



Carbon and Forest Management Work Group

Meeting 4: February 14, 2024 | 9:00 am – 3:00 pm

Meeting Summary and Notes

Meeting Overview

The second meeting of the Washington Department of Natural Resources (DNR) Carbon and Forest Management Work Group took place on Wednesday, February 14th from 9 am – 3 pm, via Zoom Webinar. The purpose of this meeting was to meet the carbon and wood basket contractors and to continue developing and refining the management scenarios. Representatives from BluePoint Planning, the firm hired to facilitate the work group in partnership with DNR staff, opened the meeting with an overview of the agenda:

1. Welcome & Updates
2. Introduction to the Carbon and Wood Basket Study Contractors
3. DNR Presentation: Work Group Timeline and Process
4. Presentation and Discussion with Wood Basket Contractor, Evergreen Economics
5. Presentation and Discussion with Carbon Contractor, ESSA
6. Understanding and Refining Management Scenario Ideas
7. Next Meeting and Next Steps

Both the carbon and wood basket contractors introduced themselves and their teams. Work group members gave brief self-introductions to the group. BluePoint planning provided an update to the Q&A protocol, requesting that questions be asked verbally and be relevant and not too broad.

Duane Emmons, Assistant Deputy Supervisor for State Uplands at DNR, presented on the next steps for the work group and modeling contractors. The presentation explained that the scenarios developed by the work group in spring 2024 would be modeled by the carbon contractor and wood basket contractor, respectively, and finally, sent to DNR as recommendations in spring 2025.

Ted Helvoigt, President of Evergreen Economics, the wood basket contractor, introduced his team and their qualifications. He then gave an overview of the economic modeling Evergreen Economics would run following the carbon study modeling. Work group members asked questions relating to the level of detail and scale of assumptions entered into the model and about data limitations. Additional detail is given in the next section of the summary.

Following a brief break, Cedar Morton, Sr. Systems Ecologist and Nature-Based Solutions Lead at ESSA, the carbon contractor, introduced his team and their qualifications. He then gave an overview of the two types of carbon models that could be used for the carbon study. The model choice will be ultimately made by DNR, but ESSA will suggest one model based on scenario possibilities and work group input. Work group members asked questions about the capabilities of the two models and were asked to each give a reflection on the two models and to state their preference if they had one.

Csenka Favorini-Csorba, Policy Director for DNR, began the conversation around management scenarios by explaining the different elements of a scenario, detailed in the next section. The work group can propose up to 16 scenarios for the carbon contractor to model. She explained “what counts” in creating a scenario, and that each additional variation on a scenario would count as a new scenario, including adding in climate change assumptions. Work group members participated in an informal straw poll to gauge how much climate change should be included in the scenarios, ranging from no scenarios to all scenarios. More details are provided in the next section.

Finally, after a lunch break, work group members continued the discussion about the management scenarios. Using the list of scenarios developed by DNR and the work group at the January meeting,





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work group members discussed whether to keep, adjust, or eliminate each scenario idea. There was not enough time to discuss every scenario but the merits of most of the scenarios were discussed.

To close the meeting, BluePoint Planning reviewed the next steps before the March 14th meeting. Work group members are asked to complete “homework” between the meetings to accommodate for the tight timeline to begin the carbon modeling. More details on the homework will be provided in an email to work group members.

Questions about defining relevant terms and concepts were raised throughout the meeting. Questions that were not addressed fully in the meeting will be addressed at the next work group meeting. All meeting materials, including presentations and the recording, are posted on the Washington DNR Carbon and Forest Management [Work Group website](#).

Attendees

Work Group Members

- Matt Comisky, American Forest Resources Council
- Russ Pfeiffer-Hoyt, Washington State School Directors Association
- Randy Johnson, Clallam County
- Hannah Jones, Firelands Workers United
- Ed Murphy, Sierra Pacific Industries
- Bryan Pelach, Washington Conservation Action
- Jason Spadaro, Washington Forest Protection Association
- Paula Swedeen, Conservation Northwest
- Brel Froebe (Alternate for John Talberth), Center for Responsible Forestry
- Pat Tonasket, Confederated Tribes of the Colville Reservation
- Steve Hinton (Alternate for Ryan Miller), The Tulalip Tribes

Not in attendance: Heidi Eisenhour, Jefferson County

Washington DNR Staff

- Julie Anderson
- Cathy Chauvin
- Duane Emmons
- Csenka Favorini-Csorba
- Mona Griswold
- Theresa Keith
- Kristoffer Larson
- Sharon Lumbantobing
- Denise Roush-Livingston
- Ben Welna

Facilitator (BluePoint Planning)

- Nora Bayley
- Mindy Craig
- Lauren Schmitt
- Chris Mendoza, Mendoza Environmental (sub-consultant to BluePoint Planning)

Contractors, Wood Basket Study, Evergreen Economics

- Ted Helvoigt
- Greg Latta
- David Ford





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Contractors, Carbon Study, ESSA

- Cedar Morton
- Don Robinson
- Alex Tekatch
- Clint Alexander
- Eric Neilson
- Frank Paulson

Work group meetings are public, meaning that members of the public may join the meeting to observe. No public comment is allowed. Eight members of the public attended the fourth work group meeting.

