

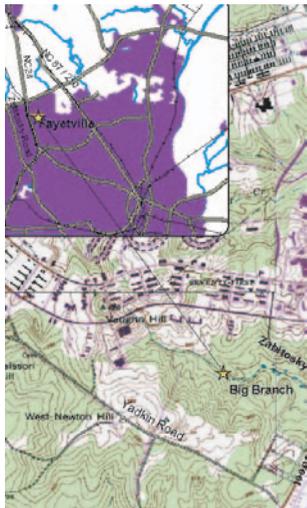


DEPARTMENT OF THE ARMY  
PUBLIC WORKS BUSINESS CENTER  
FORT BRAGG GARRISON COMMAND (AIRBORNE)  
INSTALLATION MANAGEMENT AGENCY  
FORT BRAGG, NORTH CAROLINA



Draft Environmental Assessment  
and  
Draft Finding of No Significant Impact  
for

**EROSION CONTROL ON BIG BRANCH  
PROJECT NUMBER - FW00060-1P  
FORT BRAGG, NORTH CAROLINA**



25 August 2004

Prepared for:

Public Works Business Center  
Fort Bragg Garrison Command (Airborne)  
Installation Management Agency  
ATTN: AFZA-PW-E  
Fort Bragg, North Carolina 28310

In compliance with the  
National Environmental Policy Act of 1969

**DEPARTMENT OF THE ARMY  
PUBLIC WORKS BUSINESS CENTER  
FORT BRAGG GARRISON COMMAND (AIRBORNE)  
INSTALLATION MANAGEMENT AGENCY  
FORT BRAGG, NORTH CAROLINA**

**Draft Environmental Assessment  
and  
Draft Finding of No Significant Impact  
for  
Erosion Control on Big Branch  
Project Number: FW00060-1P  
Fort Bragg Military Reservation, North Carolina**

**27 August 2004**

**Prepared for:**

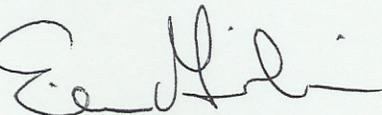
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Fort Bragg, North Carolina 28310**

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SIGNATURES

ENVIRONMENTAL ASSESSMENT AND FINDING OF NO SIGNIFICANT IMPACT  
EROSION CONTROL ON CHICKEN ROAD  
Project Number FW-00054-3P  
FORT BRAGG MILITARY RESERVATION, NORTH CAROLINA

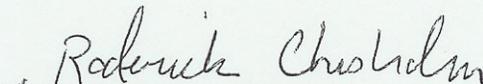
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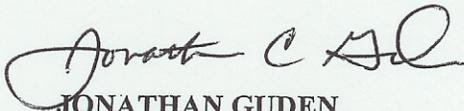
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AL AYCOCK  
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**DEPARTMENT OF THE ARMY  
PUBLIC WORKS BUSINESS CENTER  
FORT BRAGG GARRISON COMMAND (AIRBORNE)  
INSTALLATION MANAGEMENT AGENCY  
FORT BRAGG, NORTH CAROLINA**

**DRAFT FINDING OF NO SIGNIFICANT IMPACT**

**EROSION CONTROL ON BIG BRANCH  
FORT BRAGG MILITARY RESERVATION, NORTH CAROLINA**

1. **Proposed Action.** Fort Bragg proposes to restore and improve approximately 3,170 feet of Big Branch focusing on the degraded unlined portion of the channel extending from the end of the concrete lining to the culvert under Reilly Street. This project would establish a stable channel for the degraded reach of Big Branch and improve the water quality and stream habitat of the stream. The proposed action would include construction of a new channel in the floodplain of the current channel, erosion stabilization, bioengineering improvements, and site revegetation. The continued erosion of this reach of Big Branch causes concern to Fort Bragg. The past, present, and future potential for siltation and the transport of soil into downstream wetland areas could create environmental compliance problems if the proposed action is not implemented. Further, the scour hole continues to expand, undermining banks and destroying the natural vegetation in its path. The vegetation surrounding the scour hole includes pine trees that represent potential habitat for the Red-Cockaded Woodpecker (RCW).
2. **Decision.** Due to the fact that the proposed action has fewer adverse environmental consequences than the No Action Alternative, and is more cost-effective than the proposal to rehabilitate the existing channel, it is recommended that the proposed action may proceed. Failure to remedy the degraded state of Big Branch may eventually lead to significant adverse consequences to several environmental resources such as water quality and endangered species.
3. **Description of Alternatives.** Two alternatives to the Proposed Action were considered. These were the alternative of restoring the existing stream channel, and the No Action Alternative of not performing any modifications to the stream. The No Action Alternative provides the baseline for forecasting the effects of adopting the Proposed Action.
4. **Anticipated Environmental Impacts.** Implementing the proposed action may result in some incidental release of sediment and a temporary effect to water quality; however, failure to perform the recommended modifications would lead to far more significant impacts. Particularly, the No Action Alternative may result in severe degradation and eventually significant impacts to water quality, soils, and possibly vegetation and endangered species.

5. **Conclusion - Finding of No Significant Impact (FNSI).** This EA was prepared and evaluated pursuant to the Nation Environmental Policy Act (Public law 91-190, 42 USC. 4321 et seq.). Based on a review of the information contained in the project's Environmental Assessment, the proposed action does not constitute a “major Federal action significantly affecting the quality of the natural and human environment” when considered individually or cumulatively in the context of the referenced Act, including both direct and indirect impacts. Accordingly, preparation of an Environmental Impact Statement is not required. Therefore, the draft Finding of No Significant Impact (FNSI) is being made available for public review and comment for 30 days. A final decision would be rendered upon review and due consideration of the comments received.

7. **Effective Date.** The proposed project would be initiated in fiscal year 2004.

8. **Public Availability.** The Environmental Assessment (EA) and this draft FNSI for the Proposed Action are available for public inspection at the Cumberland County Public Library in Fayetteville, the Post Library and Command Information Center, Fort Bragg, North Carolina, and online at [http://www.bragg.army.mil/envbr/nepa\\_review.htm](http://www.bragg.army.mil/envbr/nepa_review.htm).

9. Requests for additional information or submittal of written comments may be made within 30 days after first publication date to Public Works Business Center, Headquarters, Fort Bragg Garrison Command (Airborne), Installation Management Agency, ATTN: AFZA-PW-E, Fort Bragg, NC 28310.

AL AYCOCK  
COL, SF  
Garrison Commander

## SUMMARY

This Environmental Assessment (EA) analyzes the environmental and socioeconomic effects of proposed modifications to the Big Branch Stream (Big Branch) along its reach from the downstream end of the concrete-lined channel to its intersection with Reilly Road. The proposed action would restore this degraded reach of Big Branch to a more stable condition using the Natural Channel Design methods, including erosion stabilization, drainage improvements, and site revegetation, as detailed in the description of alternatives.

Big Branch is located in the central portion of Fort Bragg, and historically has been subject to severe erosion problems resulting from development within Fort Bragg Military Reservation. In the early 1990s, Fort Bragg installed concrete lining along more than 3,500 feet of Big Branch and associated drainage channels upstream from the proposed project area. The lined channel increased the velocity of the water traveling through it since water will travel faster over a smooth surface than over a rough surface. A riprap field was placed at the downstream end of the lined channel in an attempt to slow the velocity of the water as it entered the downstream portion of the stream channel. However, most of it has been washed away by the incoming water which now has formed a large scour hole at the outlet of the lined channel and continues to erode the stream banks along the unprotected reach of the project area.

The continued erosion of this reach of Big Branch causes concern to Fort Bragg. The past, present, and future potential for siltation and the transport of soil into downstream wetland areas could create environmental compliance problems if the proposed action is not implemented. Further, the scour hole continues to expand, undermining banks and destroying the natural vegetation in its path. The vegetation surrounding the scour hole includes pine trees that represent potential habitat for the Red-Cockaded Woodpecker (RCW).

To address these concerns, two alternatives of the proposed action and a No Action Alternative are analyzed in this EA. The preferred alternative would use Natural Channel Design to construct a new channel for part of the stream reach immediately downstream from the lined portion of the channel. This alternative would incorporate the restoration of wetlands in the existing channel, generating restoration credits that Fort Bragg could use to offset future wetland impacts. A second alternative would restore the channel in its current location, with some diversions from the channel incorporated in the design to add meanders to the stream. This alternative would require the import of a considerable amount of foreign material such as filtered dirt and different size stones. Additionally, this second alternative would require a permit that is more difficult to acquire than the permit required for the preferred alternative. This EA also examines the effects of the No Action Alternative, allowing the stream to continue its current evolution.

This EA describes the various physical and biological resources in the vicinity of the proposed action and examines the significance of the effects the proposed action and its alternatives would have on each resource. Those

***Primary Environmental Resource Issues***

***Vegetation***

***Endangered Species***

***Water Quality***

***Soils***

issues with the potential for adverse effects include continued erosion and soil loss. This, in turn, could lead to a steady degradation of water quality, siltation of wetlands downstream, and potential loss of vegetation along the stream banks, including trees which may serve as habitat for the endangered RCW. All of these consequences could become severe if no rehabilitation for the area is implemented.

Additional impacts to endangered species and vegetation may occur if the proposed project is implemented without close coordination with Public Works Business Center (PWBC) Natural Resources Division – Endangered Species Branch. The project area runs directly through a RCW forage partition. Extreme care would be taken to disturb as few trees as possible. Moreover any tree removal would be coordinated with appropriate personnel to ensure minimal disturbance to endangered species habitat. Scope of work changes or field adjustments to project specifications may need to occur in order to accommodate strict compliance with the Installation Endangered Species Management Plan (ESMP); however, any proposed changes would be evaluated first by the PWBC Natural Resources Division.

This EA concludes that the Proposed Action would repair the erosion on Big Branch, is environmentally acceptable, and recommends that a draft finding of No Significant Impact be published for public review and comment prior to any final decision on the proposed action.

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**ENVIRONMENTAL ASSESSMENT**  
**EROSION CONTROL ON BIG BRANCH**  
**FORT BRAGG MILITARY RESERVATION, NORTH CAROLINA**

**1.0 PURPOSE AND NEED FOR THE PROPOSED ACTION**

**1.1 Introduction**

Big Branch, a stream in the central portion of Fort Bragg, has historically been subject to severe erosion problems resulting from development within Fort Bragg Military Reservation (See Appendix A, Figure 1). In the early 1990s, Fort Bragg installed concrete lining over more than 3,500 feet of Big Branch and associated drainage channels upstream from the proposed project area. Lined channels generally increase the velocity of water flowing through an area because water flows faster over a smooth surface than over a rough surface such as a natural stream channel. Natural channels are rough due to rocks and organic debris along their bottoms and sides. This debris slows the velocity of the flowing water. The natural channel of Big Branch also was characterized by a more meandering path than the engineered channel that replaced it. The meandering path of a stream is a deterrent to water velocity because the water slows down in response to barriers in its path, and the counter ripples created by obstruction collision further impedes smooth water flow.

At the downstream outlet of the lined channel, a riprap field was constructed. The riprap was installed to break the velocity of the water as it entered the downstream portion of the channel to prevent the quick water flow from scouring the banks of the natural channel. Unfortunately, the force of the incoming water has mostly washed away the riprap and a considerable amount of soil. A large scour hole has formed in a new channel that the water cut on the south side of the riprap dissipator near the outlet of the lined channel. The sediment dislodged from the banks near the outlet of the lined portion of Big Branch has now washed downstream into protected wetland areas (slow-moving or stagnant waters) where it has been able to settle out and be deposited.

The sedimentation of streams, lakes and other waters constitutes a major pollution problem. Excessive sedimentation occurs from the erosion or deposition of soil and other materials into waters, principally from construction sites and road maintenance. Commanders on Fort Bragg want to train in the kind of environment that they can expect to see in combat. In order to do this, the training environment must be maintained in as natural a condition as possible. Soil erosion represents a significant threat to that ideal training environment (INRMP, 2001). Control of

erosion and sedimentation is vital to the public interest and necessary to the public health and welfare, and may have adverse impacts on training conditions.

The expansion of the scour hole at the outlet of the lined channel has a second adverse consequence. As high velocity water undermines the banks of the hole, established vegetation is being lost into the hole. At present the hole is approximately 300 feet long, 100 feet wide, and 20 feet deep (Stantec, 2004a). Allowing continued habitat destruction in this manner represents a severe diversion from various management guidelines at Fort Bragg including the ESMP (1996) and the Installation Design Guide (2003).

## **1.2 Purpose**

The purpose of this project is to establish a stable channel for the degraded reach of Big Branch and improve the water quality and stream habitat of the stream by reducing the amount of sediment traveling in the stream. Stabilization of the existing scour hole to prevent its expansion and resultant destruction of natural vegetation is also a goal of this action.

## **1.3 Need**

There is a need to repair the condition of Big Branch. The scour hole is still expanding during high flow periods and therefore the soils around it must be stabilized to ensure compliance with applicable laws. Compliance with applicable federal and state laws such the Clean Water Act, Sikes Act, and the North Carolina Sedimentation Pollution Control Act as will be more difficult if this section of Big Branch is not stabilized.

