Report to
STAKEHOLDERS

April 2024

Volume 29 No.2

Edwards AFB pilots a new remediation technology to clean up contaminants

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Report to Stakeholders is a publication of the Air Force Civil Engineer Center, Installation Support Section at Edwards AFB (AFCEC/CZOW). Its purpose is to inform and educate the public, base workers and residents about continuing Environmental Restoration Program efforts on base. It currently has a circulation of 4,000, including about 1,100 subscribers.
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Any comments or questions about the contents of the Report to Stakeholders may be directed to:

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WHAT'S ON THE COVER?

Program manager Jeanette Van Norden (middle) visits with contractors replanting poplar trees as part of a pilot study to treat groundwater contamination at Edwards Air Force Base.

New ERP manager tests poplar trees for site cleanup

Jeanette Van Norden brought a wealth of experience to the environmental team when she joined in April 2022. She earned a bachelor's degree in environmental management through the University of Maryland. Her prior experience includes: four years as an environmental protection specialist; five years as a hazardous materials program manager; six years as a Department of Defense civilian environmental PM for bioenvironmental engineering; and, ten years as a bioenvironmental engineer when she was an Air Force active duty enlisted Airman.

"The Air Force opened many opportunities throughout my career," said Van Norden. "I am constantly empowered to develop and utilize my environmental and occupational health and safety technical knowledge and experience."

HOPING FOR HEALTHY GROWTH: (Left) In September 2022, poplar trees were replanted as part of a pilot study to treat contaminated groundwater. (Right) In March 2023 a second replanting effort was completed. The replantings were necessary because harsh site conditions made it difficult to keep the trees alive.

Two years ago, as a newly appointed environmental restoration program manager for the Edwards Installation Support Section, Van Norden had the opportunity to oversee a remediation technology new to Edwards called phytoremediation, or the use of plants to clean up contaminated environments.

Phytoremediation is a process that treats groundwater contaminants through endophyte-enhanced trees – poplars were used for this study. Endophytes are bacteria or fungi that live in between living plant cells, which aid in breaking down contaminated groundwater and reducing harm to the environment. The study was located within the NASA Armstrong complex and used some of the contaminated groundwater from Site 25, located uphill from NASA.

Van Norden explained that "the objective of the study was to lower concentrations of harmful contaminants such as trichloroethene, also known as TCE, in groundwater by breaking it down into chloride through the tree roots."

Van Norden shared an overview of the study's activities from April 2022 to February 2023 and the lessons learned. The system, which consisted of three trenches, irrigation pipes, and planted poplar trees, was installed from April to May 2022. Baseline sampling was also completed during this time. In June 2022, an inspection found that all trees were growing well and the soil moisture was consistent.

However, in July 2022, an irrigation malfunction caused extensive overwatering in each trench. The overwatering along with poor quality soil amendments caused an increase in salinity that ultimately killed 24 of the 32 trees. Efforts to replant the dead trees and optimize soil conditions were completed in September 2022. Although replanting trees in the fall was not ideal, it was necessary in order to maintain the study's timeline.

Planting in late September was partially successful, and as a result, a second round of replanting was completed in March 2023. In April 2023, an inspection revealed all trees were healthy with no visible signs of pest or disease damage. The poplar trees showed strong vigor with leaf growth emerging and buds extending down the trees. In contrast, by the June 2023 inspection, trees in all three trenches showed signs of salt, wind, and heat stresses, observed primarily through drooping and browning leaves and receding leaf margins. Partial replanting efforts were completed as nine trees with the poorest health were replaced with potted trees with healthy root systems and green leaves, indicating high vigor.

The last inspections were performed in July and August 2023, which revealed that the trees were unhealthy and dying. Samples collected showed extremely high levels of sodium, chloride, potassium, boron and iron. The low survival rate of the trees due to high salt content in the soil, high temperature, low humidity and high winds ultimately led to the decision to terminate the study. Planning for excavation of the trenches commenced in October 2023, and the study site was restored to its initial state in February 2024.

Although the results were not as expected, Van Norden and the project team obtained valuable data and lessons for future success. For instance, the study revealed the importance of planting in early spring as it gives the trees time to establish themselves before cold weather sets in and increases the likelihood the trees will survive. The project team discovered that testing soil compost and requiring current soil data for added amendments is vital. They identified the critical soil characteristics for success are low electroconductivity, high aeration, high water-holding capacity, high organic matter and minimal nutrients.

Additionally, the project team learned that a contained system is sensitive to overwatering, and therefore, installing a pump to manage potential overflow from precipitation and irrigation is important. Necessary improvements to the irrigation system and controls, such as having a localized irrigation timer with automatic shutoff and using light-colored mulch to help maintain shallow soil moisture and reduce soil temperature, were also noted. Remote sensing that provides real-time access to moisture data is instrumental in project management, maintenance and risk mitigation. Lastly, but most importantly, it was observed that the phytoremediation was successful in reducing TCE levels in all trenches. Soil and water data showed that TCE was not detected. According to the study, hybrid poplars have been found to be capable of withstanding brackish, hot conditions at Edwards. Van Norden shared that the Air Force has retained two of the healthy tree stalks at the site and the study results give her optimism about the future of cleanup using phytoremediation.

"This study was not a failure – the results provided valuable information and lessons for improvement," said Van Norden. "I am looking forward to being part of more projects that utilize nature to clean contamination."

RESTORING THE SITE: In February 2024, excavation and final grading of all three trenches to restore the site to its initial state was completed.

Where to find more INFORMATION

Published data and documents related to the Environmental Restoration Program at Edwards are available for public review at three Information Repositories and online at *https://ar.afcec-cloud.af.mil/*. The Information Repositories are located at:

Edwards AFB Main Library
5 W. Yeager Blvd.
Edwards AFB, California
(661) 275-2665
https://edwardsfss.com/library/

Kern County Public Library
Wanda Kirk Branch
3611 Rosamond Blvd.
Rosamond, California
(661) 256-3236
*https://*kerncountylibrary.org/find-hours-locations/

Los Angeles County Public Library
601 W. Lancaster Blvd.
Lancaster, California
(661) 948-5029
https://lacountylibrary.org/lancaster-library/

For questions about documents in the repositories, you may contact Gary Hatch, 412th Test Wing Public Affairs, at (661) 277-8707 or by e-mail at *412tw.pae@us.af.mil*.

General information about the environmental program at Edwards can be found at the following websites:

https://www.edwards.af.mil/About/Environment
https://www.facebook.com/EdwardsEnvMgt

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Restoration Advisory Board Information

The RAB is made up of appointed representatives from communities on and around Edwards AFB, regulators from federal and state agencies and base officials. The board's purpose is to provide a forum for two-way communication between the public and those responsible for environmental cleanup at the base.

The board meets semiannually, rotating meeting locations among communities surrounding the base. The public is welcome to attend. Those who have questions or concerns about cleanup activities at Edwards may contact any RAB member or Gary Hatch, 412th Test Wing Public Affairs, at (661) 277-8707.

The RAB also has its own Facebook site: *https://www.facebook.com/RAB.Edwards/*. "Like" us on Facebook today!

NEXT BOARD MEETING

MAY 16, 2024
5:30 p.m.
Comfort Inn
Mojave, California

RAB Members

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