FINAL RESTORATION PLAN FOR THE VERTAC SUPERFUND SITE

Trustees: U.S. Department of Interior
Fish and Wildlife Service

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Introduction

In January 1999 the U.S. Department of Interior under the authority of section 107 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. § 9607 and Section 311 of the Clean Water Act (CWA), 33 U.S.C. § 1321 entered into a Consent Decree regarding releases of hazardous substances that injured natural resources in connection with the Vertac Superfund Site and off-site areas located in Jacksonville, Arkansas, as well as from two related sites: the Rogers Road Municipal Landfill Superfund Site and the Jacksonville Municipal Landfill Superfund Site. The Department of Interior (DOI) is designated as a natural resource trustee and can seek damages for impacts to natural resources under DOI's authority. In the case of the DOI, and more specifically the U.S. Fish and Wildlife Service (FWS), natural resources include migratory birds, anadromous fish, endangered species and their habitats, as well as lands managed by the FWS. In the case of the Vertac settlement, damage to migratory birds and their habitat was the factor for initiating a natural resource damage claim. As a result of the claim and Consent Decree regarding the Vertac Superfund site the settling defendant, Hercules Incorporated, agreed to a $1.0 million dollar settlement which will be used to fund restoration activities ($634,000) and costs associated in assessing injury and extent of damage ($336,000), as well as enforcement costs ($30,000).

This restoration plan presents proposed alternatives and the selection of a plan that is consistent with maximizing the use of restoration dollars with the amount of restoration to benefit multiple natural resources. The goal of this plan is to restore habitat for trust resources which is similar to that damaged by historical on and off-site releases from the Vertac Superfund site.

Location of the Vertac Superfund Site

The Vertac Superfund site is located on Marshall Road in Jacksonville, Arkansas and encompasses approximately 193 acres. Off-site areas that were impacted by release, storage, or improper disposal of materials include the areas adjacent to the site: Rogers Road Municipal Landfill Superfund Site located immediately east of Rogers Road and one-tenth mile south of Graham Road in Pulaski County; the Jacksonville Municipal Landfill Superfund Site, located south of Graham Road in Lonoke County; and the flood plain of, and sediments in, Bayou Meto, Rocky Branch Creek, Two Prairie Bayou, and Lake Dupree.

Vertac Superfund Site History

The initial facilities, on what is now known as the Vertac site, were constructed by the U.S. government in the 1930's and 1940's and used as a munitions complex. In the late 1940's the site was owned and operated by Reasor Hills which initially manufactured the insecticides DDT, aldrin, dieldrin, and toxaphene. During the 1950's Reasor Hills switched production to the herbicides 2,4-dichlorophenoxyacetic acid (2,4-D), 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) and 2,4,5-trichlorophenoxypropionic acid (2,4,5-TP). During this time dioxin was generated as a by-product of the conversion of tetrachlorobenzene to trichlorophenol. During the operation of the plant by Reasor Hills aquatic impacts were noted with the first fish kill documented in 1955 and severe benthic impacts documented in 1961. In 1961, Hercules Powder Company (currently Hercules, Inc.) purchased the property and plant and continued operation which resulted in another fish kill in 1963 in Bayou Meto, which impacted 225 km of its 290 km length. An additional fish kill was documented six months later and Hercules under an order of cease and desist began to discharge their effluent to the Jacksonville sewage plant after pretreatment using equalization basins and neutralization systems. In 1969 Hercules and the city of Jacksonville

constructed a three acre aeration lagoon upstream of the oxidation pond. In 1971 Hercules leased the plant to Transvall, Inc. which produced 2,4-D and limited quantities of 2,4,5-T. Transvall , Inc. continued production through 1976 when the company purchased the property and transferred ownership to Vertac in 1978. The plant operated until 1986 when the company ceased operations and abandoned the facility.