The Clean Water Act establishes the basic structure for regulating discharges of pollutants into the waters of the United States. It gives the United States Environmental Protection Agency (USEPA) the authority to implement pollution control programs such as setting wastewater standards for industry. The Clean Water Act also sets water quality standards for all contaminants in surface waters. The Act makes it unlawful for any person to discharge any pollutant from a point source into navigable waters, unless a permit is obtained under its provisions. It also funds the construction of sewage treatment plants under the construction grants program and recognized the need for planning to address the critical problems posed by nonpoint source pollution. Sediment is a major pollutant regulated by the Clean Water Act (USEPA, 2003).

The Sikes Act (16 USC 670a-670o, 74 Stat. 1052), as amended, Public Law 86-797, approved September 15, 1960, provides for cooperation by the Departments of the Interior and Defense with State agencies in planning, development and maintenance of fish and wildlife

resources on military reservations throughout the United States. The Sikes Act stipulates that the Installation Natural Resources Management Plan (INRMP) includes various aspects of environmental management associated with this action and it mandates compliance with the INRMP.

The North Carolina Sedimentation Pollution Control Act of 1973 provides for the creation, administration, and enforcement of a program and for the adoption of minimal mandatory standards which will permit development of the State to continue with the least detrimental effects from pollution by sedimentation. The law requires installation and maintenance of sufficient erosion control devices and practices to retain sediment within the boundaries of a site. Under the law, compliance is determined by assessing performance. It prohibits visible off-site sedimentation from sites but permits the owner and developer to determine the most economical, effective methods for controlling erosion and sedimentation (North Carolina Department of Environment and Natural Resources (NCDENR)).

There is a further need to comply with Fort Bragg regulations, management plans, and agreements with regulatory agencies such as the U.S. Fish & Wildlife Service by ensuring minimal further damage to habitat for the endangered Red-Cockaded Woodpecker.

### **1.3 General Objectives**

Installation policies and state regulations require several factors to be considered and prioritized for the activities described in the proposed action. Additional objectives of the Proposed Action are:

- *Public safety.* Improve soldier and government employee safety
- *Natural Resources Management.* Plans for improvements should incorporate principles presented in the Installation Design Guide.
- *Environmental Compliance.* Remain in compliance with all applicable environmental laws, regulations, and policies.

### **1.4 Requirement for Environmental Analysis and Documentation**

Fort Bragg is preparing this Environmental Assessment (EA) to evaluate and compare the environmental effects of the proposed action and alternatives on the natural and human environment at Fort Bragg, NC. This EA is prepared in accordance with the National Environmental Policy Act (NEPA), the Council on Environmental Quality (CEQ) regulations, Army Regulation (AR) 200-2, and USAIC Regulation 200-1. Environmental Analysis of Army Actions; Final Rule (32 CFR Part 651, 29 March 2001) implements the National Environmental

Policy Act of 1969 and requires Army installations to consider the environmental impacts of a proposed action and its alternatives prior to making a decision on a proposed action. This document consists of an objective appraisal of the potential effects, both negative and positive, of the proposed action and its alternatives on the natural and human environment, as well as an appraisal of the cumulative effects of said actions in a specifically defined region of influence. It also contains discussions of mitigation (as needed), permit requirements, and findings and conclusions in accordance with NEPA guidelines. The EA provides the environmental information needed to help make an informed decision on the proposed action.

## **2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES (DOPAA)**

### **2.1 Description of the Proposed Action**

Fort Bragg proposes to restore and improve approximately 3,170 feet of Big Branch focusing on the degraded unlined portion of the channel extending from the end of the concrete lining to the culvert under Reilly Street (See Appendix A, Figures 1 and 2). This project would establish a stable channel for the degraded reach of Big Branch and improve the water quality and stream habitat along that stream reach. The stability of the current channel began to disintegrate with increased development within the watershed. Development increases impervious surfaces, reduces the amount of vegetation, and increases the magnitude and frequency of water discharges. To establish a stable channel, the velocity of the water streaming from the lined portion of the channel must be decreased. Additionally, action must be taken to prevent the expansion and resultant destruction of natural vegetation surrounding the existing scour hole. The elimination of downstream sedimentation is another project objective. This project should result in the generation of off-site mitigation credits for other stream impacts on Fort Bragg.

Several studies were done to determine the best approach to stream restoration and characterize the current condition of the stream. A summary of the data indicates that the stream is degraded and unstable. One study describes this portion of Big Branch as a transitional channel that is cutting downward and widening, factors favorable for continued erosion. This study further indicated that the entire system has virtually no sinuosity, does not function as a natural stream, and provides little or no habitat (Stantec, 2004a).

The proposed action would redesign portions of the current creek as described under Alternatives Considered in Section 2.2. Fort Bragg does not wish to modify the upper lined portion of the stream, but agreed to allow the design to include the lined channel to the extent necessary to make the downstream design stable (Stantec, 2004a). The restoration would focus on other downstream segments of the stream, with care to formulate a design that would minimize disturbance of potential habitat trees. Another issue is a debris dam that has formed an impoundment within a portion of the channel. This debris dam allows Big Branch to flood its banks and access its floodplain during most storm events.

The restoration of floodplain function would be a key element in the design of a stream restoration. Depending on the alternative chosen, a new floodplain may be excavated for segments of the stream. Due to the entrenched depth of Big Branch, water is more likely to flow downstream causing soil erosion than it is to overflow its banks, a characteristic of the natural system. The natural vegetation around Big Branch likely was dependent on this flooding for its

continuity and preliminary studies suggest a relic floodplain that was likely a bottomland hardwood community before the changes to the channel were made. Floodplains serve many important wetland functions. They serve as a source of groundwater recharge and discharge, provide flood storage, trap sediment, retain and remove nutrients, support and enhance the food chain, and are a habitat for fisheries and wildlife (Mitsch and Gosslink, 1993). Wetlands can lower the concentration of many water contaminants including nitrogen, phosphorus, suspended solids, biochemical oxygen demand, trace metals, and pathogens (Mitsch 1994; Hammer 1993).

The new channel would be designed to the standard of a 25-year reoccurrence stormwater event. It is likely that this new channel design would require the removal of some individual trees. Any possible timber harvest would be coordinated with the Army Corps of Engineers and Public Works Business Center (PWBC) Natural Resources Division. Further requirements for tree removal are discussed in the Vegetation section below. A detailed planting plan would be prepared for re-vegetation areas.

## **2.2 Alternatives Considered**

### **2.2.1 Alternative I: “No Action/Status-Quo”**

The No Action Alternative provides the baseline for forecasting the effects of adopting the Preferred Alternative or the Proposed Action. The “No Action” Alternative for this EA is not the environmentally preferred alternative. This alternative would involve leaving the creek in its current degraded state. High energy water flow would continue and may continue to cause bank failure, tree loss, and further sediment deposition in wetlands. Implementing this alternative would make it very difficult to comply with the Clean Water Act, the Sikes Act, and the NC Sedimentation Pollution Control Act.

### **2.2.2 Alternative II: “Repair the Stream Channel”**

This alternative would repair the existing channel using accepted bioengineering techniques, as described below. This alternative would include stabilization of the existing scour hole and other forms of erosion control and bioengineering techniques for any areas of the channel that are severely degraded or in danger of washing out. In the past, Fort Bragg has installed gabion check dams to stabilize eroding stream channels and prevent further degradation. Because Big Branch is a jurisdictional stream, the United States Army Corps of Engineers (USACE) has advised Fort Bragg that a Section 404 Individual Permit would be required to allow the restoration to take place within the boundaries of jurisdictional wetlands of the United States.

The feasibility of this alternative is limited because a large amount of clean fill would be required to repair the scour hole, and it would be difficult to obtain the required permit. This alternative also would involve the introduction of a large amount of foreign material into the restoration, contrary to the current trend in stream design. While it is an option to restore Big Branch in this manner, this is not the preferred alternative.

The majority of the restoration would involve a series of bioengineering techniques being used to achieve a stream channel that is stable, vegetated, and bears a higher sinuosity (*i.e.*, it has more meanders), all characteristic of less disturbed streams. Gabion walls and biologs are placed adjacent to streambanks to prevent further erosion (See photo). Weirs and boulder fields create eddies and pools that break the flow of water, often redirecting it. This results in lower energy flows, and creates turns in the channel, which further reduce water velocity and energy. One disadvantage of this alternative is that it introduces a large amount of foreign material (stone) into the system and may necessitate excavation of stream banks.

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**Bioengineering techniques may include:**

**Gabion walls**

**Boulder fields**

**Weirs**

**Biologs**

**Live staking**

---

The downstream two-thirds of the project would require the excavation of a new floodplain at an elevation lower than the original floodplain. For the bottom two-thirds of the project, the terrain of the valley dictates that the design weaves back and forth across the existing channel (Stantec, 2004b).

This alternative would vary from Alternative III in that all restoration efforts would be made in the existing stream channel, whereas Alternative III would construct a new channel for the upstream third of the area proposed for restoration (not including minor work done to the lined portion of the channel). The techniques used in restoring the downstream two-thirds of the channel would be similar for both alternatives.



Typical Gabion Wall Installation

### 2.2.3 Alternative III: “Divert the Stream Channel” (Preferred Alternative)

This alternative would use the Natural Channel Design procedure to stabilize the degraded reach of Big Branch. This alternative would not require a Section 404 Individual Permit, as it could be permitted under a Nationwide 27 because no gabion check dams would be used (Stantec, 2004b). Providing the completed project and subsequent monitoring results meet certain requirements, this alternative would generate stream credits that can be used by Fort Bragg to mitigate for future impacts elsewhere on Fort Bragg.

The Natural Channel Design for this project draws on a study of two similar ‘reference reaches’ located within the same physiographic region as the proposed project. The reference reaches were chosen based on a variety of factors: land use, size of drainage area, stream order, amount of relative disturbance, stream classification, and current stream condition. These reference reaches provide natural channel design ratios based on measured morphological relationships from stable channels. Information obtained from this study has factored into aspects of Big Branch’s new channel design such as buffer composition, width-to-depth ratios, and entrenchment ratios (Stantec, 2004d).

A feasibility study conducted by the engineering firm for the project determined that the restoration should focus on the unlined portion of the channel extending from the end of the lined

channel to the culvert under Reilly Street (See Appendix A, Figure 2), while avoiding the existing riprap energy dissipater and scour hole (Stantec, 2004b). The feasibility study further determined that the new channel should be constructed to the north of the existing channel because of geographical features to the south (Stantec, 2004c).

The restoration would include increases in pattern, riffle-pool sequences, sinuosity, and entrenchment ratios. The restoration would start 1,300 feet upstream from the end of the channel lining with the installation of cross-vanes into the flume (Stantec, 2004b). This should help to reduce water velocity and the energy entering the new channel. At the outlet of the lined channel, water would be diverted into a new channel to the north of the existing channel.

The new channel would have a low width-to-depth ratio relative to the existing channel with a series of riffles, runs, pools, and meanders largely based on the natural patterns defining the reference reaches. Restoration would include establishing the proper dimension, pattern, profile, and riparian buffer (Stantec, 2004b). The upper portion of the new channel design would be constructed on the remnant floodplain of the original channel. The lower portion of the channel design would be similar to Alternative II, involving excavation of a new floodplain at an elevation lower than the original floodplain.

This design incorporates wetlands into areas of the abandoned channel. Clay plugs would be installed at approximately 100-foot intervals and would create a linear series of wetlands (Stantec, 2004b). Once vegetated, these wetlands may aid in filtration of nutrient and pollutant runoff.

### **3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES**

This EA focuses on the site-specific areas potentially affected by the proposed action. The scope of analysis is directly related to the impacts expected from implementation of each alternative on individual resource areas. Although all major resource areas were evaluated for potential adverse impacts, the resource areas considered in detail are only those that are areas with a potential to be adversely impacted. After examination for applicability to the proposed action, certain resources were determined to exhibit no significant consequences as a result of the proposed action. Resource areas considered, but excluded from further examination include: utilities, telecommunications, and socioeconomic topics (except Environmental Justice and Protection of Children). The existing environment for each resource area is addressed, followed by a description of the anticipated effects of each alternative on the resource. A comparison of cumulative effects of alternatives on each resource area is then described. The final subdivision of each resource area will illustrate appropriate or required mitigation that would be conducted for each resource discussed.

The Council on Environmental Quality (CEQ) defines cumulative impacts as the “impact on the environment which results from the incremental impact of the action(s) when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions” (CEQ, 1978). The actions proposed under the alternatives in this EA, in addition to proposed projects in the geographic area (Region of Influence), have the possibility to result in either negative or positive impacts in a cumulative manner. Cumulative impacts can accrue from individually minor but collectively significant actions taking place over an extended period of time. The land comprising the Region of Influence (ROI) for the proposed action has a rich and diverse history. It encompasses numerous residential developments, commercial/retail facilities, industrial activities, training activities, and recreational opportunities. Although the long lists of past projects are not listed here, it is generally recognized that past development and land use have contributed to a long-term adverse cumulative impact to vegetation, soils, and water quality as regional growth continues. Use of mitigative measures discussed below in addition to new sustainability initiatives and Green Building practices applied to larger projects would help minimize any negative cumulative effects over time.

