Engineering With Nature Using Native Plant Communities Part 1
Moderator: Courtney Chambers
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1:00PM CT

Pamela Bailey: Good afternoon. I'm Pamela Bailey. And I will be presenting an overview, my book, the Design Manual Engineering With Nature using Native Plant Communities.

And as Courtney mentioned with the introduction, design and scientific components are blended together into a holistic approach so this manual is accessible to many people with varied professional backgrounds that work for the Corps of Engineer or the military.

This book was published last fall and in December it was sent to all the Public Affairs Offices across the Corps districts. It is additionally available through the EWN web site and those links will be presented near the end of this presentation.

So native plant communities are assemblages of species that work together in time and space; our lands provide many native plant communities. This webinar series is based on the Design Manual. However, this will feature some additional information in some sections.

It documents the use of native plants to provide engineer and design elements that consider the diverse range of Corps water research projects. And the goal of this webinar series is to describe how to utilize plant communities within the built environment to create sustainable landscapes.

The advantage of this approach is to reduce construction and operating costs, while increasing benefits to the environment.

The manual explores the idea of transforming the way in which native plant communities are thought about and valued by the Corps.

And to set this work into the larger context of Engineering With Nature Initiatives there are the following principles.

To use natural processes to maximize benefits thereby reducing demands on limited resources, minimizing the environmental footprint of projects and enhancing the quality of project benefits, to use science and engineering to produce operational efficiency supporting sustainable delivery of project benefits, to broaden and extend the base of benefits provided by projects to include substantiated economic, social and environmental benefits and use science-based collaborative processes to organize and focus interest, stakeholders and partners to reduce social friction, resistance and project delays while producing more broadly acceptable projects.

So today I'm presenting the Introduction and Design. Next week I'll be presenting Part 2, Science and Planting Techniques, and that will occur on April 8th. That will be followed by case studies presented on April 15th.

Today's part, in the introduction, I will talk about various points such as: why we need to pay attention to our native plant communities, why are native plant communities important within the Corps' mission, how to use plant resources available on Corps lands nationwide, and how to incorporate native plant communities into projects by describing specific tools and techniques to survey, plan, design, construct, maintain and monitor projects.

So plants are often overlooked, however are critical because they provide many ecological goods and services.

As you can see here are lists of provisioning services, regulating services in terms of the environment, habitat services and also cultural services. All these are important and equally so within the arena of how plants impact our lives.

Plants are the basis of all life on the planet providing oxygen we breathe, the food we eat, medicines we need. Each plant species supports insects, birds, animals, other plants and – microorganisms. , and these are relied upon in turn for survival within ecosystems that are intimately connected.

The loss of a single plant species can lead to the collapse of its related food and pollination web affecting many plant and animal species. Thirty-three percent of global plants require a conservation action, and 33% of U.S. plants also require a conservation action.

There are approximately 17,000 species of plants in the U.S., of which 217 are extinct. The Center for Plant Conservation lists 788 plant species that are threatened and endangered according to the recent statistics according to the American Public Gardens Association.

Landscapes with diverse species are far more resilient in the face of stressors such as invasive plants and pests. Therefore conserving diverse and resilient plant communities is critical to ensure that humans and other species can respond and adapt to added stresses brought about by climate change and habitat fragmentation.

So why should the Corps care? The value of native plant communities within the Corps mission are represented by quite a few important factors that are in regard to the Corps' mission, for example providing wildlife habitats and migration routes, the protection of water quality and water supply, production of oxygen and the protection of air quality, the regulation of temperatures and

nutrient cycling, the reduction of sedimentation and erosion into waterways, and commercial uses as I mentioned for food, fiber, medicine, resin, and building supplies.

Other benefits include creating riparian buffers and migration routes, using plants for phytoremediation and site cleanup of abandoned mine lands, to provide stability of coastal, riparian, and lakeshores. Using plants for bioengineering techniques, in the reduction of storm-related impacts, moderation of effects of climate change, and the reduction of operations and maintenance costs such as mowing, pesticide, herbicide, and irrigation.

So now I'm going to switch gears and talk about the design process. There are some basic design principles, as listed.

Unity is obtained by the effective use of components in a design to express the main idea through consistent style and to harmonize the whole sequence is a successive change of visual perspective or spatial transition as one moves through a series of spaces.

