

TWV Podcast #041
Planting the Rain with Brad Lancaster
Show Notes at <http://www.thewatervalues.com/pod41>

Intro: Welcome to The Water Values Podcast. This is the podcast dedicated to water utilities, resources, treatment, reuse, and all things water. Now here's your host, Dave McGimpsey.

Dave: Hello and welcome to another session of The Water Values Podcast! As Joey said, I'm Dave McGimpsey. Thanks for joining me. And thank you for helping spread the word about The Water Values Podcast by word of mouth and by social media. Your efforts are greatly appreciated.

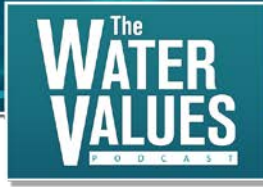
Today, we're going to talk about permaculture and rainwater harvesting with Brad Lancaster. A listener in Michigan actually suggested that we speak with Brad. It's great to have another listener-suggested topic by the way, and we have another listener-suggested topic for you next week, too. In any event, Brad is a guru in this area and will describe some very interesting methods for you to, as he and his mentor call it, "plant the rain." It's an area I didn't know that much about, but Brad really brings it to life, and I think you'll find him and his work absolutely fascinating.

With that said, let's get on with it. Open the valves, fasten your seatbelts and here we go.

Dave: Well Brad, thanks very much for coming on to The Water Values Podcast, greatly appreciate your time. To start off could you please tell us a little about how you got interested in water and what your background is?

Brad: Sure. So, I actually didn't study water-related issues in college, but my interest in water started just by growing up in the dry land environment of Tucson, Arizona, and seeing how our water situation seemed to get worse over time. I found college enabled me to articulate problems pretty well, but it wasn't until after college that I started to tap into strategies that helped me find solutions. And one of those for me was a course in permaculture. It is a methodology of sustainable, integrated design. It helped me make the connections. An aspect of the course was rainwater harvesting. I quickly learned that more rain falls on my dry land community than the entire community's population consumes of municipal water in a year. And this kind of woke me up to the potential of utilizing our free local water, such as the rain. I started to research it more on my own, practice it, seek out others doing the work, and it just grew from there.

Dave: Ok. Could you tell me a little about where did you go to find the resources? How did you kind of get involved in this permaculture and rainwater harvesting niche area?



Brad: Yep. So I was seeking out other practitioners, both domestically, who I'd often found through the permaculture community, but I also sought out people internationally. And I would go to the international rainwater harvesting conferences and also the American ones. But the international ones I found were much more valuable for me because people were typically doing far more with what seemed like far less. What I mean by that is, internationally people didn't have as much money or financial resources to tap, so they had to leverage their creativity.

And this really came to be the case when I traveled to Southern Africa and visited a subsistence farmer, Mr. Zephaniah Phiri Maseko. And this guy, he had, over a thirty year period, turned a waste land that was overgrazed, overcut and denuded into a relative oasis, and all by simply "planting" the rain as he would call it. And you go there now, and it's this oasis, it's just a multi-level forest of food producing plants and water seeping out of the ground. It's just phenomenal. And what really sparked me with my interaction with him is he had these limitations. He couldn't dig a deep well. It was not financially or physically possible. He could not divert waters from rivers because they didn't exist. So, he really had to make the most of the rain and what he had on site.

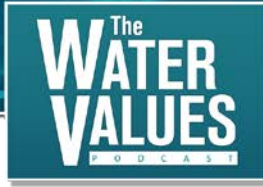
So, I really took that to heart and a lot of what I do in my work now is I try to self-impose similar constraints in a way that these constraints become leverage bars. So it is so easy in the United States to just turn on the tap and use the water from wherever it comes from. In Tucson it comes from the Colorado River 300 miles away. But if by instead of just doing the so called easy path and say hey, "How can I make the most of the rain that falls on my site? How can I make the most of the water going down my drains? Or use it before it leaves?" That way I force myself into the creativity that Mr. Phiri and many of the others that I have experienced in my international travels garnered because of their situation.

As a result, I've been able to figure out how to harvest about 100,000 gallons of rain a year, on an eighth of an acre urban lot where we just get eleven inches of rain falling from the sky. I am able to grow an abundant landscape just on rainwater and recycled household greywater, as opposed to be reliant completely on drinking water, which is the typically scenario in the Western U.S., where 30-70% of the drinking water household consumes is used to irrigate the landscape. So, I've just cut that out of the scenario. If we could do this as a society, we can reduce our drinking water consumption by 30-70% simply using what we already have free of charge on site.