Mitigation can be a broad term as defined by the Fort Bragg INRMP. The President’s Council on Environmental Quality also broadly defines mitigation describing it as encompassing several aspects of environmental planning and implementation:

- Avoidance: Avoid impacts by changing the plan. Do not take certain actions that would cause the environmental effect.
- Minimization: Minimize impacts by changing the intensity, timing, or duration of the action and its implementation.
- Rectification: Fix, repair, or restore damage that may be caused by implementing the proposed action.
- Reduction: Reduce or eliminate the impact over time.
- Compensation: Compensate for the impact by replacing the damage, by improving the environment elsewhere, or by providing other substitute resources such as funds to pay for the environmental impact.

This type of definition expands the spectrum of what mitigation should and can be. For this reason, mitigation is discussed in general terms for each resource area, encompassing topics that should be understood but are sometimes neglected.

### **3.1 Existing and Future Land Use**

Fort Bragg is the site of military training, administrative, and residential activities. Fort Bragg is divided into 5 geographic areas, and 94 training areas. Big Branch is in the cantonment area of the Installation. Fort Bragg has been divided into watershed management units and habitat management areas. Fort Bragg uses a watershed planning approach to soil conservation. This watershed approach is based on water quality and considers effects that individual site characteristics and restoration techniques may have on ecosystem integrity and/or the training mission within watersheds. Fort Bragg's 62 watershed management units comprise separate and distinct units for prioritizing soil and water conservation efforts on Fort Bragg (INRMP, 2001). The proposed action is in the watershed of Big Branch.

The watershed of Big Branch upstream from Reilly Road consists of 38 percent impervious surface and 62 percent mixed hardwood forest and pine plantation. The impervious surfaces include roadways, barracks, parking lots, and facility buildings. The valley in which Big Branch is located has been dramatically disturbed, but is still heavily forested. Several development projects are planned within the watershed before 2010. Some of these, such as renovation and repair projects, would not increase the ratio of impervious surfaces in the watershed. Other projects, including a new vehicle maintenance shop, new parking areas, and new facility buildings will cause an increase in overall percentage of impervious surfaces (Stantec, 2004c).

### **3.1.1 Alternative I Impacts to Land Use**

This alternative would not change existing land use, but may adversely affect the quality and quantity of vegetation and wildlife habitat provided by the forested areas. Erosion would continue, with the potential to increase as additional projects are completed upstream.

### **3.1.2 Alternative II Impacts to Land Use**

Implementation of this action would neither adversely affect nor alter land use on Fort Bragg. There would be some benefits to creating a higher quality stream channel for Big Branch including improvements in aquatic habitat and wetland function, and a decreased loss of vegetation and soils. Proposed development in the northern portion of the watershed may affect the restoration by increasing the percentage of impervious surfaces, thereby increasing stormwater flow. However, stormwater management and erosion control practices on Fort Bragg would prevent any significant changes to flows within Big Branch that may negatively affect a stream restoration project (Stantec, 2004c).

### **3.1.3 Alternative III Impacts to Land Use**

This alternative would involve more vegetative habitat removal than Alternative II. However, the quality of aquatic habitat created is projected to be greater than that of the trees removed in association with this alternative. These issues are further explored in the discussions of vegetation and endangered species impacts. After project completion, the land use would be consistent with its current designation. Therefore, there are no negative impacts to land use as a result of this alternative.

### **3.1.4 Cumulative Impacts to Land Use**

The threshold level of significance for land use would be to alter the existing land use in such a manner as to cause severe incompatibility with adjacent land uses. None of the alternatives would significantly alter land use either currently or cumulatively. Minor long-term cumulative impacts to regional lands are likely to continue regardless of which alternative is chosen.

### **3.1.5 Land Use Mitigation**

Neither alternative represents a significant change in land use, nor would specific land use mitigation be required as a result of initiation of either alternative. Mitigation involving specific resources related to land use is described under the appropriate resource areas below.

### 3.2. Vegetation and Natural History

Located in the Sandhills region of the Atlantic Coastal Plain, the climate and related hydrology of Fort Bragg are influenced by proximity to both the Atlantic Ocean and the Piedmont Plateau. The climate of Fort Bragg is characterized by long, hot summers and relatively short, mild winters. The area is sheltered from the severity of winter by the Appalachian Mountains. Average annual precipitation in the area is approximately 47 inches. The major portion of summer precipitation is received in the form of convectional thunderstorms and occasional tropical depressions. Mid-latitude, low-pressure cells preceding cold fronts are the major source of precipitation in the late fall and early spring. The climatic conditions expected for the proposed project site are consistent with those described for Fort Bragg and the Sandhills region of North Carolina by the National Weather Service.

Broad sandy ridges and long, less sandy side slopes, characterize the Sandhills. Many streams have cut deeply into the sediments, creating a much hillier landscape than in the rest of the Coastal Plain. The dominant forest species on Fort Bragg are longleaf pine (*Pinus palustris*) and loblolly pine (*Pinus taeda*). Understory vegetation consists of turkey oak (*Quercus laevis*) on xeric sites, with other oaks on less xeric sites; wiregrass (*Aristida stricta*) dominates the herb layer with other common species. The plant communities vary little from those found throughout the Atlantic Coastal Plain. Plant surveys

to determine the community type and surveys for threatened or endangered plant species have been conducted in this location in anticipation of this project. The only suitable habitat in the project area is for pondberry; however, no individuals were found after a systematic survey (Gray, 2004).

*The following federally protected plant species are located in Cumberland County:*

*Rough-leaved loosestrife – Lysimachia asperulifolia*

*American chaffseed – Schwalbea americana*

*Michaux's sumac – Rhus michauxii*

*Pondberry – Lindera melissifolia*

There are several vegetative communities present within the project area (See Appendix A, Figure 3). There is a mixed pine and hardwood closed canopy system, a relic bottomland or hardwood floodplain community, an oak/hickory community, and a small patch of gum swamp.

The United State Fish and Wildlife Service is concerned about the use of exotic plant species for erosion control. Fort Bragg's INRMP emphasizes the preferential use of native species in revegetation efforts. The Service encourages the use of only native species and the Soil Erosion Control Plan should include information on native vegetation to be planted for soil stabilization. A revegetation plan for Alternative III is included in Appendix D.

### **3.2.1 Alternative I Impacts to Vegetation**

This alternative would have an impact on vegetation as unchecked erosion would eventually harm trees adjacent to the scour hole. These trees provide potential habitat for the endangered Red-Cockaded Woodpecker. The erosion and loss of soil would also further deteriorate the substrate required for vegetation growth.

### **3.2.2 Alternative II Impacts to Vegetation**

Although it is difficult to determine exactly how many trees would be removed through this Alternative without a specific design, it was decided that this alternative would have less of an impact on vegetation than Alternative III (for which more definite impacts have been estimated). The upper portion of the restoration would be conducted mainly within the existing channel, so it is expected that fewer trees would be removed through execution of this alternative than under Alternative III. The large equipment needed to fill the scour hole and conduct the complicated earthmoving and civil works necessitated by this alternative likely would harm surrounding vegetation. These activities may increase vegetation disturbance or have increased effects on soil compaction relative to Alternative III. Although a specific plan was not developed, it is likely a revegetation scheme similar to that presented for Alternative III in Appendix C would apply to this scenario, as well.

### **3.2.3 Alternative III Impacts to Vegetation**

Implementation of this alternative would require construction of temporary roadways adjacent to the new channel to develop the new stream course. This construction along with the disturbance required to create a new channel would remove approximately 66 loblolly pine trees scattered throughout the project area. There are no known long-leaf pine in this area, and the area is not characteristic of prime habitat for the red-cockaded woodpecker as described in Section 3.5.2 (Chisholm, 2004).

Removal of the pine trees and other hardwoods from the new channel and surrounding area may benefit the stand by thinning the over stocked stand and possibly help connect two other stands (Stands 4055 and 4052, (Chisholm, 2004)). Removal of pine trees over 4" diameter breast height (dbh) require approval from Fort Bragg Endangered Species Branch. A tree removal plan illustrating all trees to be removed for the project, including the byproducts of utilities, erosion control, and grading would be prepared (IDG, 2003).

There are revegetation plans for the proposed project area as well as the abandoned portions of the channel. The plantings would serve several functions within the restoration scheme including bank stabilization, wildlife habitat, and cover for disturbed areas. These plantings are dependent upon the vegetative community type, which is determined by location within the restoration such as streambank area, floodplain, riparian buffer, wetlands (See Appendix C).

#### **3.2.4 Cumulative Impacts to Vegetation**

The threshold level of significance for vegetation would be the potential to alter vegetation to such an extent that the existing habitat could not be recovered without intervention. Due to the small size of the area under consideration, and the close coordination with Natural Resources Division and USFWS (See Appendix C), no alternative is likely to result in a major loss of habitat.

Alternative I would result in potentially moderate to severe adverse impacts to vegetation over time because of the inability of vegetation to grow on the increasingly eroded surface, and the potential for vegetation to be undermined by the expanding scour hole. Alternatives II and III would result in positive cumulative impacts to vegetation because the scour hole would be stabilized and native plants would be used to restore the site.

#### **3.2.5 Vegetation Mitigation**

During construction, there should be no adverse impacts to vegetation outside of the expansion footprint. Any trees to be removed would be well marked and no unmarked trees shall be removed or injured. The Contractor would assume responsibility for “in-kind” replacement of any trees damaged within sensitive areas. A biologist supervising the planting would make a field demarcation of revegetation zones after final grading is complete (Stantec, 2004b). Any areas outside the designated revegetation zones that are disturbed by construction operations would be seeded with a non-invasive grass species and either mulched or matted.

### **3.3 Soils**

Soils on Fort Bragg are generally sandy and easily eroded. Organic material can be highly variable depending on the vegetation and proximity to water. Most soils are well drained or even excessively well drained. Soil conservation is a high priority in any area with insufficient ground cover. Two major soil associations, Blaney Loamy Sand and Johnston Loam, are found in the project area. These soil associations are described below.

**Blaney:** Blaney is a well drained loamy sand found in side slopes and narrow ridges of the uplands. It is mainly located along the Little River and most other streams on Fort Bragg. This soil is strongly acidic and has slow to moderate permeability.

**Johnston:** This soil is a very poorly drained loam found on nearly level areas along major drainageways and floodplains. It has moderately rapid to rapid permeability and is strongly acidic. However, the seasonal high water table is at or above the surface most of the year. This is a hydric soil.

### **3.3.1 Alternative I Impacts to Soils**

This alternative would have adverse effects on soils due to soil loss from the scour hole and stream banks that are not stable because of the high velocity of the water entering the degraded portion of the channel.

### **3.3.2 Alternative II Impacts to Soils**

This alternative would have significant positive effects to soils as it would reduce the erosion that is currently occurring on the project site. Stabilization of the streambanks with vegetation or bioengineering techniques would substantially reduce the extent and amount of future erosion.

### **3.3.3 Alternative III Impacts to Soils**

This alternative would have the same effect as Alternative II in the project vicinity. All abandoned stream banks would be revegetated. The creation of wetlands, as discussed under water quality, would have additional positive effects because the wetlands would provide a settlement area for eroded soils. Implementing this alternative would not adversely affect soil conservation goals.

### **3.3.4 Cumulative Impacts to Soils**

The threshold level of significance for soils is any ground disturbance or other activity that would violate applicable Federal or state laws and regulations, such as the North Carolina Sedimentation Pollution Control Act (SPCA), and the potential for Notices of Violation (NOVs) for the failure to receive applicable state permits prior to initiating a proposed action.

All land disturbing activities planned in the ROI have the potential to result in the disturbance of soils. There is a long-term adverse cumulative impact to soils as regional growth

continues and topsoil is removed; however, use of mitigative measures would help minimize any negative effects.

### **3.3.5 Soils Mitigation**

The predominant soil types on Fort Bragg are sandy and easily eroded. These characteristics make minimizing soil disturbance a top priority to prevent further erosion and stream sedimentation. Best management practices as defined by the NCDENR must be followed to prevent erosion and consequent damage to endangered species habitat or sedimentation of streams and wetland areas. Projects over one acre require a State-approved Soil Erosion and Sedimentation Control Plan (SESC). All construction, operation, and maintenance activities involving land disturbance must consider and comply with soil conservation measures and the Post's Storm Water Management Permit in their planning and execution. Fort Bragg's soil conservationist reviews all projects for compliance. The project to restore Big Branch is more than one acre in size. The State approved SESC Plan would incorporate measures to control soil erosion during construction.

The SESC Plan generally includes a project description, soil information, changes to existing contours, existing drainage patterns, general location of structural best management practices (BMPs), BMP specifications, quantity, cost estimates, BMP inspection and maintenance requirements, detailed preconstruction and during-construction drawings, and a construction schedule. BMPs likely to be included in the SESC Plan would be silt fencing, rock check dams, planting of disturbed areas, and erosion control blankets. Monitoring of these mitigation measures would also be required to further ensure the success of this mitigation.

