally helpful to actively manage plants to ensure there are the right number of the right kind.
Evergreen plants are active all year.
If you expect constant, water saturated conditions, use wetland plants, which pump oxygen out their roots.
- 6) **Warmth**—*The warmer it is, the better the treatment. The rule of thumb is that for each additional 10°C you get twice the treatment.*

Code issues

Greywater Policy Center: <http://oasisdesign.net/greywater/law>

Includes California greywater law and needed improvements, AZ and NM improved laws, inspection checklist.

Strategic paths through code quagmire for non AZ/NM residents:

- Branched drain system
- Subsurface drip system
- Stub out plumbing for future system:
<http://oasisdesign.net/greywater/stubout.htm>
-or- combine wastewater and go with septic system code:
- Green septic system (no written material available-contact Oasis for design consult:
<http://oasisdesign.net/design/consult/specialties.htm#gs>
- Advanced Treatment: <http://www.orenco.com>

Edible landscaping

Plant list: <http://www.oasisdesign.net/landscaping/fruittrees.htm>

Rainwater harvesting

Good for flushing salts from soil:

<http://www.oasisdesign.net/water/rainharvesting>



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