

ERDC-EL
Moderator: Courtney Chambers
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1:00PM CT

Dr. Pam Bailey: Good afternoon. I'm going to present the last Webinar in this three part series based on the Design Manual: Engineering With Nature Using Native Plant Communities.

I have previously talked about the introduction and design and also last week the science and planting techniques. Today I'm going to be presenting a series of case studies that blend both the design with the science.

I have started with this slide just as a quick review for those who have been involved in the Webinar series. The sustainable uses of native plants for Corps mission - they provide wildlife habitat and migration routes, protect water quality and water supply, produce oxygen, protect air quality. They're instrumental in regulating temperatures and nutrient cycling. They also are major components to help reduce sedimentation and erosion into waterways and also provide many commercial uses.

The case studies that I'm going to be talking about are climate control or using sun, shade, windbreaks for energy conservation, also the reduction of storm water runoff, planting to stabilize steep slopes, bioengineering and biotechnical planting, geo-cells and geo-grids and other permeable pavements. I'll also be talking about riparian corridors, greenways and buffers, bio retention features or rain gardens and constructed wetlands.

Wetlands can be used for treatment of waste water or septic. I will also be showing some examples of native plantings for recreational features enhancement, creating habitats for pollinators, planting on dredged materials, plants in remediation and reclamation. They're used for carbon sequestration.

I'll be describing living shorelines and also nature based protection for storm surge, and lastly the establishment of native aquatic plants to improve aquatic habitats.

So the first item is a program that I found and it was put together by the US Forest Service. What I-Tree Program does is calculate heating and cooling costs and pollution removal as well as carbon storage from tree, woodland and forest planting. By planting trees and creating shade there can be a difference of ten degrees Fahrenheit, and it's quite apparent when you walk from a field into a forest canopy. The site for that program is listed on this slide and so you can use the tool.

Reduction of storm water runoff - there's a program called City Green which evaluates storm water runoff for land use changes. It assesses and calculates based on how land cover types have changed, the soil type, and precipitation from the storm water runoff volume. Trees provide for the decrease in total storm water volume and help to decrease retention times.

Native plantings can also prevent erosion and stabilize deep slopes. Insulation details for a reinforced vegetated system which is a high performance turf reinforcement mat fixed in place with driven anchors, and then planted with trees and hydro seeding. This system can stabilize steep grades and road cuts.

I've used these materials - geo-grid - and this picture shows what the geo-grid actually looks like installed. It increases bearing capacity within the soil and then you can plant grass - native grasses on top of that and the parking lot just disappears - looks like a lawn, yet it's hardened enough so that it will be able to be driven on without impact in terms of mud or rutting.

It also provides the ability to absorb water unlike pavement. So it is a sustainable type product, which allows for absorption of water. This is a geoweb product that's used - also this was constructed at the National Park Service.. You can see it in the road in the picture on the right and this material actually runs underneath this road right to the edge of the hill. There is a steep drop-off on the side of this road although it's not apparent from this picture.

The picture on the left shows what it looks like on that steep slope so it has a series of cells that can be packed with earth and then plants can be grown in it so that that material just disappears. It looks like a green edge and this is holding a fairly steep slope. It is also used in the road grade which is filled with stone. So those are the type materials that also offer a lot of benefits in terms of permeability from storm water and lend themselves to a more sustainable and naturalized look in the environment, which the park service likes to have in their built environments and on their facilities.

This is a constructed wetland and this was a mitigation feature in West Virginia. This pond was designed actually before I got involved in this project. Unfortunately it has a liner as the pond bottom which is not as good as having a clay liner. A lot of plants could be planted in the pond with a clay liner. I was given the pond to do a mitigation planting. I planted a series of native trees and shrubs and herbaceous plants around this pond.

During its establishment Canada Geese thought the plantings were a buffet. I It was a difficult problem to try to get some plants going, but with so much of the area around the pond planted with so many plant species. Finally many became established and now the pond is used quite often by waterfowl.

You can see it does have a variety of plants growing around the edges and this was early, after the mitigation planting. I've been back to the pond since.

It's even more lush and there are many species that have been brought in naturally by the bird life and by wind.

Bioengineering and biotechnical planting are basically treatments using native plants that easily root adventitiously and can be used for live logs, plant bundles, blankets and many other applications of biotechnical planting. These tend to be combined with other materials such as stone, geotextile, and geogrids. These techniques reduce overall project costs, but often require more intensive labor during the installation. Once construction is completed, the benefit of these treatments are that they are often self-repairing and self-maintaining.

I'm going to talk a little bit about this project that was done at El Dorado Lake in Kansas. We had an active workshop with local Corps sponsor, Boy Scouts of America and some other local organizations. The volunteers harvested local plant material from onsite as you can see in the first picture on the left, and we did this when the plants were dormant - in March.

