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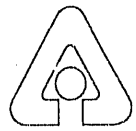
Freihölser Forst Local Training Area Demonstration Project: Prescription Development and Installation

Energy Systems Division
Argonne National Laboratory



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Freihölser Forst Local Training Area Demonstration Project: Prescription Development and Installation

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Abstract

The Freihölser Forst Local Training Area (LTA) Rehabilitation Demonstration Project is part of the Integrated Training Area Management program being developed by the U.S. Army Corps of Engineers' Construction Engineering Research Laboratory for the Seventh Army Training Command of the U.S. Army in Europe. The rehabilitation demonstration project was begun in 1987 to develop and demonstrate rapid, cost-effective methods to stabilize the LTA's barren, eroding maneuver areas and make training conditions more realistic. The sandy, infertile, and acidic soils at the LTA are considered the major factor limiting rehabilitation efforts there. The project involves the evaluation of three procedures to revegetate the soils, each incorporating identical methods for preparing the seedbed and a single seed mixture consisting of adapted, native species but using different soil amendments. All three treatments have satisfactorily reestablished vegetation and controlled erosion on the demonstration plots at the LTA, but their costs have varied widely.

1 Introduction and Background

1.1 Condition of Training Areas in Germany

Although approximately one-third of the U.S. Army is deployed in Europe, the amount of land available for housing and training U.S. military personnel there is very small -- less than 2% of the total land area available to the entire U.S. Army. In addition, most of the combat units assigned to the U.S. Army in Europe (USAREUR) are stationed in the Federal Republic of Germany (FRG). Because of West Germany's strategic location, these units must maintain combat readiness, which requires nearly constant tactical training. Yet the country is densely populated and heavily industrialized. Maneuvers in the countryside are difficult because the land is already intensively used for forestry, farming, and recreation, and because the cost of compensation for maneuver damage is high. This intensive land use has also limited the number and size of military training areas. Several large training areas in Bavaria (e.g., Hohenfels, Grafenwohr, and Waldflicken) and numerous smaller Local Training Areas (LTAs) such as Freihölser Forst receive heavy and almost constant use because so many U.S. and other North Atlantic Treaty Organization combat units use them. Finally, new and improved weapon systems

have changed training doctrines, requiring combat units to operate over larger sectors and engage targets at greater ranges than in the past. All these factors result in very high training pressure (intensity of military use of a training area during a given time period) at all the U.S. training areas in FRG. This intensive and continued use of training areas has damaged or destroyed their vegetative ground cover, which, in turn, accelerates soil erosion. Loss of plant cover and the resultant soil erosion damage the environment, create safety hazards, result in unrealistic training conditions, and can adversely influence the environment of adjacent lands.

Vegetative ground cover that protects and stabilizes the soil is a key factor in maintaining an environmentally healthy, safe, and realistic vehicle training area. This type of cover intercepts raindrops, reducing their impact energy and potential for erosion. Fibrous-rooted plants like grasses bind soil particles, and their multiple stems inhibit sheet and wind erosion. Vegetative ground cover also reduces runoff velocity, which prevents the concentration of overland flow and development of rills. Rills become gullies that get bigger with each storm. Gullies in training areas are safety hazards to vehicles and personnel. Sheet, rill, and gully erosion also produce sediments that are carried into receiving streams and onto adjacent land, degrading it. In addition, a barren, eroded landscape is not a realistic training environment. The most cost-effective method for preventing soil erosion is the establishment and maintenance of a dense, self-sustaining plant cover composed primarily of grasses and legumes.

1.2 Rehabilitation and Demonstration Projects for Training Areas

Several rehabilitation demonstration projects are being sponsored by the U.S. Army Corps of Engineers' Construction Engineering Research Laboratory (CERL). All these projects are part of the Integrated Training Area Management (ITAM) program being developed for the Seventh Army Training Command (7ATC) of USAREUR. The Environmental Division of CERL, located in Champaign, Illinois, is responsible for developing the ITAM program for the U.S. Army. The goal of the ITAM program is to provide the processes and tools needed to support the management programs that enhance resource conservation and training at Army installations. Major thrusts of the ITAM program are to (1) assess environmental conditions and classify training-area use and capacity, (2) integrate environmental concerns with long-term training needs, (3) increase various troops' environmental awareness through educational programs, (4) design and implement a computer-based management and scheduling system adapted to each installation to aid in making land-management decisions, and (5) develop reclamation methods for rehabilitating and maintaining training areas. The revegetation research projects in West Germany are specifically designed to develop the reclamation and maintenance technologies necessary to preserve and extend the use of tactical training areas.

The Freihölser Forst LTA project is one of three rehabiliation and demonstration projects in West Germany being conducted by Argonne National Laboratory (ANL). The two other CERL/ANL training-area rehabilitation projects currently underway in Germany are both at the Hohenfels Training Area (HTA). These are the Range 8C Rehabilitation Demonstration Project (Zellmer et al. 1987) and the Minimal Technologies Application Project, both currently in the monitoring phase. These projects have provided ANL personnel with experience in negotiating

international contracts, translating detailed specifications, working with and supervising German contractors, and with a knowledge of the materials and services available in West Germany.

1.3 Condition of Freihölser Forst Local Training Area

Freihölser Forst LTA is relatively small in size (less than 138 ha, or 341 acres). It is located in an area of intensively managed forests in the Oberpfaltz region of northern Bavaria, about 8 km (5 mi) east of the city of Amberg and close to the Czechoslovakian border. This region contains isolated areas of extremely sandy soils that have an almost dune-like character. Because of the poor water-holding capacity of these soils, they often become droughty, particularly in exposed areas, even during short dry periods. Freihölser Forst LTA is one such area, consisting of a series of sandy ridges and swales. It is characterized by a number of scattered large conifer trees (suggesting the area was probably once forested) and several small forestry plots of younger conifer trees surrounded by large expanses of barren, rutted sand.

The region in which the LTA is located has a humid mesothermal climate, with an average annual precipitation of about 960 mm (37.8 in.). This precipitation occurs mainly as rainfall that is fairly evenly distributed throughout the year. Snow can fall from late October through early April, but the snow cover usually lasts only a few days because of the above-freezing daytime temperatures. Winters are moderately cold, with daytime temperatures averaging about 0°C (32°F) in January. Summers are cool, with warm days and cool nights; the temperature averages 13°C (55°F) during July, the warmest month.

The LTA is heavily used by a unit of the U.S. Army's 3rd Squadron Armored Cavalry stationed at Pond Barracks in Amberg, various FRG Bundeswehr forces stationed in the Amberg area, and units of the German border police. Training facilities include a mortar minirange, a miniature target tank range, structures representing buildings in a village setting for mock attacks against defense positions, tank firing stands, and training courses with pop-up targets. The limited remaining areas are used to practice maneuvers with tanks, armored personnel carriers, and other military vehicles (Fig. 1).

Intensive and continued use of the Freihölser Forst LTA has resulted in severe environmental problems exemplified by the severely eroded, loose, sandy soil (from water and wind) and the resultant complete lack of training realism. Vehicle traffic has almost completely destroyed the natural vegetative cover. Remnants of this cover, consisting of grasses, forbs, and a low-growing heather, can be seen around the bases of some of the large trees and at the edges of the forestry plots. The severe and accelerated erosion created by the lack of vegetation increases the runoff rate and volume, and sediments are carried onto roadways and into adjacent areas, causing further environmental problems. If this condition remains unabated, the LTA will continue to degrade until it becomes a major environmental problem and unusable for effective training.

