CRITERION 3—

Chapter 3. Drought Occurrence

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Why Is Drought Important?

Drought is an important forest disturbance that occurs regularly in the Western United States and irregularly in the Eastern United States (Dale and others 2001). Moderate drought stress tends to slow plant growth while severe drought stress can also reduce photosynthesis (Kareiva and others 1993). Drought can also interact with other disturbances, such as fire, insects, and diseases, that may lead to tree mortality and can exacerbate ecosystem stress.

Methods

The National Climate Data Center (NCDC) calculates the Palmer Drought Severity Index (PDSI) monthly by climate division for the conterminous United States. The NCDC archive contains monthly estimates of PDSI from 1895 to present (National Climate Data Center 1994). Using the PDSI, the average number of months of moderate, severe, or extreme drought was calculated for each ecoregion section of the conterminous United States for each year from 1895 through 2004 (for details about the method used, see Conkling and others 2005).

Both the 2004 drought occurrence and the 1995-2004 drought deviation were examined for each ecoregion section. Drought deviation compares drought occurrence in the current decade to the historical average (Conkling and others 2005). The frequency of drought from 1895 through 2004 served as a historical account or reference point for each ecoregion section. For example, if 396 months of drought were recorded in an ecoregion section from 1895 through 2004, then approximately 36 months of drought would be expected on a 120-month (10-year) basis. The historical account was then compared to the current decade. If the expected number of months with drought conditions was 36, and 48 months of drought were recorded in the current decade, then the drought deviation was 48 – 36 = 12. This technique simply compared the number of months of drought in the current decade with the expected value. There was no analysis of either the number of sequential months of drought or any possible temporal autocorrelation in drought occurrence, both of which may be important when assessing drought impacts.

What Do the Data Show?

In the Eastern United States, 2004 was a relatively wet year, with all ecoregion sections experiencing < 2 months of drought (fig. 3.1). The Western United States was considerably more droughty in 2004. Forests in section M332D–Belt Mountains experienced 12 months of drought. The scattered forests in sections 331G–Powder River Basin, 342G–Green River Basin, 322B–Sonoran Desert, and 342F–Central Basin and Hills experienced 11 months of drought in 2004.

The past decade (1995-2004) was more droughty than expected for several ecoregion sections in the Western United States (fig. 3.2). Forested areas in section 313C–Tonto Transition experienced 43 more months of drought than was expected based on long-term averages. The ecoregion sections in the American Semi-Desert and Desert Province (322) had a drought deviation of > 36 months. Forests in section M332D–Belt Mountains had a drought deviation of 33 months during the past decade (1995-2004). Section M331A–Yellowstone Highlands had a drought deviation of 32 months.

Most ecoregion sections in the Eastern United States experienced the expected amount or less than the expected amount of drought during the past decade (1995-2004). However, there were a few exceptions. The forested areas of section 232G–Florida Coastal Lowlands (Eastern) experienced 19 more months of drought than expected. Forested areas in section M221D–Blue Ridge Mountains experienced an additional 13 months of drought, and forests in section 221C–Upper Atlantic Coastal Plain experienced an additional 10 months of drought.

Drought stress plays a major role in ecosystem dynamics, influencing insect populations, uptake of ozone in plants, and fire occurrence. Over the past decade, ecoregion sections in the Western United States experienced drought conditions more often than ecoregion sections in the Eastern United States. The large-scale influence of drought stress on ecosystems is unknown, but continuous monitoring of drought conditions can help elucidate the relationships between drought and other disturbances at a national scale.