Important for soil loss mitigation, the project specifications include detailed vegetation establishment specifications. Vegetation is important because it controls soil erosion rather than merely capturing eroded sediment. It is also the most effective BMP with success in the ninety percent range as opposed to half that for some non-structural BMPs such as silt fences (Fifield 2001).

### **3.4 Wetlands and Water Quality**

In general, wetlands on Fort Bragg are found along stream bottoms, in the headwaters of small streams, and around lakes. There are numerous hillside drains and seeps throughout the area. These qualify as jurisdictional wetlands as defined by the U.S. Army Corps of Engineers. These hillside drains and seeps are often discontinuous with other wetlands found along streams. The 100 year (Zone A) and transitional 100 to 500 year (Zone B) areas are found along creeks,

and streams. Most of the northeast area lies outside the 500-year flood plain (Zone C). Flood zones are shown in the Federal Emergency Management Agency's flood zone maps of Cumberland County. The soil survey of Cumberland and Hoke Counties provides detailed information using 1:24,000 scale orthophotoquads showing the locations of hydric soils associated with wetland terrain. The general locations of rivers, streams, lakes, ponds and major wetland areas are clearly shown in both 1:24,000 and 1:50,000 scale topographic maps of the area.

National Wetland Inventory (NWI) mapping shows two wetlands within the general project area (Stantec, 2004c). These wetlands have been severely degraded as a result of the erosion of Big Branch, a result of high water velocities created by upstream development including the installation of channel lining. A more recent wetland inventory indicated that an additional wetland has formed in the area of a debris dam in the existing channel, and a large riverine wetland complex has developed just upstream of the culvert under Reilly Street (Stantec, 2004a)

The Army's water resources management program focuses on compliance with all legally applicable Federal, State and Local laws and regulations regarding the management of all water resources including, wetlands, estuaries, watersheds and groundwater. Fort Bragg uses a watershed planning and management approach to soil conservation. The project area is in the Big Branch watershed encompassing approximately 1,185 acres and is part of the larger, southern Fort Bragg Rockfish Creek watershed. The Big Branch watershed and the Rockfish Creek watershed are listed in the INRMP as watersheds that are part of an ongoing program to mitigate erosion and resolve turbidity problems. This program resulted from an agreement between Fort Bragg and the State of North Carolina after Fort Bragg received several NOV's for exceeding water quality standards for turbidity in 1989.

#### **3.4.1 Alternative I Impacts to Water Quality**

This alternative would have continued significant adverse effects to water quality. The high velocity of the water entering the unlined channel is eroding the stream banks and destabilizing the entire stream. The existing condition of the stream banks adds to their instability.

#### **3.4.2 Alternative II Impacts to Water Quality**

A permit for construction activities within a wetland area would be required in conjunction with implementation of this alternative. Less than one acre of wetlands would be

impacted as a result of construction activities, but the precise quantity is difficult to estimate without further design efforts. This alternative may result in the incidental release of sediment temporarily affecting water quality. However, failure to perform some remediation in the project area would lead to far more severe impacts. This alternative would have significant positive impacts to water quality both on and off the reservation. Implementation of this alternative would facilitate compliance with federal and state laws, as well as Installation policies. Sedimentation would decrease.

### **3.4.3 Alternative III Impacts to Water Quality**

The construction of a new stream channel through the jurisdictional wetland at the bottom of the project would result in permanent impacts to 0.25 acres of wetland, but these impacts would be offset by the restoration of 0.37 acres of wetland where the old channel is filled (Stantec, 2004b). These additional wetland credits would be held in reserve for other Installation projects that have permanent impacts to waters of the United States. Wetland areas outside of the construction area would be protected from intrusion of construction machinery and other vehicles.

The proposed action may result in the incidental release of sediment temporarily affecting water quality; however, failure to perform the recommended modifications would lead to far more severe impacts. Overall, implementation of the preferred alternative would positively affect water quality. Implementation of this alternative would facilitate compliance with federal and state laws, as well as Installation policies. The creation of additional wetlands through this alternative would benefit water quality because wetlands function as sediment and pollutant traps, and would prevent the migration of these pollutants downstream, thereby improving the overall health of the ecosystem.

### **3.4.4 Cumulative Impacts to Water Quality**

The ROI for water quality consists of the streams and other surface water bodies within the Rockfish Creek watershed. Watershed health may have a direct impact on water quality and the health and welfare of the military and civilian community in and around Fort Bragg. Preserving and enhancing the quality of water in the watershed is normally beyond the capabilities of any single project, agency, or group. State and federal government regulatory programs play an important part, but much of the responsibility for compliance is at the Installation level. The Sustainable Fort Bragg and Sustainable Sandhills initiative are making strong efforts to improve water quality in the region. The multi-agency approach would have a long-term beneficial cumulative impact to water quality.

Alternatives II and III would have positive cumulative impacts on water quality because of a direct reduction in sedimentation and stabilization of an unstable system. Implementation of Alternative III would constitute a positive cumulative effect on water quality because it also would reestablish wetlands in the area. Wetlands improve water quality through sedimentation, filtration, chemical precipitation and adsorption, microbial interactions, and nutrient uptake by vegetation (Watson et al. 1989).

#### **3.4.5 Water Quality Mitigation**

Wetlands adjacent to this site may be impacted by this project. However, adherence to applicable federal and state laws and regulations and Installation policies and guidelines would minimize these impacts. All construction activities greater than one acre in size and/or as part of a common development area, such as this proposed action, require a North Carolina permit from DENR issued by the Land Quality Division. Erosion control BMPs would be used to minimize deposits of sediment into surface waters adjacent to the site of disturbance. A variety of methods would be used for erosion and sediment controls such as mulching, silt fences, rock check dams, straw bales, drainage swales, sedimentation basins, etc. These measures may be garnered from the SESC Plan prepared as a requisite for compliance with the North Carolina SPCA.

A Spill Prevention, Control and Countermeasure (SPCC) Plan and erosion control BMPs would also be implemented to avoid impacts to desirable habitat during construction. The preparation and implementation of a SPCC Plan and/or its requirements during construction activities would prevent and/or minimize spill/release from hazardous materials into waterways. The SPCC is just one aspect of the Environmental Protection Plan (EPP), prepared by the contractor that would be required for construction to commence. The EPP would specifically address discharge from control areas for equipment maintenance or repair, waste locations, wash-down locations, and sanitary facility areas.

#### **3.5 Wildlife including Protected Species**

The Nature Conservancy inventory identified 33 natural communities and variants on Fort Bragg representing a broad array of topographic, climatic and hydrologic interactions. Other inventories have identified 100 avian, 67 mammalian, and 58 reptilian and amphibian species on Fort Bragg. Large game includes black bear (*Ursus americanus*), eastern wild turkey (*Meleagris gallopavo silvestris*), and white-tailed deer (*Odocoileus virginianus*). Other species include beaver (*Castor canadensis*), opossum (*Didelphis virginianus*), bobcat (*Lynx rufus*), muskrat (*Ondatra zibethica*), raccoon (*Procyon lotor*), and eastern fox squirrel (*Sciurus niger*). Among

upland game birds the common bobwhite quail (*Colinus virginianus*) is found. Migratory game birds include the wood duck (*Aix sponsa*) and the mourning dove (*Zenaida macroura*). Streams and ponds include inland game fish such as the chain pickerel (*Esox niger*), black bass (*Micropterus salmoides*), redbreast sunfish (*Lepomis auritus*), bluegill (*Lepomis macrochirus*), redear sunfish (*Lepomis microlophus*), and the channel catfish (*Ictalurus punctatus*). In general, wildlife should not be killed, captured, harassed, nor should dens, nests, or eggs be disturbed. Poisonous snakes should not be killed indiscriminately but may be killed if a life-threatening situation provides no reasonable alternative. Wildlife that is found injured or orphaned should be reported to Natural Resources Division personnel. Release of non-native wildlife such as boa constrictors, tropical fish, feral swine, ferrets, and other animals is prohibited.

The Red Cockaded Woodpecker (RCW) is the most prominent federally endangered species on the Installation. The RCW was placed on the Federal list of endangered species in 1970. The RCW is known to coexist with humans and their activities and, through proper management, this species is compatible with most of the Installation's training, operations, and maintenance activities. RCWs have a social structure that involves a breeding pair and helpers that assist with various activities; this compilation of individuals is referred to as a cluster. The Installation contains over 300 active and primary recruitment clusters covering approximately 12,500 acres, as well as 81 supplemental recruitment clusters as part of the Post's share of the regional recovery goal (INRMP, 2001). Discrete cluster sites are typically located where mature pine trees are more than 60 years old. Foraging habitat is more variable with timber taking on increasing value as the stands age past 30 years. Both nesting and foraging habitat can be characterized as open stands of pine with a scarce to moderate midstory.

Several trees would be removed through Alternatives II & III that are within the managed forage partition for RCW cluster 280. A visit to the particular stand where the trees would be removed determined that the stand was composed of more than 50 percent loblolly pine.

All endangered species sites on Fort Bragg have been precisely located using the Global Positioning System (GPS). The boundaries of endangered plant sites are permanently marked with yellow diamond-shaped signs warning "ENDANGERED PLANT SITE - OFF LIMITS - NO MILITARY ACTIVITY - FB REG 350-6". Aluminum tags with identifying numbers and two broad white bands currently mark all Red-cockaded woodpecker (RCW) cavity trees. The 200-foot buffer zones surrounding the RCW clusters on Fort Bragg are marked with signs warning, "ENDANGERED SPECIES SITE - DO NOT DISTURB - RESTRICTED ACTIVITY - RED-COCKADED WOODPECKER - FB REG 350-6". A site visit determined that there was

no suitable Saint Francis' satyr present (Hoffman, 2004). There are no other endangered species located on the project site.

Army installations must be sensitive to those species listed as endangered or threatened under State law, but not federally listed (AR 200-3). State listed species are not protected under the Endangered Species Act (ESA); however, whenever feasible, installations cooperate with State authorities in efforts to conserve these species and identify State listed species in the Installation's INRMP. For example, State listed species are identified and addressed in the Fort Bragg INRMP. Complete surveys have not been conducted in the project area, but it is unlikely that any state protected species are within the work boundaries of the project.

Management of wildlife and wildlife habitat complies with the provisions of the ESMP, and the INRMP, which are incorporated herein by reference. Informal consultation has been initiated and is documented in Appendix C. Formal consultation with the U.S. Fish and Wildlife Service (FWS) would not be required. Informal consultation is documented in Appendix C. All measures in accordance with the USFWS approved ESMP would be incorporated into the project specifications and drawings.

### **3.5.1 Alternative I Impacts to Wildlife**

This alternative would not affect wildlife relative to current conditions. Implementing this alternative would not have significant adverse impacts upon threatened or endangered species with the exception of potential future RCW habitat degradation.

### **3.5.2 Alternative II Impacts to Wildlife**

There would be minimal to no impact to wildlife or any federally threatened or endangered species as a result of construction. Over time, there may be a minor positive impact to endangered species as pines that are planted in conjunction with this alternative grow to an age suitable as forage habitat for the RCWs. There may also be minor positive impacts resulting from the thinning of the stands; the current condition of the stand includes a dense understory which is not characteristic of prime habitat. The restoration would improve aquatic habitat and the plantings may include species that would provide cover or fodder for other wildlife species.

### **3.5.3 Alternative III Impacts to Wildlife**

This alternative would result in potential future RCW habitat improvement as described under Alternative II. The additional creation of wetlands would improve habitat for several

wildlife species, and the wetland plantings have been designed with wildlife cover and food support in mind.

### **3.5.4 Cumulative Impacts to Wildlife**

Positive cumulative effects to wildlife are anticipated as a result of the proposed action. Habitat for the RCW may be increased; at a minimum, one stand would be cleared of much of its understory. The plantings would increase wildlife habitat, although the positive effects would be minimal because the project area is surrounded by developed land.

### **3.5.5 Wildlife Mitigation**

If Alternative II or III were selected, no mitigation would be required, with the exception of revegetation requirements detailed under vegetation mitigation above (Section 3.2.5). If Alternative I is selected and the site continues to degrade, initiation of consultation with the Fish and Wildlife Service may be required to discuss potential impacts to the RCW.

## **3.6 Cultural Resources**

Fort Bragg manages cultural resources through its Cultural Resources Program in accordance with the Fort Bragg Integrated Cultural Resources Management Plan (ICRMP), completed in 2001, and relevant federal legislation such as the National Historic Preservation Act (NHPA), Archeological Resources Protection Act (ARPA), and the Native American Graves Protection and Restoration Act (NAGPRA) as well as Army Regulation 200-4, Historic Preservation. Fort Bragg currently manages a total of over 2,800 archeological sites, two historic districts, six historic structures, and 27 historic cemeteries. The project site is not historic, nor is it located within a historic district or within the view shed of either the Old Post or the Overhills Historic Districts.

Consultation with Stacy Culpepper (November, 2003) from the Cultural Resource Management Program has indicated that the area of proposed action has been inventoried for cultural resources and no protected or significant resources exist in the area.