Dave: That is absolutely amazing. So, tell me how do you get into these dry land strategies? What are they? Can you talk a little about the methods you use to harvest the rain?

Brad: Yep. So, again, the African water farmer, Mr. Phiri, he's been my greatest inspiration. And I take his rule to heart of the first step is we plant the rain, because the soil is our largest and least expensive tank. It's already here on site. I do harvest water in tanks, but I start with the soil.

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That's where I collect the majority of the water. I simply change the surface of the soil so that instead of being hill-like in form, a hill-like form would drain water out of the system, I instead create bowl-like forms. So I collect that water. I then turn that bowl into a sponge by planting a lot of living pumps in the form of vegetation, and I cover the surface of the soil in organic matter, the leaf drop prunings that I already have on site. It rapidly absorbs the water and much more slowly releases it or loses it to evaporation. So this way, when it rains, my landscape absorbs every drop of the rainfall including runoff from neighbor's roofs and the surrounding streets. I'm maximizing what I catch and absorb, I dramatically reduce my need for a manufactured or purchased tank because I'm banking so much in the soil, I don't need to bank so much in the tank. This dramatically reduces costs.

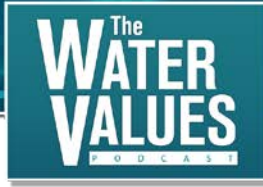
The other great thing about these earthworks, these rains gardens, these bowl-like shape that passively harvest the rain, they work whether I'm home or not. They always work. They're not dependent on anyone turning a lever or turning on a pump. They work all the time, as they're based on natural systems and the simple gravity fed distribution of the water.

So my main strategy is I plant that rain. And these earthworks, these rain gardens, these bowl-like shapes that harvest the rain, the great thing is they harvest any and all waters. I can direct the greywater from my household drains with a pipe having a 2% slope to the same rain gardens, these same earthworks. In times of no rain, I turn these rain gardens into greywater gardens. The great thing about greywater, greywater being the water from our household sink, bathtub, shower and washing machine drainage is, it's perennial flow as long as I'm home. So even in the dry times, I can freely irrigate my fruit trees with this previously considered wastewater, which I've converted into a resource water. And I can also send air conditioning condensate into these same earthworks, evaporative cooler bleed off. It's great. Can take all the waters.

I can also send street run-off into these basins. I would not want to store greywater or street run off in a tank because of all the organic matter with the street run-off, the pollutants coming off the street. I don't want to store that in the tank. Whereas in the soil, no problem. Because much of the soil life actually helps transform and filter those toxins such as the oils coming off the street or the soaps coming out of the greywater. They transform it into a benign form and sometimes a beneficial form. There are a lot of actually nitrates coming off streets plants can convert into a readily accessible form for the plants as fertilizer.

By working with these living systems in the soil, not only am I able to capture the water, but these living systems are able to passively and freely filter some of the bad things coming into the system and transform those into resources.

Dave: Ok, that's sounds really interesting but I've got a bunch of questions. I'm going to have to list them off here so I don't forget them all. First off, health issues about greywater and just



putting that on your yard. I mean, are there issues about health if you touch the area that's being irrigated with the greywater are you going to get sick.

Brad: Ok. There have been no documented cases of anyone having any health issues with greywater. And so I find it very safe. Again, I want to clarify, greywater is not black water. Black water would be the water coming from the toilet and some states consider kitchen sink water also to be black water because of the higher amount of organic matter in it and food for bacteria, like salmonella and ecoli.

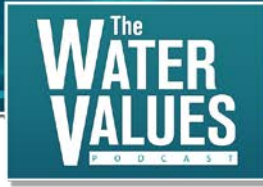
But greywater, very safe and if you just think about it, you don't get sick in the shower, right? You're basically, as you shower, you're generating greywater and it's fine. So we just send that to the plants, and I recommend people primarily use that greywater for perennial plants like trees and shrubs. And that way if there's any risk like, let's say, sorry to be a little graphic, but say someone accidentally craps their pants, they need to clean up. They wash their pants in the washing machine and they wash themselves in the shower. As long as that water is going very quickly being absorbed by the soil, and we're irrigating perennial plants, there's no risk because what goes down the drain and is absorbed by the soil does not come into direct contact with the part of the plant you're eating.