Proportion refers to the size of the parts of the design in relation to each other. Rhythm is achieved with the elements of a design create a feeling of motion leading the viewer's eye through or beyond the designed area.

Accent brings attention to the feature by simplifying elements around it in space. Repetition is repeated use of features like plants with identical shape line, form, texture and/or color, and can harmonize the design by simplifying elements.

Variety can provide interest by featuring diversity of design elements for example a flower garden or a riparian forest.

The elements of design as displayed in this and the next slide, there's color, line, patterns of light and shade within the site and the form provided by a particular tree or a focal object; mass such as a mass planting and then perspective which allows the viewer to actually look through the site.

Scale can be provided by plants or built elements within the greater landscape. Texture can also provide interest by contrasting various plant textures together.

Time can be suggested by the use of an old historic planting, or tree, or other historic element within the landscape.

The assessment of needs and constraints are the first step in how you go about designing. The design process is one of continual change based on information, refining the design until all pieces work efficiently together and function as a whole.

Several steps and products define the design process for any design to move forward off paper and into construction.

Major considerations of safety, health and welfare for all the users of a site need to be considered to make it a functioning design.

The first process withindesign is to start with a site assessment, this considers topography and land forms, views in and around the site, and soil. Also the plant communities can be surveyed and identified on site, aspect and hydrology noted.

Manmade aspects such as circulation and transportation routes through and around the site are important factors to consider, as well as built structures and any infrastructure like overhead or underground power lines and other utilities.

Climate considerations are also extremely important aspect. Light and shade patterns, seasonal wind and microclimate conditions and solar gain are very important for creating comfortable living conditions for human and also extremely important in creating successful plantings because plants are driven by light, moisture and temperature.

Within the design process develops a site plan first, followed by a planting plan, grading plan andh specific site details detailing exactly how that site will be put together and constructed.

Construction specifications override any of the plans in terms of legality issues, and they further define how and what kind of materials will be used within the design.

A monitoring plan, and maintenance documents are also necessary parts of a design, to see if the design has adequately worked, and is functioning according to the goals of that project.

This is an example of site plan with a couple typical construction details; a typical tree planting and a typical shrub planting. This site was built and the photograph is of the channel, that you can see within the site plan.

Here's an example of a planting plan. In the planting plan we want to list all the plants to be planted by the common name, the Latin name, and then you can specify how those plants are to be bought and planted. If it's a seed mix, if

it's a containerized plant, bare root, etcetera, as well as any other notes that you may find necessary to convey information to a contractor in order to build the design.

And monitoring is extremely important because as a site develops, maintaining records of species diversity, percentages of cover and other aspects of monitoring will aid in understanding site dynamics.

Important questions to ask yourself in terms of monitoring are: which of the planted species germinated and grew?, what is the overall percentage of planting survivability?, which plants came in from wild sources versus specified plantings?, and what is the percentage of native species versus non-native exotic species. How are treatment techniques working on any invasive species present?

So maintenance is also a critical element of any design. The use of native plants will reduce maintenance costs such as irrigation, mowing, the use of chemicals, herbicides, pesticides, etcetera, and this is a sustainability approach within shrinking maintenance budgets.

Native plants are adapted to a site, therefore they offer greater resiliency genetically to environmental stressors providing more survivability. They can also self-repair, through floral succession. They use of natural processes to maximize benefits thereby reducing demands on limited resources. For example prescribed fire in a fire dependent ecosystem benefits the native plant community, which may eliminate the need for mowing.

There's beauty in naturalized grass and wildflowers , tree and shrub plantings which provide for wildlife and pollinators, and offers a great opportunity to educate the public to appreciate the differences.

So here's the address that you can use to download a copy of the book. An web page will soon be launched with an active link as well.

Additionally you can get it through the EWN web site portal. Go tothe R&D tab, there'll be a list on the left hand side that lists publications, and you can go from there to download a copy of this book..

So if you have a project that you've been working on, or is built and you think is a good example of using native plant communities we're definitely very interested in expanding the case studies and featuring the project on the web site as well as possibly in a future edition of the book.