### **3.6.1 Alternative I Impacts to Cultural Resources**

Of all practices associated with natural resources management on Fort Bragg, erosion control projects have perhaps the greatest potential to affect archeological sites. Projects involving excavation, earth moving, and fill deposition can damage or bury cultural resources sites. However, effects to archeological resources from reduced erosion are generally positive,

provided sites are not damaged during erosion control activities (INRMP, 2001). Potentially minor detrimental effects to cultural resources may result from implementation of this alternative.

### **3.6.2 Alternative II Impacts to Cultural Resources**

This alternative potentially would have a minor positive effect to cultural resources in the Big Branch project vicinity because it would curb erosion that may erode or conceal potential cultural resources sites.

### **3.6.3 Alternative III Impacts to Cultural Resources**

Implementation of the preferred alternative would have the same effect as Alternative II on cultural resources.

### **3.6.4 Cumulative Impacts to Cultural Resources**

The threshold level of significance to determine impacts to cultural resources is the potential to violate Federal and State laws and regulations and Installation policies and guidelines, such as NAGPRA, ARPA, NHPA, and (Installation) Best Management Practices. No consequential cumulative effects are expected as a result of any alternative; however, implementation of Alternative II or III would positively affect cultural resources for reasons described above.

### **3.6.5**

#### **3.6.6 Cultural Resources Mitigation**

No mitigation is required as a result of the proposed action. However, the Army has an established protocol for inadvertent discovery of archaeological resources during construction projects.

#### **The following protective measures should be taken upon discovery of sites:**

- Cease ground-disturbing activities immediately and report to the Cultural Resources Manager (CRM) (Jeff Irwin, 396-6680) upon discovery of potential cultural deposits.
- Do no further investigation if remains are determined by the CRM to be natural, and resume the project. Protect the site until such time that it is determined ineligible for the NRHP if remains are determined to be cultural.

### **3.7 Human Environment**

The proposed action was determined to have an inconsequential affect on several factors relating to the human environment. These factors were population, transportation, utilities, and

additional information regarding the urban area around Fort Bragg. The alternatives discussed are located in the interior of the installation where their effects will be limited.

The Fort Bragg area has experienced substantial growth over the past two decades. Further population growth is expected, largely due to the presence of Fort Bragg. The Installation's substantial contribution to the local economy encourages economic activity and expansion in areas near Post. The availability of military benefits such as health services, the commissary and Post Exchange draws military retirees to the area, adding to the need for expansion and development in the surrounding civilian community. Urban encroachment forces Fort Bragg to carefully consider how its operations affect the surrounding area and how land use around the installation affects Fort Bragg.

In Cumberland County, most land bordering Fort Bragg is already developed for residential use. In Hoke County, south of the installation boundary, development is not as wide spread, but is growing. Moore County, the home of Southern Pines and Pinehurst, an area undergoing substantial growth, is located to the west of the installation. The Woodlake subdivision, near the northern boundary of the installation, is substantially developed. Harnett County currently has no zoning laws in place for the southern portion of the county allowing mobile homes to constitute a substantial and growing percentage of residential land use near Fort Bragg. This is a problem due in part to the noise impact from operations at Fort Bragg and Pope Air Force Base.

Sediment is a major pollutant of off-Post waters that are used by the community for drinking water supply and recreation. Sediment can accumulate and decrease the depths of recreational lakes, and suspended sediment particles increase water temperatures. These impacts can lead to species changes that affect local fishermen.

***Environmental Justice.*** The concept of environmental justice is based on the premise that no segment of the population should bear a disproportionate share of adverse human health or environmental effects. To address these concerns, Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority and Low Income Populations* was issued. It requires each federal agency to “make the achievement of environmental justice part of its mission by identifying and addressing disproportionately high and adverse human health and environmental effects on minority and low-income populations.” There are no low income or minority populations living in areas surrounding the project area that meet the definition of EO 12898; there are no mobile homes or substandard housing located in these areas. Therefore, no environmental justice issues are raised by the proposed action.

***Protection of Children.*** The concept of protecting children arises out of a growing body of scientific knowledge, which demonstrates that children may suffer disproportionately from environmental health and safety risks. To address these concerns, EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks* was issued on April 21, 1997. It requires federal agencies to identify and assess environmental health and safety risks that may disproportionately affect children and to ensure that its policies, programs, activities, and standards address disproportionate risk to children that result from environmental health or safety risks. The EO defines environmental health and safety risks as risks to health or to safety that are attributable to products or substances that children are likely to come in contact with or ingest [(such as the air they breathe, the food they eat, the water they drink or use for recreation, the soil on which they live and play, and the products which they use or to which they are exposed). There are no children living in areas surrounding the project area that meet the definition in EO 13045; there are no mobile homes or substandard housing located in these areas. Therefore, the concerns raised by the Executive Order are not relevant to the proposed action.

***Public Health and Safety.*** Training continues to require, the use of “blank” as well as “live” ammunition. The range of ammunition used for training purposes is very broad. Blank ammunition and various pyrotechnic simulators are used throughout the entire training area. Live-fire training is conducted in designated ranges and training areas, with projectiles directed towards designated impact areas.

Fort Bragg’s military, civilian personnel, and the community are routinely advised and reminded not to handle any suspected unexploded ordnance (UXO), and to report their location to the Explosive Ordnance Demolition Detachment or to the Director of Public Safety via 911 call. A restricted UXO ammunitions region immediately bounds the north side of the project. No UXO is evident within the project boundaries.

### **3.7.1 Alternative I Impacts to Human Environment**

Implementing this alternative would not disproportionately affect human health, economic or environmental conditions of minority and low-income populations as defined through EO 12898. Implementing this action would not cause significant environmental health and safety risks, therefore it would not disproportionately affect children, within the meaning of EO 13045. Civilians live in the vicinity of the project site; thus, continued degradation of the Rockfish Creek watershed may have minor adverse effects to public welfare.

### **3.7.2 Alternative II Impacts to Human Environment**

Implementing this action would not adversely affect the human health, economic, or environmental conditions of minority and low-income populations within the meaning of EO 12898 because there are no minority populations in the vicinity of the project site. Implementing this alternative would not cause significant environmental health and safety risks, and thus, it would not disproportionately affect children within the meaning of EO 13045. Minor positive effects to public welfare may be generated by the cessation of sedimentation off-Post.

### **3.7.3 Alternative III Impacts to Human Environment**

Environmental justice and the protection of children concerns of this alternative mirror the conclusions of alternative II. Moreover, control of erosion and sedimentation is deemed vital to the public interest and necessary to the public health and welfare under the North Carolina SPCA. This alternative would directly result in facilitating compliance with this statute, and generate additional wetland credits.

### **3.7.4 Cumulative Impacts to Human Environment**

The cumulative effects of this project would not significantly affect the quality of the human environment. The construction and repair of the roadway and its drainage would be in accordance with all applicable environmental regulations.

## **3.8 Air Quality**

Fort Bragg manages its air resources in compliance with its Title V Air Quality Permit. The Fayetteville-Fort Bragg area is an air quality attainment zone for all pollutants. National Ambient Air Quality Standards (NAAQS) for ozone have been exceeded during several recent summers. Increased ozone levels at near ground level are taken as an indicator of poor air quality. Because this is a perennial problem, North Carolina is developing a State Implementation Plan (SIP) to govern compliance with the NAAQS standards for ozone in Cumberland County.

Sources of potential air emissions at the Installation include particulate matter (PM) from dust, CO and PM from prescribed burning activities, and nitrous oxides from the combustion of fuels. Fugitive Dust is particulate emissions released from sources that do not have a pinpoint exit such as a stack or vent. Relief from regulation of fugitive dust is available during military training and exercises, but not for activities such as construction. Fort Bragg's Air Program Manager has cleared the proposed action (Stancar, 2004).

### **3.8.1 Alternative I Impacts to Air Quality**

No construction activity would take place to generate air pollutants. This alternative would not adversely affect air quality relative to current conditions.

### **3.8.2 Alternative II Impacts to Air Quality**

Implementing this action would not adversely affect air quality on Fort Bragg (Stancar, 2004). Engine exhaust and dust from vehicles and construction equipment would be transitory and limited to the immediate vicinity during the proposed action. However, there is no reason to anticipate that this would have a significant detrimental effect to air quality.

### **3.8.3 Alternative III Impacts to Air Quality**

Implementing this action would not adversely affect air quality on Fort Bragg (Stancar, 2004). Engine exhaust and dust from vehicles and construction equipment would be transitory and limited to the immediate vicinity of the project during the proposed action.

### **3.8.4 Cumulative Impacts to Air Quality**

The threshold level of significance for Air Quality is the violation of applicable Federal or state laws and regulations, such as the Clean Air Act, and the potential for Notices of Violation (NOV) for the failure to receive applicable state permits (such as those required for construction projects) prior to initiating a proposed action or the failure to follow permit requirements. By regulation, all alternatives should maintain air quality to ensure that the Installation does not violate any applicable requirements developed under the SIP approved or promulgated by the USEPA Administrator pursuant to Section 110 of the Clean Air Act. No alternative is likely to cumulatively impact air quality.

### **3.8.5 Air Quality Mitigation**

Fort Bragg would observe construction actions to mitigate the release of emissions, dust, or particulate matter into the air.

### 3.9 Noise

Fort Bragg is a fully operational military installation with the mission of training soldiers for war. Environmental noise produced by normal daily operations is assessed under the Environmental Noise Management Program (ENMP) and Air Installation ENMP programs. Zones of ambient noise are identified by predictive modeling and field checked with noise monitors. Land use planners use this information to guide land development both on and off post.

The day-night level (DNL) is the primary description used to assess relative noise levels. This represents a weighted sound level over a 24-hour period, with a 10-decibel penalty added for nighttime noise levels. The DNL is accepted as the unit for use in quantifying human annoyance to general environmental noise. Noise from transportation and continuous sources is assessed using the A-weighted DNL. Noise for impulsive sources such as that resulting from artillery or demolition activities is assessed using the C-weighted DNL. The percentages of the population annoyed by various noise levels, decibel parameters for A-weighted (dBA) and C-weighted (dBC) noise, and guidance for noise sensitive land uses are listed below:

ZONE	POPULATION ANNOYANCE	DECIBEL RANGE		LAND USE GUIDANCE
		dBA	dBC	
I	<15%	<65	<62	Acceptable
II	15-39%	65-75	62-70	Normally Unacceptable
III	>39%	>75	>70	Unacceptable

For purposes of this EA, the A-weighted DNL is most significant for evaluating the effects of the Proposed Action. The area near the roadway is classed as Zone II, an area normally considered to be acceptable for noise sensitive land uses. There are no potential cumulative effects on noise as a result of any alternative and no mitigation is required.

#### 3.9.1 Alternative I Impacts to Noise

Implementing this action would not adversely affect ambient noise levels. No construction activity would take place to generate additional noise.

#### 3.9.2 Alternative II Impacts to Noise

Implementing this alternative would not adversely affect ambient noise levels. There would be a slight increase in noise levels at the site due to the use of construction; however, this would be transient.

### **3.9.3 Alternative III Impacts to Noise**

Implementing this alternative would not adversely affect ambient noise levels. There would be a slight increase in noise levels at the site due to the use of construction; however, this would be transient.

### **3.10 Hazardous and Toxic Materials/Waste**

Hazardous and Toxic Materials/Waste Management programs on Fort Bragg has three major functions: (1) storage, handling, and disposal; (2) waste minimization; and (3) remediation. The objectives for hazardous and toxic material and waste management programs are to ensure compliance with all applicable laws and regulations, eliminate, minimize, and remediate hazards to human health and damage to the natural environment, and to save money by implementing waste management procedures which conserve resources in such a way as to protect public health and safety. A detailed discussion of these programs is presented in the Installation Sustainable Integrated Solid Waste Management Plan (September, 2003).

There are three Solid Waste Management Unit (SWMU) cells related to an abandoned solid waste landfill that are northwest of the project area (Appendix A, Figure 4). One of the SWMUs is an active site under long-term monitoring for groundwater, and the others were determined to have no contamination present (Schwacke, 2004). The possible presence of hazardous material is a potential issue since one goal of the project is to restore ecological function to the stream. North Carolina's Division of Water Quality and the USACE were contacted and decided that the potential benefits of restoration outweighed the potential issues associated with the hazardous material (Stantec, 2004c).

#### **3.10.1 Alternative I Impacts to Hazardous and Toxic Materials/Waste**

The SWMUs are currently being monitored through a series of groundwater wells. They would continue to be monitored if this alternative were implemented.

#### **3.10.2 Alternative II Impacts to Hazardous and Toxic Materials/Waste**

Implementing this alternative would not adversely affect toxic material/waste on Fort Bragg. The SWMUs upstream would continue to be monitored if this alternative were implemented.

### **3.10.3 Alternative III Impacts to Hazardous and Toxic Materials/Waste**

Implementing this alternative may result in a positive impact to toxic materials/waste on Fort Bragg because if any hazardous waste were to leak from the SWMUs, the created wetlands would help filter any pollutants and prevent their transport downstream.