So a general rule is for greywater, send it to perennial plants or annual plants like a tomato on a trellis where the tomato doesn't touch the greywater but the roots get the water and then you're totally fine. And one other thing that I'll say about health, I find people that harvest their greywater, their health improves, because you have to be careful what soaps you use. If you use soaps high in salt or sodium or chlorinated bleach, that soap, that cleanser, that bleach can kill your soils and plants. And too much exposure to these same things that are harmful to the soil and the plants are harmful to us. So as people change the product or detergent they use so it's healthier for their soil, they find it becomes healthier for their skin and bodies as well.

Dave: Ok. Do you have some examples of types of products that would be safe to, let's just say, these products that will be healthier for you? What are some examples of those?

Brad: Yep. So the first step is, you want to, you can't really trust the product labels or brands. You really need to look at the ingredients of all the products. And I've got a lot more detail on the greywater harvesting page of my website which is harvestingrainwater.com. But real quickly, avoid powder soaps and detergents. They tend to be much higher in salt. Liquid soaps are much better. Don't use chlorinated bleach. Instead use hydrogen peroxide bleach, that's ok. Look on the ingredients of your soaps and if you see salt or sodium anything or chlorine, don't get it. So a lot of soaps to sodium lauryl sulfate and what not, you don't want those ones. But the basic rule is liquid soaps instead of bar or powdered detergents and use hydrogen peroxide bleach as opposed to chlorinated bleach.

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Dave: I am going to go back to my mental list of questions here. The other question I had going was what happens in the event of torrential rains, are your earthworks and harvesting systems, can they get overwhelmed by a torrential rain?

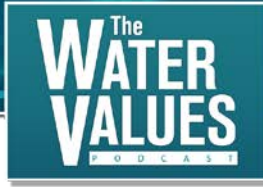
Brad: Well, no because I've got eight common sense principles for any water harvesting system, and one of those is you've always got to have an overflow sized to handle a peak flow event and set up in such a way that it turns that overflow into a resource. So as long as you've got an overflow route preplanned, you're fine. So the earthwork can fill up with water but once full, it can overflow where it's not a problem.

Now, I want to give you an example of this. I've created about seven water harvesting rain gardens or basins along the street beside my house. And I designed these to handle the rainwater runoff from the street. So the street irrigates the street-side trees with the runoff I capture from the street. And the inlet point for each of these basins doubles as what you might call the outlet point. We cut the street curb so the cut in the curb becomes the inlet point. Water flows through that inlet, fills up the street-side basin. Once it is full the water in the basin backs up to the inlet point so no more water comes in and the surplus water goes down to the next basin. So these basins act like back waters or eddies, and it's always worked great.

And this summer, I decided to push the system. So I decided to divert water from the other side of the street with a temporary diversion berm I made out of some lumber and soil and sandbags. And I increased the watershed area, the total area that drains water to my basins by twelve times because the other side of the street receives much more water than my side of the street because there's a big parking lot that dumps into it. And anyhow, I basically turned a 1 1/2 inch rain event into a 19 1/2 inch rain event. That's never been recorded in recorded history to get that much water in Tucson. And yet everything was fine. If filled up all my basins, and it was only in the last twenty minutes of the storm that the system finally started to overflow. And that overflow water was caught by my neighbor's street-side basins downstream. So no water was lost from the system. So that just showed me how incredibly resilient these systems are in wet times. To be able to handle such a biblical fabricated rain event.

And that was in the wet time. Let me just talk about the dry time. So let's say that 1 1/2 inch rain was the only rain that we got all year round. We're set, ok? Because we maximize the capture and infiltration and storage of that water so now it can slowly be doled out from the soil via the plants' roots and whatnot long into the dry time. So we can shrink droughts. We can shrink dry seasons. And we can significantly mitigate the peaks of the flood wet events.

Dave: What is the adoption process like? How are you seeing people take this up? What strategies that they're using that seem to work the best?



Brad: I find these things take off when people can regularly see a great working example. So our strategy has been to create really great effective examples, beautiful examples in the community and then talk it up to anyone who asks. And so this is how it started to spread in my neighborhood. And then we went further when we started these curb cuts, to be honest, they were illegal at the time in my community. So we did our first curb cut, we tried to make the cut super clean so we'd be improving public property not making it worse by sledgehammering stuff. And it worked so well that a lot of neighbors got excited. They wanted to do likewise. So we spoke to the city, started a long process, but it's since been legalized and now it's incentivized. You can actually get a rebate for doing this work, and the city now requires it in all new city street construction or significant renovation.

