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News From the Mandatory Center of Expertise and Design Center

July–September 1997 Vol. 4, No. 3

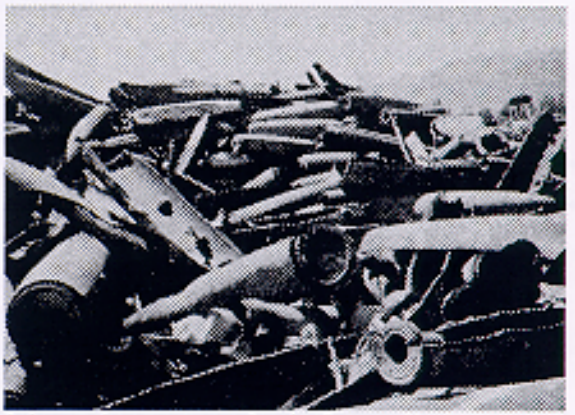
One Fontana site cleared as Army Corps of Engineers continues ordnance cleanup

The Army Corps of Engineers finished cleanup of explosive ordnance at one of two Fontana metal scrap yard sites under investigation where a worker was killed in a UXO accident last March. Specialists working for the Corps searched a yard on Sultana Avenue, finding and destroying eight pieces and fragments of munitions with varying amounts of live explosives.

Although all were relatively small munitions, because they had some explosive charge, they were considered hazardous. The items were cartridge cases from five .50 caliber and one 20mm rounds and two 30mm projectiles.

No other hazardous materials were found at the site.

In clearing the yard, workers searched more than 2,000 10-foot by 10-foot grids and examined some 750 tons of scrap metal. They identified 425 tons of it as scrap ordnance, but only the eight pieces and fragments posed a possible danger to public safety. The workers also had to move about 100 cubic yards of concrete and dirt to get at some pieces of ordnance materials pressed into the soil underneath.



Ordnance pile at a scrap metal yard in Fontana, CA, where a yard worker was killed in an ordnance accident last March. The Corps of Engineers is currently searching the scrap yard for any other UXO that may still remain. Of 425 tons of scrap ordnance, only eight item have been found. The rest has been inert.

Workers also discovered and removed about 20 large pieces, ranging from 500- to 2,000-pound

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Fort McClellan gets jump start on UXO cleanup

The Huntsville Center, U.S. Army Corps of Engineers, and the U.S. Army Training and Doctrine Command will join in a special partnership to remove unexploded ordnance from Fort McClellan, AL.

"I want to give Fort McClellan a jump-start on this program," said Ms. Sherri W. Goodman, Deputy Undersecretary of Defense for Environmental Security. Ms. Goodman made the announcement when she visited Fort McClellan in June to discuss base closure issues faced by the installation. Her visit was part of a three-day meeting held by the Defense Environmental Response Task Force (DERTF).

Hud Heaton, manager of the Ordnance and Explosives Center of Expertise, briefed Ms. Goodman and the task force on the execution of ordnance response actions and technology applications. The Huntsville Center also demonstrated ordnance-locating technologies to DERTF members.

"The new technology allows us to find unexploded ordnance faster and cheaper than we were able to do before. We've been using World War II equipment until now," Goodman said

The executive director of the Fort McClellan Reuse and Redevelopment Authority said that unexploded ordnance is the "biggest obstacle" in remaking the Army training installation into a site that will attract commercial industry. □

Determining the risk assessment code

by Bill McPherson and Richard L. Pike

During the preliminary assessment of a potential ordnance project site, the geographic Corps district generates the risk assessment procedures. Through those procedures, site investigators determine the risk assessment code (RAC) score for each site.

In accordance with MIL-STD 882C and AR 385-10, the RAC score is used by the U.S. Army Engineering and Support Center, Huntsville to prioritize response actions at formerly used defense sites (FUDS). The score is based on information from records searches, reports from explosive ordnance disposal units and local law enforcement agencies, interviews, and field observations from the preliminary assessment phase. RAC information is used to assess risk, based upon *potential* OE hazards identified at the site.

The RAC score is composed of two factors: hazard severity, which indicates the level of damage, and hazard probability, which indicates the potential for exposure.