The Vertac facility was added to the EPA National Priorities List (NPL) in 1982 with a Remedial Investigation/Feasibility Study (RI/FS) completed in June 1990 and a Record of Decision (ROD) for the off-site areas signed September 1990. Off-site areas included the active and abandoned sewage collection lines, abandoned sewage treatment plant, active West Wastewater Treatment Plant, and the Rocky Branch Creek and Bayou Meto flood plain and sediments. The off-site ROD was amended September 1996 to change the disposal method for off-site soil and debris. In 1996 the Department of Interior notified Hercules that it intended to assess injuries and losses of natural resources that were suspected to have occurred and were still occurring as a result of the releases from the site. Subsequently, DOI and Hercules entered into settlement discussions.

Determination of Natural Resource Damages Related to Dioxin Releases from Vertac

Existing data and the habitat equivalency analysis (HEA) were used to determine the amount of trust resource habitat impacted by dioxin releases from Vertac. HEA allows for the application of information derived from injury studies to estimate the quantity of habitat needed to functionally replace ecological services lost as a result of damage which in this case was caused by dioxin releases. In the case of Vertac, HEA was used to determine a figure of lost acre-years of service due to injury to a habitat until recovery. HEA was also used to determine the number

of acres of replacement habitat of a certain type that must be provided in order to replace the lost acre-years of service. Using HEA, the FWS determined the amount of off-site habitat needed to compensate for loss of ecological services since 1980 through the date that the FWS predicted Bayou Meto would recover to baseline conditions. Scientific literature was used to predict the time it would take for dioxin levels in sediment and soil to decrease below levels of concern for trust resources. The time of lost services was based on dioxin levels from 1991 and projected based on a two year half-life in sediment and a ten year half-life in soil. To formulate the amount of natural resource damage the FWS divided the Bayou into aquatic and terrestrial areas and used the best available data about levels in the Bayou associated with wood duck injury (White and Hoffman 1995, White and Seginak 1994), impacts on fish and aquatic invertebrate community structure (Heckathorn 1993, Thompson 1994), and literature based assumptions about levels of dioxin that would cause injury to terrestrial birds (Nosek *et al.* 1992).

Criteria for Selection of Restoration Plans

Several restoration options were evaluated to maximize restoration opportunities for trust resources. Criteria used in evaluating each restoration plan are as follows:

1. Restoration of habitat that would benefit trust natural resources impacted by dioxin releases from the Vertac site.

2. Assess the relationship of restoration costs to maximizing benefits to natural resources (cost effectiveness).

3. Proximity to established Bird Conservation Areas since natural resource damage was linked to migratory birds and their habitat.

4. Likelihood that restoration activities are successful and can be completed within a reasonable time frame.

5. Consideration of the risk that restoration activities may have on additional natural resource damage.

Restoration Options for Consideration:

Alternative 1: Restore aquatic and riparian resources by excavation of contaminated sediments from the Bayou Meto stream channel and incinerate the materials off-site. Based on the level and extent of contamination approximately 30 to 35 miles of Bayou Meto would need to be excavated with the removal of approximately 660,540 cubic yards of sediment, assuming an average channel width of 75 feet and an average depth of 18 inches for removal of contaminated sediments. The advantage to alternative one is that all contamination would be removed from the site, mitigating the risk of fish and wildlife exposure to elevated dioxin levels. In addition the contaminated sediments would be destroyed via incineration. Two major disadvantages of this alternative is the cost and damage to Bayou Meto if contaminated sediments were excavated. Costs would be related to the haul road which would require construction to the bayou. In addition, the vertical and horizontal delineation of contamination would be required to determine areas that require removal and to verify clean-up once excavation is complete. The construction of haul roads and excavation of sediment would also cause a large amount of physical habitat damage to Bayou Meto and the surrounding area. In addition excavation would resuspend sediments and increase availability of dioxin for transport and incorporation into the food chain.

