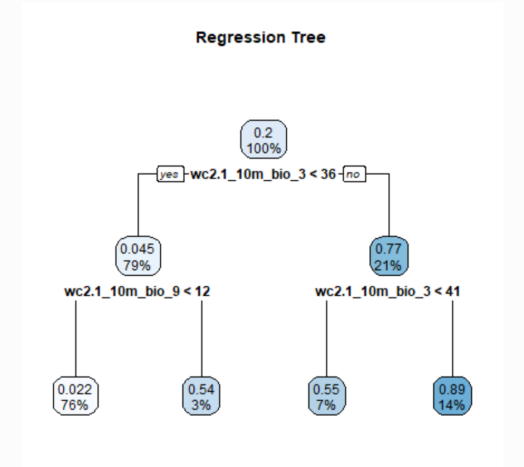
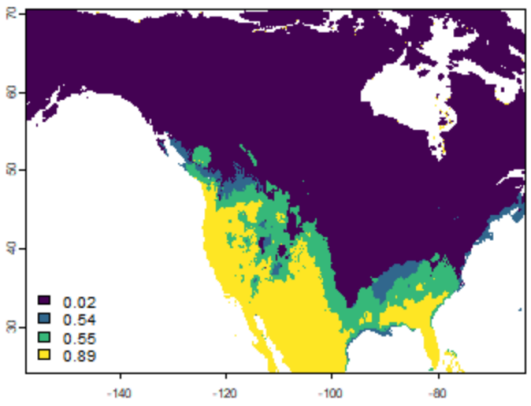
Bigfoot Species Distribution

Question 1: *What are the environmental conditions that Bigfoot appears to enjoy most?*

Based on the CART regression tree, bigfoot seems to enjoy conditions where the bio3 variable is lower than 36 and where the bio9 variable is lower than 12. The World Clim website metadata tells us that bio3 corresponds to isothermality (relatively small diurnal temperature swings compared to annual temperature swings) while bio9 is the mean temperature of the driest quarter. This suggests that bigfoot prefers more stable temperatures without large daily swings. The species also prefers colder temperatures during the dry season.

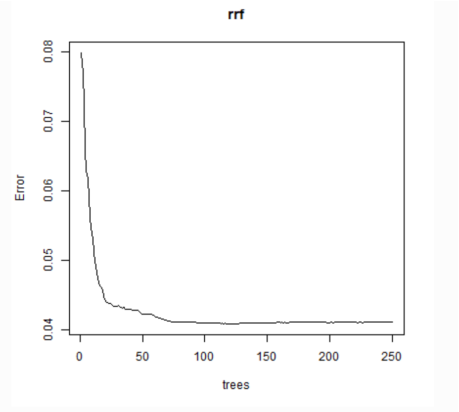




Question 2: *What did tuneRF help us find? What does the values of mt represent?*

The tuneRF function helped us find the least important variable in the random forest model. The value of mt represents the variable with the lowest change in out of bag error when removed from the model.

Question 3: *What does ``plot(rrf)`` show us?*



The plot shows us that the training error drops with more trees. The error declines steeply for additional trees up until ~20 trees then the error rate continues to decline, but it levels off a little above 0.04. Beyond about 50 trees, adding additional trees seems to produce a pretty negligible decline in the training error.

Question 4: *Why would it be that the model does not extrapolate well?*

Although the model fits the western species distribution well, it doesn't do well predicting species distribution in the eastern part of North America. This could be due to different climate preferences between the eastern and western subspecies. This could mean that entirely different variables are more important to the eastern subspecies compared to the western subspecies or perhaps the same variables are relevant, but the decision tree requires different breakpoints for accurate prediction in the east. Finally, the ecological meaning of certain variables could be different in the two regions. For example, the CART model suggested that western bigfoot likes colder temperatures in the dry season. In a Mediterranean climate like California, the summer months are dry, so bigfoot prefers cooler summers. In many parts of the eastern US, the summer can be quite wet, and the driest part of the year might be fall or early winter. Given this scenario, even the western bigfoot might prefer warmer temperatures during the dry season.

Question 5: *What are some countries that should consider Bigfoot as a potential invasive species?*

The map indicates that Mexico should consider bigfoot a potential invasive species since the climate is suitable and the country's suitable range is contiguous with purportedly existing populations. If bigfoot really does hop on a plane or get introduced through air travel or by boat, then Australia, India, the Saudi Arabian Peninsula, much of Africa, especially southern Africa, and parts of Argentina and Brazil would also need to keep an eye out for invasive bigfoot.