The hazard severity value is a qualitative measure of the worst credible mishap from exposure to various types and quantities of unexploded ordnance. The higher the value, the more severe the potential mishap. For example, an unexploded bomb carries a hazard severity value of 10, while a round of small arms ammunition carries a value of 1. The value is based on the site's history for each type of munition. The total hazard severity value, then, is the sum of all suspected hazards on a site. That total is used to rank severity within four categories, I through IV, "I" being the most severe.

The hazard probability value indicates the likelihood that a hazard will be created by the presence of ordnence and other factors regarding the ordnance. The higher the value, the greater the likelihood of a mishap. For example, surface ordnance carries a value of 5, while subsurface ordnance carries a value of 2. The total hazard probability level is the sum of all hazard probability values for a site. That total is used to rank probability within five categories, A through E, "A" being the most probable.

After both hazard values are calculated, total hazard probability is then plotted against total hazard severity to determine the final RAC as shown in the table. All RAC 1 sites are then ranked within each RAC band to prioritize sites for funding.

Severity Category	Probability Level				
	Frequent A	Probable B	Occasional C	Remote D	Improbable E
Catastrophic I	1	1	2	3	4
Critical II	1	2	3	4	5
Marginal III	2	3	4	4	5
Negligible IV	3	4	4	5	5

The RAC score is based on hazard severity, which indicates level of damage, and hazard probability, which indicates the potential for exposure. All RAC 1 sites are then prioritized for action.

The RAC is required for all inventory project reports, including sites with no further action, thus providing a permanent record to satisfy congressional intent that a conscientious effort has been made to determine the presence or absence of ordnance.

The risk assessment procedures are outlined in appendix B of draft ETL 1110-1-165, *Procedures for Conducting Preliminary Assessments at Potential Ordnance Response Sites*, which is available on the OE website.

Bill McPherson is a Huntsville Center EOD Safety Specialist. Richard Pike, Quality Assurance Specialist, Ammunition Surveillance, is team leader of the Ordnance and Explosives Archives Search Report Team. □

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practice bombs. Those arebomb casings filled with concrete to approximate the weight of live bombs, but some also have spotting charges—small amounts of explosives that detonate on impact to mark where the bombs actually hit. Casings were blown open to see if there were spotting charges in any of them, but all the bombs were inert. There were no live explosives.

Work is now under way at a second site about a mile away, where the job is more complex—and more dangerous. Work began there on June 5, with technicians wearing protective suits, masks, boots, and gloves because of potentially dangerous chemicals in the soil. Monitoring the first day, however, revealed no detectable amounts of lead or cadmium in the air. Nonetheless, air sampling will be repeated a week later.

This yard is also divided into 10-by-10-foot grids. By midweek 225 of the 870 grids had been checked and cleared, but to investigate the remaining 645 requires heavy equipment to move large items. Workers are going through items that can be moved by hand to make space for the equipment. Because of the larger amount of materials to be sorted through, work on these grids will take longer than the first 225.

The Corps of Engineers' center of Expertise for Ordnance and Explosives in Huntsville, AL, awarded the contract to OES, a civilian firm. Huntsville continues to monitor work progress and provide information and support as needed. Day-to-day safety oversight is being done by the Corps' Los Angeles District.

Los Angeles District Public Affairs Office □

Model-based processing helps new UXO sensors separate ordnance from scrap

by Thomas Bell and Bruce Barrow, AETC, Inc.

Seeking to reduce UXO removal costs, researchers are developing new ways of using UXO sensors to distinguish between ordnance and buried pieces of scrap metal.

As normally used, conventional UXO sensors find a lot more than ordnance. They find pretty much every piece of metal in the ground. This is a serious problem for buried ordnance clearance: roughly 85-95% of the items dug up at a typical site are not ordnance. Researchers are working on technologies to deal with this problem. One promising approach uses a mathematical fitting procedure that identifies subsurface objects by matching electromagnetic induction (EMI) sensor readings to calculated signatures for ordnance items.

The advantage of EMI sensors for ordnance characterization work is that they permit some measure of control over their response to ordnance and other metal objects. Figure 1 shows how an EMI sensor works. A primary transmitter coil creates a time-dependent electromagnetic field that induces eddy currents in a nearby conducting object. The secondary, or induced, electromagnetic field caused by the eddy curents, is measured by a receiver coil. The strength and duration of the inducted field depends on the size and shape of the object. Furthermore, the same object can have distinctly different signatures depending on its orientation.

