From:

http://www.nrs.fs.fed.us/disturbance/climate_change/landscape_ecological_modeling/distrib/

DISTRIB Model Assumptions and Limitations:

- The method is limited in scope to modeling the potential current/future suitable habitats – not their actual future distributions.
- The method was designed for Eastern United States only.
- Forest Inventory Analysis (FIA) data are spatially sparse so that fine-scale analyses are not usually appropriate – 20 x 20 km seems about right. Scale matters!
- We may predict inaccurately for species with relict populations (e.g. aspen, primarily in western North America)
- For some species that occupy Canada and/or the western US, we did not have FIA plots for the entire ranges encapsulated with Importance Values (IVs); we only had Little's range boundaries.
- There could be missing predictors that matter at the 20km scale that we haven't accounted for.
- Our method depends on a decent sample size (>~50 cells, more is better) so that it is not that good for rare species which usually have finer scale processes going on.
- The models assume equilibrium with environment (but this is now shown to be less of a problem for historically 'fast' moving organisms, like plants and birds, as compared to reptiles or amphibians (Araujo and Pearson 2005 Ecography)
- The models do not account for direct effects of CO_2 enhancement (but so far no proof of sustained growth enhancement of elevated CO_2 on mature trees, and elevated O_3 cancels out some CO_2 effects).
- The models do not account for future biotic interactions (competition, herbivory, mutualism, rapid *in situ* adaptation, mast yrs), or other human (land-use change, fire) or natural (ice, wind) disturbances except indirectly as legacies within the current distributions.

DISTRIB Model Strengths:

- FIA samples are statistically sound and non-biased
- Analysis and prediction based more on core of distribution via IVs, not the range edges or just presence/absence maps that are more susceptible to error
- Extremely robust non-parametric statistical tools using ensemble “tri-model” approach
- The reliability of individual species models can be evaluated
- RandomForest is stable predicting into novel environments
- Can use different variables/parameters to describe primary parameters in different parts of its geographic setting
- Accounts for reality in that a particular species exists where it is, in spite of all legacies over decades and centuries. It therefore integrates over historic disturbances and climatic phenomena.
- Need not be parameterized with a large suite of variables that are imperfectly known or cannot be adequately generalized for a species throughout its range.
- Provides risk assessments for individual species due to climate change (change in area-weighted IV).
- Can rank among species for the most vulnerable to change (mean center changes).
- Can produce ranked lists of species that may be in greatest risk (protection management needed – e.g., Hoosier National Forest) or likely to have sufficient suitable habitat for future management (possible species for planting – e.g., Drew University in New Jersey).
- Can be readily adapted to Google platform for worldwide viewing.
- Output from DISTRIB (potential suitable habitat) can be input into SHIFT Model to get potential geographic distribution over next 100 years.