Meeting Highlights and Themes

- Q&A Protocol: Work group members were requested to ask questions verbally and to keep questions relevant and not too broad. If a question is not answered during the meeting, DNR will try to answer it by the next work group meeting.
- Developing Scenarios Presentation: This presentation outlined the next steps for the work group and modeling contractors until June 2025. Important details include:
 - The carbon modeling and economic analysis will run from April 2024 to June 2025, including one possible re-analysis of certain scenarios.
 - DNR will present the work group's recommendations to the Board of Natural Resources and will submit a final report to the legislature in late 2025.
- Wood Basket Contractor: Evergreen Economics is tasked with conducting an economic analysis of wood supply in western Washington and estimating impacts from the management scenarios on Washington's regional wood supplies and rural economies. Major themes of the discussion with Evergreen Economics staff include:
 - Assumptions: Evergreen Economics will not be making any assumptions for the analysis; the work group and DNR staff will make all assumptions and decisions about what goes into the analysis.
 - Scale: Evergreen Economics can track all mills and ports at the national level and has location-specific tracking at the local and state levels.
 - Data Limitations: The Forest Inventory and Analysis (FIA) data from the U.S. Forest Service does not include the ownership breakdown of plots of land (private, industry, public).
- Carbon Contractor: ESSA is tasked with modeling the management scenarios using a forest carbon calculation model. ESSA presented two model choices, CBM3.CFS3 and the Forest Vegetation Simulator (FVS). The model choice will be ultimately made by DNR, but ESSA will suggest one model based on the draft management scenarios and work group input. The discussion with ESSA focused on determining the difference between the two models.
 - Work group members were each asked to reflect on the two models and to state their preference if they had one: of those with a preference most leaned towards the FVS model.





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- Work group members asked questions about how each model handles thinning, deferrals, and more granular details such as seed selection and planting density. ESSA staff responded with the ability of each model to handle the variable.
- Management Scenario Discussion: The work group can propose up to 16 management scenarios for the carbon contractor to model. Each additional variation of a scenario, such as thinning, deferrals, or climate change, will create a new scenario to model. Major themes of the discussion about management scenarios include:
 - In an informal straw poll asking to what level climate change should be included in the scenarios, members indicated the following preferences (not all work group members participated or were present):
 - On all scenarios: 1 person
 - On some scenarios: 3 people
 - On all scenarios, but half high- and half mid-level severity: 4 people
 - No climate consideration on any scenario: 1 person
 - Work group members agreed that Scenario 1, Current DNR Operations, should be kept. However, several people asked for details about current DNR operations; DNR will elaborate on their current operations at the March meeting.
 - Members debated the DNR- and work group-proposed scenarios and suggested additional variations to clarify wording and remove duplicates.
 - DNR staff stressed that although the “no harvest” and “State forest practice legal baseline” scenarios are technically viable, they are very unlikely to ever come to fruition and may be polarizing discussion topics, taking away time from discussion of other, more viable scenarios. Given the limited number of scenarios the group will be able to evaluate, DNR proposed discussion of whether or not they should be included.
 - Work group members debated whether to include the two proposed scenarios that are not likely to be feasible (no harvest and the legal baseline). No conclusion was reached at this meeting.
- Next Steps: Work group members were asked to complete “homework” between the meetings to accommodate for the tight timeline to begin the carbon modeling. More details on the homework will be provided in an email to work group members. Homework will likely include reviewing the draft list of scenarios and providing feedback to better shape the discussion at the March 13th meeting.



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Detailed Notes

DNR Presentation: Work Group Timeline and Process

DNR staff presented the next steps for both the work group and the modeling contractors from the third work group meeting in January 2024 to the end of the work group process in June 2025. Most of the next several months will be spent on the carbon modeling and economic analysis of the management scenarios selected by the work group.

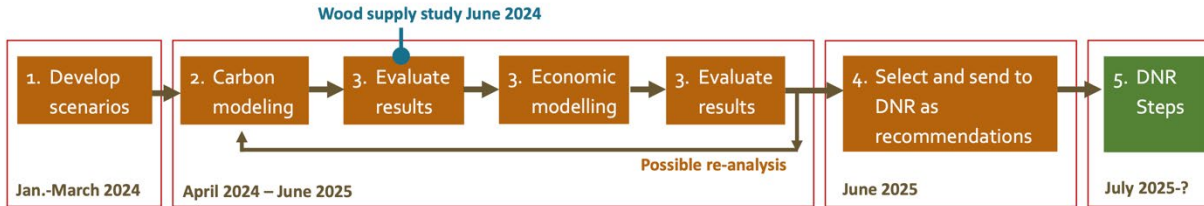


Figure 1 - Timeline of the Work Group Process

Work group members asked a few clarifying questions about how the work group process relates to other DNR projects and about the scope of the modeling, specifically that the models are focused on DNR-managed lands in western Washington.