Alternative 2: Isolate the contamination in-place with the use of a gravel layer which would be deposited using a hopper barge. An advantage of this approach would be that the determination of the vertical extent of contamination would not be required. Disadvantages of this alternative relate to potential high costs and further damage to Bayou Meto. The use of gravel would be expensive as well as the construction of haul roads which would be required for access purposes. The addition of gravel may also exacerbate damage to the bayou by suspending contaminated

sediment and affecting benthic fauna that support fish and wildlife in the bayou. The use of gravel may not isolate contamination especially during times of potential high flow velocities. Finally a survey to verify cover of contaminated sediments would be difficult to perform.

Alternative 3: Use double layer woven fabric revetment mats to cover contaminated sediments. The fabric forms are placed on the areas that require protection and are filled with a fine aggregate concrete which is pumped onto the forms. This alternative would reduce the level of sediment disturbance compared to the use of gravel and would not require determining the vertical depth of contamination. However use of revetment mats would be more expensive than gravel and would also require the construction of haul roads and the sloping of channel sides. The construction of haul roads would cause habitat damage to the area surrounding Bayou Meto while the use of concrete in Bayou Meto would cause severe biological impacts to the benthic fauna and primary production which would subsequently impact fish and wildlife that use the bayou.

Alternative 4: The contaminated sediments would be excavated with a small suction dredge and consolidated along a reach of the bayou. A new channel would then be constructed adjacent to the consolidated area. This alternative would consolidate contamination at a central location and also create a channel free from contamination. This method would be cost prohibitive because the extent of contamination would need to be verified and would require the excavation of a new channel at the consolidation site. In addition the bayou would have to be large enough to support a floating dredge. Biological damage would also occur during the dredging process due to the suspension of contaminated sediments which would be available for transport and introduction into the food chain.

Alternative 5: Excavate a new channel adjacent to the existing bayou and stockpile the excavated

soil between the new channel and bayou. Once the bayou is diverted to the new channel, the excavated soil could be used to fill the existing channel. The advantage of this approach is it provides a new clean channel, however, the approach is limited due to the feasibility of creating a new channel at bridge crossings. In addition, excavating a new channel would require the construction of a haul road which would increase costs in addition to the costs of creating a new channel. From a biological perspective the disruption of habitat with the construction of roads and a new channel would cause large amounts of physical disturbance throughout the length of the bayou.

Alternative 6: No direct intervention to remove contaminated sediments or physically alter the bayou. The major advantage of not disturbing contaminated sediments from the bayou is that the risk of reintroducing dioxin into the food chain through resuspension of sediments is minimized and the physical disturbance to the habitat is avoided. In addition restoration dollars can be used to restore larger areas of habitat not impacted by contamination and requiring costly clean-up procedures. The disadvantage of not removing contaminated sediments is that dioxin contamination would persist in the bayou. While contamination still exists in the bayou, fish tissue data has shown that dioxin levels are decreasing (FTN 1996, Johnson *et al.* 1996) and levels should continue to decrease if bed sediments are not disturbed within the bayou.

Selection of Restoration Plan

After careful consideration of all the alternatives relative to the criteria used in the selection process, the decision of no direct intervention was selected. The high cost of implementing alternatives one through five, and their potential for additional chemical and physical environmental damage to Bayou Meto were the deciding factors in allowing dioxin levels to

naturally attenuate. In addition recent data has shown that dioxin fish tissue levels are declining and should continue to decline if bed sediments are not disturbed.

The next step in the selection of the restoration options was to select areas for restoration that would have the greatest benefit to natural resources in proximity to a ecosystem similar to the one at Bayou Meto. Conservation areas were identified by the FWS, Arkansas Game and Fish Commission, and the Mississippi Alluvial Valley Migratory Bird Initiative (MAVMBI). The MAVMBI is a cooperative effort involving federal and state agencies, private conservation organizations, universities, and private corporations to identify Bird Conservation Areas (BCA), which are critical sites for reforestation to benefit migratory birds (Mueller *et al.* 2000). The identification of BCA's in Arkansas is part of a larger effort to identify bird conservation areas within the seven state Mississippi Alluvial Valley. Sixteen potential restoration sites were identified on national wildlife refuges, BCA's, and areas proposed for acquisition by the Arkansas Game and Fish Commission (Table 1).