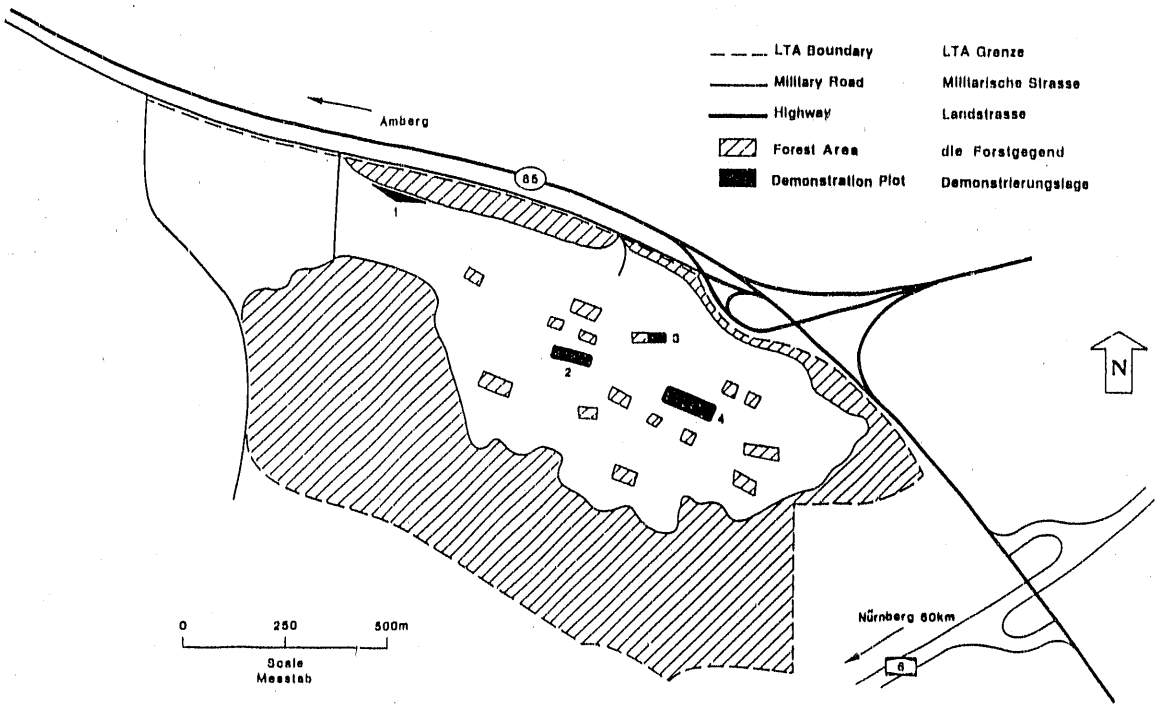

FIGURE 1 Locations of Rehabilitation Demonstration Plots

1.4 Rehabilitation and Demonstration Project for Freihölser Forst Local Training Area

1.4.1 Background and Description

Development of the ITAM program for Freihölser Forst LTA was initiated by USACERL in 1986. USACERL requested the assistance of the Renewable Resources Section (RRS)* of the Energy and Environmental Systems Division at ANL in the development and demonstration of rehabilitation and maintenance methods for the LTA. The RRS at ANL was selected because it had more than 10 years of experience in applied and basic research in land reclamation and it was working on a similar USACERL/ANL training-range rehabilitation demonstration project underway at Fort Carson, Colorado.

The Freihölser Forst LTA Rehabilitation Demonstration Project, begun in 1987, is designed to demonstrate rapid, cost-effective methods for stabilizing barren maneuver areas. The sandy, infertile, and acid soils at the LTA were considered a major limiting factor in the rehabilitation effort. The project involves the evaluation of three procedures to revegetate these soils, each incorporating different soil amendments (fertilizer, chicken manure, or compost) combined with identical seedbed-preparation methods and a single seed mixture consisting of

*Name changed to Reclamation Engineering and Geosciences Section in 1989.

adapted, native species. The three treatments differ widely in cost. The project is designed to have a minimal effect on the primary training mission of the LTA.

1.4.2 Goal, Objectives, and Approach

The goal of the Freihölser Forst LTA project is to develop and evaluate rapid revegetation techniques for sandy soils that will result in the establishment of adequate ground cover to control erosion by water and wind, reduce sediment loads, and improve the quality of water leaving the site. To attain this goal, the following specific project objectives were developed.

- Assess the prerehabilitation conditions at the LTA site.
- Select several plot locations that are representative of soil conditions and slopes at the LTA.
- Collect information on materials for and methods and costs of rehabilitating sandy soils in Bavaria.
- Develop detailed plans and specifications (prescriptions) for revegetating the demonstration plots.
- Implement the rehabilitation prescriptions using a local contractor.
- Evaluate the development of the revegetation plant communities under field conditions using a site-specific vegetation monitoring program.
- Based on monitoring results, develop recommendations for and/or modifications to the prescriptions and transfer this information to personnel responsible for future rehabilitation efforts in Germany.

The LTA project has been divided into two phases. Tasks in Phase I (planning and installation) included the (1) development of a project work plan; (2) collection and analysis of baseline data; (3) selection of study plots; (4) development of contractor specifications for seedbed-preparation operations, soil amendment types and application methods, seeding, and rolling; and (5) supervision of contractor implementation of the specifications. Phase I began in January 1986 when a work plan was developed and a preliminary site evaluation was conducted, and it was completed in June of 1987 when the revegetation treatments were installed.

In Phase II (monitoring), the vegetative ground cover on permanent transects in each of the three replicated revegetation treatment areas will be measured using the point-intercept method (Chambers and Brown, 1983) three times a year (during the spring, summer, and fall) for two or more growing seasons. These vegetation data and field observations will be used to assess the effectiveness of the revegetation techniques.

Results of this study will provide basic information on the soil amendments, seedbed-preparation methods, and seeding methods used. It will also permit estimates of the time required to establish stabilizing vegetative cover on the initially barren LTA. Information from this study can be used as a guide for rehabilitation efforts at training areas in other West German and U.S. installations that have similar soil and climatic conditions.

1.5 Organization of Report

This report describes the planning, prescription development, and installation of the revegetation and demonstration project at Freihölser Forst LTA. It provides a description of the initial five tasks and observations made during installation of the revegetation treatments (Phase I) as well as a brief summary of results to date. A later report will present the results of the monitoring program (Phase II) at the site.

2 Description of Effort

2.1 Development of the Project Work Plan

In January 1986, CERL and the 7ATC asked ANL to review a set of contractor specifications for stabilizing the steep berms around the mortar range and adjacent areas at Freiholser Forst LTA. This review was to include a visit to the LTA site. In addition, personnel from the Directorate of Engineering and Housing (DEH) at 7ATC had expressed concern about the severely degraded conditions that had developed on the maneuver areas of the LTA. Because ANL personnel were already working with 7ATC, CERL, and HTA's DEH on the Range 8C project, ANL was asked to prepare a rehabilitation demonstration plan for the maneuver areas of the LTA.

2.2 Plot Location and Baseline Data Gathering

The Freihölser Forst LTA is located on the south side of Highway 85, approximately 8 km east of Amberg, Bavaria. The LTA is northwest of the intersection of Highway 85 and Autobahn 6 (Fig. 1). The soils at the LTA are essentially structureless sands, which require different rehabilitation approaches than those proposed for the loamy soils at HTA. Therefore, the initial visit included a reconnaissance and evaluation of the entire LTA. Based on data that were gathered on vegetation and topography and observations of traffic patterns and other items that were made during this and several subsequent site visits, 15 potential locations for treatment plots were selected. These treatment plots were to be excluded from military traffic by being surrounded with posts in a manner similar to that used for tree plots. The final treatment and control plots approved by personnel at Pond Barracks were to be located in areas that would have the least impact on the training mission of the LTA.