### **3.10.4 Cumulative Impacts to Hazardous and Toxic Materials/Waste**

The threshold level of significance for hazardous and toxic materials or waste is the violation of applicable Federal or state laws and regulations, and the potential for Notices of Violation (NOV) for the failure to receive applicable state permits prior to initiating a proposed action or the failure to follow permit requirements. All Fort Bragg construction contractors would be required to adhere to Installation, State, and Federal hazardous materials regulations. There is potential for occasional spills among all the construction and operations occurring at Fort Bragg and within the region. There would be no significant cumulative impacts related to hazardous and toxic materials because of the tight spill prevention controls and emergency response.

### **3.10.5 Hazardous and Toxic Materials/Waste Mitigation**

Although mitigation associated with the contaminants related to the SWMUs in the vicinity of this project is occurring, it is not directly associated with this project and will not be discussed here. This project would not result in the release of hazardous waste; therefore, no mitigation would be required.

## **4.0 CONCLUSIONS & RECOMMENDATIONS**

### **4.1 Conclusion**

Alternative I, “No Action/Status Quo,” would minimally affect resources because Fort Bragg would be following already-established procedures. However, failure to implement the proposed action could lead to significant adverse effects to soils and water quality, and potentially adverse effects to vegetation and protected species habitat. Cumulatively, Alternative I would result in minimal negative effects on soils and water quality.

Alternative II, “Repair the Stream Channel” would involve filling the scour hole and trying to restore the stream to a condition that existed prior to the failure of the energy dissipation structure. This option is technically very difficult and risky since it would involve building a new stream on fill (unstabilized dirt). This option would require a large volume of high quality fill material that is not available on the base resulting in high construction costs. Construction would require a temporary stream channel that may result in the loss of additional pines. The creation of a stable stream channel will require the restoration of a more sinuous pattern and the excavation of the streambanks resulting in the destruction of some pines along the existing channel banks. Filling the scour hole would create new habitat for pines. This alternative would have localized positive effects on soils and water quality. This alternative would facilitate compliance with Federal and State laws. The sedimentation issue would be resolved but there is a high risk of channel failure that would increase the sediment load to the stream. Further mitigation can be accomplished through native plant reclamation, increased water quality monitoring, seeding and other erosion control measures.

Alternative III, “Divert the Stream Channel” would involve creating a new channel north of the existing channel using Natural Channel Design Methods and abandoning the old channel. This option would be less technically challenging and has a higher chance of success. This option would not require a large volume of fill and therefore be less costly. This alternative would have positive effects on soils, water quality, vegetation, and endangered species. Cumulatively, this alternative may result in significantly positive impacts since excess wetlands would be created and native plants would be used in revegetation efforts. This alternative would facilitate compliance with Federal and State laws. The creation of a new channel will result in the loss of additional pines but a survey of the trees in the valley will help minimize the number of trees. Natural Resources Division would be extensively consulted with regarding tree clearing. The slopes of the scour hole will be stabilized creating new habitat for pines. The abandoned stream channel would create some wetland habitat and help restore the groundwater hydrology of

the valley. This alternative would require close coordination with Endangered Species Branch personnel to ensure that no unintended direct or indirect (impacts to vegetation) impacts to the endangered species in the area occur as a result of the proposed action. Careful planning would be undertaken to ensure that no significant features of the remediation plan fall within jurisdictional wetlands or areas that contain habitat trees for RCWs.

#### **4.2 Recommendation**

Alternative III, “Divert the Stream Channel,” is the recommended course of action because it involves no significant change in land use and enables fulfillment of missions on Fort Bragg. Based on a review of the information contained in this EA, which was prepared under consultation with cultural resources, environmental compliance, soil conservation, natural resources, wildlife, and training managers at Fort Bragg, the project to construct a new, more stable channel for Big Branch within its existing floodplain on Fort Bragg in Cumberland County, North Carolina, would not constitute a major federal action significantly affecting the quality of the human environment within the meaning of Section 102(2)(c) of the NEPA. Accordingly, preparation of an Environmental Impact Statement is not required. A draft Finding of No Significant Impact (FNSI) will be released to announce this conclusion to the public, and afford them an opportunity to comment on the Proposed Action. All plans and specifications prepared by the design firm for this project should incorporate all environmental permits, compliance, mitigation, and monitoring as detailed in this document. In order to mitigate the potential for adverse environmental impacts at the project site, Fort Bragg would conduct all construction activities in compliance with all applicable construction standards and environmental regulations. Stringent attention would be paid to soil erosion control in order to prevent sedimentation of downstream waters. A State approved Soil Erosion and Sedimentation Control Plan would be required.

## **5.0 PREPARATION AND CONSULTATION**

### **5.1.1 Prepared by:**

ECW Environmental Group, Hampton, Virginia:  
Cristen L. Taylor, Environmental Resource Specialist  
John A. Esson, Senior NEPA Consultant

### **5.1.2 Reviewed by:**

Fort Bragg Environmental Sustainment Division:  
Emile Gillin, NEPA Analyst

## **5.2 Persons & Agencies Consulted**

### **5.2.1 Agencies**

Headquarters, Fort Bragg Garrison Command (Airborne), Installation Management Agency, Fort Bragg, NC

Office of the Staff Judge Advocate. Public Works Business Center. Readiness Business Center.

N.C. Department of Cultural Resources, State Historic Preservation Office

N.C. Department of Environment and Natural Resources

### **5.2.2 Persons.**

Bean, G.G., Colonel, U.S. Army, Director of Public Works Business Center, Fort Bragg Garrison Command (Airborne), Installation Management Agency, Fort Bragg, NC.

Chisholm, R.A., Deputy Director of Public Works Business Center, Fort Bragg Garrison Command (Airborne), Installation Management Agency, Fort Bragg, NC.

Combs, C.P., Senior Code Enforcement Administrator (Zoning), City of Fayetteville Inspections Department, Fayetteville, North Carolina.

Culpepper, W.S., Archaeologist/GIS Analyst, Cultural Resources Branch, Environmental Sustainment Division, Public Works Business Center, Fort Bragg Garrison Command (Airborne), Installation Management Agency, Fort Bragg, NC.

Gray, J.B., Botanist, Endangered Species Branch, Public Works Business Center, Fort Bragg Garrison Command (Airborne), Installation Management Agency, Fort Bragg, NC.

Hoffman, E.L., Wildlife Biologist, Environmental Sustainment Division, Public Works Business Center, Fort Bragg Garrison Command (Airborne), Installation Management Agency, Fort Bragg, NC.

Irwin, J.D., Archaeologist, Environmental Sustainment Division, Public Works Business Center, Fort Bragg Garrison Command (Airborne), Installation Management Agency, Fort Bragg, NC.

Lantz, J.C., Soil Conservationist, Environmental Sustainment Division, Public Works Business Center, Fort Bragg Garrison Command (Airborne), Installation Management Agency, Fort Bragg, NC.

Schwacke, E., Underground Storage Tank/Installation Restoration Program Project Manager, Environmental Sustainment Division, Public Works Business Center, Fort Bragg Garrison Command (Airborne), Installation Management Agency, Fort Bragg, NC.

Stancar, J., Air Program Manager, Environmental Sustainment Division, Public Works Business Center, Fort Bragg Garrison Command (Airborne), Installation Management Agency, Fort Bragg, NC.

Whitley, G.F., Civil Engineer, Construction Management Division, Public Works Business Center, Fort Bragg Garrison Command (Airborne), Installation Management Agency, Fort Bragg, NC.

Williams, W.H., Captain, U.S. Army, Office of the Staff Judge Advocate, Headquarters, XVIII Airborne Corps, Fort Bragg, NC.

Williamson, S.D., Solid Waste/Recycling Manager, Environmental Sustainment Division, Public Works Business Center, Fort Bragg Garrison Command (Airborne), Installation Management Agency, Fort Bragg, NC.

## **6.0 LITERATURE**

This EA incorporates by reference the following documents:

Army Regulation 200-1, Environmental Protection and Enhancement, Department of the Army, Washington, DC, 1997.

Army Regulation 200-2, Environmental Effects of Army Actions, as amended by 32 CFR Part 651 (29 March 2002), Department of the Army, Washington, DC, 1988.

Army Regulation 200-3, Natural Resources - Land, Forest and Wildlife Management, Department of the Army, Washington, DC, 1995.

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Endangered Species Act of 1973 (as amended), U.S. Fish and Wildlife Service, Washington, DC, 1988.

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Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations, 1994.

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Explosive Ordnance Disposal, Forces Command, 1986.

Fort Bragg and Camp Mackall Endangered Species Management Plan, XVIII Airborne Corps and Fort Bragg, Fort Bragg, NC, 1996.

Fort Bragg East Military Installation Map, RCW Overprint 1998, 1:50,000 Map, Fort Bragg, NC.

Fort Bragg Forest Management Plan, XVIII Airborne Corps and Fort Bragg, Fort Bragg, NC, 1993.

Fort Bragg Integrated Cultural Resources Management Plan, XVIII Airborne Corps and Fort Bragg, Fort Bragg, NC, 2001.

Fort Bragg Integrated Natural Resources Management Plan, XVIII Airborne Corps and Fort Bragg, Fort Bragg, NC, 2001.

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- Mitsch, W.J., 1994, The nonpoint source pollution control function of natural and constructed riparian wetlands, in W.J. Mitsch, ed., *Global wetlands: Old world and new*: New York, Elsevier Science B.V.
- Mitsch, W.J. and J.G. Gosselink, 1993, *Wetlands*, 2<sup>nd</sup> edition: New York City, New York, Van Nostrand Reinhold.
- National Environmental Policy Act of 1969 (as amended), U.S. Environmental Protection Agency, Washington, D.C., 1975.
- North Carolina Department of Environment and Natural Resources, [www.dlr.enr.state.nc.us/eroncsc.html](http://www.dlr.enr.state.nc.us/eroncsc.html)
- Stantec Consulting Services, Big Branch Stream Restoration Restoration Reach Study, Fort Bragg Military Reservation, Cumberland County, NC, 2004a.
- Stantec Consulting Services, Big Branch Stream Restoration Conceptual Design, Fort Bragg Military Reservation, Cumberland County, NC, 2004b.
- Stantec Consulting Services, Big Branch Stream Restoration Feasibility Study, Fort Bragg Military Reservation, Cumberland County, NC, 2004c.
- Stantec Consulting Services, Big Branch Stream Restoration Reference Reach Study, Fort Bragg Military Reservation, Cumberland County, NC, 2004d.
- Soil Survey of Cumberland and Hoke Counties, North Carolina, U.S. Department of Agriculture, Soil Conservation Service, Washington, D.C., 1984.
- United State Environmental Protection Agency, February 20, 2003. <http://www.epa.gov/region5/water/cwa.htm>
- Watson, J.T., S.C. Reed, R.H. Kadlee, R.L. Knight, and A.E. Whitehouse, 1989, Performance expectations and loading rates for constructed wetlands, in D.A. Hammer, ed., *Constructed wetlands for wastewater treatment*: Chelsea, Lewis Publishers, CRC Press LLC.

## ACRONYMS AND ABBREVIATIONS

ADNL	A-Weighted Day Night Level
AR	Army Regulation
BMPs	Best Management Practices
CDNL	C-Weighted Day Night Level
dBA	A-Weighted Decibels
dBC	C-Weighted Decibels
DNL	Day-Night Level
COE	Army Corps of Engineers
dbh	diameter at breast height
EA	Environmental Assessment
ENRD	Environment and Natural Resources Division
EO	Executive Order
EPP	Environmental Protection Plan
ESMP	Endangered Species Management Plan
FB REG	Fort Bragg Regulation
FNSI	Finding of No Significant Impact
GPS	Global Positioning System
ICRMP	Integrated Cultural Resources Management Plan
ICUZ	Installation Compatible Use Zone
IDG	Installation Design Guide
INRMP	Integrated Natural Resources Management Plan
NAAQS	National Ambient Air Quality Standards
NCDENR	North Carolina Department of Environment and Natural Resources
NRHP	National Register of Historic Places
PWBC	Public Works Business Center
RCW	Red-Cockaded Woodpecker
ROI	Region of Influence
SESC	Soil Erosion and Sedimentation Control (Plan)
SIP	State Implementation Plan
SPCA	Sedimentation Pollution Control Act of 1973 (North Carolina)
TNC	The Nature Conservancy
USFWS	United States Fish & Wildlife Service
UXO	Unexploded Ordnance