Dave: Time out real quick, was that a direct result of your process?

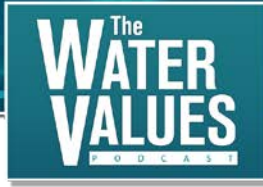
Brad: It was a direct result of my process but it wasn't that alone. At the same time there were people within the transportation department, the landscape architect there pushing for change and harvesting water because he had found that he was able to significantly reduce the costs of the city's street-side landscaping if he harvested rainwater. Because as opposed to having to put in a drip irrigation system, he could instead just get a watering truck contract for the first year of the plant's establishment. And then from that point on, everything would be irrigated by rainwater. So this dramatically reduced his cost in irrigation installation, maintenance of leaks and what not, but more than anything, weeding. He found plants regularly irrigated had much more weed issues but those irrigated by rainwater had far fewer weeds. So there was stuff like that going on.

There were other organizations advocating for this as well. And then I'd say my books were a big part of it because public policy folks, citizens, everyone was able to read up on what was this about? See how it could work. See real life examples. And they could then understand it and they could do this in the privacy of their own homes without being publicly challenged in a meeting. And so there was this big ground swell of people calling the mayor and council saying they want more of this. So this helped generate the political will around the movement, as well, which was key.

Dave: That's very interesting. Do you have any insight as to why irrigated green space has more weeds than rainwater harvested irrigated space has more weeds?

Brad: Yeah. So when we are planting the perennial plants and I and the city have found that the most successful plantings are those that are native to the area. So we're planting the hardiest, most likely to succeed perennial plants. And they are perfectly adapted to our climate's rain and dry season cycle and our soils. So once they get established they're fine even if we get a bad drought year or a real wet year, they respond accordingly. And they are able to out compete the weeds. Whereas, if we had regular irrigation, that is more favorable to non-native vegetation, and the invasive weeds because they are getting water all the time, regularly. And we find in the dry

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season, our weeds die out whereas the perennial plantings don't when we are just irrigating with harvested rainwater. Whereas when you're irrigating with the imported irrigation water, you can pamper those weeds all year round. So it is a matter of working with the abilities of the plants that we want, which are already adapted to our local rain cycles and soils.

Dave: What about those plants? It sounds to me like wherever you're going to adopt this permaculture, the plants you're using are going to be different depending on the area of the country you're going in.

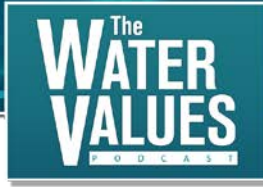
Brad: Sure. So that's up to every community to talk to their local plant nursery folks, horticulturalists and what not and create lists, plant lists, that are best adapted for their area. So in the back of my books and on the plant list section of my website, I've got a lot of information and template lists of the plants that are best for my area, both native plants and climate appropriate non-native exotic plants.

And we basically categorize them by what's their best micro-climate preference within a rain garden? So do they like the bottom, the terrace or the top? So the bottom plants are the plants that can take periodic inundation of water. They're placed at the bottom of the basin. The terrace plants are planted on the bank of the rain garden, a little bit higher up, so we can have less water tolerant plants and slightly more drought tolerant plants there. And then at the top, we have the least water tolerant plants and the most drought tolerant. So at the top, the base of the plant never gets inundated with water but the roots can access the water. So this helps shift and enlighten people's thinking so they can put right plants in right microclimate. And we also then select along the streets trees and shrubs that have deep roots not shallow heaving roots that might heave a sidewalk or street curb.

In addition it's great to list other uses of the plants. I really like to emphasize food bearing plants. So we have planted a lot of food bearing trees and shrubs along our neighborhood streets irrigated with the street run off. This way we create these passively, freely irrigated green belts of shade that also produce food while generating wildlife habitat. And the key thing there is that we don't want the food that we eat from these plants to have any toxins from the street, so we don't plant leafy greens or tuber roots along the street that get the street run-off. Instead we just plant woody perennials. Studies at the university have found that no toxins are up-taken into the foods of these woody perennials. So that's safe. Whereas a leafy green, it is up-taking toxins. So it's got to be right plant in right place.

Dave: Now, I want to follow up on, you mentioned the City of Tucson adopting these green infrastructure regulations after they realized a lot of the benefits that you've espoused here. What other communities have you, or are you working with other communities to develop green infrastructure standards?