Four treatment plots, consisting of nine treatment locations (see Fig. 2), and two control plots were proposed for installation at the LTA. The nine locations contained three replicates of three types of treatment (A, B, and C). Two large treatment plots (2 and 4) containing multiple treatments were placed on relatively flat areas on the crest of a hill that was exposed and thus seldom used for maneuvers. Two smaller treatment plots (1 and 3) consisting of single treatments were located next to existing forestry plots. These plots, one of which is on a slope of about 10%, merely extended the area of the tree plots and did not create new obstacles in the open maneuver areas. One control plot was located in an initially barren area at the base of a tank firing ramp; the other was located in an area of moderately disturbed natural herbaceous vegetation next to an existing tree plot.

After the locations for the treatment plots had been selected, soil samples were taken from each location and analyzed for texture, pH, plant nutrients (phosphorous and potassium), and organic carbon to determine organic matter. These analyses confirmed earlier assumptions that the sandy soils of the LTA were strongly acidic, extremely low in plant nutrients, and very low in organic matter. An indurated (and possibly impervious) pan, usually about 15 cm below the surface and characterized by reddish-brown iron deposits, had been observed in eroded areas during the site visits. Based on these data and observations, a detailed rehabilitation demonstration

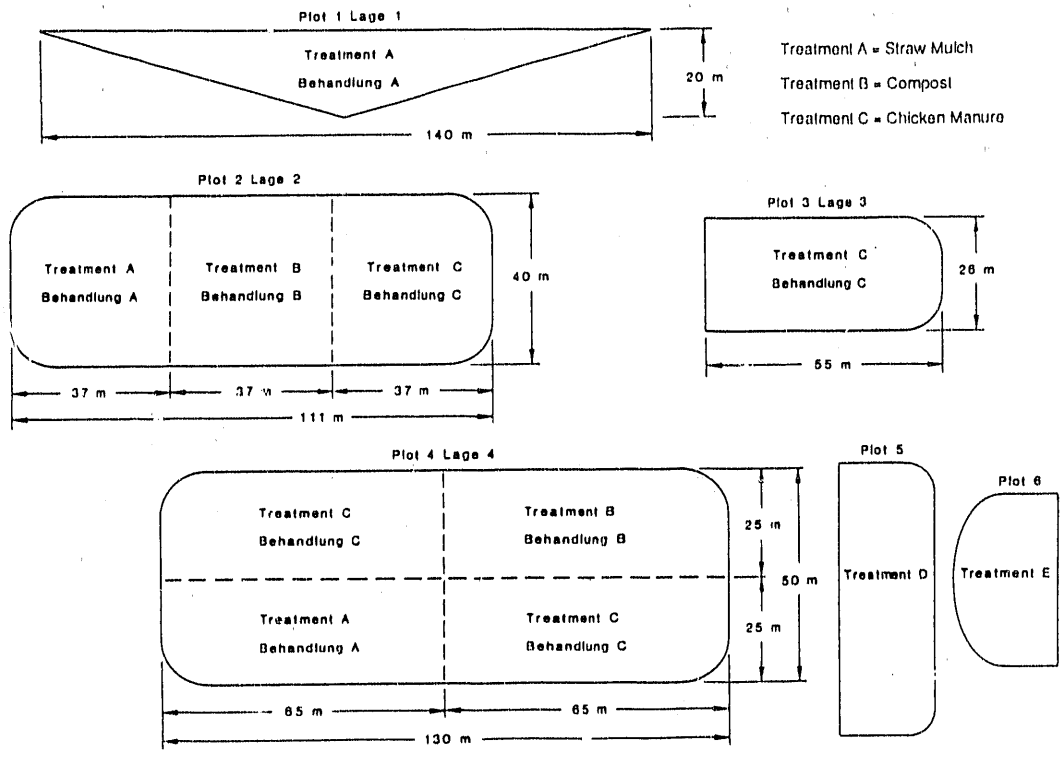

FIGURE 2 Relative Size and Shape of Plots and Treatment Locations

plan for the LTA was prepared. It emphasized the establishment of native, adapted vegetation to (1) bind and stabilize the sandy soil, (2) control erosion by wind and water and gully formation on slopes, (3) reduce the off-site movement of sand and other sediments, and (4) improve training realism at the site. The plan included the preparation of contractor specifications and bid documents for the revegetation operations and the development of a monitoring program to evaluate the progress of the rehabilitation process.

2.3 Preparation of Contractor Specifications and Modifications and Installation of Treatments

Argonne personnel prepared detailed contractor specifications for the revegetation operations based on their (1) evaluation of the baseline data; (2) field observations; (3) photodocumentation; (4) review of information on agricultural and rehabilitation construction techniques used in Germany, the availability of equipment, soil amendments, and seed; and (5) their experience gained on similar projects in Germany and the United States.

The original contractor specifications required three revegetation procedures, each incorporating identical seedbed-preparation methods and seed mixtures but different soil amendments. The resulting three treatments were all designed to produce acceptable vegetative

cover, but their costs differed greatly. The choice of a particular treatment, or modification of it, will depend on the results of the monitoring and evaluation program that is currently under way.

Copies of the complete, original specifications and the bid package are provided in App. A. The five operations that were covered in the contractor specifications are summarized below.

1. Smoothing or leveling and deep tillage of all areas to receive treatments;

2. Installation of Treatment A, consisting of:

   - Fertilization,
   - Seedbed preparation,
   - Seeding,
   - Harrowing to cover the seed,
   - Mulching with straw, and
   - Crimping to anchor the straw; or

3. Installation of Treatment B, consisting of:

   - Fertilization,
   - Application of peat moss,
   - Seedbed preparation,
   - Seeding, and
   - Harrowing to cover the seed; or

4. Installation of Treatment C, consisting of:

   - Application of hen manure,
   - Seedbed preparation,
   - Seeding, and
   - Harrowing to cover the seed; and

5. Installation of plot boundary markers.

Because of environmental concerns and the unavailability of some rehabilitation materials, some parts of the original specifications were amended. The following sections discuss those changes, the reasons for them, and the actual treatments installed by the German landscape contractor, Lafostra of Dorfen. Each treatment was installed at three locations at the LTA (replicates). Figure 1 shows the location of plots at the LTA, and Fig. 2 shows the individual treatments applied to each plot. The treatments were installed in late June 1987.

2.3.1 Leveling and Deep Tillage Operations

The original specifications required all treatment areas to be smoothed or leveled and then deeply tilled to a depth of 30-40 cm. Plot leveling was done with a bulldozer using a front-mounted blade. Deep tillage was accomplished with a chisel plow mounted on a four-wheel-drive, agricultural tractor. The chisel plow had a rototiller and roller attachment that smoothed the soil surface as part of the deep tillage operation. The leveling and deep tillage operations were carried out as originally specified.

2.3.2 Species Selection and Seed Mixture

Criteria for plant species selection included a consideration of their adaptations to regional climatic and site-specific conditions. Even with the adequate and uniform precipitation that occurs in Germany, conditions at the LTA can become droughty because of the poor water-holding capacity of the sandy soil, and this situation was taken into account. Other factors considered were the type of revegetation plant community desired and the use the land would be put to after revegetation. The seed had to be available locally at a reasonable cost. At the LTA, where a resumption of vehicle traffic on the treated areas was anticipated in about one year, a grass-legume mixture was used because of its rapid growth and stand development and good soil-binding qualities. Cereal rye was included in the mixture to provide rapid cover and stabilization. Specific species were selected based on the following criteria:

1. Tolerant of drought,
2. Tolerant of infertility,
3. Adapted to sandy soil,
4. Ability for rhizomatous/vegetative reproduction,
5. Capable of forming sod,
6. Capable of reseeding well,
7. Tolerant of vehicle traffic, and
8. Capability for rapid growth and stand development.
9. The species also had to be approved for use by the Bavarian government.