## **APPENDICES**

Appendix A - Figures

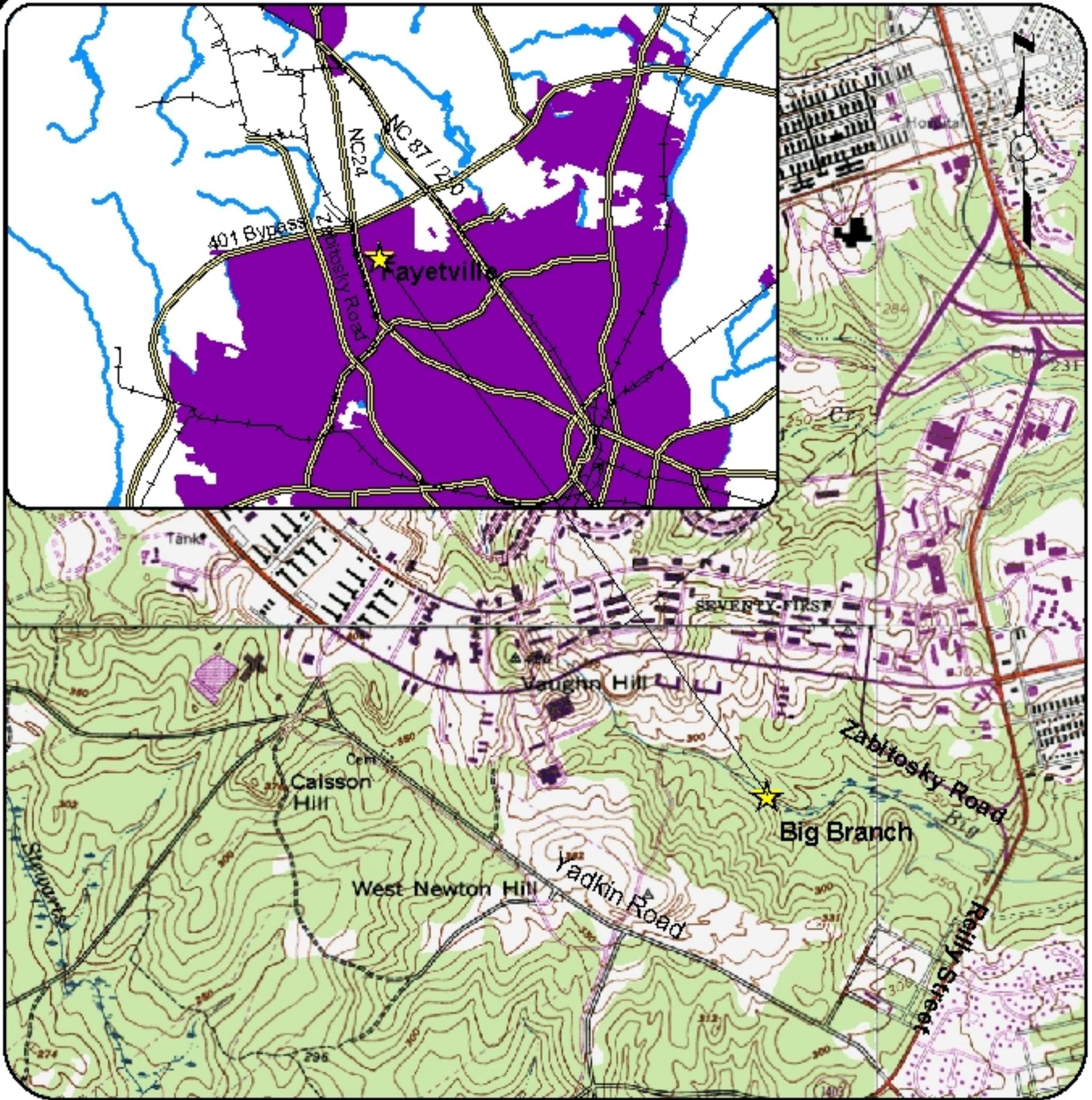
Appendix B - Photographs

Appendix C - Informal Consultation

Appendix D – Alternative III Revegetation Plan

# APPENDIX A

## FIGURES



**Legend**

-  Cape Fear River Basin
-  Cumberland County

**Not to Scale**



**Stantec**

**Big Branch  
Stream Restoration Project**

**Fort Bragg Military Reservation  
Cumberland County, North Carolina**

**Project Location**

**Figure 1**



### Legend

- Concrete Lined Channel
- Unstable Natural Channel
- - - Tributaries

**Big Branch  
Stream Restoration Project**

**Fort Bragg Military Reservation  
Cumberland County, North Carolina**

**Big Branch**

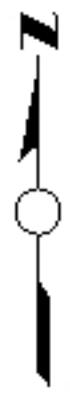


**Stantec**

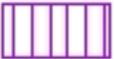
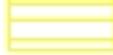
0    250    500  
Feet



Figure 2



### Legend

- |   |  |  |
|---|--|--|
|  Watershed   |  Impervious Surface |  Sand Lots/Open Areas |
|  Tributaries |  Evergreen Forest   |  Big Branch           |
|   |  Mixed Forest       |  |

**Big Branch Stream Restoration Project**

**Fort Bragg Military Reservation**  
Cumberland County, North Carolina

 **Stantec**

**Watershed Land Use**

0 500 1,000 Feet

**Figure 3**



**Legend**

- Watershed
- Tributaries
- SWMU Cells
- ➔ Big Branch

**Big Branch  
Stream Restoration Project**

**Fort Bragg Military Reservation  
Cumberland County, North Carolina**

**Hazardous Materials**

 **Stantec**

0    500    1,000  
Feet

Figure 4

# Figure 5 RCW Forage Partitions



### Legend

-  Wetlands
-  RCW Forage Partitions
-  RCW Clusters
-  RCW Greenbelt Area
-  RCW Trees
-  Wetlands

■ Feet  
800



Title: RCW Forage Partitions Figure 5  
PN:

Source: M:/Arc/masterCantonment.mxd  
Coordinate System: NAD 1983 UTM Zone 17N  
Prepared By:

# Appendix B

## Photographs









# Appendix C

## Informal Consultation



DEPARTMENT OF THE ARMY  
INSTALLATION MANAGEMENT AGENCY  
HEADQUARTERS, FORT BRAGG GARRISON COMMAND (AIRBORNE)  
FORT BRAGG, NORTH CAROLINA 28310

August 5, 2004

REPLY TO

Public Works Business Center

Mr. Peter Benjamin  
Ecological Services Supervisor  
United States Fish and Wildlife Service  
Raleigh Field Office  
Post Office Box 33726  
Raleigh, North Carolina 27636-3726

Dear Mr. Benjamin:

As an important partner working with Fort Bragg on the recovery of the red cockaded woodpecker (RCW), we are notifying you of the following project that is located within the managed forage partition for RCW cluster 280 and the Greenbelt (see map). This notification is not to initiate formal consultation with United States Fish and Wildlife Service pursuant to Section 7 of the Endangered Species Act of 1973, as amended. The purpose of this letter is to informally notify you of work being accomplished on Fort Bragg.

Big Branch Creek, located on Fort Bragg, flows into Beaver Creek and is within the Cape Fear River Basin. In the early 1990s development within Fort Bragg began causing severe erosion problems on Big Branch. In response, Fort Bragg lined a portion of stream channel with concrete, which caused a dramatic increase in water velocity. This increased water velocity has caused a large scour hole to form which increases sediment loading of the creek. While Big Branch is not 303(d) listed, it is clear that contaminants from the existing upstream development are reaching the stream in the project area. Any changes that will improve water quality and reduce sedimentation within the degraded reach would support the restoration of Big Branch.

As a result of these existing water quality and sedimentation problems, Fort Bragg is working with the Wilmington District, Corps of Engineers (USACE) and the North Carolina Division of Water Quality (NCDWQ) in restoring a portion of Big Branch, upstream of Reilly Street. A new 3,200-foot long stream channel will be excavated north of the existing channel and the water velocity within the concrete lined stream channel will be reduced. In order to accomplish this task additional access must be provided. The contractor will need to

**COPY**

habitat (see Form 3's). Note: However, On May 5, 2004, a site visit determined in the project area Stand 4053 consisted of <5 percent loblolly pine so this habitat was not considered suitable RCW forage habitat.

Therefore, since the project area is located entirely within the floodplain of Big Branch and is dominated by wetland community vegetation, we believe that the floodplain area is considered unsuitable RCW forage habitat. Additionally, removal of these pines and other hardwoods from the new creek channel alignment would likely benefit the stand by thinning the overly stocked stand and possibly help connect forest stands 4055 to 4052 within RCW Cluster 280 (see enclosed map). These tree impacts will not impact any suitable RCW forage habitat.

Loss of about 66 pines within this loblolly pine drain habitat will not cause significant forest fragmentation since the scale of tree impacts is very small. Also, the impacts will not affect the manageable minimum forage acreage requirement of 132 acres; therefore, RCW dispersal pathways and forage requirement are not going to be affected. In addition, the project is located within the floodplain, therefore, will not impact the management activities within cluster 280. Since only unsuitable forage habitat will be removed, the project impacts will not affect the Recovery standard in this cluster.

Impacts from the operational phase of this project will not likely disrupt the ongoing forest management activities. These activities are aimed at reaching the desired habitat structure and will demonstrate reasonable progress reflecting the important habitat elements in the Recovery standard. The long-term human activity associated with the project should be a "no effect" on RCW activity since the purpose of this project is to improve water quality and reduce sedimentation within Big Branch. We do not anticipate any impacts to the birds themselves since the project would be confined to the floodplain of Big Branch.

On May 5, 2004, Ms. Janet Gray, Botanist, Endangered Species Branch, conducted an onsite survey for rare and endangered plants within the project area. Big Branch is located within Cumberland County of which the following federally protected plant species are listed by the USFWS: Rough-leaved loosestrife *Lysimachia asperulifolia*, American chaffseed *Schwalbea americana*, Michaux's sumac *Rhus michauxii*, and Pondberry *Lindera*

construct temporary roadways adjacent to the new channel to construct the new stream course. All excess material excavated from the new channel alignment will be placed in trucks and hauled to an upland disposal area. Once all work is accomplished, the new channel banks and the alignment of the temporary access roads will be stabilized and planted. Both the new channel and temporary access roadways would be located within the existing floodplain of the creek. This area is non-suitable RCW habitat. No upland habitat will be impacted by the proposed action. Before any work is initiated, the required Nationwide Permit #27 will be obtained from the USACE and the Section 401 Water Quality Certificate from NCDWQ.

The Big Branch stream restoration project will remove about 66 loblolly pines (*Pinus taeda*), which are scattered throughout the project area. The following pines would be removed within the floodplain of the creek:

4 to 9.9 inches DBH.	18 loblolly pines
10 to 13.9 inches DBH.	17 loblolly pines
14 to 17.9 inches DBH.	16 loblolly pines
Greater than 18 inches DBH.	15 loblolly pines
Total Trees Removed:	66 loblolly pines

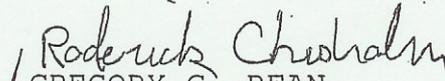
The floodplain canopy of Big Branch is dominated by tulip poplar (*Liriodendron tulipifera*), American sycamore (*Platanus occidentalis*), sweetgum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), laurel oak (*Quercus laurifolia*), loblolly pine (*Pinus taeda*) and blackgum (*Nyssa sylvatica*). The dense understory contains canopy species as well as sweetbay (*Magnolia virginiana*), flowering dogwood (*Cornus florida*), American holly (*Ilex opaca*), and ironwood (*Carpinus caroliniana*). Shrubs and vines include common sweetleaf (*Symplocos tinctoria*), coastal sweet pepperbush (*Clethra alnifolia*), highbush blueberry (*Vaccinium corymbosum*), giant cane (*Arundinaria gigantea*), greenbrier (*Smilax* spp.), and grape (*Vitis* spp.).

These 66 pines would be removed from forest stand 4053 within the managed forage partition for RCW cluster 280. Currently cluster 280 has about 224 acres of total forage habitat and the minimum forage area needed is approximately 13 acres as determined by the 2003 RCW Recovery Plan's forage guidelines and based on stand index (see enclosed Form 3's). Stand 4053 consists of 52-year-old loblolly pine Sandhill

*melissifolia*. No suitable habitat is present for rough-leaved loosestrife, American chaffseed, Michaux's sumac. Suitable habitat for pondberry is present. A plant-by-plant systematic survey was conducted to determine the presence of pondberry within the proposed construction areas. No individuals were found. No impacts to listed plant species will occur. An earlier visit by the biologist, Mr. Erich Hoffman, Endangered Species Branch, determined no Saint Francis' Satyr habitat in the project area.

In summary, the project at Big Branch is a "no effect" determination for the RCW because only unsuitable habitat will be impacted and the integrity of the Greenbelt will not be adversely affected. Additionally, the project is also determined a "no effect" for the Saint Francis' satyr, rough-leaved loosestrife, American chaffseed, pondberry, and Michaux's sumac. If you have any questions, please contact Mr. Erich L. Hoffman, (910) 396-2867.