The January and February work group meetings both focused on developing the scenario ideas that will be finalized and advanced into modeling at the March meeting. These scenarios will be vetted through the modeling; the carbon modeling results are expected in October 2024, and the wood basket analysis results are expected in March 2025.

The modeling exercises are meant to evaluate the carbon and economic implications of the different scenarios put forth by the work group. After the carbon modeling and economic analysis are complete, the work group may eliminate or combine some scenarios to better meet the five goals of the budget proviso. The contractors may do one additional model run on the revised scenarios, with the results presented in May 2025 (carbon) and June 2025 (wood basket).

The work group will then take a formal vote on which management scenarios to advance to DNR as recommendations in June 2025. DNR will present the work group’s recommendations to the Board of Natural Resources and will submit a final report to the legislature in late 2025.

This presentation can be viewed by visiting the [work group website](#).

Presentation and Discussion with Wood Basket Contractor, Evergreen Economics

Wood basket supply contractor Evergreen Economics is tasked with conducting an economic analysis of wood supply in western Washington and estimating impacts from the management scenarios on Washington’s regional wood supplies and rural economies. Evergreen Economics will model the management scenarios chosen by the work group after the carbon study modeling is complete. Evergreen Economics has a team of four that will conduct the forest modeling, analyze the carbon markets, and conduct a forest product life cycle assessment.





“Baseline” Wood Supply Study

- ✓ Analyze the current wood supply and the potential, future wood supply and demand in western Washington.
- ✓ Considering the dynamics of the timber market, including export and import of timber into and out of Washington State.
- ✓ Determine what is known about the needs of western Washington's forest industry infrastructure and what information gaps exist.
- ✓ Analyze the level of wood required to maintain existing timber industry infrastructure in western Washington.

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Figure 2 - Slide from Evergreen Economics' presentation, titled, “Baseline” Wood Supply Study”

Work group members asked questions about the wood supply study, which are summarized below.

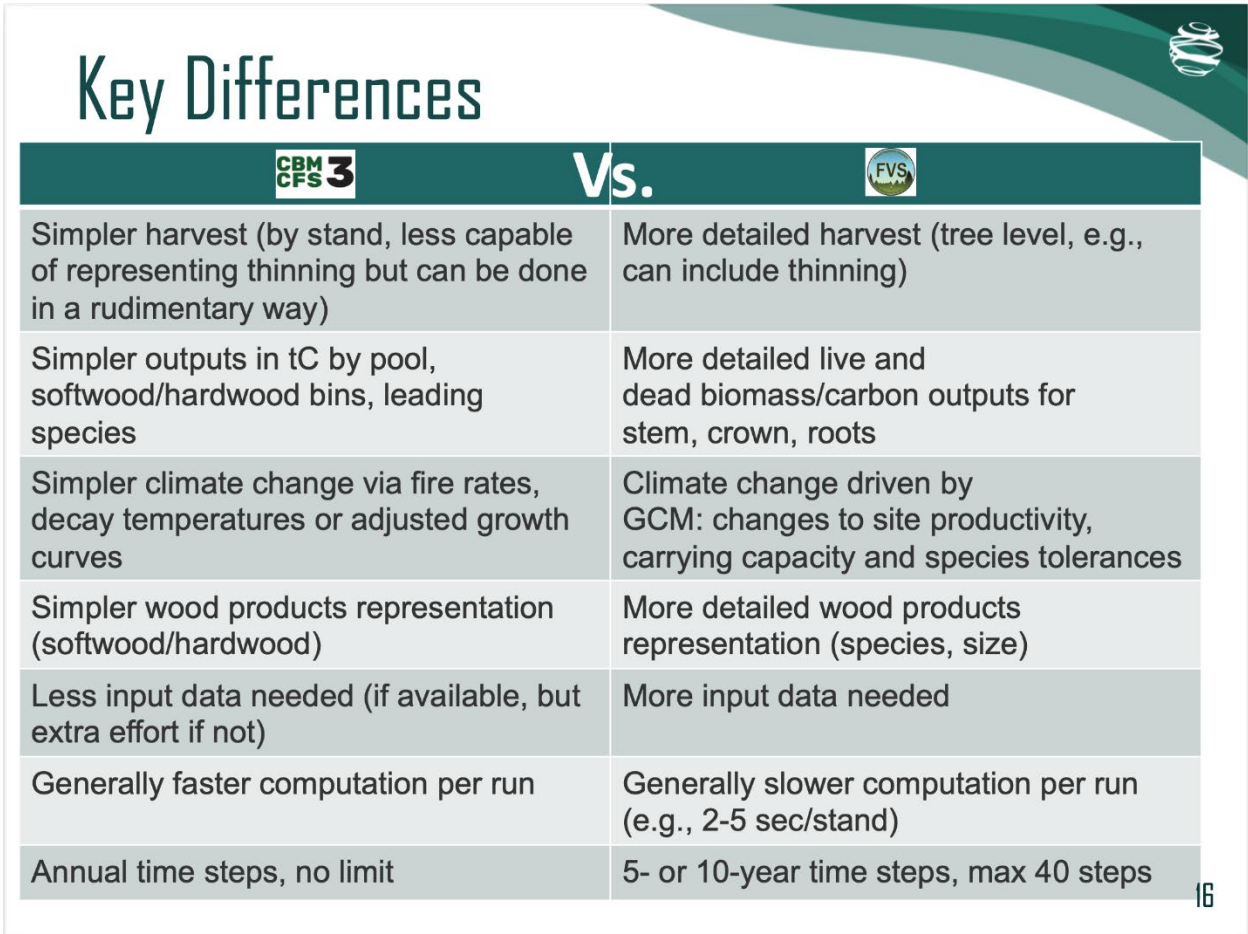
- Assumptions Within Scenarios: There are no predetermined aspects of the model. Evergreen Economics will not be making any assumptions for the analysis; the work group and DNR will make all assumptions and decisions about what goes into the analysis. The model will use real data to understand how the forests and economy are affected by the management scenarios.
- Carbon Market Analysis: Evergreen Economics will conduct a carbon market analysis and will assume that the markets will grow over time.
- Scale of the Models: The economic model is capable of analyzing effects at the national, state, and local level. Evergreen Economics can track all mills and ports at the national level and has location-specific tracking at the local and state level.
- Data Limitations: There are a few data limitations that will affect the scope of the economic analysis. The Forest Inventory and Analysis (FIA) data from the U.S. Forest Service does not include the ownership breakdown of plots of land (private, industry, public).