The seeding rates and mixtures (Table 1) were modified slightly from the original specifications in response to local availability, cost, and the recommendations of the contractor. Because of the degraded condition of the site, the seeding rates were somewhat higher than those for normal plantings.

TABLE 1 Seeding Mixture and Rate Used on All Treatment Areas

Scientific Name	German Names American Names	Broadcast Seeding Rate (kg/ha)	Weight (% of total mixture)
Achillea millefolium	Wiesen-Scharfgarbe Common yarrow	0.9	3.0
Agropyron repens	Kriechende Quecke Quackgrass	6.2	20.0
Bromus inermis	Wehrlose Trespe Smooth brome	4.7	15.0
Calluna vulgaris	Besenheide Scotch heather	0.31	0.1
Dactylis glomerata	Knäuelgras Orchardgrass	1.4	4.5
Festuca ovina	Schafschwingel Sheep fescue	6.9	22.4
Festuca rubra	Auslaufertr. Rotschwingel Creeping red fescue	1.5	5.0
Lotus corniculatus	Hornschotenklee Birdsfoot trefoil	4.7	15.0
Phalaris arundinacea	Rohrglanzgras Reed canarygrass	1.9	6.0
Trifolium repens	Weissklee White clover	2.8	9.0
Total		31.31	100.0
Scale cereale[a]	Roggen Rye	50.0	

[a]Cereal rye is included as a nurse and quick cover crop.

2.3.3 Treatment A (fertilizer and straw mulch)

Treatment A was installed according to the original specifications. Following leveling and deep tillage, dry chemical fertilizer of the slow-release type was applied by hand at a rate to supply 50 kg/ha (45 lb/acre) each of N (nitrogen), P_2O_5 (phosphorus), and K_2O (potassium) plant nutrients. The fertilizer was incorporated into the upper 10 to 15 cm of the soil surface, and the seedbed was prepared using a rototiller mounted on a Unimog vehicle. The grass-legume seed mixture was applied using a broadcast seeder; the rye was seeded by hand. Straw mulch was applied by hand at a rate of 3,400 kg/ha (1.5 tons/acre). The plots were then rolled with a Cambridge disk to anchor the straw mulch in the soil surface layer.

2.3.4 Treatment B (peat moss and fertilizer)

The original specifications for Treatment B called for the application and incorporation of peat moss into the surface soil. However, currently there are environmental concerns about using peat moss in West Germany. Concerned groups contend that the mining of peat is destroying the few remaining moors in Germany. Most of the peat moss available is a product of Eastern Block countries. For these reasons, a composted material was substituted for the peat moss. This material (Edelkompost Humka) is composted food-processing waste with a plant nutrient analysis of about 3% N, 2.9% P_2O_5, and 3.4% K_2O. It was applied at a rate of 10,000 kg/ha (about 4.5 tons/acre). Because of the nutrient content of the compost, no fertilizer was needed. After leveling and deep tillage, the compost was applied to the soil surface using a broadcast spreader mounted on a Unimog vehicle. Because of its moisture content, the compost formed clumps, which resulted in some areas of uneven application. The composted plots were then rototilled and seeded in the same manner as that used for Treatment A, but straw mulch was not applied. The Treatment B plots were also rolled with the Cambridge disk to press the seed into the the soil surface.

2.3.5 Treatment C (hen manure)

Treatment C specifications had originally called for the application of unprocessed hen manure as the major soil amendment. Because of the potential problems with odor, a processed, pelletized hen manure with a guaranteed plant nutrient analysis was used instead. This product (AGRICON) has 3%-5% N, 4%-4.5% P_2O_5, and 3.5%-4.0% K_2O. The processed chicken manure was also applied at a rate of 10,000 kg/ha (4.5 tons/acre). All operations for Treatment C were the same as those for Treatment B, except hen manure was used instead of compost.

2.3.6 Installation of Plot Boundary Markers

Following the installation of the treatments, the boundaries of all treatment plots were marked with wooden posts on 3-meter centers. The posts were provided by the Forstmeister and installed by the contractor.

3 Rehabilitation Costs

Costs, broken down by materials and installation, for the three modified rehabilitation treatments as actually installed by the contractor are presented in Table 2. They include costs for all work and materials necessary for the contractor to complete the work, transporting equipment to and from the site, transporting materials to the site, supplies, handling seed and fertilizer, labor and supervision, and profit. Costs for installation of the plot boundary posts by the contractor were DM 3.80 per post.

Some additional costs were incurred because of unanticipated factors due to the experimental nature of the work. Argonne experience indicates that the cost of applying treatments to small test plots is 25%-50% higher per unit area than the normal cost for similar operations under large-scale, field conditions. The higher cost for experimental efforts is usually related to the need to distribute the costs for equipment mobilization and demobilization over smaller total areas and to the inconveniences that result from treating small, randomly located plots. Therefore, the installation costs for the three treatment methods shown in Table 1 are probably somewhat higher than those that would be expected for the treatment of larger areas. Costs for materials are the prices charged by the contractor and would not be expected to vary with larger operations.

TABLE 2 Costs for Materials and Installation for Various Treatments

Materials and Services	DM/unit	Units/ha	DM/ha	$/acre[a]
Treatment A				
Materials				
Fertilizer (kg):				
N	1.35	50.0	67.50	15.61
P_2O_5	1.35	50.0	67.50	15.61
K_2O	1.35	50.0	67.50	15.61
Straw for mulch (Mg)	200.00	3.4	680.00	157.25
Seed, including rye (kg)	3.15	81.0	255.15	59.00
Installation (ha)				
Leveling and deep tillage	6,200.00	1.0	6,200.00	1,433.77
Application of materials and seedbed preparation	9,600.00	1.0	9,600.00	2,220.04
Total			16,937.65	3,916.89
Treatment B				
Materials				
Compost (Mg)	2,062.50	10.0	20,625.00	4,769.61
Seed, including rye (kg)	3.15	81.0	255.15	59.00
Installation (ha)				
Leveling and deep tillage	6,200.00	1.0	6,200.00	1,433.77
Application of materials and seedbed preparation	7,600.00	1.0	7,600.00	1,757.53
Total			34,680.15	8,019.91
Treatment C				
Materials				
Hen manure (Mg)	3,850.00	10.0	38,500.00	8,903.28
Seed, including rye (kg)	3.15	81.0	255.15	59.00
Installation (ha)				
Leveling and deep tillage	6,200.00	1.0	6,200.00	1,433.77
Application of materials and seedbed preparation	10,130.00	1.0	10,130.00	2,342.60
Total			55,085.15	12,738.65

[a]2.471 acre = 1 ha; $1.00 = 1.75 DM.

4 Site Monitoring

A limited environmental monitoring program was begun at the Freihölser Forst LTA in the fall of 1987 to determine the effectiveness of the rehabilitation demonstration treatments. A major objective of the project is to achieve stabilization of the sandy soil and reduce runoff, erosion, and sedimentation. Low erosion rates are highly correlated with high levels of herbaceous vegetative cover. Plant cover is measured in the ongoing monitoring program by the point intercept method (Chambers and Brown 1983). Replicated sampling transects were established in each of the treatment plots. Plant cover data are collected from the transects three times a year (spring, summer, and fall) and organized by cover category (grass, legume, forb, bare soil, litter, etc.). These data are used to determine and evaluate changes in the revegetation community and in the relative establishment rates of the planted species and to identify the species that seem to adapt best to the conditions at the site. Documented field observations are used to supplement the transect data and to record trends and less obvious occurrences and conditions. This information will be used to refine the seeding mixture for future rehabilitation efforts.