When you're cutting pieces of stems, you can see where the growth is - where all the buds are. Those plants really need to be planted when it's dormant because they will just die if they're planted after they've already leafed out- they will transpire too much water and desiccate. The picture on the right shows what the planting actually looks like once it starts taking off.

We did a series of four different types of treatments. The volunteers learned these four different types of treatments, and after one season you can see the plant growth on the shoreline. And you can also see out in the water there's a pile of dead cedars - this was used to break the wind. This shoreline was eroding 20 feet horizontally after a storm event with the wind fetch coming across the lake.

So we put the cedar barrier out at the lake's edge. This is in prairie land, so they don't like cedars succeeding into the prairie, so they cut them. We used the cedar breakwater and then planted behind that which offered protection until the young plants could get established. And this picture was just a few months after that planting. So it was a successful project. There were so many people involved in this project, and many people learned the techniques, so I hope they are out there doing these kinds of projects.

Riparian corridors, Green ways and buffers restore function to the landscape, and restores connectivity within the system. So you can have these interrelated features, and they can blend one from another throughout the greater landscape and they provide great habitat as well as migration routes for wildlife through the landscape.

This project was done at the Dyess Air Force Base and 9 miles of plantings installed on drainage channels. In some places the channel had a concrete drainage way, and in other places the stream was more naturalized with native soils.

The reason the base wanted this done is and why we got the money, was to reduce sediments into the water and to increase the water quality going into these drainages. The secondary reason was to prevent birds of prey from colliding with the aircraft they were flying into the airstrip adjacent to these drainage ways.

The intent was to provide a wildlife habitat so that the birds would be lured away from the flight line. We planted a series of native trees, shrubs and a native seed mix to prevent erosion. We repaired the gullies on the slopes. As you can see in this area, there's a lot of bare soil, this was an area of repair-

grading and re-seeding in addition to the tree planting. I did a walkthrough of the entire site and found over 50 species of wildflowers growing in the channel, and decided to keep all of the existing native plants and interplant the trees and shrubs that we had planned for in those areas. The entire project was done over a three-year period.

So in the picture at the bottom, this was an area after 3 years of growth in the channel. So I'm hoping that now it should be a very vegetated buffer strip at this point.

We obtained the native trees and shrubs through the NRCS Plant Material Center in Knox City, TX., and they helped to do the first year planting – this is them in the top picture. It's a great resource to be able to work with those folks - They can grow plant materials, provide seed mixes, and recommendations for native tree and shrub plantings, and sometimes they will plant an area. You can contract with them, and they're really a pleasure to work with. There's 26 NRCS Plant Centers across the country, within all eco-regions. They're a great partner to have on your plant projects because of their knowledge.

This is a case study I have from the NRCS Plant Material Center in Alderson, West Virginia. This picture is of a septic treatment using native plant materials. The area is fenced although the fence just disappears within the vegetation. It was originally planted with herbaceous plants but then birds land on the fence and deposit seeds; so now it is a little wetland shrub area. It's designed just like a typical septic system would be designed.

It was designed by an engineer within that agency and in the background to the left you see a building. There are about three to four employees that work out of this facility, and so the septic design is based on that number and how

many hours they would normally use that system. This is the result - a very simple naturalized wetland treatment.

So here's an example of a site design leaving the native plant communities intact to keep an area natural for recreational purposes. This was a project I did when I worked at National Park Service at New River Gorge; I designed a series of small campgrounds. This was the first to be constructed. It had five campsites. If you're ever at New River you can camp there for free - it's a really nice little campground. .

The day labor maintenance folks built this and took great pride in their work. They were establishing nice little rock features and transplanting some ferns from one part of the woods into areas around the kiosk, around the restroom facility, and where there's some picnic tables. It turned out to be a great site and it is well used q by people fishing, boating and enjoying the river in the summer.

As I mentioned, there's a number of these small campgrounds along the river that were designed. It's really important to keep those native plant communities there rather than take them out and then replace them with something else. That way it provides privacy between campsites and really offers the natural beauty of the area.

Another project that I've been involved in, and a subject I've also learned quite a bit about from recent research and PhD effort, is pollination biology. Pollination is critical for national security. One third of our food supply is pollinator dependent - over 80% of native plant species are dependent on pollination for their survival, and the protection of pollinator and plant interactions is critical for national food security and for the sustainable use in plant communities and agricultural crops.

I wrote a guidebook that's entitled, "Sustainable Landscape Designs Utilizing Native Species to Increase Pollinator Habitats". It was written for military bases and it's available through Legacy which has a web site. They feature reports, research and other projects awarded funding through the Legacy program. Anybody can go into the Legacy site and download this information.