This presentation can be viewed by visiting the [work group website](#).



Presentation and Discussion with Carbon Contractor, ESSA

Carbon contractor ESSA is tasked with modeling the management scenarios using a forest carbon calculation model. ESSA presented two carbon model choices, CBM3.CFS3 and the Forest Vegetation Simulator (FVS), one of which will be used in the modeling of the management scenarios. The model choice will be ultimately made by DNR, but ESSA will recommend one model based on the draft management scenario ideas and work group input from the February meeting. The discussion with ESSA focused on determining the differences and advantages of the two models.



The slide titled "Key Differences" compares two forest carbon models: CBM3.CFS3 and FVS. The slide features a dark green header with the model logos and a "Vs." separator. Below the header is a table with eight rows comparing various aspects of the models. A small logo is visible in the top right corner of the slide, and a page number "16" is in the bottom right corner.

CBM3.CFS3	Vs.	FVS
Simpler harvest (by stand, less capable of representing thinning but can be done in a rudimentary way)		More detailed harvest (tree level, e.g., can include thinning)
Simpler outputs in tC by pool, softwood/hardwood bins, leading species		More detailed live and dead biomass/carbon outputs for stem, crown, roots
Simpler climate change via fire rates, decay temperatures or adjusted growth curves		Climate change driven by GCM: changes to site productivity, carrying capacity and species tolerances
Simpler wood products representation (softwood/hardwood)		More detailed wood products representation (species, size)
Less input data needed (if available, but extra effort if not)		More input data needed
Generally faster computation per run		Generally slower computation per run (e.g., 2-5 sec/stand)
Annual time steps, no limit		5- or 10-year time steps, max 40 steps

Figure 3 - Slide from ESSA's presentation, titled, "Key Differences"

Work group members asked questions about how each model handles thinning, deferrals, and more granular details such as seed selection and planting density. ESSA staff responded with the ability of each model to handle the variable; these responses are summarized below.

- Understory Vegetation: The FVS model can look at how certain trees will infill after a harvest, considering manual and natural infilling. The CBM3 model can estimate the biomass of the understory but not the individual units.
- Thinning: FVS can model based on the number of trees removed during pre-commercial thinning. CBM3 can model thinning based on the amount of biomass removed during thinning.



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- Structural Complexity: The FVS model can model structural complexity based on how a structurally complex stand is defined before the model is run. The CBM3 model is based more on what forest imagery shows and what factors are present beyond just age.
- Carbon Sequestration Rate: Both models can determine carbon flux among the natural carbon pools.
- Level of Detail: Both models are able to model detailed silvicultural practices, but the FVS model is more detailed than the CBM3 model.
- Decay Rate: The FVS model has one fixed decay rate that can be changed by the user but is not able to change over time. The CBM3 model can be more sensitive to temperature changes over time, which changes the decomposition rate.

After most clarifying questions had been answered, each work group member was asked to give a reflection on the two models and to state their preference if they had one. Several work group members noted that they are not experts in the carbon modeling field. About a third of the work group had a preference between the two models; most of those who had a preference leaned towards the FVS model.

A key theme in the discussion about management scenarios has been around the forest management practice of thinning. Several work group members stated that the FVS model seems better suited for the work group's needs because of its ability to model thinning. Another key theme was the data used for the carbon model and the level of detail within that data; DNR and ESSA have not yet decided on what data will be inputted into the model.

This presentation can be viewed by visiting the [work group website](#).

