

Changes in Imperviousness Near Military Installations

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INTRODUCTION

The population and rate of land development in and around many US. cities has grown significantly in the past twenty years. Urbanization and sprawl in proximity to military installations has influenced the military community's ability to maintain their mission focus. This study uses satellite remote sensing data to identify spatial changes over time for communities neighboring two military installations – Fort Benning, GA, and Fort Bragg, NC. Established in 1918, Fort Benning is located in the lower Piedmont Region of West Central Georgia and spreads over 182,000 acres. Fort Benning's immediate neighbor is Columbus, Georgia. Fort Bragg, also created in 1918, is the world's largest airborne training facility with over 45,000 military personnel. It is located just west of Fayetteville, North Carolina, and covers approximately 160,700 acres. Both installations are experiencing pressure from urban expansion associated with the surrounding communities.

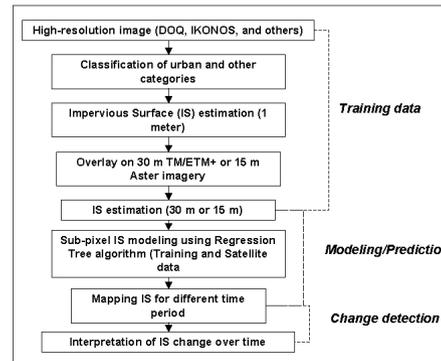


Fig. 1 Impervious surface change detection method

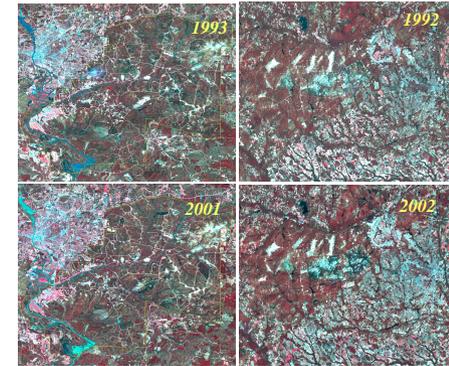


Fig. 3. Landsat 5 TM in 03/09/93 and 03/11/92 (upper) and Landsat 7 ETM+, 03/07/01 and 03/05/2002 (lower) over Fort Benning (left) and Fort Bragg (right)

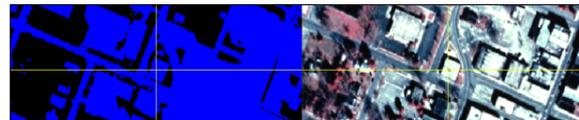


Fig. 2 Urban land use classification (left) from 1 meter resolution DOQQ (right).

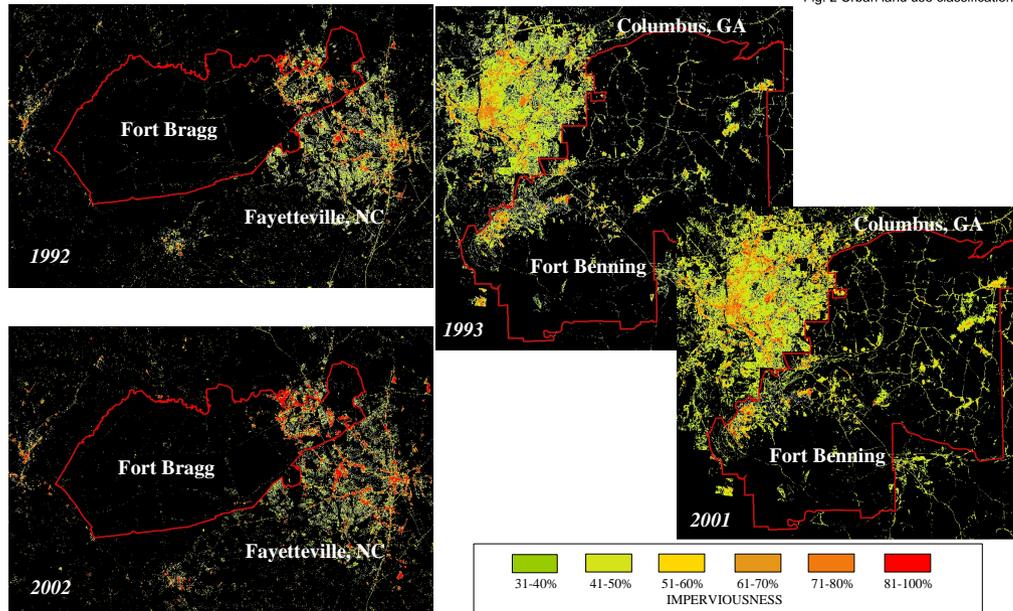


Fig. 5 Impervious surface of Fort Bragg and Fayetteville, 1992 and 2002 (left), Fort Benning and Columbus, 1993 and 2001 (right)

Fig. 4 IS pixel changes for Fort Benning, 1993 to 2001 (left), and Fort Bragg, 1992 to 2002 (right).

DATA AND METHOD

To detect and map urban growth over time, a sub-pixel impervious surface (IS) change detection method (Fig. 1) was applied. This procedure uses high-resolution DOQQs (1m) to classify urban land cover and estimate IS at 1 m resolution (Fig. 2) for training datasets. Landsat 5 TM and Landsat 7 ETM+ images acquired in 1993 and 2001 for Fort Benning, and 1992 and 2002 for Fort Bragg (Fig. 3), were used as the primary data sources for mapping IS changes from the training datasets. A regression tree algorithm was used to model percent imperviousness for two dates in a 30 Meter spatial resolution. Changes in urban land cover were identified through quantifying percent impervious surface as an indicator of urban sprawl.

RESULTS

The change in percent imperviousness from 1991 to 2001 in Fort Benning, and 1992 to 2002 in Fort Bragg are displayed in Fig.4. Figure 5 illustrates the percent imperviousness in and around Columbus and Fort Benning in 1993 and 2001, and Fayetteville and Fort Bragg in 1992 and 2002. Most changes occurred in the north and south-east side of Columbus, and western side of Fayetteville. Urban sprawl within the military installations is also evident in areas adjacent to the respective communities.