A visual record of site conditions and activities, including slides, photographs, and video tape, is being kept. This record was started before any rehabilitation activities occurred to document the prerehabilitation conditions of the plot areas and the LTA in general and to demonstrate the progress of the treated areas.

5 Results and Future Plans

The rehabilitation demonstration treatment plots at the Freihölser Forst LTA were inspected and vegetative cover and other monitoring data were collected by ANL personnel in June and September 1987 and in April, July, and September 1988. A detailed report on the results and evaluation of the LTA monitoring program is forthcoming. Only a brief summary of the progress of the rehabilitation treatments at the LTA will be presented here.

Based on data and observations to date, and considering all factors, including the July 1987 record rainstorm (which occurred only days after the installation of rehabilitation prescriptions at the LTA), all replicates of the three revegetation treatments have resulted in satisfactory plant cover and stabilization of the soil and are performing as designed. However, considering the large area remaining to be revegetated at the LTA, and the potential for continuing damage that will require repeated rehabilitation efforts, the high costs of the manure and compost amendments are unacceptable. In addition, hand spreading of the straw mulch may not be practical for large areas. These high costs and labor-intensive activities have led us to recommend that the rehabilitation specifications for any additional areas at the LTA should be modified to reduce costs. Other questions that require further evaluation relate to how effective the deep tillage operation is and whether the pan reformed after the ripping operation.

Differences in vegetative growth, species composition, and total ground cover were observed among replicates and treatments, depending on plot location. These differences appear to be related to differences in the amount of (1) plant nutrients in the root zone at the time of planting and (2) soil moisture in the root zone (which is influenced by plot location and topography). The control plot with some natural vegetation has not changed much since monitoring began, and the second control plot (without vegetation) is still essentially barren. This situation indicates that natural revegetation at the LTA is a very slow process.

Several species of natural invading grasses that have promising characteristics as revegetation species (e.g., wiry, stoloniferous growth pattern, rapid growth rate, and high biomass production) have been observed at the LTA, both on and off the treatment plots. Their rate of natural invasion is slow because of limited seed or propagule sources. Volunteer species that have desirable rehabilitation attributes are always good candidates for revegetation seed mixtures because it is certain they are well adapted to site conditions. In managed or agricultural plantings, these species may be considered weeds; however, tough, aggressive plants are what is needed on tank maneuver ranges. The identity of these grasses will be confirmed, and if seeds are available commercially at a reasonable cost, they will be considered for inclusion in future revegetation seed mixtures in Germany.

Original plans called for the rehabilitation demonstration plots at the LTA to be reopened to training traffic in 1988 (after about one year of traffic exclusion). However, the training procedures at the LTA changed, and most of the tactical traffic has been restricted to several training courses consisting of constructed roads and firing positions. There is still some off-road maneuvering, but this change in major traffic patterns has prompted 7ATC and CERL to begin planning and negotiating with ANL to revegetate a large part of the LTA that remains barren.

6 Conclusions

The goal of the Freihölser Forst LTA Rehabilitation Demonstration Project is to develop and demonstrate rapid, cost-effective methods to stabilize the barren, sandy, and infertile soils of the maneuver areas at the LTA. This goal was met by the straw mulch treatment; the compost and chicken manure treatments cost too much. A detailed analysis of the monitoring data and field observations will be used to modify the prescription so it can be used on the remaining barren or damaged areas of the LTA.

Many of the prerehabilitation conditions that had to be altered to accomplish the project goal were identified. Military and other personnel at 7ATC and Amberg became aware of the potential for and benefits of improving the quality and realism of the training environment at the LTA. Regional and site-specific data necessary to plan and implement the rehabilitation project were located, assembled, and documented. Information on native, adapted plant species was assembled. Sources of information about materials (such as the availability and cost of fertilizer and seed) and equipment were identified. All the above information as well as data on the methods used to design the current rehabilitation plan for the LTA are available for future rehabilitation efforts at the LTA and other installations in Germany.

The three revegetation treatments installed at the LTA have resulted in satisfactory plant cover, stabilization of the soil, and improved training realism. The treatments do show what can be accomplished under adverse site conditions. But the real value of the LTA rehabilitation project and its benefit to the ITAM program will be determined in the future. The effectiveness of the various soil amendments, mulch, and composition of the seed mixture must be assessed after renewed military use. Questions on the rate of renewed site degradation, the required frequency of additional rehabilitation, and the influence of these activities on the adjacent environment can only be answered after tactical vehicles resume their use of the treated areas and several years of monitoring have occurred.

References

Chambers, J.C., and R.W. Brown, 1983, *Methods for Vegetation Sampling and Analysis on Revegetated Mined Lands*, U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station, General Technical Report INT-151, Ogden, Utah.

Zellmer, S.D., et al., 1987, unpublished information, Argonne National Laboratory, Argonne, Ill.

Appendix:

Specifications and Bid Package for the Rehabilitation of Freihölser Forst Local Training Area

SPECIFICATIONS

FOR

FREIHÖLSER FORST REHABILITATION DEMONSTRATION PROJECT
FREIHÖLSER FORST LOCAL TRAINING AREA
NEAR AMBERG, WEST GERMANY

English

by

Renewable Resources Section
Energy and Environmental Systems Division
Argonne National Laboratory

May 1987

prepared for

United States Army Corps of Engineers
Construction Engineering Research Laboratory
Champaign, Illinois

NOTICE TO BIDDERS

The following specifications are for the Freihölser Forst Rehabilitation Demonstration Project, Freihölser Forst Local Training Area, Amberg, West Germany. These specifications, drawings, and tables are intended to describe the work required to complete the habilitation effort. The bidder shall take no advantage of any apparent error or omission in the specifications or drawings and the resident engineer shall be permitted to make such corrections and interpretations as may be deemed necessary for the fulfillment of the intent of the specifications and drawings.

Requirements occurring in all sections in the specifications are binding and the size of the areas and amounts of materials within each category are established. For these reasons bidders are advised to examine the site and the rehabilitation specifications carefully before submitting a bid. For access to the site and questions regarding the specifications contact:

Ms. Winifred Hodge

U.S. ARMY CONSTRUCTION ENGINEERING RESEARCH LABORATORY
ATTN: Directorate of Engineering and Housing
HOHENFELS TRAINING AREA
Building 13
Phone: 09472-83-2025 ask for 78

Bidders should submit a single bid price for all necessary supplies and materials, use of equipment, implements and tools, and labor and trained operators, and other associated costs to complete the work described in Section 2.1 (Smoothing or Leveling and Deep Tillages) through Section 2.5 (Seed Mixture). A separate bid should be submitted for the work described in Section 2.6 (Installation of Plot Boundary Markers). Only the cost of installation of the boundary markers (wooden post) should be included in the bid price. The boundary markers (wooden post) will be provided by Argonne National Laboratory. Bids must be submitted in the form of Tables 1, 2, and 3 as shown on pages 3, 4, and 5 of the **bid package.**

In addition, all bids must include the following information:

1. A time schedule for the rehabilitation effort. This schedule must include the starting date of the rehabilitation effort, estimated period of time needed to complete each work section and final completion date.

2. A listing of major equipment and implements that are available and will be used during the rehabilitation effort.

3. A listing of job categories and number of individuals that are available and will be employed on this job.

4. A list of rehabilitation or similar jobs (location, size, type of work involved, name and phone number of person to contact) that have been completed during the past two years by your company.

All of the above items, in addition to the bid price, will be considered in the awarding of the contract.