Understanding and Refining Management Scenario Ideas

Work group members continued to refine the management scenario ideas created at the January work group meeting. As previously noted, the work group can propose up to 16 management scenarios for the carbon contractor to model. Each additional variation of a scenario, such as thinning, deferrals, or climate change, will create a new scenario to model. Using the [list of scenarios](#) developed by DNR and the work group, work group members discussed whether to keep, adjust, or eliminate each scenario idea. There was not enough time to discuss every scenario but the merits of most of the scenarios were discussed.

The work group gave feedback, but did not decide on, whether climate change should be included in the scenarios, and if so, to what degree it should be included. In an informal straw poll asking to what level climate change should be included in the scenarios, members indicated the following (not all work group members voted or were present):

- On all scenarios: 1 person
- On some scenarios: 3 people
- On all scenarios, but with mixed severity: 4 people
- No climate consideration on any scenario: 1 person



A continued discussion on the inclusion of climate change in the scenarios is proposed for the next meeting, which will be followed by a formal vote on the subject. Several work group members expressed dissatisfaction at not being able to discuss the topic, while others requested more information about what assumptions would go into modeling climate change in the scenarios.

What Counts as a "Scenario"?

- **Current practice = +1**
 - **Current practice + increased wildfire = +1**
 - **Max harvest within state law = +1**
 - **No-harvest bookend = +1**
 - **70yr rotation = +1**
 - **70yr rotation + increased thinnir**
 - **70yr rotation + increased thinnir**
 - **70yr rotation + increased thinnir**
- ig = +1
 ig + **increased wildfire** = +1
 ig + **deferrals** = +1



Figure 4 - Slide from the general meeting presentation, titled, "What Counts as a "Scenario"?"

Following the January work group meeting, the project team compiled the list of DNR- and work group member-proposed scenarios and put them into a table which can be viewed on the [work group website](#). The table divided the proposed scenarios into three columns defined below: Proposed Scenario, Relevant Work Group-Suggested Scenarios, and Potential Variations.



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Category	Meaning
Proposed Scenario	Potential scenarios to move forward
Overlapping Work Group-Suggested Scenarios	Work group proposals that correspond to existing DNR suggested scenarios
Potential Variations	Variations to both DNR- and work group-proposed scenarios, all suggested by work group; these could represent unique scenarios to move forward

Figure 5 - Definitions of Proposed Management Scenario Categories

Recommendations and questions from the work group throughout the management scenario discussion were recorded and will be used to further refine the scenario ideas before the March meeting.

Major themes of the discussion about management scenarios include:

- Proposed Scenario 1, Current DNR Operations: Work group members agreed that Proposed Scenario 1 should be kept as a scenario. However, several people asked about what the current DNR operations are; DNR will elaborate on their current operations at the March meeting.
- Proposed Scenario 2, Shorten Harvest Rotation from Current 60–80-year Average: Work group members discussed making the scenario more specific, such as shortening rotations on DNR GEM lands. Several work group members suggested removing "increase deferrals" from the potential variation of proposed Scenario 2, as this would be duplicative as there will be existing deferrals. HCP limitations on some lands were also mentioned as a possible constraint.
- Proposed Scenario 3, Lengthen Harvest Rotation from Current 60–80-year Average: Work group members pointed out that there is no one rotation age on DNR land, so the scenario would be talking about shorter or longer rotations on the average. DNR suggested a scenario with different rotation length based on site class.
- Proposed Scenario 4, Defer Additional Acres of Structurally Complex, Carbon-dense Forest: DNR asked if work group members saw value in a scenario that only looks at deferrals. One member said that it would be important to have a sense of the carbon impacts of deferring structurally complex forests. Work group members suggested a potential variation to this scenario of "not currently structurally complex" with high potential to become structurally complex over time.
- Members debated the other DNR- and work group-proposed scenarios and suggested additional variations to clarify wording and remove duplicates.
- DNR staff stressed that the two "bookend" scenarios of "no harvest" and "State forest practice legal baseline" would require significant amendments to current law or governing plans (such as the *State Trust Lands Habitat Conservation Plan* [HCP]). While they are technically viable, they are unlikely to happen given the legal frameworks and political considerations, and, if attempted, would take many years to implement. Although it could be interesting to see the results of these scenarios, it would be preventing more feasible scenarios from being modeled and could take valuable time away from discussing more feasible recommendations.





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- Proposed Scenarios 7, No Harvest, and 8, Legal Baseline: Work group members debated whether to include the two proposed scenarios that are not politically/legally viable. No conclusion was reached at this meeting; several work group members thought it would be ideal to include the two scenarios (but generally did not express strong opinions), and several thought they should not be included.

Next Steps

The next meeting of the work group will be held on March 13, 2024, from 9 am to 3 pm. The focus and goal of the March meeting is to refine and finalize the list of management scenarios that will be given to the carbon study contractor to model. The proposed topics for the meeting are:

- Discussion of the inclusion of climate change in the management scenarios.
- Continued discussion and refinement of the management scenarios.
- Additional information on current DNR forest management operations.
- Formal vote on each scenario to give to the carbon contractor.