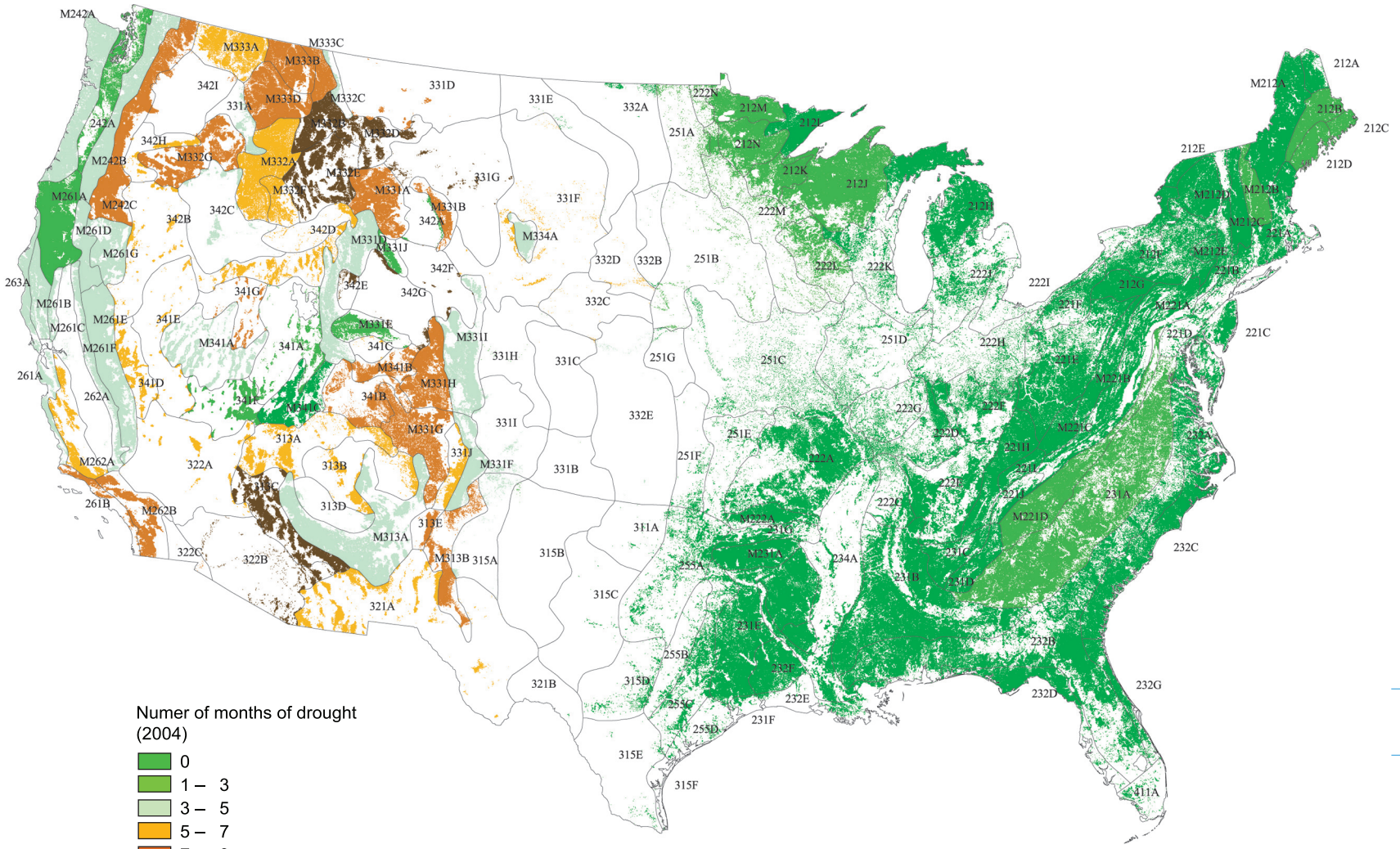

Figure 3.1—The average number of months of drought for forested areas of each ecoregion section (Bailey 1995, McNab and Avers 1994) in 2004. Forest cover is derived from Advanced Very High Resolution Radiometer (AVHRR) satellite imagery (Zhu and Evans 1994). (Data source: National Climate Data Center)