Sealed bids for the rehabilitation work described in the attached specifications must be received no later than 5:00 pm., Friday, May 29, 1987, by:

Mr. Robert P. Houghton
SSD-PRO 201, Rm. 235
Argonne National Laboratory
Argonne, IL 60439, USA

Argonne National Laboratory reserves the right to reject any and all bids.

CONTENTS

TABLES

DRAWINGS

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SPECIFICATIONS FOR

FREIHÖLSER FORST REHABILITATION DEMONSTRATION PROJECT
FREIHÖLSER FORST LOCAL TRAINING AREA
NEAR AMBERG, WEST GERMANY

1 GENERAL CONDITIONS

1.1 SCOPE OF WORK

The Freihölser Forst Rehabilitation Demonstration Project at Freihölser Local Training Area (LTA), located east of Amberg, West Germany, will consist of revegetating about 1.4 ha using three separate rehabilitation treatments on four separate plots at the LTA. All treatment areas will be smoothed to level the tank tracks and other minor surface irregularities and tilled to a depth of 30 to 40 cm to break a compacted soil zone in the soil subsurface. Different soil amendments (i.e., slow or time release fertilizer, natural peat moss, hen manure) will be applied to the three treatment areas. A soil amendment will be incorporated into the soil to a depth of 10 to 15 cm during seedbed preparation operations. All areas will be seeded with a common seed mixture using a broadcast seeder and lightly harrowed to cover the seed. One of the treatment areas will be mulched with straw and crimped into the soil surface. In addition, this project may include the installation of plot boundary markers (wooden posts) on the perimeter of each treatment areas. The perimeter of two additional, smaller areas may be marked with boundary markers (wooden posts). The boundary markers (wooden posts) will be provided by Argonne National Laboratory and are not to be included in the cost of the project.

Drawings showing the location of the plots on the training area (8C439-FF-2) and the relative shape, size, and treatment areas within each plot (8C439-FF-3) are given on pages 14 and 15 of this document. The plant species in the common seed mixture, amount of seed of each species, and the amount of seed mixture to be applied per hectare is given in Table 1 on page 10 of this document. The total amounts of the various material required for the project are given in Table 2 on page 11 of this document. The total area for each of the various operations required for the project are given in Table 3 on page 12 of this document.

1.2 PROJECT LOCATION AND PROJECT ACCESS

The Freihölser Forst Local Training Area is located approximately 8 km east of Amberg, on the south side of highway 85. This location is also northwest of the intersection of highway 85 and Autobahn 6. The location of the Local Training Area is shown on page 13 (drawing No. 8C439-FF-1) of this document.

Access to and travel on the training area is restricted and controlled. Clearance for entry and travel must be obtained each day from First Lieutenant Mark J. Prusiecki, LTA Project Officer, or his representative (telephone number 09621 700 820).

1.3 SECURITY AND STORAGE

Security of all equipment, materials, supplies, and tools shall be solely the responsibility of the contractor. Loss by theft, vandalism, pilferage, fire, flood, or waste in no way reduces the obligation of the contractor to complete all work described herein. No payment shall be made for lost or damaged materials or equipment. The contractor shall arrange to have all supplies and equipment removed from the LTA and stored off site adjacent to the LTA each evening. Moreover, all bulk materials stockpiled for use as part of the rehabilitation work shall be stored at a convenient location off site. Storage arrangements are to be solely the responsibility of the contractor.

1.4 VEGETATION AND WATER

Contractor shall avoid unnecessary destruction of existing vegetation at the site unless authorized by the resident engineer for accomplishment of work. Construction water and potable water shall be provided by the contractor.

1.5 HANDLING AND STORAGE OF MATERIALS AND CLEANUP

All materials shall be handled and stored in such a manner as to preserve their quality and fitness for the work. The contractor shall at all times maintain the project site in an orderly manner and keep the site free from accumulations of debris, waste materials, or rubbish. At the completion of work, the contractor shall remove from the area all materials, tools, equipment, and rubbish, as determined by the resident engineer.

1.6 CONTRACTOR RESPONSIBILITY

The contractor shall defend, protect, indemnify and save Argonne National Laboratory and the United States Government, its successors and assignees, harmless against any and all claims, demands, and liability of every kind and character for any loss, damage, injury or other casualty to property whether it belongs to either of the parties hereto or to a third person, and to persons, including the parties hereto, their employees and third persons, caused by, growing out of, incident to or resulting directly or indirectly from the activity undertaken by the contractor associated with the Freihölser Forst Rehabilitation Demonstration Project, Freihölser Forst Local Training Area, near Amberg, West Germany.

2 DESCRIPTION OF WORK

The work described here is divided into six sections. The first section describes the smoothing and deep tillage operations that are to be carried out on all the plots. The next three sections describe the various operations and sequence of those operations on each of the three different types of treatment areas located with the various plots. The fifth section describes the requirements for the seed mixture that will be applied to all treatment areas. The sixth, and final section, describes the installation of plot boundary markers (wooden posts).

Individual operations within each of the three treatment areas can be conducted in conjunction with similar operations on other treatment areas or plots. However, the sequence of operations within a given treatment area are to be carried out in the order that the operations are listed in this document. Any change in the sequence of the operations or modification of the operations as described here can only be made with the approval of the resident engineer.

Bidders should submit a single bid price for all necessary supplies and materials, use of equipment, implements and tools, labor and trained operators, and other associated costs to complete the requirements described in the document for Sections 2.1 (Smoothing or Leveling and Deep Tillage) through 2.5 (Seeding Mixture). This project may include the work described in Section 2.6 (Installation of Boundary Marker). A separate bid price shall be prepared for work described in Section 2.6.

2.1 Smoothing or Leveling and Deep Tillage

All treatment areas in all plots (1.4 hectares total) will be smoothed or leveled to fill tank tracks and other minor surface irregularities. All treatment areas will then be deep tilled to a depth of 30 to 40 cm to break and loosen the compacted zone in the subsurface of the soil.

2.1.1 Smoothing or Leveling

Description. Smoothing or leveling shall consist of smoothing or leveling the soil surface to fill all tank tracks or other minor surface irregularities.

Requirements. Smoothing or leveling shall be the initial operation and done on all treatment areas in all plots (1.4 ha). A grader, bulldozer with blade, or similar type implement shall be used to produce a smooth or even soil surface free of tank tracks or other minor surface irregularities.

2.1.2 Deep Tillage

Description. Deep tillage shall consist of tilling or loosening the soil to a depth of 30-40 cm.

Requirements. Deep tillage operation shall be done following the smoothing or leveling operation on all treatment areas in all plots (1.4 ha). A chisel-plow, ripper, or similar implement shall be used to break and loosen the soil to a depth of 30 to 40 cm. Spacing of tines on the chisel-plow or ripping implement shall not be more than 40 cm.

2.2 TREATMENT A

Three separate treatment areas, all of plot 1 and parts of plots 2 and 4, shown on drawing 8C439-FF-3, and totaling about 4500 m^2 (0.45 ha), will receive the following operation after smoothing or leveling and deep tillage operations. Slow or time release fertilizer will be applied to the treatment A areas. A seedbed will be prepared and the areas seeded with the common seed mixture. The treatment areas will then be harrowed to cover the seed with soil. Treatment A areas will be mulched with straw and the straw crimped into the soil surface to prevent windblow of the straw mulch.

2.2.1 Fertilizing

Description. Fertilizing will consist of the uniform application of dry, slow or time release fertilizer.