You can contact me if you have such a project, either directly on the phone or by email. I'm in the global addressbook. I'd really like to thank Dr. Todd Bridges and Ms. Cynthia Banks for creating the EWN Initiative, and of course Ms. Banks for funding this book and webinar series through the DOTS Program. At this time I would like to open it up to questions.

Operator: All participants are now in interactive talk mode.

Pamela Bailey: In the future if anyone has any need for botanical surveys, design or restoration, you can give me a call or email me at this address. And thank you for your participation today.

Courtney Chambers: Wonderful. Thank you very much Pam for your presentation. Okay at this time you're welcome to ask questions by taking your phone off of mute or once again you can utilize that chat feature in the lower right hand corner of your screen once or once we return to the meeting interface. Here we go, one second.

Courtney Chambers: Okay. So now you should be seeing your meeting interface again. And you'll notice the chat box over there.

And many of you have requested PDHs and now is a great time to go and send me your full name and affiliation and email address if you would like to receive a Personal Development Hour.

Okay, let me start with a question we received in the chat box. In the Army Corps of Engineers 3x3x3 process when are the best opportunities to plan such features presuming maybe perhaps in the feasibility and in the (PED) stage? And then also how best to estimate cost and opportunities?

Pamela Bailey: I think the earlier you can actually plan on these in the planning phase because it is best to incorporate it right from the very start.

To be able to acquire the botanical data, you do this within the NEPA process, as part of the assessment and formulation of the project. Then you can use this data through into the design, as well as construction of the project. So there is an efficiency by using the data throughout the process.

Courtney Chambers: Very good, thanks Pam. Okay, would anybody like to take a minute to ask a question over the phone?

While people are thinking, Pam we got another request in the chat to elaborate a little on phytoremediation especially for SWM.

Pamela Bailey: So with phytoremediation, you know, there are a large number of plants that will take up various toxins and pollutants, and the plants are specific to those pollutants.

That process definitely needs some detailed study to be able to pinpoint the right species for the use to clean up particular toxins or pollutants. Like for example within the book, I looked at a septic waste treatment, and the phytoremediation process that can be done with a simple wetland planting based on a designed septic treatment.

For surface mine reclamation, which is an area with detailed emphasis on the plant communities, because those plants are critical to stabilize and adjust the soil chemistry.

- I can't describe thoroughly, the different plants for those various processes, because it's a very complex area of research. , However, there are definitely some wetland plants that lend themselves very well to septic treatment. And there are many native plant communities that can mitigate for many different pollutants.

Courtney Chambers: Very good, thank you Pam. Just a quick reminder if you double check your phone is on mute while we're wrapping up. Thank you. Okay. Let's give another opportunity for questions, any more questions.

Here's another one in the chat box. How do you recommend quantifying reduction in the use of irrigation, mowing and the use of herbicides for skeptical DPW staff? Basically the benefits I guess by - of using native plants to minimize the irrigation, mowing and herbicide use.

Pamela Bailey: Well native plants will adapt themselves and there will be a higher survivability when they're planted. And because they're adapted to the site, they should reduce the need for irrigation. This may or may not be true on arid lands. I think you still would probably have to irrigate to get things

established. I've had some experience of that in lands that have about 10 inches or less of rain per year and irrigation has been necessary..

Courtney Chambers: To get them established.

Pamela Bailey: Yes. . Once they're established after a year in arid situations, maybe two years, then the irrigation can be taken away.

Because of their adaptability, they're able to minimize cost. Now how you quantify that: you can actually look at the cost that it would take to put in these plantings, and record the cost data for the reduced compared to the usual maintenance to get accurate cost. And that varies with factors such as what kind of environment, what kind of plant communities you're putting in, and for what kind of purposes..

Courtney Chambers: Okay, thank you Pam. We are getting some background noise. If you just check your phone on more time to ensure that you're on mute while we ask a few more questions.

I had another question in the chat box Pam that wanted to know if you know of any progress being made to combat invasive plants such as English ivy, ailanthus trees, kudzu etcetera.

Pamela Bailey: Well there's an entire group of scientists here in the Environmental Lab and that's what they do; work on the invasive plant techniques to rid those particular invasive species.

So there's a lot of products that this group has available, like PMIS. There's a lot of data actually about that subject, not only from this lab, but also the

U.S. Forest Service and other agencies who've worked extensively on this issue.