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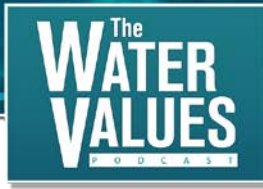
Brad: Quite a number. So I'm continuously teaching and presenting throughout the Southwest but also internationally. So recently, I've been able to collaborate with a non-profit in Los Angeles, LA Water, otherwise known as the River Project. And they're working with the City of Los Angeles transportation officials to develop new standards for green infrastructure, water harvesting systems along and within city streets, while at the same time, helping to create guides for people doing so on their individual properties. Now I've done that same work here in Tucson, not only with the City of Tucson, but also the non-profit Watershed Management Group, which recently came out with a Spanish edition of their guide which is Green Infrastructure for Southwestern Neighborhoods. And you can download that from their website for free in English or Spanish. The Spanish version came after I did work with the City of La Paz, Mexico and the City of Ciudad Obregón in Sonora, Mexico where I went down, gave presentations, did hands on workshops and then working with the city, both cities, we created their first street-side water harvesting system as the test plot. And both are working phenomenally well, and now they've gone on to do many more. This is yet another example of what we talked about before about how key it is to get a good working example in place that people can learn from, evolve from and be inspired by.

Dave: That's absolutely fantastic. Let's talk a little about the legality of these systems. You had mentioned greywater harvesting. I live in Colorado now and while the state has passed a statute that might allow for greywater harvesting, the dominoes that need to fall before greywater harvesting is legal have not fallen yet. So I'm just curious about your experience with the various legalities of greywater harvesting in some of your other rainwater harvesting methods.

Brad: Yep. Well, let's start with greywater harvesting. So prior to 2001, in the State of Arizona, for all intents and purposes, greywater harvesting was illegal. Now you could legally do it but it was a very expensive permitting process, very laborious, and no one had any interest in participating. So people basically disregarded anything the State was saying because it was so burdensome. Nonetheless, and so I just want to clarify if you did not go through that permitting process and testing of the water, it was illegal to harvest greywater. None the less, there was over 100,000 documented people-households-harvesting greywater in the State of Arizona, illegally. So study by the university, others Val Little, the local conservation group was keying all this, they documented this and they also found that there were not health issues associated with these wildcat systems, as long as people were following common sense.

And so based on those findings, they generated thirteen best management practices for guidelines and then proposed to the State of Arizona that they change the law. And instead of having burdensome requirements to actually have an easier guidance system that incentivizes this practice that would save the state huge amounts of water and promote safe practices. So that's what happened. The State of Arizona legalized the harvest of greywater. You don't need any permit, there's no inspection and there's no fee as long as you follow the thirteen common sense guidelines or best management practices. The only time any enforcement comes into play is if

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you don't follow those guidelines and a problem arises and then someone complains. That's when the hammer comes down. So this has been very successful and has led to more adoption and use of the greywater harvesting, of using the safe practices and now it's even rebated. You can get up to \$1000 in the City of Tucson for harvesting greywater. So, New Mexico soon followed suit, California in a large degree has, West Texas so it's really been taking off after Arizona turned things around within its own policies.

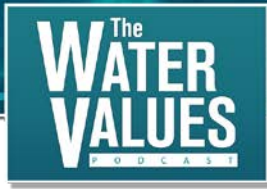
Now, for rainwater harvesting, the primary way I advocate that, planting the rain, harvesting and infiltrating your on-site rainfall and the soil, using the living pumps of plants to primarily access that water, that's legal. As far as I know, that's legal everywhere in the United States including Colorado. And I'm not talking about creating dams in creeks and rivers. You're intercepting that water before it gets to the water way. This does not reduce downstream flows. We actually find it increases downstream flows but not the flood flows. It decreases floods because you're infiltrating the water and then it's the much slower release out of the soil into the water body as opposed to a spike flood flow running of the surface. So we get more sustained year round flows downstream without the spike flood flows.

Now the one thing that is illegal in terms of harvesting water in some places, like some places in Colorado, is harvesting rainwater in tanks. And thankfully, that is even beginning to shift in Colorado. In Arizona, New Mexico, California, it is no problem to harvest rainwater in tanks. Colorado is an exception. It used to be that you just could not harvest rainwater in a tank period. But that changed in a study done in Colorado, in Douglas County. Bjorn Courtney, a local engineer and some others, they looked at how much rain flows off an undeveloped track of land in Douglas County, and they found that on average, no more than 3% of the rain falling on that undeveloped parcel of land runs off.