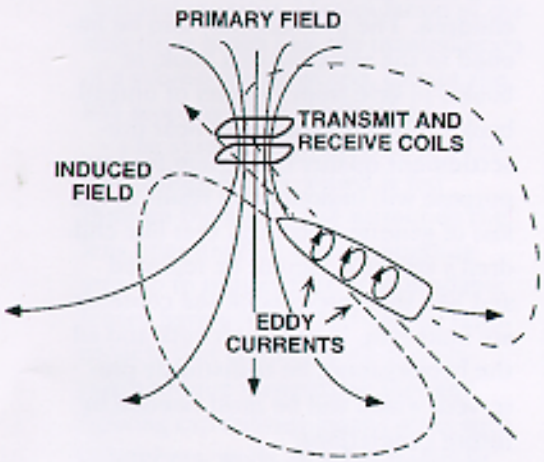

Figure 1. The primary field created by the transmit coil of an induction sensor induces eddy currents in a nearby object. The eddy currents produce a secondary field which is measured by the receive coil.

Figure 2 shows signatures of an M151 rocket warhead for two different orientations: upright and lying flat, aligned along the survey line. The signatures are different because the induced field is much stronger when the primary field is aligned with the rocket than it is when the primary field is oblique or transverse to the rocket. Like most ordnance items, the rocket is long and slender. The signatures of differently shaped objects, such as the odd flattened-out piece of metal, have distinctly different dependencies on orientation.

Those factors can be turned to advantage. The dependencies of the signal on the shape and orientation of the object are mathematically predictable and are being exploited in new model-based data processing techniques for remotely determining the shape of a detected object. The new techniques rely on reconfigured sensors that view the target with several different orientations of the transmit and receive coils. The goal of this work is to be able to identify ordnance items by their shape, and reject signals from other, differently shaped objects. Before the new technology can be introduced in the field, it will have to be thoroughly tested and refined to ensure that no UXO items are erroneously identified as clutter.

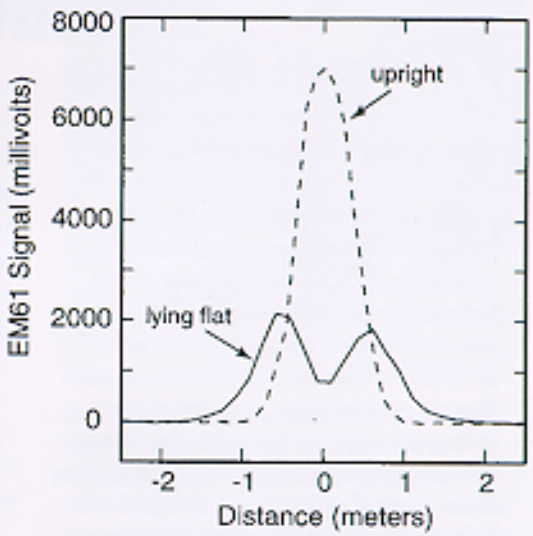

Figure 2. EM61 signatures of an M151 rocket warhead oriented vertically (dashed line) and horizontal, parallel to the survey track (solid line). Data were collected by the Naval Research Laboratory at their Chesapeake Bay facility using the Multisensor Towed Array Detection System.

Drs. Bell and Barrow are with AETC, Inc., which has developed buried UXO location and characterization software for Navy organizations. AETC processing technology was recently used to expedite buried UXO removal activity at the Idaho National Engineering Laboratory. □

Range impact areas harbor native flora and fauna

by John W. Simmers, Waterways Experiment Station

Range impact areas are unique and require careful and enlightened management. Generally, an Army installation's artillery impact area occupies the portion of the installation not considered suitable for buildings. Often, prior to the establishment of the installation, the land was considered unsuitable for farming activities. This means that many of the current impact areas have been relatively isolated from human activities for years. During the "Smokey the Bear" period when fire was withheld from historically fire-dependent ecosystems, the incoming rounds often caused the areas to burn. Because of isolation from man and Eurasian weed species and the periodic presence of fire, the impact area ecosystems preserved and encouraged the native species. One such area, consisting of old farms closed in about 1940, now contains a savanna remnant and wetland with a high percentage of native plant species. Another impact area contains more than 400 native plant species and no Eurasian weeds.

Such impact areas frequently contain quality ecosystems and provide unique habitats for numerous threatened and endangered plant and animal species, and thereby serve as repositories of genetic resources.