So there's a lot of resources out there to combat those invasive species. In some cases it's chemical control, and in other cases it's biological controls. And there's a lot of different techniques and mechanical controls for those invasive species that can be used.

Courtney Chambers: Have you seen any work or looked at yourself, the ability of native to - what - to reestablish in place of invasive species Pam or any intersection of those two topics in your work?

Pamela Bailey: I have actually seen some invasive plants that are really having a huge impact on the native plant communities. And I have done this by surveying the situation. Those are really important features to always note, because then managers of that property can go back in and determine what treatment is best to rid the particular invasive plant.

So I've entered this arena through the actual identification of those invasive species. Then it's up to the resource managers of the land to actually get rid of those invasive species and monitor those problems.

Courtney Chambers: Right. Okay, thank you. We had another question requesting if you have a source that you prefer for identifying native plants for any specific site that you're working on.

She - the - this participants recognize, there's a lot of good web site, was wondering if you have a preference for plant identification help for a site, for a specific site.

Pamela Bailey: For identification? or for plant materials?, I'll answer both of these.

Courtney Chambers: Okay. I'm not sure myself.

Pamela Bailey: So for the identification there's always state floras which I use in my work when I actually do survey work.

Courtney Chambers: What did you say? I'm sorry, can you say it one more time?

Pamela Bailey: State - floras mainly...I try to get my hands on the regional or state flora that I'm working in. And then I guess the other part of the question would be that - I don't know if that answers the person's question or if there was another (question).

Courtney Chambers: Right. I realize is you need to go to a location or state you're working in. But is that usually on a web site or is it a publication you got to request?

Pamela Bailey: Well there are some publications. and literature citations in the back of this book.

And there's many good web sites out there. But for the floras you can obtain those within your area through a public library or a research facility.

And the other thing that I wanted to say, this is the other possible part to that question, is that for sources of native plant materials I recommended and talked about some other sources within the book that you can take a look at. This includes the Natural Resource Conservation Service Plant Material Centers.

On one of my projects, once I actually knew who was there botanically because I did the survey initially, I decided to put back the dominant plants on the site which I had identified through that survey process. And then I worked with NRCS to harvest those plants on the site before it actually underwent construction.

Those plants were grown out in the Plant Material Center through a contract like a MOA, and a three or four year contract. Then at the end of that time, those plants came back to the site for planting.

So not only did I have the same species I had the same genetic diversity that was planted back onto the site.

And anybody across the country can utilize the NRCS Plant Material Centers. It's a great resource for plant materials and they can actually help you obtain results that you may or may not be able to get through commercial nurseries.

Courtney Chambers: Okay, great information. Thank you, Pam. We had a pretty specific question here. Wondering about when there will be a viable American Chestnut Cultivator that can be planted extensively in their former ranges. Do you know anything about that?

Pamela Bailey: They have heard some mixed things about that. But I can't give you any definitive answer on when that will be. I don't know because that's not my research.

Courtney Chambers: Right, right. Okay. Let's see, any other questions? And you're - again you're welcome to ask Pam over the phone if you'd like. I don't want to rush anyone but not hearing any further questions. Pam do you have any final comments for us today?

Pamela Bailey: I really hope that people have been interested - I'm really kind of curious if this book has made it through their districts, so that people are aware of it.

It was intended to be written to pull people into the subject, by having a lot of nice photographs of native plant communities across the country to garner interest in this subject. It's an important subject; plants have been overlooked in terms of both interest and budgets, and they're basically the fabric that holds ecosystems together. I can't stress enough how important they are and how I really hope that this webinar series will have people really appreciating them and considering them in their projects.

Courtney Chambers: Very good, thanks Pam.

Pamela Bailey: Look forward to the next two weeks.

Courtney Chambers: Great. And we did have one last comment or bit of information. Someone suggested that the Lady Bird Johnson Wildlife Center is also a great source for native plant materials, just another tidbit of information.

But with that thank you very much for sharing with us today Dr. Bailey. And thank you participants for joining us for Part 1 of this series. Our Part 2 is going to be next Wednesday, April 8 and then Part 3 will be once again on the following Wednesday, April the 15th.

Please watch for additional information on these presentations and future DOTS webinars from Cynthia Banks here at ERDC. Thank you very much and have a good afternoon.

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