Requirements. Fertilizing shall be done following the deep tillage operation on the areas receiving treatment A areas totaling about 4,500 m^2 (0.45 ha). The fertilizer shall be of the slow or time release type and be uniformly applied to the treatment A areas by a mechanical broadcast fertilizer spreader. The fertilizer shall be a dry free-flowing type of uniform composition, free of lumps or consolidated fertilizer materials. The fertilizer shall be of a composition and applied at a rate to supply 50 kg of N, 50 kg of P_2O_5, and 50 kg of K_2O nutrient each per hectare. A total of 22.5 kg of each nutrient will be required for this operation on treatment A areas.

2.2.2 Seedbed Preparation

Description. Seedbed preparation will consist of incorporating the soil amendment (fertilizer) into the upper 10 to 15 cm of the soil and preparing a seedbed.

Requirements. Seedbed preparation will be done following fertilizing on treatment A areas, totaling about 4,500 m^2 (0.45 ha). Seedbed preparation consists of rototilling, disk harrowing, or using a similar implement to incorporate the fertilizer into the surface soil to a depth of 10 to 15 cm and to prepare a seedbed free of large clods and a smooth surface before seed application.

2.2.3 Seeding

Description. Seeding shall consist of the uniform application of the seed mixture using a mechanical seed broadcaster.

Requirements. Seeding shall be done following the seedbed preparation on treatment A areas totaling about 4,500 m^2 (0.45 ha). The seed mixture (Table 1) shall be uniformly broadcast on the area using a mechanical seed broadcaster at a rate of 59.0 kg per hectare. A total of 26.6 kg of seed mixture will be required for treatment A areas.

2.2.4 Harrowing

Description. Harrowing will consist of covering the seed with a thin layer of soil using a harrow or similar implement.

Requirement. Harrowing shall be done following seeding on treatment A areas, totaling about 4,500 m^2 (0.45 ha). This operation consists of lightly harrowing or using a similar implement to cover the seed with a thin covering (1 cm or less) of soil.

2.2.5 Mulching

Description. Mulching shall consist of the uniform application of straw mulch by hand or mechanical implement for spreading straw mulch.

Requirement. Mulching shall be done following harrowing of treatment A areas totaling about 4,500 m^2 (0.45 ha). This operation consists of uniformly applying straw mulch by hand or a mechanical implement designed for this purpose. The straw mulch material shall be free of weed seeds and other foreign materials. The straw mulch material shall be applied at the rate of 3.4 Mg* (3400 kg) per hectare (340 g per m^2). A total of about 1.55 Mg* (1550 kg) of straw mulch will be required for this operation on the treatment A areas.

2.2.6 Crimping

Description. Crimping shall consist of anchoring the straw mulch into the soil surface immediately following application.

Requirements. Crimping shall be done immediately following application of straw mulch on treatment A areas totaling about 4,500 m^2 (0.45 ha). This operation shall consist of anchoring the straw mulch into the soil surface using a mulch crimper, straight bladed disk or similar implement to push a part of the straw mulch into the soil surface. The implement used in this operation should NOT till the soil or result in coverage of the seed with soil.

2.3 TREATMENT B

Three separate treatment areas, all of plot 3 and parts of plots 2 and 3 shown on drawing 8C439-FF-3, totaling about 4,500 m^2 (0.45ha) will receive the following operations following smoothing or leveling and deep tillage. A slow or time release fertilizer will be applied to treatment B areas followed by an application of peat moss. A seedbed will then be prepared and the areas seeded with the common seed mixture followed by harrowing.

*1 Mg equals 1,000 kg.

2.3.1 Fertilizing

Description. Fertilizing will consist of the uniform application of dry, slow or time release fertilizer.

Requirements. Fertilizing shall be done following the deep tillage operation on the areas receiving treatment B areas totaling about 4,500 m^2 (0.45 ha). The fertilizer shall be of the slow or time release type and be uniformly applied to the treatment B areas by a mechanical broadcast fertilizer spreader. The fertilizer shall be a dry free-flowing type of uniform composition, free of lumps or consolidated fertilizer materials. The fertilizer shall be of a composition and applied at a rate to supply 25 kg of N, 25 kg of P_2O_5, and 25 kg of K_2O nutrient each per hectare. A total of 11.3 kg of each nutrient will be required for this operation on treatment B areas.

2.3.2 Application of Peat Moss

Description. Application of peat moss will consist of uniformly applying peat moss to the soil surface.

Requirements. Application of peat moss shall follow fertilizing of the treatment B areas totaling about 4,500 m^2 (0.45 ha). Application of peat moss consists of spreading the peat moss in a uniform layer on the soil surface by hand or a mechanical implement designed for this purpose. The natural peat moss shall be free of fertilizer and other foreign materials. The peat moss shall be applied to a depth of 5 cm on the soil surface (50 L per m^2). A total of 225 m^3 (225,000 L) of peat moss will be required for this operation on treatment B areas.

2.3.3 Seedbed Preparation

Description. Seedbed preparation will consist of the incorporating the soil amendment (peat moss) into the upper 10 to 15 cm of the soil and preparing a seedbed.

Requirements. Seedbed preparation will be done following application of peat moss on treatment B areas, totaling about 4,500 m^2 (0.45 ha). Seedbed preparation consists of rototilling, disk harrowing, or using a similar implement to incorporate the peat moss into the surface soil to a depth of 10 to 15 cm and to prepare a seedbed free of large clods and a smooth surface before seed application.

2.3.4 Seeding

Description. Seeding shall consist of the uniform application of the seed mixture using a mechanical seed broadcaster.

Requirement. Seeding shall be done following seedbed preparation on treatment B areas, totaling about 4,500 m^2 (0.45 ha). The seed mixture (Table 1) shall be uniformly broadcast on the area using a mechanical seed broadcaster at a rate of 59.0 kg per hectare. A total of 26.6 kg of seed mixture will be required for treatment A areas.

2.3.5 Harrowing

Description. Harrowing will consist of covering the seed with a thin layer of soil using a harrow or similar implement.

Requirement. Harrowing shall be done following seeding on treatment B areas, totaling about 4,500 m^2 (0.45 ha). This operation consists of lightly harrowing or using a similar implement to cover the seed with a thin covering (1 cm or less) of soil.

2.4. TREATMENT C

Three separate treatment areas, parts of plots 2 and 4 shown on drawing 8C439-FF-3 totaling about 4,700 m^2 (0.47 ha), will receive the following operations following smoothing or leveling and deep tillage. An application of hen manure will be made to treatment C areas followed by seedbed preparation. The areas will then be seeded with the common seed mixture and harrowed.

2.4.1 Application of Hen Manure

Description. Application of hen manure will consist of uniformly applying hen manure to the soil surface.

Requirements. Application of hen manure shall follow deep tillage on the treatment C area totaling about 4,700 m^2 (0.47 ha). Application of hen manure shall consist of spreading hen manure in a uniform layer on the surface by a manure spreader or other implement designed for this purpose. The hen manure shall be free of weed seeds and other foreign materials. The hen manure shall be applied at the rate of 100 Mg* per hectare (10 kg per m^2). A total of 47.0 Mg* (47,000 kg) of hen manure will be required for this operation on treatment C areas.

2.4.2 Seedbed Preparation

Description. Seedbed preparation will consist of the incorporating the soil amendment (hen manure) into the upper 10 to 15 cm of the soil and preparing a seedbed.

Requirements. Seedbed preparation will be done following application of hen manure on treatment A areas, totaling about 4,700 m^2 (0.47 ha). Seedbed preparation consists of rototilling, disk harrowing, or using a similar implement to incorporate the hen manure into the surface soil to a depth of 10 to 15 cm and to prepare a seedbed free of large clods and a smooth surface before seed application.

2.4.3 Seeding

Description. Seeding shall consist of the uniform application of the seed mixture using a mechanical seed broadcaster.