Table 1. Possible habitat restoration projects using funds from the Vertac Superfund settlement.

Project	*Type*[1]	*Relative Location*[2]	*Size (ac.)*	*Land Purchase (ac.)*[3]	*Reforestation (ac.)*	*Water Mgt.*
White River North	BCA	30	232,963	OK	232,963	?
Bald Knob	NWR	30	2,000	240	2,000	Yes
Cache River	NWR	35	8,850	8,850	3,000	Yes
Raft Creek	AG&FC	30	2,806	2,806	No	No
Bayou Meto	BCA	35	23,524	OK	23,524	No
Big Ditch	BCA	32	2,693	OK	2,693	No
Overflow	BCA	120	9,589	OK	9,589	No
Overflow	NWR	120	6,000	6,000	5,000	Yes
Rainy Brake	BCA	90	18,379	OK	18,379	No
Brandywine	BCA	110	20,027	OK	20,027	No
Oakwood	NWR	60	3,000	3,000	500	Yes
Felsenthal	NWR	110	?	?	?	?
Sunken Lands	BCA	120	35,361	OK	35,361	No
Portis	AG&FC	120	5,300	5,300	300	No
Black River	BCA	130	?	OK	Yes	No
Mill Lake	AG&FC	130	460	460	255	No

[1] BCA = Bird Conservation Area. These areas were identified by the Mississippi Alluvial Valley Migratory Bird Initiative as critical areas for reforestation to benefit forest breeding birds . NWR = Implemented on or adjacent to National Wildlife Refuges (USFWS managed lands). AG&FC = Land acquisition areas proposed by the Arkansas Game and Fish Commission in planning not associated with Vertac.

[2] Distance in miles from the intersection of State Highway 70 and Bayou Meto.

[3] OK = Land purchases are one acceptable method of implementing the project. Easements could also be used.

Of the sixteen possible areas identified, the Bald Knob National Wildlife Refuge (BKNWR) was selected for the following reasons:

1. The refuge was established to improve waterfowl and other wildlife habitat, therefore

long term management for these purposes is assured.

2. BKNWR lies within 30 miles of the Vertac Superfund Site which is a small distance for migratory birds (Figure 1).

3. Will be able to establish a large patch of forest and wetland habitat which meets the requirements of migratory birds.

4. The refuge is federally owned therefore all of the restoration money can be spent on habitat improvement as opposed to purchasing property which would not be as cost effective.

5. The refuge is contained within a Bird Conservation Area (BCA) (Figure 1).

6. The refuge lies within the Mississippi Flyway and is a site in Arkansas that is helping to meet the habitat conservation goals of the North American Waterfowl Management Plan, which is an international effort to increase and protect waterfowl populations.

7. The refuge serves as a preserve for wintering habitat of lesser snow geese, Canada geese, mallards, northern pintails, blue-winged teal, and wood ducks, which are some of the species of birds injured by releases from the Vertac Superfund Site.

8. Accelerates the implementation of reforestation and water control measures that were scheduled to occur at BKNWR.

Proposed Restoration Plan for Bald Knob National Wildlife Refuge

The habitat restoration plan on BKNWR has two elements:

1. Reforestation of approximately 2,000 acres of bottomland hardwood wetland habitat

2. Installation of a large water control structure which will allow refuge managers to restore the flooding regime that existed before local and regional flood control programs were implemented.