Artillery impact area use is highly disciplined. Range control officers closely control the training and monitor the number and kind of rounds fired at each target. Additionally, the target areas occupy only small portions of the total impact area, while the largest portion of the impact area, the buffer zone that surrounds the target area or areas, receives few rounds. Target zones, usually high ground, may be significantly disrupted because of incoming rounds, an accumulation of metal shards from the exploding rounds, targets (often old armored vehicles), and UXO; however, target zones represent only a small portion of the impact area. The buffer portions of the impact area are only occasionally hit by long or short rounds and generally are not significantly characterized by impact craters.

Typically, then, the target zone is a single area or series of small areas where targets are located and most of the incoming rounds land. Surrounding the target zone is an extensive buffer area containing only a few signs of impact and unexploded rounds. The buffer zones have also been known to contain ecosystems of very high floristic quality. The higher the floristic quality index, the greater the number of native species restricted to narrow ecological niches. Ecosystems with very high indices approach presettlement quality and represent areas that have only been subjected to the kinds of disturbance for which the vegetation components have a 'genetic memory.' For example, fire in ecosystems that have historically burned by natural causes or were burned as management by the early native Americans promotes vegetation diversity and an increased floral quality index while mowing, grazing, or farming reduces the vegetation diversity and lowers the floristic quality index. Faunal diversity follows floral diversity, so that an impact area with 400 native American plant species and no Eurasian weeds may have a rich vertebrate population and hundreds of insect and invertebrate species that may not have even been identified.

Because of isolation from man and Eurasian weed species and the periodic presence of fire, impact area ecosystems preserve and encourage native species.

Impact areas combining target areas and buffer zones also have over the years accumulated UXO, much of which may be hidden in the vegetation that has developed. The question of the practicability of UXO cleanup must then be considered. Cleanup procedures within the impact area in locations other than the actual target must be considered in the context of the ecosystems in which the UXO is located. The disruption of an ecosystem of high floristic quality was likened to saving children's artwork by Gardner Brown, Jr. Some children will become artists and their childhood artwork will subsequently become valuable and desirable. The crucial problem is deciding which pictures to save from the vast array of artwork by children. The problem may also be likened to the selection of a book, or books, to save from a library of unread books. The disruption of a near presettlement quality ecosystem for any purpose will undoubtedly result in the loss of genetic resources, that like children's art work, cannot be replaced and like the unread book the contents are unknown. If all the artwork and all the books cannot be realistically preserved, which will be most needed by future generations?

The physical activities such as vehicle and foot traffic, excavation, and

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From a distance: remote video inspection

by Kim Speer, Huntsville PAO

In the field of ordnance and explosives, having the most advanced technological tools available may be crucial to conducting the safest and most thorough investigation possible. The remote viewing inspection (RVI) system is just such a tool because it enables ordnance specialists to make assessments and evaluations of potential ordnance areas remotely. "Based on our ordnance specialists' past experiences and their need for portability, combined with the system's potential use in other areas, we felt this system would best meet those requirements," says Preston Kiss, civil engineer at Huntsville Center's Advanced Technology Branch.

RVI technology is based on the concept of a remote surveillance camera but has been modified into a portable system. The lens can be manipulated through a hand-held device that is attached to the system's scope. The lens is enclosed in a 5/16-inch scope that is part of a 7.5-meter scope, which is in turn attached to a control unit and monitor. Manipulation of the lens tip is much like the manipulation of a submarine periscope, except the RVI scope is more "snakelike."

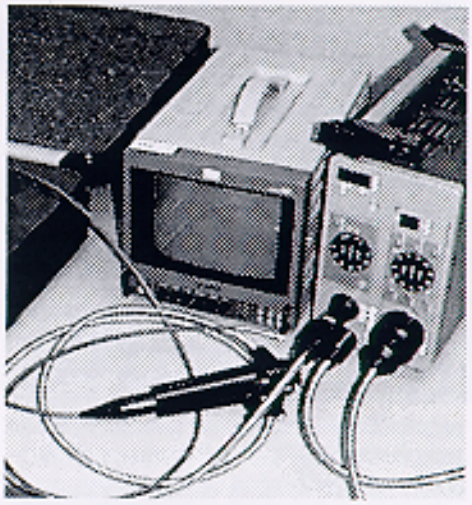
The system's light source is a 150-watt halogen bulb, which is fed through the scope and surrounds the lens, illuminating the surrounding area up to tens of feet. The available lenses have a 60- to 100-degree field-of-view that coupled with the system's unique maneuverability and lighting capabilities means areas such as bunkers, wells, or other poorly lit and confined spaces are easily viewed from a safe distance.

