AMERICAN CARBON REGISTRY

AFOLU TECHNICAL COMMITTEE RECOMMENDATION

Issue Under Review:	Proposed modification to ACR *Methodology for Afforestation and Reforestation of Degraded Land (version 1.0, March 2011),* to include Forest Vegetation Simulator (FVS) as an approved quantification tool
Issue Number:	2012-001
Entity Requesting Review:	US Forest Service - Forest Management Service Center
Date Presented to Committee:	September 4, 2012
Committee Members Reviewing:	Neil Sampson (Chair), Dr. Tim Robards, Dr. Gordon Smith
Earlier Actions (if applicable):	The AFOLU Technical Committee provided an earlier review of this proposal, provided to USFS on October 3, 2012. USFS provided responses and methodology edits, which were provided to the Committee on March 21, 2013. These were provided to USFS on April 26. USFS provided its second round of responses (below) on June 4.
Recommendation:	Approve methodology modification, with text added to methodology requiring proxy monitoring plots to ensure assumptions about baseline natural regeneration are valid.

Background

The technical committee reviewed the initial Forest Service proposal to include the FVS model as an option in the methodology for afforestation and reforestation (A/R) in late 2012. The reviewers asked that the Forest Service add detail to the explanation of the FVS and its proper use. The Forest Service responded with edits to the original proposal in March, 2013.

Summary of Committee Review and Discussion

The committee wishes to thank and commend the Forest Service for its attention to our previous comments. The methodology is much improved and seems workable, particularly for afforestation projects. We still have some questions that ACR may need to consider:

1. The issue of calculating baselines for projects that reforest degraded lands, particularly where there are remnant trees involved. Calculating a without-project baseline involves making accurate assumptions about the type and carbon density of natural regeneration, and this can be a significant challenge. Project proponents will want to predict little or no regeneration in order to maximize project benefits, but the actual results may be far different. This is not just a problem with the FVS or other models, it is a methodological challenge. One solution in these cases would be to require the establishment of an appropriate network of untreated areas that can be monitored to re-calibrate baseline assumptions where necessary. Where patches of remnant trees exist, ACR should require that those be removed from the project boundaries.

   USFS response:

Because the calculation of baseline values is a methodological issue, and not specific to FVS, it will be left to ACR to decide how this will be addressed. It is beyond the scope of this request. As suggested, a note about establishing untreated areas for monitoring regeneration rates would be desirable. An additional note about excluding patches of remnant trees would also be desirable. The following paragraphs are suggestions for these notes. ACR should feel free to modify the wording as they see fit, particularly regarding more specific guidelines as to the number, size and location of the monitoring areas and the instances when they are deemed necessary.

> *In an effort to ensure that reasonable regeneration rates are included in the baseline scenario, a regeneration monitoring area must be established for each of the strata in the project. Each monitoring area must be at least 1/4 hectare in size and must be designated outside the project boundary in an area that is very similar and preferably adjacent to the project area, but which will remain untreated. Each monitoring area must be examined close to the time of project commencement to determine initial regeneration values. Each area must be examined again during the ex-post examination and compared to the initial values to determine whether assumed baseline regeneration values were appropriate. If examination reveals a significant difference in regeneration from the assumption used in the baseline scenario, the baseline scenario must be modified to better reflect the observed values.*
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> *Patches of remnant trees as well as scattered remnant trees must be handled appropriately. Project boundaries should be established so they exclude patches of remnant trees. Scattered remnant trees may be present within the boundaries, but must be included in both the baseline and project scenarios.*

2. It is not clear how including the FVS predicted values can alter the number of plots required to achieve statistical sampling criteria during monitoring (III.2.2). If the number of plots measured yields the targeted precision (±10% at 90% confidence), what effect does a previously modeled value have upon that? FVS can be used to estimate annual increments in growth between field sampling and, by lengthening the interval between required field inventories, cut monitoring costs. There should be a stated maximum length (ten years is suggested) between inventories however, as model accuracy drops rapidly with extended time.

   USFS response:

   This section on reducing the amount of monitoring data was included at the recommendation of Tim Pearson, and had been retained because he and Nick Martin felt it was important. However, we were unable to capture the true intent, so this section has been deleted – see the comments on page 43. If Tim still feels strongly that this section should be included, then it is suggested that he work directly with the ACR to get the intent correct. We certainly don't want approval of the modifications to be held up because of our lack of understanding of the issue.

3. For individual reviewer comments, see the attached.

Comments from Tim Robards (4/5/2013)

1) I think this is a workable change to the protocol.