Reforestation efforts using the Vertac settlement are consistent with past reforestation efforts on the BKNWR as well as projected 2001 reforestation projects (approximately 623 acres) using funding sources other than the Vertac settlement (Figure 2). Areas on the refuge that have been selected for reforestation are previous bottomland hardwood lands that were cleared for

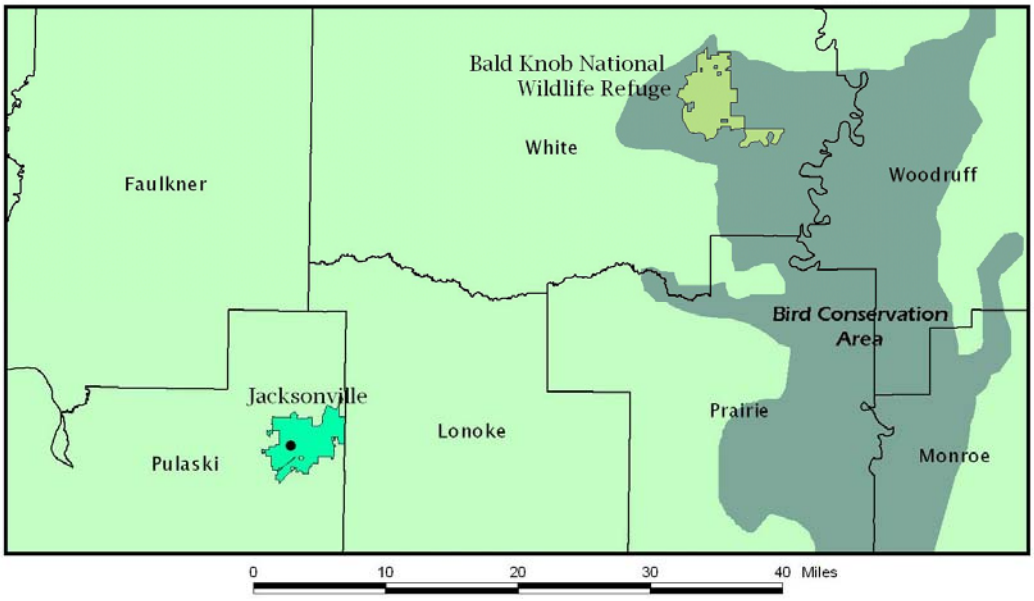

Figure 1. Location of Bald Knob NWR in relation to the Vertac Superfund Site in Jacksonville and Bird Conservation Areas.