"The system's portability and the ability to change camera lenses and scope lengths make it a versatile tool," said Kiss. "It's one of the best systems in industrial optical equipment, and it's easy to use." Because Huntsville Center specialists travel nationwide, the issue of portability was a factor in the purchase. "The scope and hand operating device are carried in a suitcase, while the control unit, light source, and monitor can be carried in a camera case," said Kiss.

The system's advanced technology includes a light-sensitivity device that ensures proper lighting and adjusts for distance. The system can also be switched from an automatic illumination to a manual illumination mode. According to Kiss, the auto-focus is so advanced, the lens can accurately focus on an object within a range of several millimeters to infinity.

Although Huntsville Center is using a smaller, high-quality monitor to meet the portability requirements, the monitor can also be changed. The system can also be connected to a VCR, so video tapes of areas can be made for study, analysis, or reference.

The system can stand up to the normal wear-and-tear of site use and ensures that an accurate picture is available because it is one of the most technologically advanced systems available. "Many times the picture you saw on earlier versions had dark spots, which were a result of the fiber optics being frayed over time. Our system still uses fiber optics to send the light, but it uses electronic impulses to return the image, so images are processed and displayed clearly, as on any other high quality video," said Kiss. The risk posed by unexploded ordnance, particularly chemical ordnance, means the equipment must be reliable. "The technology used in this camera is the same type of technology used by the medical profession," said Kiss.



The 7.5-meter "snakelike" scope of the remote video inspection system has a lens in the tip, which is manipulated much like a periscope to inspect for ordnance where distance viewing is desirable, as in the case of chemical warfare materiel. The RVI is available through Huntsville Center.

"The remote viewing inspection system is for unique situations," says Wayne Galloway of Huntsville Center. "Particularly when dealing with potential ordnance/chemical warfare materiel sites." According to Galloway, the need to have the technology available is part of good planning. "We've already encountered at least one situation where there was no way to safely evaluate an area without something like the remote viewing inspection system." The system functions almost like a type of insurance. The initial investment can pay for itself when an emergency situation arises. "If you have to totally stop an operation to think of other ways to safely resolve the situation, or attempt to find this type of equipment, you may ending spending more money in the long run."

Galloway and Kiss both emphasize that ordnance and explosives are not the only area for RVI application. Galloway cited the potential for using it

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Camera device speeds UXO identification

by Rick S. Stauber, STI

For a small investment, one UXO contractor found one way to save time when it comes to ordnance identification in the field.

Currently, at any of the hundred ordnance sites scattered across fifty states and various territories, ordnance workers are faced with accurately identifying military munitions items that may be over 100-years old. Even for active-duty explosives ordnance disposal (EOD) technicians, identification of old ordnance can be difficult for various reasons. First, there are countless types of ordnance, both domestic and foreign. Also, ordnance exposed to the elements, subject to frost heave, and undergoing oxidation for years may lose identifying features. Commercial ordnance workers can be further hindered in making identifications, since they do not have direct access to the EODB-60-series publications, the classified documentation of munitions that active duty EOD technicians use.

Often, the ordnance identification process results in various time delays. Current procedures involve taking a photograph and/or drawing a field sketch. With a photograph, you have a hasty run to the friendly 1-hour developer and then to the local FEDEX to send the information to the Safety Office at the U.S. Army Engineering and Support Center, Huntsville. After a review and search of the EODB-60-series publications, a FAX of the unclassified information concerning the previously unknown piece of ordnance is sent back to the requestor.

With modern technology and the use of e-mail, however, I was able to shortened that process considerably.

Available for less than $200, a simple device turns a standard video camera into an unlimited digital camera with the assistance of a 486 computer or better. With that device, an ordnance worker can capture any individual video frame and then send it as an attachment to e-mail, thereby saving time when ordnance needs to be identified in the field. Such technology can also be used to e-mail on-site photographs relating to site reports and other site information quickly and effectively.