2) Regarding the issue of open grown trees, the competition indices in FVS diameter and height growth models are generally based on BAG (basal area greater) or CCF (crown competition factor), although there are others as well. The CCF measure is based on open grown trees and the BAG would also reflect free to grow trees when they are isolated trees. There is no reason to think that these trees would not be grown accurately relative to more dense situations. They would likely develop more bole taper and have more crown length.

USFS response: We agree with this and see no issue with how FVS would grow open-grown trees.

3) What is the impact of having to run each Rx sequentially to get the 100 year values of wood products storage? Is this an issue since probably only need one harvest to be simulated to cover period to next inventory? This would still impact projections to estimate total project life wood products storage.

USFS response: This is a valid concern, and is the reason it was proposed differently in the original modification. With the current proposal the assumption is that harvest entries will be relatively infrequent, so that although this may require some additional simulations, it will not be a large burden.

4) I'm not clear on how the FVS projections reduce the plot size required for periodic remeasurement. How is this statistically set up when the new plots are used for validation of the projections? Should new plots focus on areas that had more change such as harvests of residuals, ground disturbance, etc. What are the criteria for evaluating the projections with plot data? What statistical test is used? This seems to need a methodology added.

USFS response: We agree this was confusing and deleted this section.

5) In the guidelines, I would add that the certain species may not be appropriately modeled due to a lack of models in certain regions. This includes California coast redwoods. (I don't know of other specific areas). If there is doubt about the applicability of the FVS growth models they may be verified and/or calibrated using growth increment data from the inventory.

USFS response: If calibrated to local conditions FVS should be able to model any species well. A note about calibrating the growth estimates with measured growth samples was added to section IV.

6) I suggest that site index or class (can use Dunning in region 5) is a required input. It could be field measured or taken from soil surveys for the project area, especially since site trees may not be available.

USFS response: The measure of site quality used in a variant is often, but not always, site index. In some cases habitat type, plant association, or ecoregion is used instead. The definitions of these attributes are not necessarily common. In variants that do use site index, the base age and age type (total or breast-height age) must match what the model expects. Many applicants may not be familiar with the methodologies needed to derive the necessary attribute in the expected format. It could be considered overly burdensome to require the attribute required by the particular variant, so language was added to section IV that says it is highly recommended.

7) I agree with the suggestion to use the FFE models unless you can show the Jenkins et al. models are more appropriate. In comparisons in the mountains of Virginia hardwood stands and in the Sierra Nevada mixed conifer, the Jenkins et al. equations produced estimates 10-30% higher on average than regional equations.

USFS response: The requirement to use FFE unless it can be shown that the Jenkins equations are more accurate is included in section IV.

Comments from Gordon Smith (4-1-2013)

The big thing is that last time we recommended not using FVS to model changes in baseline carbon stocks over the project lifetime because of the uncertainty of these many-decade projections. The proponent of the changes to the methodology still wants to include use of FVS to model changes in baseline carbon stocks.

An applicability criterion in the methodology is that, in the absence of the project, the project lands would continue to be degraded and trees would not re-grow. If this applicability criterion really is met, then there is no need to model growth of baseline trees.

USFS response:

We still don't fully understand these objections. If the concern is that FVS will grow new regeneration under the baseline when none should be present, we would suggest that regeneration is appropriate in some cases. Unless we are misinterpreting the definition, lands that stay degraded or continue to degrade could still have tree regeneration. It would just be in small enough amounts that the lands would continue to be classified as degraded. Assuming regeneration in the baseline is zero would not be conservative, as any regeneration that would occur naturally will not be accounted for in the baseline scenario.

A note about establishing an untreated area for monitoring regeneration rates was suggested above. This monitoring would be useful for instances in which, before the project starts, it is believed that trees would not re-grow, when in fact some trees do regenerate once the project starts. If an applicability criterion is that, in the absence of the project, trees would not re-grow, this criterion should monitored for accuracy after the project has started. It would be conservative to include some regeneration in the baseline, with monitoring used to validate the assumptions made, and if necessary the amounts of regeneration in the baseline FVS simulation could be modified accordingly.

If the concern is how FVS will grow scattered remnant trees under the baseline, we refer to Tim Robards' comment #2 above, which states that given the nature of the FVS growth equations there is no significant issue with how FVS would grow open-grown trees. Remnant trees would need to be grown in a baseline FVS simulation or they would not be able to be correctly accounted for in project scenarios, in which the remnant trees will grow. Assuming remnant trees do not grow would not result in a conservative estimate of project carbon.

FVS also includes default values for dead wood and litter. These pools change as the wood breaks down and decays. Without including a baseline FVS simulation, all dead wood and litter in the project simulation would be considered additional carbon. This would not result in a conservative estimate of project carbon.