Sincerely,

  
GREGORY G. BEAN  
Director of Public Works  
Business Center

Enclosures

# RCW Forage Analysis

Cluster 280

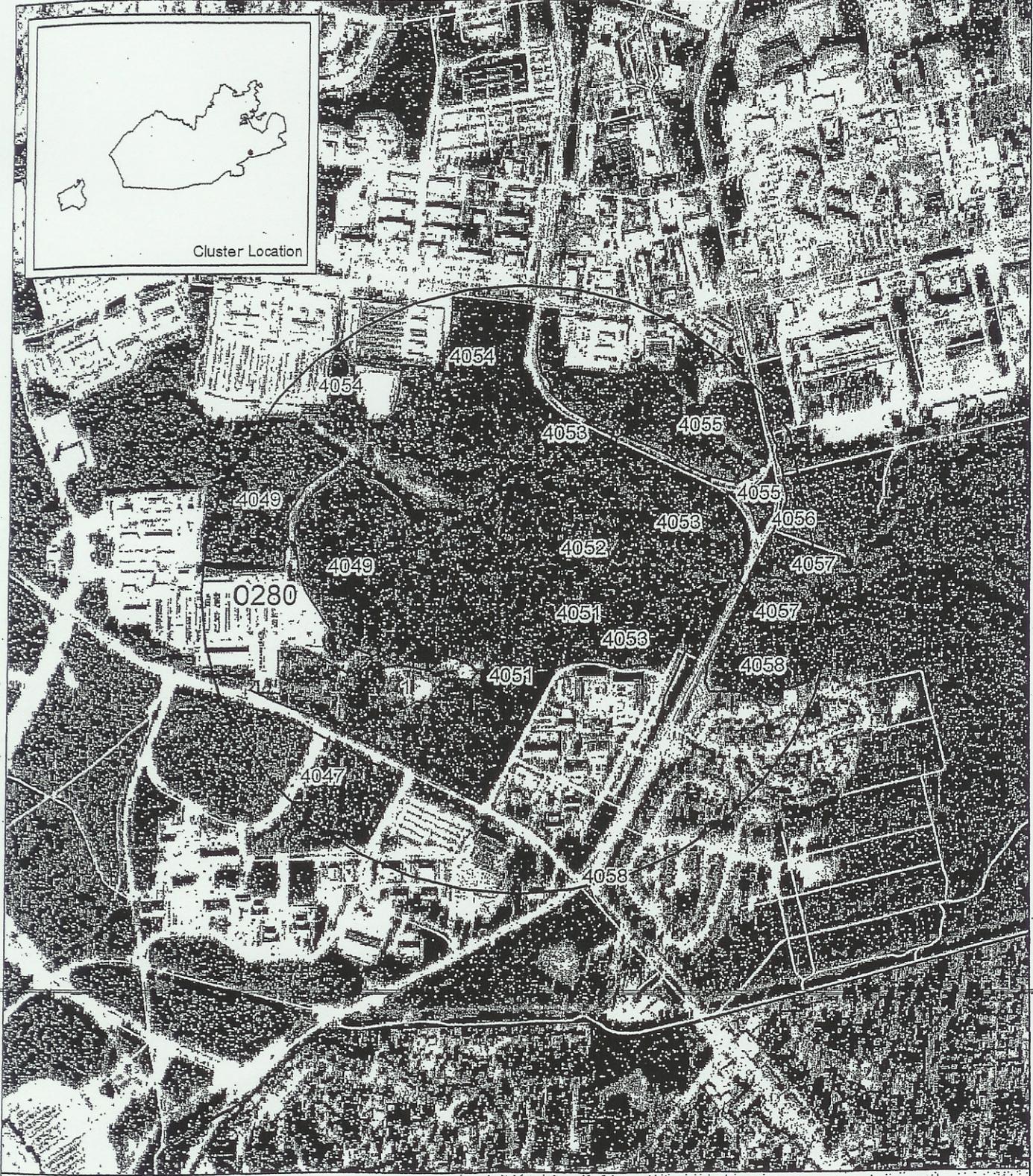
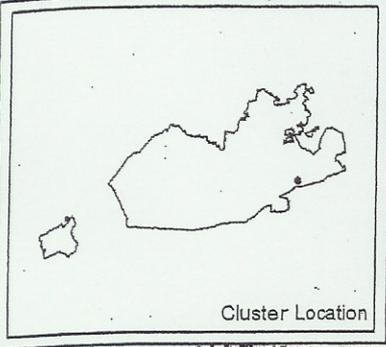


Fort Bragg

North Carolina

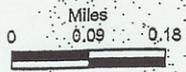
7/30/2004

File 2



# Forage Assessment

-  RCW Tree
-  Road/Firebreak
-  Bragg Boundary
-  RCW Forage Partition
-  Forest Stand



Stand	Type	Pine Age	Pine TPA 4-9.9"	Pine TPA 10-13.9"	Pine BA 4-9.9"	Pine BA 10-13.9"	Pine BA 14+"	Total Pine BA (Per/Acre)	Pine BA => 10in (Per/Acre)	Total Pine BA => 10"	Stands Older than 30' (10in BA * Ac) (BA 40-70)	Stands older than 30 Pine BA <10in (BA < 20)	Stands older than 30 no pine midstory	Total 30 Yr. old stand BA Stands > 80 BA	Total Acres
1	OPEN	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	4.67
4047	LB	34	67.8	39.0	21.9	30.0	10.0	61.9	40.0	769	769	0	0	0	19.23
4049	LB	41	96.1	20.0	20.0	16.5	34.0	70.5	50.5	3,408	0	0	0	6,816	67.48
4051	LL	69	92.2	24.6	20.0	19.0	29.0	68.0	48.0	1,575	1,575	0	0	0	32.80
4052	LL	45	98.1	10.3	13.7	8.8	12.5	35.0	21.3	411	0	0	0	0	19.30
4053*	LB	52	45.7	16.3	10.7	13.3	32.7	56.7	46.0	4,441	4,441	0	0	10,872	96.55
4054	LB	38	37.0	41.1	12.0	30.0	21.0	63.0	51.0	1,127	1,127	0	0	0	22.11
4055	LB	48	25.0	43.3	9.0	32.0	42.0	83.0	74.0	2,091	0	0	0	2,825	28.25
4056	LL	62	54.8	26.7	14.0	21.0	43.0	78.0	64.0	501	0	0	0	646	7.83
4057	LHAR	51	2.1	2.7	0.5	2.4	11.0	13.9	13.4	121	0	5	0	0	9.00
4058	LB	35	29.5	36.0	11.0	27.5	40.5	79.0	68.0	733	0	0	0	1,067	10.78

\* Note: 80.1 acres of the poor quality forage primarily occurring in stand 4053 are typed as drain with boundaries determined by GPS. Due to this habitat characteristic and the probability of rapid hardwood midstory growth, no intensive hardwood control is planned to upgrade the area to Good Quality Forage. This figure explains the difference between total acres of pine-forested area (304) and total forage available (224).

Stand	Type	Pine Age	HWD TPA 4-9.9"	HWD TPA 10-13.9"	HWD TPA 14+"	HWD BA 4-9.9"	HWD BA 10-13.9"	HWD BA 14+"	% Hardwood	Total Hwd BA >10"	No HDWD midstory Pine > 30	Project Acres	Total Acres	Good Quality Acres	Poor Quality Acres	Non-suitable acres
1	OPEN	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	4.67	0.00	0.00	4.67
4047	LB	34	17.4	2.6	1.6	4.3	1.9	2.9	12.8	4.8	0	0	19.23	0.00	19.23	0.00
4049	LB	41	88.8	10.3	2.4	19.0	8.0	3.5	30.2	11.5	0	0	67.48	0.00	67.48	0.00
4051	LL	69	15.3	0.0	0.0	2.0	0.0	0.0	2.9	0.0	0	0	32.80	0.00	32.80	0.00
4052	LL	45	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19	0	19.30	0.00	19.30	0.00
4053	LB	52	69.3	22.6	13.8	17.3	17.3	21.3	49.6	38.6	0	0	96.55	0.00	96.55	0.00
4054	LB	38	20.6	10.6	1.3	5.0	8.0	2.0	19.2	10.0	0	0	22.11	0.00	22.11	0.00
4055	LB	48	38.2	10.4	1.5	8.0	7.0	2.0	17.0	9.0	0	0	28.25	0.00	28.25	0.00
4056	LL	62	13.4	1.8	0.2	2.5	1.5	0.5	5.5	2.0	0	0	7.83	0.00	7.83	0.00
4057	LHAR	51	150.5	20.3	10.1	31.0	15.3	18.6	82.4	33.9	0	0	9.00	0.00	0.00	9.00
4058	LB	35	38.9	7.4	2.7	10.0	4.5	5.5	20.2	10.0	0	0	10.78	0.00	10.78	0.00

Stand	Type	Criteria A Age	Criteria A TPA	Criteria B Range	Criteria C BA	Criteria C Stems	Criteria E Midstory	Criteria F % HDWD	Criteria H Contiguous	Total Score	Total Acres
1	OPEN	0	0	0	0	0	0	0		0	4.67
4047	LB	2	1	4	2	1	1	3		14	19.23
4049	LB	3	5	2	2	1	1	1		15	67.48
4051	LL	5	5	3	2	1	5	5		26	32.80
4052	LL	3	1	3	4	1	5	5		22	19.30
4053	LB	4	3	5	4	1	1	1		19	96.55
4054	LB	2	3	4	4	1	1	0		15	22.11
4055	LB	3	5	1	5	3	1	1		19	28.25
4056	LL	5	5	1	4	1	4	4		24	7.83
4057	LHAR	0	0	0	0	0	0	0		0	9.00
4058	LB	2	5	1	4	3	1	1		17	10.78

Max Score = 35

Notes:

Good Quality Forage Habitat Category Description	Category Ranges 1 (Least Desired)- 5 (Most Desired)					
	Criteria	1	2	3	4	5
Pine stands must be at least 60 years old	A Age	<=30	31-40	41-50	51-59	>=60
Must be => 18 pines per acre at least 14in dbh	A TPA	<= 10	10.01-11.99	12.01-15.99	16.01-17.99	>=18
BA of Pines =>4in must be between 40-60	B	< 25 or > 75	25-30 or 70-75	30-35 or 65-70	35-40 or 60-65	40-60
Pine BA of Pines 4-10in dbh must be < 10	C BA	>25	20.01-25	15.01-20	10.01-15	<10
Pine 4-10in dbh must be < 20 Trees per acre	C Stems	>=35	30.01-35	25.01-30	20.01-25	<20
Hardwoods => 4in dbh must be <5% of total BA	E	>8.00%	7.01%-8.00%	6.01%-7.00%	5.01%-6.00%	<5.00%
Hardwoods => 4in dbh must be =<10% of the stand	F	>=30 %	25%	20%	15%	<=10%

Goal

<b>Cluster</b>	<b>280</b>
Good Quality Acres	0.0
Poor Quality Acres	304.3*
Non-Suitable Acres	13.7
Non-Contiguous Acres	0.0
Project Acres	0.0
<b>Total Acres</b>	<b>318*</b>

Pine BA > 10in (All Pine Stands)	15,056.0
<b>Pine Stands &gt; 30</b>	
Acres of Pine Stands > 30	304.3
Average Pine BA (Stands 40-70)	46.4
Average Pine BA (Pine <10 in of stands <20 BA)	0.5
Acres of stands with no hdwd midstory	19.3
Acres of stands with no pine midstory	0.0
Total BA (Incl hdwd),stands BA > 80	22,225.5

\* Note: 80.1 acres of the poor quality forage primarily occurring in stand 4053 are typed as drain with boundaries determined by GPS. Due to this habitat characteristic and the probability of rapid hardwood midstory growth, no intensive hardwood control is planned to upgrade the area to Good Quality Forage. This figure explains the difference between total acres of pine-forested area (304) and total forage available (224).

# Appendix D

## Revegetation Plan

## Proposed Planting by Zones

Zone	Vegetative Community Type	Common Name	Scientific Name	Southeast Region Indicator Status
A	Streambank	Swamp Dogwood	<i>Cornus amomum</i>	FACW+
		Virginia Willow	<i>Itea virginica</i>	FACW+
		Elderberry	<i>Sambucus canadensis</i>	FACW-
		River Birch	<i>Betula nigra</i>	FACW
		Tag or Smooth Alder	<i>Alnus serrulata</i>	FACW
		Black Willow	<i>Salix nigra</i>	OBL
B	Floodplain	Sycamore	<i>Platanus occidentalis</i>	FACW-
		Water Oak	<i>Quercus nigra</i>	FAC
		Green Ash	<i>Fraxinus pennsylvanica</i>	FACW
		Willow Oak	<i>Quercus phellos</i>	FACW-
		Swamp Blackgum	<i>Nyssa biflora</i>	OBL
		Ironwood	<i>Carpinus caroliniana</i>	FAC
		Swamp Red Bay	<i>Persea palustris</i>	FACW
		Titi	<i>Cyrilla racemiflora</i>	FACW
		Coastal Dog-Hobble	<i>Leucothoe axillaris</i>	FACW
		Sweet Bay	<i>Magnolia virginiana</i>	FACW+
C	Riparian Buffer	Water Oak	<i>Quercus nigra</i>	FAC
		Willow Oak	<i>Quercus phellos</i>	FACW-
		Cherrybark Oak	<i>Quercus falcata</i> var. <i>pagodaefolia</i>	FAC+
		Yellow Poplar	<i>Liriodendron tulipifera</i>	FAC
		Sweet Bay	<i>Magnolia virginiana</i>	FACW+
		Swamp Red Bay	<i>Persea palustris</i>	FACW
D	Wetlands	Swamp Blackgum	<i>Nyssa Biflora</i>	OBL
		Bald Cypress	<i>Taxodium distichum</i>	OBL
		Swamp Dogwood	<i>Cornus amomum</i>	FACW+
		Buttonbush	<i>Cephalanthus occidentalis</i>	OBL
		Lizard's Tail	<i>Saururus cernuus</i>	OBL
		Pickerelweed	<i>Pontederia cordata</i>	OBL
		Black Willow	<i>Salix nigra</i>	OBL
		Arrow arum	<i>Peltandra virginica</i>	OBL