Work group members are asked to complete “homework” between the meetings to accommodate for the tight timeline to begin the carbon modeling. More details on the homework will be provided in an email to work group members. Homework will likely include reviewing the draft list of scenarios and providing feedback to better shape the discussion at the March 13th meeting.



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Raw Notes: Verbal and Written Communication

These notes include verbal and written questions and comments from the Zoom chat log.

- Comments from the Zoom chat are denoted with (chat) at the beginning of the comment or question.
- Questions and comments from the work group members are denoted with **WGQ** (work group question) or **WG** at the beginning of the comment or question.
- Responses from DNR staff or BluePoint Planning staff are noted with **DNR** or **BPP**, respectively.
- Responses from the other two contractors, Evergreen Economics and ESSA are noted with **Evergreen** or **ESSA**, respectively.

1. Welcome

- a. Updates to Q&A
 - i. No comments or notes

2. Introduction to Contractors

- a. No comments or notes

3. DNR Presentation: Work Group Timeline and Process

- a. WGQ: Will forest estate be modeled for its carbon sequestration, and what dials can be turned to increase? From presentation – will modeling NOT look at entire forest estate?
 - i. DNR: This model isn't the forest estate model looking at everything in totality. Focused on Western Washington
 - ii. ESSA: Yes, DNR-managed lands west of the cascades is the study area
- b. WGQ: Whole estate is complex but necessary, need to put in enough area to understand carbon dynamics in the whole area.
- c. WGQ: Timeline – assuming proposals are taken to Board of Natural Resources, then assuming dept is not doing much work on west side sustainable harvest calculations? 2027 for next plan?
 - i. DNR: Yes, final environmental impact statement (EIS) would come in 2027. Will likely also be modeling other alternatives
- d. WGQ: If modeling all DNR-managed acres in west Washington, does that include currently deferred acreage?
 - i. DNR: Yes
- e. WGQ: Silvicultural practices – other methods to increase carbon sequestration. Feel like ignoring the other methods/alternatives.





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- i. DNR: Yes other options for enhancing carbon sequestration. Dial could be silvicultural treatments, and thinning is a part of that. This model wouldn't take into account increasing demand for new forest products, for example
 - ii. Not off the table, still an option and will discuss later in the meeting
- 4. Presentation and Discussion with Wood Basket Contractor, Evergreen Economics
 - a. WGQ: Localized effects – incremental supply could have a high cost. Is that part of the model?
 - i. Evergreen: Yes, and with information received from ESSA and DNR. Will have localized effects.
 - b. WGQ: Focusing on what happens if log supply is reduced. Scenarios that can increase supply and carbon supply. DNR is constrained with thinning, but lots of volume that is left on the table. Possible optimization scenarios.
 - i. Evergreen: Not making any assumptions, work group is making the decisions/assumptions. Will know what the silvicultural treatments are. Using actual data to understand what is happening to the forests and economics. Also recognize impact technology has on employment
 - c. WGQ: Carbon market analysis? Is that correct?
 - i. Evergreen: Yes, assuming will grow over time. Private owners have to make decisions about cutting or holding timber and have to take that into account in their modeling.
 - d. WGQ: Presentation talked about impacts at state and local level. Does the model account for things like significant impacts like major fires or policy changes?
 - i. Evergreen: Can fit those things in, model just gives you market representation for scenario that you mentioned.
 - e. Model – there aren't any predetermined aspects of the model.
 - f. WGQ: Stumpage – part of the modeling scenario? Can model translate into something that's meaningful for revenue?
 - i. Evergreen: supply: plots, demand: mills
 - g. WGQ: Looking at volume of whole logs and products being exported? To get accurate picture?
 - i. Evergreen: As part of the national model, will track all mills in the US, and 126 ports. Tracking all parts that leave mills, including logs, chips, etc.
 - h. WGQ: Looking at nationally makes sense, but also looking at the state level?
 - i. Evergreen: Yes, looking at very specific points, tracking everything. Location specific tracking.



