

## Reading

40 points

**You are going to read an extract from a scientific article** (Tamm review: Terrestrial vertebrate biodiversity and intensive forest management in the U.S. by Stephen Demarais, Jacob P. Verschuyf, Gary J. Roloff, Darren A. Miller, T. Bently Wigley // *Forest Ecology and Management* 385 (2017) 308–330). **For questions 1-6, put the phrases given below (a-f) into their correct place in the text (1-6). For questions 7-10, choose the answer (A, B or C) which you think fits best according to the text.**

### 4.3. Biomass feedstock production

Increased interest in biofuel production from forests has led to experimentation in the Southeast with intercropping of native prairie grasses, primarily switchgrass (*Panicum virgatum*), to produce herbaceous biomass feedstock (Riffell et al., 2012). In intercropping systems, herbaceous plants are seeded between rows of planted trees and then grown and harvested annually (or semiannually) until shade from crop trees excludes the herbaceous crops. Wider tree spacings (often 6.1 m) provide sunlight to biofuel crops and facilitate access by harvest machinery (Riffell et al., 2012).

Potential negative implications of intercropping for vertebrates include removal of woody debris during site preparation (Riffell et al., 2012), replacement of a more diverse understory by a planted monotypical understory (Iglay et al., 2012b; Loman et al., 2014), and more frequent forest disturbance (1) \_\_\_\_\_. Grassland bird use of pure switchgrass patches in a forest matrix was minimal (Marshall, 2016). Although researchers speculated that wider tree rows in intercropping forest systems would benefit terrestrial vertebrates (2) \_\_\_\_\_, these benefits may be offset by potential within-stand edge effects and disturbances associated with switchgrass harvest (Riffell et al., 2012).

Intercropping increased coverage and species richness of forbs and non-switchgrass grass species and decreased woody plant coverage (3) \_\_\_\_\_ (Iglay et al., 2012b). Researchers concluded that intercropping promoted a diverse, herbaceous plant community, but cautioned that longer-term studies are needed (Iglay et al., 2012b). Plant species diversity, non-pine tree biomass, and biomass of white-tailed deer forage was reduced in intercropped stands after switchgrass establishment, but these effects were no longer apparent 2 years after establishment, except that less white-tailed deer browse and total forage was found in the intercropped beds (Wheat, 2015).

Biomass removal or switchgrass establishment did not affect detection, diversity, or relative abundance of 15 species of amphibians and reptiles within 2 years post-establishment, (4) \_\_\_\_\_ (Homyack et al., 2013). However, site preparation for switchgrass intercropping, (5) \_\_\_\_\_, influenced volume and dispersion of coarse woody debris (Loman et al., 2013). Intercropped forests had fewer retained trees and snags than non-intercropped stands, likely having a negative effect on vertebrate species requiring snags (Loman et al., 2013). Neotropical migrants and forest-edge associated species were less abundant in intercropped stands for the first 2 years after establishment and more abundant by year 3 (Loman et al., 2014). Vertebrate species associated with pine-grasslands were less abundant initially but converged with control plots (standard pine silviculture) in subsequent years (Marshall, 2016).

White-footed mice (*Peromyscus leucopus*) did not change diet or trophic position within intercropped and non-intercropped pine forests, indicating that this species maintained functional roles in a novel environment (Briones et al., 2013). As part of the same study, Homyack et al. (2014a) found that, over a 4-year period, natural succession in intercropped forests appeared to exert greater influence on rodent communities than intercropping. Conversely, in Mississippi, intercropping reduced rodent community evenness and diversity as compared to non-intercropped forests, (6) \_\_\_\_\_; survival and recruitment of cotton rats did not differ between forest types (King et al., 2014). Larsen et al. (2016) concluded that intercropping switchgrass in loblolly pine stands had minimal effects on rodent communities.

- a. despite removal of coarse woody debris
- b. compared to non-intercropped forests of the same age
- c. due to annual or biannual harvest of grass
- d. because it delays the time until overstory canopy closure
- e. due to high abundance of hispid cotton rats (*Sigmodon hispidus*) in intercropped forests
- f. compared to standard site preparation for pine plantations

7. Experimentation with intercropping of native prairie grasses is driven predominantly by interest in

- a) preservation of biodiversity
- b) facilitation of forest growth
- c) green technology

8. The term “intercropping systems” refers to the practice of

- a) using one crop to fertilize another
- b) simultaneously growing two or more crops in the same stand
- c) growing one crop after another in the same stand

9. Herbaceous plants are grown in intercropping systems until

- a) crop tree canopy blocks the sunlight
- b) they are removed by the forest management
- c) they are harvested for biofuel

10. In intercropping systems, herbaceous plants are harvested

- a) every 6 or 12 months
- b) every year
- c) every year or two years

## **Speaking**

### **60 points**

11. Researchers concluded that the effect of intercropping was....

12. What was the result of removal of coarse woody debris during site preparation for intercropping?

13. In the long run, vertebrate species associated with pine-grasslands....

14. What are the effects of natural succession in intercropped forests over a 4-year period?