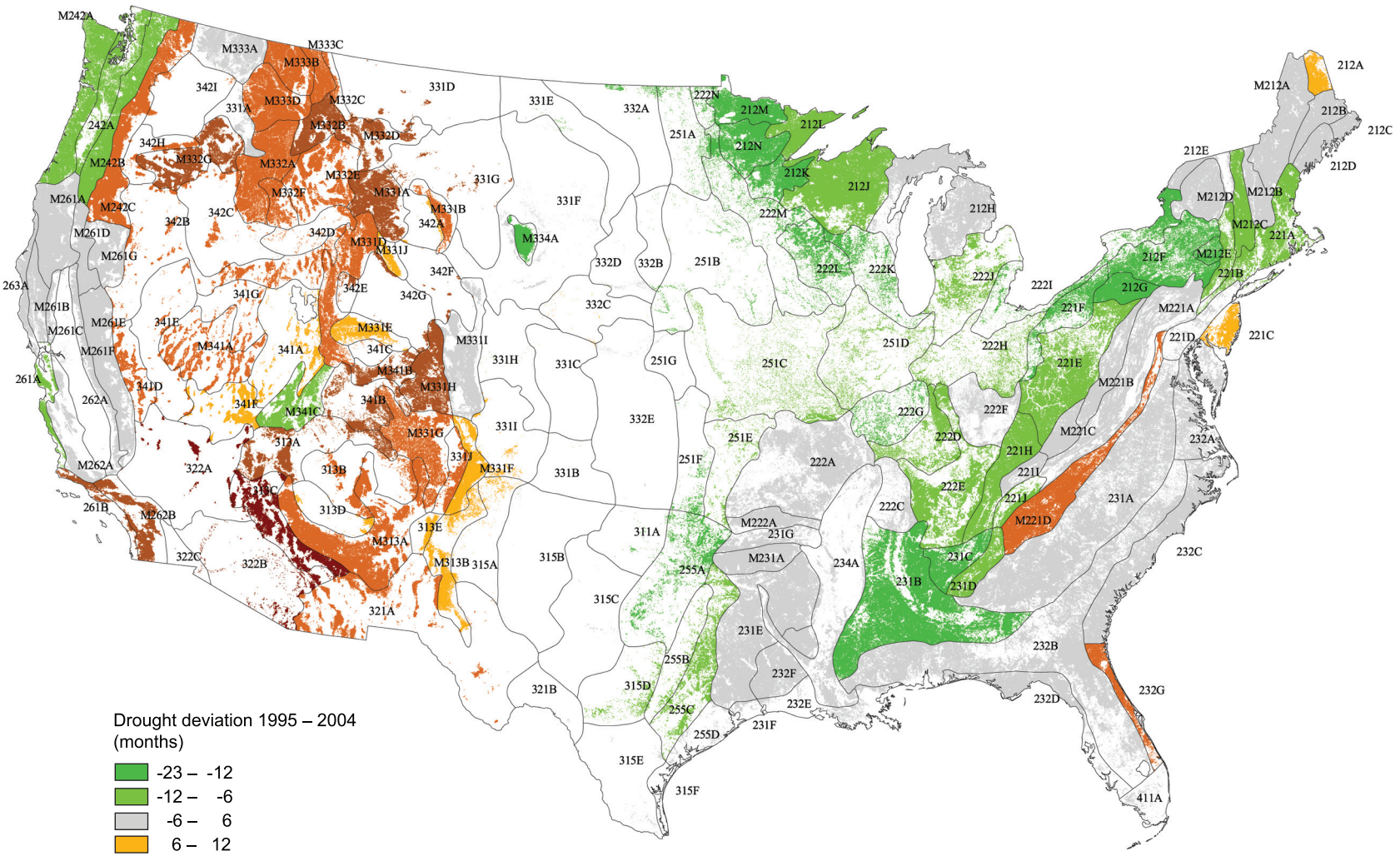

Figure 3.2—Drought deviation for the period 1995–2004 for forested areas of each ecoregion section (Bailey 1995, McNab and Avers 1994). Forest cover is derived from Advanced Very High Resolution Radiometer (AVHRR) satellite imagery (Zhu and Evans 1994). (Data source: National Climate Data Center)

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