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*1 Mg equals 1,000 kg.

Requirement. Seeding shall be done following seedbed preparation on treatment C areas, totaling about 4,700 m^2 (0.47 ha). The seed mixture (Table 1) shall be uniformly broadcast on the area using a mechanical seed broadcaster at a rate of 59 kg per hectare. A total of 27.7 kg of seed mixture will be required for treatment C areas.

2.4.4 Harrowing

Description. Harrowing will consist of covering the seed with a thin layer of soil using a harrow or similar implement.

Requirement. Harrowing shall be done following seeding on treatment C areas, totaling about 4,700 m^2 (0.47 ha). This operation consists of lightly harrowing or using a similar implement to cover the seed with a thin covering (1 cm or less) of soil.

2.5 SEEDING MIXTURE

A single seed mixture will be used on all treatment areas in all plots. Table 1 gives the plant species to be used, the relative amounts of each species in the mixture, and the application rate per hectare.

2.5.1 Seed

Description. All weights of seed given are for a pure live seed basis (PLS). Pure live seed for each plant species is defined as equal to the produce of percent purity times the percent germination divided by 100.

Requirements. Information on the name and address of the seed supplier, the seed name and variety, germination, purity and weed seed content shall be provided to the resident engineer. Appropriate legume root inoculants will be included in the seed mixtures. Application of seed mixture will be on the basis of pure live seed (PLS).

2.6 INSTALLATION OF PLOT BOUNDARY MARKERS

The effort described in this section may be included as part of the project. Bid price for this section shall be prepared and reported separately from the other sections.

Plot boundary markers (wooden posts) will be installed on the parameter of all plots at 2 meter intervals. Plot boundary markers will also be installed on additional areas not receiving treatment.

2.6.1 Installation of Boundary Markers

Description. Installation of boundary markers shall consist of installing markers (wooden posts) on the perimeter of areas indicated by the resident engineer.

Requirement. Installation of boundary markers (wooden posts) will be done following the completion of all operations with a given treatment area. This operation will consist of installing boundary markers (wooden posts) at 2 m intervals on the perimeter of areas marked by the resident engineer. One

BID PACKAGE

FOR

FREIHÖLSER FORST REHABILITATION DEMONSTRATION PROJECT
FREIHOLSER FORST LOCAL TRAINING AREA
NEAR AMBERG, WEST GERMANY

submitted by

COMPANY NAME _____

_____

ADDRESS _____

_____

TELEPHONE _____

PERSON IN CHARGE OF THIS PROJECT:

NAME _____

TELEPHONE _____

by

Renewable Resources Section
Energy and Environmental Systems Division
Argonne National Laboratory

prepared for

United States Army Corps of Engineers
Construction Engineering Research Laboratory
Champaign, Illinois

May 1987

1

METHOD FOR THE EVALUATION OF CONTRACTORS

A point assignment system has been developed and the bidder with the highest total point count will be awarded the contract. Points will be assigned as follows:

A. **Bid price:** one (1) point for each one (1) percent difference from the average bid price.

([average bid - bid price]/average bid) x 100 = points.

B. **Schedule:**

Starting date: Subtract one-half point (0.5) for each working day after 8 June 1987, (suggested starting date) no points given for starting before 8 June 1987.

Duration of work: Subtract one-tenth point (0.1) for each working day more than 5 working days to complete the project. No points awarded for estimate of 5 working days or less.

C. **Equipment, personnel, and work history:**

Any bidder who does not have the equipment and personnel necessary to satisfactorily complete the rehabilitation effort, in the judgment of the Argonne representative, will be rejected. However, points will be awarded to bidder with above-average equipment, personnel, and contractor history. Information on work history will be developed from telephone interview with persons representing organizations having related work done in the past.

Average contractor record - no points awarded.

1. Has most of the equipment and personnel necessary and available to complete the rehabilitation effort on schedule.
2. Usually completes jobs on schedule.
3. Done acceptable quality work.
4. Has done one (1) or more job related to rehabilitation effort.

Good contractor record - half (0.5) point awarded.

1. Has all equipment and personnel necessary and available to complete the rehabilitation effort on schedule.
2. Completed jobs on schedule.

3. Done above average quality work.

4. Has done several (3-5) jobs related to rehabilitation effort.

Excellent contractor record - one (1) point awarded.

1. Has all equipment and personnel necessary and available to complete the rehabilitation effort on schedule.

2. Has a record of completing job on or ahead of schedule.

3. Done exceptional quality of work.

4. Has done many (more than 5) jobs related to rehabilitation.

Because of the several factors and combinations considered in the area of equipment, personnel, and work history, fractional parts of a point may be awarded. However, no more than one (1) total point can be awarded in this area.

TABLE 1 Bid Sheet for Freihölser Forst Rehabilitation Demonstration Project, Freihölser Forst Local Training Area, Near Amberg, West Germany

COMPANY NAME _____ TELEPHONE _____

Section No.	Description	Quantity	Unit of Measure	Unit Cost	Total Cost
2.1	Smoothing or leveling and deep tillage	1.40	ha	____	____
2.2	Treatment A	0.45	ha	____	____
2.3	Treatment B	0.45	ha	____	____
2.4	Treatment C	0.47	ha	____	____
Bid price (Sections 2.1 through 2.4)					____
2.6	Installation of plot markers - 615		ea	____	____
Bid price (Sections 2.1 through 2.4 plus Section 2.6					____

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TABLE 2 Schedule for the Freihölser Forst Rehabilitation Demonstration Project, Freihölser Forst Local Training Area, Near Amberg, West Germany

Section No.	Description	Starting Date	Number of Working Days
	Project starting date	_____	
2.1	Smoothing or leveling and deep tillage	_____	_____
2.2	Treatment A	_____	_____
2.3	Treatment B	_____	_____
2.4	Treatment C	_____	_____
	Estimated completion date	_____	
	Total number of working days (Sections 2.1 through 2.4)		_____
2.6	Installation of boundary markers	_____	_____
	Total number of working days (Sections 2.1 through 2.4 plus Section 2.6)		_____

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TABLE 3 Cost of Material Required for the Freiholser Forst Rehabilitation Demonstration Project, Foreholser Forst Local Training Area Near Amberg, West Germany

COMPANY NAME_____ TELEPHONE_____

Material	Quantity	Unit of Measure	Unit Cost	Total Cost
Fertilizer (slow or time released)		kg	____	__
N nutrient	34.0	kg	____	____
P_2O_5 nutrient	34.0	kg	____	____
H_2O nutrient	34.0	kg	____	____
Straw mulch	1550.0	kg	____	____
Peat moss	225.0	m^3	____	____
Hen manure	47.0	Mg*	____	____
Seed mixture (Pure Live Seed)	81.0	kg	____	____

*1 Mg = 1000 kg

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EQUIPMENT
COMPANY NAME:_____ TELEPHONE _____

Major equipment and implements to be used on this project:

Description	Type (size, etc.)	Number

7

PERSONNEL
COMPANY NAME:_____ TELEPHONE_____

Job category and number of individuals to be employed on this project:

Job Category	Number

8

WORK HISTORY
COMPANY NAME: _____ TELEPHONE _____

Work history related to rehabilitation efforts:

Location or Name of Project: _____

Size (ha) _____

Type of work (grading, seeding, hydromulch, etc.)

Name of individual to contact: _____

Telephone number: _____

Location or Name of Project: _____

Size (ha) _____

Type of work (grading, seeding, hydromulch, etc.)

Name of individual to contact: _____

Telephone number: _____

DUPLICATE THIS PAGE IF FOR MORE THAN TWO (2) RELATED JOBS.

END

DATE
FILMED
6/19/92