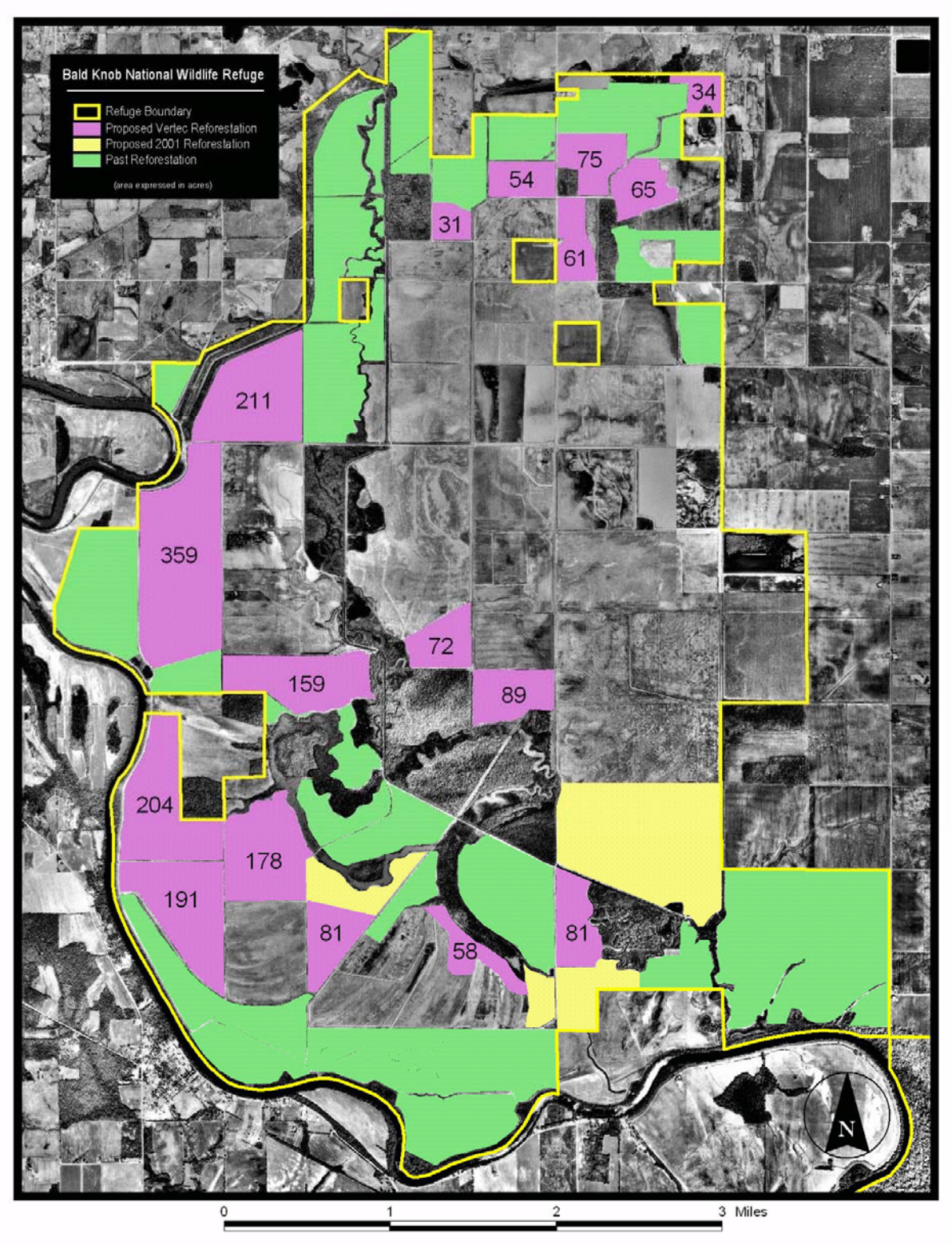

Figure 2. Proposed reforestation areas at the Bald Knob NWR

agricultural uses prior to FWS acquisition (Figure 3). Tree species indicative of bottomland

hardwood habitat such as white oak, swamp chestnut oak, overcup oak, black gum, sycamore, ash, native sweet pecan, persimmon, tupelo gum, cypress, cherrybark oak, water oak, willow oak, shumard oak, nuttal oak, and possibly burr oak, will be planted in all areas proposed for reforestation. Reforestation will begin late 2001 and is expected to take three planting seasons with anticipated completion during the winter of 2003/04. Planting dates and time to completion will be dependent on the capacity to plant trees each year which is limited by weather, flooding and the availability of seedlings.

In addition to the reforestation effort on the refuge, a large water control structure will be constructed which will provide 4,000 to 5,000 acres of open and wooded wetland habitat on the BKNWR. Pending approval of the design plans by FWS engineers, construction of the water control structure is scheduled to begin in the summer of 2001 with completion before the end of the year.

The proposed reforestation activities at the BKNWR will aid in providing large tracts of forested areas which are required for sustainable breeding populations of migratory birds (Blake and Karr 1987, Bushman and Therres 1988, Robbins *et al.*1989, Robbinson 1992, and Whitcomb *et al.* 1981) and is consistent with bird conservation areas that have been recommended within the Mississippi Alluvial Valley (Mueller *et al*. 2000). The creation of open and forested wetland habitats will provide habitat for overwintering waterfowl as well as other wildlife that use wetland habitats.

(a) Area to be reforested adjacent to the BKNWR refuge office.

(b) Rice field on BKNWR that will be taken out of production for reforestation.

Figure 3. Historical agricultural areas that will be reforested on the Bald Knob National Wildlife Refuge (BKNWR).

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