The book was focused on ten eco-regions. It offers planting plans for generic footprints of a building, an open space plan, and also a seed mix suitable for each one of the eco-regions that were featured.

The intent of this book is that an military installation would be able to use this to guide to do landscape design or plantings for the purpose of attracting pollinators.

The next project I want to talk about is a really nice example of reuse of dredge materials, with native prairie plant community establishment. The Saint Paul's District supplied me with this case study: they acquired the dredge material from an adjacent waterway, stockpiled the top soil and this was maintained to protect the seed source preventing it from drying out.

The land forms were created to mimic the rolling topography of adjacent sand prairie owned by The Nature Conservancy. Volunteers harvested the seeds from The Nature Conservancy land, and planted onto the rolling topography. The picture on the right is the result of the plant community once established.

This project has been highly successful, now supports the native sand prairie community with over 50 species of herbaceous plants and native grasses. It has been established for seven growing seasons and they use prescribed fire

to restore the natural fire cycle to it because the sand prairie is a fire dependent ecosystem.

This prescribed fire will continue to be used as a maintenance tool in the future to control undesirable species while increasing the diversity within the native plant community.

The next project I want to talk about is a project that was done by the private consulting firms; Anchor, Parsons, Exponent Terrestrial Environmental Specialists, and SUNY The wetland was constructed for the purpose of heavy metal phytoremediation at Nine Mile Creek in New York. This was in conjunction with a number of other restoration projects at Onadaga Lake. The lake is a sacred site to the Native Americans where the first representative democracy between tribal nations was held.

In the 19th century, local industries created many pollution problems. The lake was designated as a super fund site. Since that time it's actually had many large restoration projects to clean up the water and lake shores. This project was part of a series of projects to achieve phytoremediation of heavy metals.

Carbon sequestration is also another function that plants lend and you can see by these statistics globally combined salt marshes and mangroves stores at least 44.6 million tons of carbon per year and this was reportedly an underestimate because details were not available in some regions.

Here is another statistic - the overall carbon sequestration rate on an annual basis is 210 grams of carbon dioxide per square meter per year. Here's the source for that data; plants are able to provide a vast ability to sequester additional carbon in the environment.

Living shorelines and nature based protection from storm surge is also another very important service that plants can provide, particularly at this time of global climate change. Landscape features such as salt marshes, sea grass beds, coral reefs, provide coastal protection from flooding and storm events. This has become a very critical environmental service in many coastal regions because of the increased risk, severity, and frequency of storm events. Salt marshes play a leading role in inner-tidal areas dissipating wave and tidal energy thereby reducing the cost of flood defense measures. They absorb huge amounts of water when inundated and then slowly release it afterwards which can also prevent flooding.

There was a report written by the ERDC labs, by a number of researchers here. It describes nature based features providing shoreline protection study after Hurricane Sandy. It's featured and available on the EWN Web site, and you can download it - It has a lot of interesting data.

Gary Dick and Lynde Dodd who work for ERDC at the Lewisville facility in Texas, which focuses specifically on aquatic plants to improve water quality, reduce sedimentation, and prevent shoreline erosion. I also worked with people from this facility on the Dyess Air Force Base Project. They provided aquatic plants and planting in a treatment pond that was on the Air Force Base.

You can read more about their work starting on page 59 to page 60 in the book. Our environmental lab's Web site features more information and many tech notes on this subject written by the Lewisville facility.

So for a free download of this design manual, you can go to this Web site .
Print it in landscape format and if you copy it to both sides of the paper then it
will print the book as intended.

To conclude this Webinar series I want to add that all literature citations and
additional sources of information are included in the book as well as the
national vegetation classification data form. I hope that the Webinar series
has been inspiring. There's a lot of different techniques, and much can be
done on our Corps lands. You've seen some excellent examples of sustainable
designed projects today.

This is the EWN Web site. You can also go onto the site through the R&D tab
where there'll be a list on the left, with new publications featured. You can
download information there. By the way in this picture on the right hand side
at the bottom - EWN News - that's the report for the Hurricane Sandy nature
based features that I mentioned – and that's available for download as well.

I will be adding a Webpage onto this Web site soon. I really hope that if you
have an interesting case study - something that you've built or are planning or
designing, you could contact me and we could feature your project on this
Web site. We're really hoping to expand the site so that it's a place where
people will look for projects that use native plants incorporated into
sustainable design features.

I'd like to thank Dr. Todd Bridges and Mrs. Cynthia Banks for establishing
the EWN Initiative and also thank Mrs. Banks for providing funding for the
book and Webinar series through the DOTS Program. At this time I'd like to
open it up to questions.

Courtney Chambers: Great. Thank you, Pam.

Operator: All participants are now in interactive talk mode.