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- ii. DNR: For DNR revenue, it stays in revenue and goes to various beneficiaries, government agencies to build schools. Have a larger weight on the local economy.
 - 1. Evergreen: Can't look at that but can look at jobs.
- i. WGQ: Big prediction for land going out of production. Based on prices, land will go in and out of production?
 - i. Evergreen: Yes can look at that but won't be a primary focus. Data limitations – FIA plots measured every 10 years. Don't have ownership breakdown of that, private, industry, state, etc. Unless DNR knows that, hard to figure that out.
 - j. WGQ: Lifecycle analysis – assumptions made about product substitution? Several papers recently critique product substitution assumptions. Will we look at assumptions for the lifecycle analysis?
 - i. Evergreen: Yes, those are all assumptions. Do have knowledge of lumber and what product it was made for. Post-processing thing.
 - k. (chat) There is work underway at UW with Luke Rogers Lab (Under contract with WFFA) to generate landownership data that could be useful to the Wood basket analysis
- 5. Presentation and Discussion with Carbon Contractor, ESSA
 - a. WGQ: Each model's ability to handle understory vegetation?
 - i. ESSA: FVS handles it well for the tree component. Shrub layers – grows back as stand fills in. Trees – infill from underneath. Some trees do better in understory, some do worse. Some manual infilling, some natural infilling.
 - ii. CBM3: Simulation based on plot measurements taken in Canada, where everything was measured, including understory. Function of the overall volume of the stand. Estimation of the biomass of the understory but not of the individual units.
 - b. WGQ: FVS would be better for pre-commercial thinning?
 - i. ESSA: wouldn't be able to tell in CBM the number of trees removed but could tell the biomass removed
 - c. WGQ: General overview of the IPCC Tier 3 guidelines?
 - i. ESSA: Best would be to send the guidelines after the call. Requirement for IPCC Tier 3 was a requirement in the Proviso. Tiers relate to the veracity of the modeling, more complexity is higher tier
 - d. WGQ: Possible scenario is looking at putting additional acres of structurally complex forest and carbon impacts of that. What inputs would you put into the models to do that, how does the model look at structural complexity? Handling deferrals? How to quantify how many acres are being talked about?



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- i. ESSA: Would be part of the scenario development, deciding what areas would be deferred.
- ii. DNR: More of a DNR question – would depend on what we tell the model. Work group would come up with a few scenarios that could represent different definitions of structurally complex forests. What variables need to be tweaked in the model to have those different outcomes
- iii. ESSA: FVS: Begins with the creation of a scenario where structurally complex older stand is defined in some way. Then take older tree inventory, snags, as model progresses the trees continue growing, dying, will all be present in the simulation. Also, can define what is present in the stand before the modeling
- iv. ESSA: CBM: Depends on what the forest imagery is telling us, what is there beyond just age. Model itself is highly dependent on the shape of the volume yield and age curves. The way that carbon is moved in older stands is based on how carbon moves from standing trees and to dying trees
- e. WGQ: Question about rate of sequestration for different land categorizations. Hearing that modeling has capability for determining carbon flux among the natural pools?
 - i. ESSA: Yes
- f. WGQ: Curious about opportunities to improve forest management and carbon sequestration on DNR forest lands. Are the models capable of incorporating things like seed selection, planning density, commercial thinning, etc.? At that level of granularity? Do contractors feel constrained by work group or DNR in addressing other what-if scenarios?
 - i. ESSA: Model decisions will depend upon what is agreed upon in the work group. But even if not agreed upon, everything mentioned FVS is capable of modeling. Challenge isn't if it's possible, but defining what kinds of silvicultural rules are used, bearing in mind the limitation to the number of scenarios modeled.
 - ii. ESSA: CBM3 – Yes, can explore those different options. Won't have level of granularity as FVS has, but still will be able to show it
- g. WGQ: Any differences in way CBM VS FVS models handles decay of ecosystem carbon that's left behind after logging?
 - i. ESSA: FVS – Looks at foliage falling off and decaying at one rate. Each species has different rate, based on species and size. But, decay rates are fixed. Can be changed by the user but model is not able to be sensitive to that as it changes over time (climate becomes warmer and wetter, for example).
 - ii. ESSA: CBM: Can be sensitive to temperature changes over time, which changes decomposition rate. Handles it in a similar way FVS does. General rule, 85% of trees taken out in a clear cut, tops and branches left over after clear cut follow unique decay rates.
- h. WGQ: Are models for carbon dynamic on DNR-land based on DNR survey data or FIA?
 - i. DNR: Haven't landed on that yet.



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- ii. WG: Wouldn't results be better if using DNR data?
 - 1. DNR: The more robust the data, the better. Need to look at the data, format of the data, etc.
- iii. WG: Yes more robust data, but also depends on the quality of the data
- i. Round robin
 - i. WG: Work group members should get list of criteria for deciding which model will be used. Based on scenarios discussed so far, lean towards FVS.
 - 1. ESSA: Draft criteria that ESSA put together but waiting until hearing the work group member input to make the decision. ESSA will make recommendation on which model and then DNR will decide on the model
 - ii. WG: Don't have recommendation yet, but looking at structural complexity and snags, with the data sets that DNR uses, whichever one could accommodate DNR's data would be preferable. Curious if ESSA could describe how the models look at emissions from logging, entire picture
 - 1. ESSA: FVS – touches on integration with Evergreen and ESSA. Once harvest activity takes place, have commercial portion – which FVS tracks harvested products as they go into permanent products, tracks decay of those products over 100-year period.
 - 2. WG: So, emission from transporting logs to factory, or factory emissions, taken into account?
 - a. ESSA: No, they are not. Burning of waste is included
 - iii. WG: Not ready to pick one or the other, both have pros and cons. FVS does well with trees over age 20, might be other models that perform better with younger trees. Boils down to level of data, how DNR will provide data to both contractors. What challenges or problems come from mixing very detailed and not detailed data? Want to understand best way for ESSA and Evergreen to interact, which model each is using.
 - 1. Evergreen: Differences in data are not an issue. At the end of the day, going to be interacting with ESSA a lot, but don't have to wait for ESSA to produce the data for them. Want to apply to model the same management regime as ESSA
 - iv. WG: Difference between models – FVS can look at individual trees, species.
 - v. WG: Don't have expertise to make decision. Is there a win-win? Can model things well with different levels of thinning, seems like FVS would be better for that.
 - vi. WG: Want to make sure that whichever approach is used can take into account pre-commercial thinning and options around commercial thinning as well. Seems like FVS might be better for that.



