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Species thrive where tanks drive

GRAFENWOEHR, Germany – Military training areas are well known for their crisscrossing tank trails, disheveled heaps of ruptured earth, and a grab bag assortment of bogs, pits, puddles, and mounds. But in spite of the apparent damage, these areas have been found to provide sanctuary to a diverse and sometimes threatened host of plant and animal species. And now the U.S. Army Corps of Engineers, Europe District, is helping to study why they exist and what can be done to promote these and other vulnerable ecosystems.

Nature likes order. Sometimes. We know down to the minute when the sun will rise and set each day. We know when asparagus is in season and we know why apples don't fall up.

But nature also likes disorder. New life that appears after natural disasters like forest fires and landslides suggest a more irregular natural law – one that isn't as uniformly tidy as we humans like, with our neat rows of corn and our well manicured golf courses and back yards.



Photo by Marlin Sandera
Bufo calamita (Natterjack toad)



Photo by Nathalie Strippe
Gentiana ciliata (Fringed gentian)



Photo by P. Dubois
Oedipoda caerulea
(Blue-winged grasshopper)



Photo by Linda Lee
Aira caryophylla
(Silver hairgrass)



Photo by Anders Ohlsson
Cicindela hybrida
(Brown sand-beetle)



Photo by John Crellin
Teesdalia nudicaulis
(Shepherd's Cress)



Photo by H. Schön
Limosella aquatica (Mudwort)



Photo by Klaus Bogon
Bombina variegata
(Yellow-bellied toad)



Photo by Michael Linnenbach
Corynephorus canescens
(Silvergrass)

These species, some of them “red-listed” on the German endangered-species list, all live in U.S. Army live-fire training areas in Germany, where ruts from roaring tanks and holes from artillery fire create a pock-marked earth. According to several studies, however, they love it there. A new Army study will determine just how detectable ecosystems like these are.

The U.S. Army Europe (USAREUR) discovered that most evidently in places that are used to occasional distress, said Mark Mann, U.S. Army Corps of Engineers, Europe District, environmental project manager. Places like Hohenfels and Grafenwöhr – two of the U.S. Army’s Major Training Areas (MTAs) in Europe – have become vital breeding grounds for diverse biological species that, without the continued disruptions caused by roaring tanks and exploding artillery rounds, would be homeless.

“It seems counterintuitive,” said Mann, who is administering an Installation Management Command, Europe Region (IMCOM-Europe) contract to study the relationship between measuring biodiversity on these training lands through visual cues and through satellite imagery. “But certain species actually flourish in areas that are disturbed.”

The hypothesis behind the estimated three-year study, said principal researcher Dr. Steven Warren from Colorado State University, stems from a realization that biodiversity is decreasing because of the human desire to suppress natural disturbances like forest fires, floods, insect outbreaks, and migrating herds.

“Our world is becoming more and more uniform,” said Warren. But on these MTAs, where non-uniform disturbances in size, shape, duration, frequency, and severity occur sporadically, biodiversity is among the highest densities in Europe.

“Different species, including some threatened and endangered species, prefer different conditions,” said Warren. Some prefer severely disturbed conditions, while others prefer pristine conditions. And because MTAs tend to have a variety of conditions along this spectrum, these lands “appear to provide ideal habitat for a much wider range of species than lands managed more uniformly.”

In fact, some species are called “disturbance-dependent” – a term used to describe

plants and animals that can only thrive in temporary ecosystems free of competing species and predators, such as puddles and ditches created by tanks – because they thrive best in disturbed areas. Eliminate that disturbance, and you may eliminate those species.

This study should be a major advance in curbing the unwarranted criticisms of those who accuse the Army of being a poor steward of the land, Mann said. “There are people ... who say ‘get these old mean ugly Army tanks out of our area. They’re bad, they’re bad, they’re bad. Let the land be natural and everything will be back on balance.’ Well, it’s been theorized that, in some areas ... a little disturbance now and then will allow for variation of habitat.”

USAREUR’s push to maintain native species’ habitats on training facilities comes as a result of the U.S. Department of Defense’s recognition that healthy, diverse ecosystems provide more realistic, sustainable training resources.



Despite the apparent destruction caused by military training activities, military training areas around the world are recognized for their biodiversity and for providing refuge for threatened and endangered species.

“In essence, [USAREUR] is leading the way in understanding the impacts of training on the environment,” said Warren.

The motivation also comes amid growing emphasis of the European Union’s Natura 2000 legislation, which seeks to protect the habitats of threatened and endangered species across Europe and has classified 77 percent of all U.S. Army training lands in Europe as “special areas of conservation.”

“The Natura 2000 legislation assists us by identifying and giving legal status to red list species,” which exist on the MTAs, said Warren. “If the data show an enhancement in the abundance of some of [these species], it will draw more attention to the effort and to the fact that the Army has unwittingly become one of the best stewards of the land to be found anywhere.”

Two threatened and endangered disturbance-dependent species thriving on the Hohenfels and Grafenwöhr MTAs are the natterjack toad and the yellow-bellied toad, both on the World Conservation Union’s “Red List of Threatened Species.”

These species find refuge here not only because of their love for disturbed environments (see Figures 1, 2), but also because their historic natural habitat along rivers where seasonal flooding scoured the flood plains have all but disappeared due to modern flood control and irrigation practices.

Other species, while not endangered or threatened throughout the world, are threatened in these areas because of the risk of vanishing habitats. Studies conducted at former U.S. Army training areas throughout Germany where tanks once roamed show dramatic shifts in biodiversity due to the loss of heterogeneous disturbance. Recently, the German government undertook initiatives at these abandoned Army sites – many now called Nature Protection Areas – to help the disturbance-dependent species by ripping the soil to produce similar markings caused by tank traffic.

Although these activities temporarily promoted biodiversity, Warren advises against establishing any sort of fixed training schedule at U.S. Army MTAs, despite the waning intensity and frequency of land-based training present in a post-Cold War world. “The disturbance should vary in space and time in order to maximize biodiversity,” he said. “This may have serious repercussions for species dependent on frequent large-scale disturbance from force-on-force maneuvers. However, the military should not be in the business of scheduling the nature, frequency or intensity of its training to favor specific species.”

The contract Mann is administering plans to compare field data from 2008 with existing satellite imagery from 2006 and 2007 to study the training areas in three phases. The studies will measure the current rate of change in the structure of the ecosystem – a concept in ecology called succession – to determine if, where, and how quickly the sites are transforming from uncultivated meadows to scrubland to forest.

The intended outcome of this “whole landscape” comparison, Warren said, would be to determine if satellite imagery alone could be used to compare the biodiversity of training areas with surrounding areas around the world.

“The science we are conducting in Germany will eventually pay dividends in the [continental United States military community] as well as build recognition that training impacts can have very positive effects on the ecosystem,” Warren said. This is an exciting opportunity to take the research to the next level.”

These simple charts show that the amount of disturbance in a particular area can greatly affect the representation of disturbance dependent species. Each chart shows a strong correspondence between the amount of surface disturbance in a particular plot of land and the number of disturbance-dependent species present. When possible, the study used similarly positioned and vegetated plots as well as measured each area of disturbance in equal amounts.

Study by Dr. Steven Warren, director and senior researcher for Colorado State University's Center for Environmental Management of Military Lands and Dipl.-Biol. Reiner Büttner, Institut für Vegetationskunde und Landschaftsökologie, April 2006