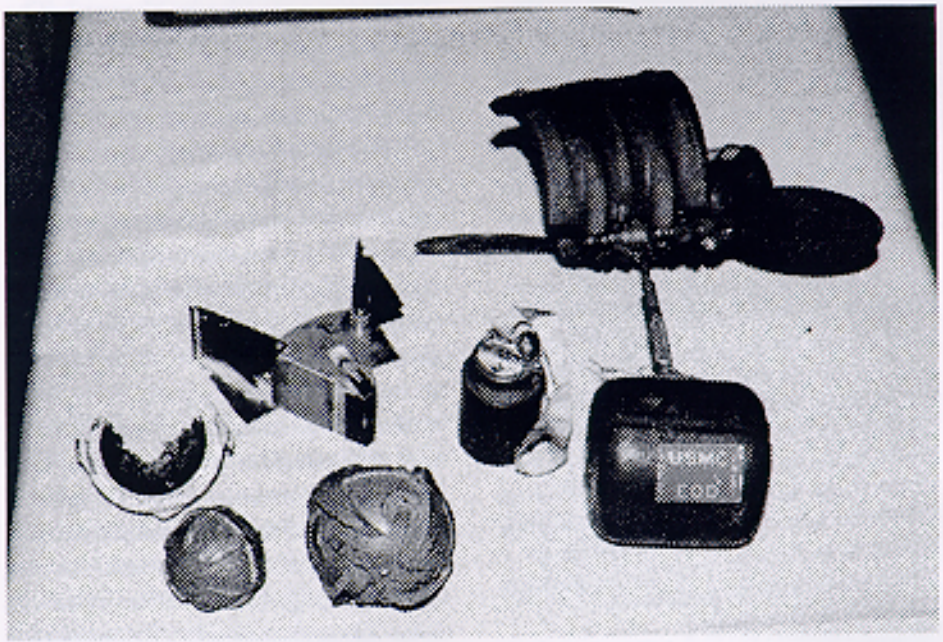
At the Umatilla Army Depot, I used this technology to brief personnel from our Boston and Rockville offices on everything from equipment failures to problems with vegetation. The old adage "a picture is worth a thousand words" has been proven many times with this technology here at the ADA area of the Umatilla Army Depot.

Rick Stauber is a senior supervisor with Search Technologies, Inc. He is a retired master ExplosivesOrdnance Disposal technician with 25 years experience in the ordnance field. Rick's e-mail address is rstaub@ops.geo-centers.com □

RVI *continued from page 5*

for quality assurance checks for construction projects. Kiss noted that Corps environmental specialists had also expressed an interest in using it for their projects. "I'm sure that as more offices learn about this system and the fact we own one, the more requests and ideas there will be for its use at various projects."

Additional information regarding the remote viewing inspection system and other Huntsville Center advanced technology is posted on the Center's web page at http://www.hnd.usace.army.mil/oew/tech/techindx.html. Huntsville Center also offers demonstrations of the RVI system to interested parties. For more information, contact Preston Kiss at 205-895-1889, or e-mail at kissp@smtp.hnd.usace.army.mil.□



Submunitions, such as bomb live units (BLU's), M42's, and M43's are packed inside cluster bombs. One cluster bomb can deliver dozens of submunitions, each of which explodes to inflict injuries on enemy personnel. Munitions were displayed at the Ordnance Familiarization Course during the UXO Forum1997. Hosted by the Department of Defense Explosives Safety Board, this year's forum was attended by over 600 stakeholders, contractors, and scientists working in the unexploded ordnance industry.

Bronze Star for valor awarded twenty-nine years later

by Linda James, Huntsville Center PAO

The Army honored one of Huntsville Center's safety specialists recently for his actions of bravery during the war in Vietnam 29 years ago.

Doug Rhodes, known by friends and family as Dusty, received the Bronze Star with "V" Device for valor in a ceremony during March. The official award citation reads: "Specialist Five Rhodes displayed heroic actions by placing himself at risk by exposing himself to enemy fire to make possible the successful completion of a very dangerous mission."

Rhodes' own account of the events in December 1968 are much more modest. A 20-year Army veteran who served as an ordnance and explosives specialist, Rhodes insists that words like "hero" and "valor" would apply to any soldier in a combat situation, and that he did nothing more than what many others did during that war.