Courtney Chambers: Okay, at this time we would welcome your questions. Feel free to unmute your phone line or you can use the chat feature.

I did receive one privately in the chat box here. Of the various models mentioned, have any of these been certified for USACE project use by the Eco PCX or has ERDC reviewed them officially to recommend them to the PCX for certification?

Dr. Pam Bailey: I have not done a model certification on these projects because it's really not what I would consider as a model. They're more like design applications and techniques that you can do with a construction project. However the National Vegetation -Classification -System which is the scientific basis that I use to survey - has been endorsed and adopted by the Corps in terms of methodology. For example look at the "subclass level in the NVCS, that's basically the Corp's inventory level one the Corps has been using for mapping vegetative data. And they have been in the process of adopting further levels within the NVCS for OMBIL.

So in terms of an endorsement to use native plants - we can't grow invasives obviously because they're problematic so that's an endorsement!- This isn't really a model so that I don't have any certification on it, and many projects were completed long before model certification came into existence

Courtney Chambers: All right, thank you Pam. (Steve) if you had a specific model you had in mind there that she mentioned, just let us know which one you were curious about.

(Steve): Thank you. I don't have a specific one at this point but we're in the process of - pardon me - we're in the process of getting certification for a model for a project and it's just - I mean people are familiar with the process. It's complex and it's detailed and it takes a long time and just is a challenge but I support the process entirely. So I just wondered if there was a possibility that ERDC was starting through this process with saying any of these things that could be helpful but like you say, I understand that it's a lot easier if you've got a specific application to start from.

Dr. Pam Bailey: Yes, these are really techniques. They're not a model, although the Hurricane Sandy - that is a model and it probably is undergoing that process. So if you look at that report, that will describe the model.

(Steve): I guess my question is just that - and I don't know if any from - I assume some folks from the PCX are on the line too perhaps today but it seems like a lot of the techniques if you will, that are being assessed are considered models through the Corps process and I don't profess to be all that well informed about the process so I just - I defer to others about what is - what is needed and when that's needed. Thank you. Sorry to interrupt.

Dr. Pam Bailey: No. That's a good question.

Courtney Chambers: And I will just speak from my exposure to other parts of our restoration program. It is understood that in order for you all to use things that come out of ERDC, certification is required. And so from what I've seen that's been much more built into our R&D process as part of the tech transfer. Most of our researchers are working to insure their products are then certified as necessary.

All right, any other questions?

Woman: Yes. Are there examples of using geo-grid or reinforced vegetation systems in arid areas? Is it hard to get self-sustaining plant herbaceous vegetation when it doesn't rain, especially on slopes?

Dr. Pam Bailey: Yes, I think you could use these geo-grid materials there. – You would have to look at grasses that would occur naturally there and then the question becomes you need to find species that aren't impacted by vehicular traffic.

So in an arid area, I'd say that's definitely going to take some research and it's definitely going to be a challenge to get a parking lot or something like that established with those materials. But the geo-grid itself can help stabilize the earthen materials as well, even if there are no plants on it and it will provide greater bearing capacity to whatever those native soils are in that area.

Are there any other questions?

Courtney Chambers: Well while we give another moment for someone to get their thoughts in order for a question, I did type in the Web site for the engineering with nature page because Pam did have it listed in our Web site but you can copy and paste it if you'd like from your chat box here and go look around on the engineering with nature Webpage and again that's where we'll post these Webinars that Pam has shared with us over the last couple of weeks and you'll find her Webinar listed under the resources tab on that page and there's a lot of other neat tools and case studies and things on that page as well for you to check out.

All right, one last call for questions.

All right well hearing none Pam do you have any closing comments for us?

Dr. Pam Bailey: I'm just really glad that I had the opportunity to do the book and also this Webinar series. I really hope that it does inspire people to really consider the beauty of the native plant communities. We have a wide variety across the country on our property, and we have a lot of good natural resources that we can utilize for more sustainable design within the agency.

So I'm really hoping that this will inspire people to really start looking at what they have. They have access to The Nature Conservancy and state-Heritage - Program databases to look at for their areas.. They know what they have for plant communities, – and really that's the basis, then you can incorporate those into designs and into constructed projects. Thank you very much.

Courtney Chambers: Thank you for those resources Pam and I'm sure you - you provided your contact information here so I'm sure you would welcome any questions that people might have on a more specific level.

Okay well participants thank you all for joining us for today and for our earlier presentations in this series. Again check out that Web site and you can share these with other colleagues or maybe catch a presentation that you missed in part one or part two but thank you all very much.

I'm going to be sending your requested PDH certificates for those of you who asked for them within the next - within the week, so be watching for those. And also watch for additional information on future DOTS Webinars from Cynthia Banks here at ERDC. Thank you all very much and I hope you have a good afternoon.

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