Then doing more computer modeling, they put in some crazy rain events into the model, they said that in a huge storm, you would not have more than 15% of the rain flowing off the site. So they then took that to the state legislature and what not, with that scientific data, were able to change the law because they proved that the bulk of the rain falling on an undeveloped parcel of land doesn't run off. However, when you develop, you create hardscape like roofs, paving, more water does run off. But you should have the right to harvest that run off water you generated. That's run off water that did not exist predevelopment. So due to that, you can now legally harvest rainwater in a tank in Colorado as long as you're not connected to a municipal sewer system or water system. So that part, that's a funky little detail in it. But if you're on your own well, and you have your own septic or compost toilet system or greywater harvesting system, you can legally harvest rainwater in a tank in Colorado.

That's a great start but I think it needs to go further, and we need to legalize the harvest of rainwater in tanks for those within the urban environment, as well.

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Dave: Well, Brad, I think we could talk for a heck of a long time. We're just scratching the surface I feel like. We've already hit 35 minutes so. I'd love to have you back sometime and talk more about what you're doing, some more projects you're working on but before we leave, could you please tell folks who would like to find out a little more about you and your projects where they can go to find that out.

Brad: Absolutely. I would strongly recommend folks check out my books. I've got two books. They're both titled *Rainwater Harvesting for Dry Lands and Beyond*. One is volume one, and the other is volume two. You can get those books direct from my website or any book store. They're available nationally and internationally. But my website has a ton of free info, videos, lots of other great resources. The web site is www.harvestingrainwater.com.

And another side project I have is promoting the planting of food bearing native vegetation using water harvesting. That group is called Desert Harvesters. You can get more information on it at desertharvesters.org.

Dave: Well, Brad, again thank you so much. It has been really interesting to hear about your work. I really appreciate your time. Hope to talk to you soon.

Brad: I look forward to it as well. Thank you so much for this opportunity.

Dave: You bet. We'll talk to you soon, Brad. Bye.

Dave: That was my conversation with Brad Lancaster, a permaculture guru from Tucson, Arizona. I loved his enthusiasm, didn't you?

Here are a couple takeaways. The first is a theme Brad repeated several times. He said he finds the rainwater harvesting systems work best when people have a good, working example they can see first. Think about it. If a rainwater harvesting system was an eyesore and was shoddily constructed so that it didn't work properly, no one would adopt it. Brad indicated that he was careful when creating his to make clean curb cuts, even though illegal at the time, rather than sledgehammer the curbs. This is a strategy that transcends rainwater harvesting – any project in which you want public adoption to ensue, you're going to want a great example of it to start.

My next takeaway is the greywater situation. As we discussed during the interview, greywater reuse has and is still evolving from being prohibited or so highly regulated that no one will use it now to the point that it is becoming more accepted. I'm hoping Regulation 86 here in Colorado

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that would create the framework for greywater reuse for homes with municipally-connected water/sewer systems finally gets moving.

My final takeaway is that I'm thankful for you, the listeners, bringing topics like these to my attention. It was terrific speaking with Brad and learning about what he does with permaculture and rainwater harvesting. Hopefully, you enjoyed it, too.

Well, you can check the Show Notes out for this session at <http://thewatervalues.com/pod41>. Leave a comment on the Show Notes or email me at david@thewatervalues.com. You can also tweet at me @DTM1993, and you can tweet about the podcast using #WaterValues. And don't forget to rate and please review the podcast on iTunes, Stitcher and other podcast directories. And please don't forget to tell your friends and colleagues about the podcast and to sign up for The Water Values Newsletter, which can be done at <http://thewatervalues.com>.

In closing, please remember to keep the core message of The Water Values Podcast in mind as you go about your daily business. Water is our most valuable resource. So please join me by going out into the world and acting like it.

Outro: You've been listening to The Water Values Podcast. Thank you for spending some of your day with my dad and me.

Dave: Thank you for tuning in to the disclaimer. I'm a lawyer licensed in Colorado and Indiana. And nothing in this podcast should be taken as providing legal advice or as establishing an attorney-client relationship with you or with anyone else. Additionally, nothing in this podcast should be considered a solicitation for professional employment. I'm just a lawyer that finds water issues interesting and that believes greater public education is needed about water issues. And that includes enhancing my own education about water issues because no one knows everything about water.