"In those situations, you don't have time to think; you just do what you have to do to get the job done," he said. The "job" in this case was to place a pin in a land mine so it would not explode. Easy enough except that another young soldier was standing on the mine and if he lifted his foot—the mine would detonate. What's more, Vietcong snipers were firing on Rhodes and his team leader as they made their way to the young soldier.

To draw enemy sniper fire, Rhodes moved to an open area away from the soldier on the land mine while his team leader finished rendering the mine safe. Once the soldier could safely lift his foot off the mine, the three soldiers ran for cover and escaped the site by helicopter.

Rhodes was assigned to the 184th Ordnance Battalion, Qui Nhon, only 1-1/2 months before this incident. He finished a 12-month tour in Vietnam and re-enlisted to make his career with the Army. Rhodes retired in 1988 and moved to Huntsville. Since 1992, he has worked for Huntsville Center as a safety specialist. □

Dusty Rhodes, safety specialist at Huntsville Center, received a bronze star for valor 29 years after helping defuze a pressure-release landmine while under fire in Vietnam. Rhodes drew enemy fire to keep others safe during defuzing procedure. Rhodes added this to his other high honors, a bronze star for meritorious service and an Army Commendation Medal for valorous action in Vietnam.

Flora *continued from page 4*

clearing of vegetation necessary for the location and removal of UXO from an impact area ecosystem will be likely to reduce the diversity of the vegetation species just as did colonization by western European settlers. As an example, if a buffer zone of an impact area containing 300 native American species was to be 'cleaned up' in terms of location and removal of all UXO and large fragments of munitions and the site was then 'restored,' the expected number of species remaining and/or successfully reestablished would be about 100. The best restoration successes to date have not resulted in reestablishment of more than about 30% of the native species appropriate to a geographical area.

The site managers and the decision makers must then weigh the consequences of site cleanup for UXO removal and future site usage against the irretrievable loss of species, unique associations of species, and genetic resources. In general, the rich buffer zone ecosystems of impact areas are the result of the range use activities that are currently underway. If these practices stop, and no other changes are made, the ecosystem will gradually change in some ways that cannot be accurately predicted. If preservation is chosen, the decision makers must also weigh the cost of preservation in terms of resources. It costs different amounts to save different species or associations of species and these costs are necessarily ingredients in the preservation decision. The informed decision maker must not disregard this, since a species or ecosystem may be preserved at the expense of losing more than one without knowing the cost of the loss. Within an active military installation or during the closure of an installation, it is critical that the decision makers be accurately informed of the quality of the ecosystems that are present and provided with defensible data describing the installation and the included ecosystems.

Dr. Simmers is a Research Biologist with the Environmental Laboratory, Ecosystem Processes and Effects Division at the U. S. Army Coprs of Engineers Waterways Experiment Station. He conducted the assessment of 23 Army impact areas for white phosphorus contamination, and acquired an appreciation for the uniqueness of the variety of military installation ecosystems and the complexity of contaminant mobility where rare species are closely associated with unexploded ordnance. □

Calendar of Events

- ❑ Munitions Survivability for Force XXI: October 6-8, Tampa, FL. Call 703-533-1820.
- ❑ HAZWASTE World/Superfund XVIII Remediation Conference and Exhibition: December 2-4, Washington, DC. Call 301-986-7800; fax 301-986-4538.
- ❑ Strategic Environmental Research and Development Program (SERDP) Third Annual Symposium, December 3-5, Washington, DC. Call 703-736-4548, fax 703-736-4500.

New Address

OE Homepage

http://www.hnd.usace.army.mil/oew/oewindex.html

POC Joan Burns 205-895-1766

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Input Wanted! What would you like to see in the OE Newsletter? Below, please list any topics that you would like to see covered. We are also seeking authors for feature articles. If you'd be interested in writing an article, please indicate the topic below and give us your name, organization, and work phone. FAX this page to 205-895-1798 or call 205-895-1778.

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Distributed quarterly by the Ordnance and Explosives Center of Expertise and Design Center, *Ordnance and Explosives Environment* is an unofficial newsletter published under the authority of AR 25-30. The purpose of this newsletter is to provide information about DOD ordnance response actions, issues, policy, and technology. Address comments to Commander, U.S. Army Engineering and Support Center, Huntsville, ATTN: CEHNC-OE-MC, P.O. Box 1600, Huntsville, AL, 35807-4301.

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