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- vii. WG: No one in forest products industry uses FVS. But, given that these are the only two choices, might decide that FVS is more appropriate. If DNR sets criteria, could do some simple comparative runs of their own scenarios on FVS vs CBM. Might find that FVS is slower and under-predictive in results.
- viii. WG: Contractors seem to understand the complexity of these issues and models. With complexity, there are always more assumptions that have to be made. Important to know what the assumptions are to appropriately think about the model outputs.
- ix. WG: Not familiar with CBM. Based on the presentation, FVS can handle some of the thinning scenarios that work group will want to see moved forward. Curious about the contention that FVS is not accurate for DNR lands.
 - 1. WG: Because FVS is a single tree model, it can do a lot of things we are asking it to do. But, do we have data to support the output?
- x. WG: Lean towards FVS, but also not an expert. Like the ability to do thinning and different species.
- xi. WG: Lots of good input and comments. Big end goal is to think of about improved forest management in scenarios. Should be DNR's goal to have granularity around that. Data sourcing question is critical at this point and lean towards model that can handle that type of granularity.
- xii. (chat) Evergreen: Smith, J.E., L.S. Heath, K.E. Skog and R.A. Birdsey. 2006. Methods for calculating forest ecosystem and harvested carbon with standard estimates for forest types of the United States. Gen. Tech. Rep. NE-343. USDA, Forest Service, Northeastern Research Station, Newtown Square, PA. 216 pp.

6. Management Scenarios Discussion

a. What counts as a scenario? Discussion

- i. WGQ: Understand why climate change is needed as a scenario but would be better to treat it as a factor instead of an additional scenario
 - 1. DNR: Could apply climate change to all scenarios
- ii. WGQ: What is DNR's current scenario?
 - 1. DNR: Will discuss after lunch
- iii. WGQ: Important to lay out what scenario is. But, many changes to different factors – length of time for increased rotations. Scenarios to optimize conditions are important.
- iv. (chat) WG: Did DNR ever answer the question of how they have determined their current average rotation age? Whether or not they are counting areas that have HCP requirements which preclude clear-cut harvest versus just the GEM lands makes a big difference on how we think about an extended rotation scenario.



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1. (chat) DNR addressed this question in the Q/A document:
https://www.dnr.wa.gov/publications/bc_cfm_m3_qa.pdf
 - v. (chat) WG: Was the CNW/WCA report on longer rotations ever added to the bibliography or provided to the workgroup?
 1. (chat) WG: Hey, I have been focused on adding relevant journal articles, so have not uploaded our presentation yet, but thanks for the prompt. Also want to make sure you and everyone knows we are in the process of refining the model so we will have new results in about six weeks.
 - b. Climate change question
 - i. WG: What climate change factors specifically?
 1. ESSA: Changes in disturbance, carbon decay dynamics. Might include global climate model assumptions. But, integration across all of those things that needs to happen to get it all in the model
 2. ESSA: Where we need to choose carefully about scenarios, too many things to consider. Under different climate scenarios, might get different species mixtures.
 - ii. WG: Do the modeling options in a climate change scenario also include difference in drought and resilience with differences with structurally complex forests
 1. ESSA: Will have to think about this.
 - iii. (chat) WG: When we return, will be important to understand what assumptions are made in "high" and "moderate" climate impacts for modeling.
7. Management Scenario Discussion
- a. WGQ: Point of order question – narrowing down scenarios, using the supermajority in the charter, or what is the process?
 - i. DNR: Will use thumbs up/thumbs/down for today but trying to get a sense of people's positions before the more formal vote at the next meeting.
 - ii. DNR: Will be ok if we have more than 16 scenarios today, because can narrow them down further at the next meeting. Would be great to get a high-level idea of what the scenarios are going to be, and then can dig into it at the March meeting.
 - b. WGQ: Current DNR operations should be a scenario, but what are DNR operations?
 - i. DNR: might fit best into the next meeting, where we will discuss each scenario in greater detail
 - ii. DNR: Answered at the last meeting with a presentation by DNR?
 1. WG: No, that presentation didn't answer question.



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- iii. DNR: DNR assumptions that go into sustainable harvest model will go to ESSA. Rotation age is not something in the model, DNR doesn't have a set rotation age.
- c. WGQ: Don't have problem with current operations. Doesn't like referring to current operations as baseline/business-as-usual.
 - i. DNR: Yes, meant to remove it and will refer to just as current operations.
- d. WGQ: What are DNR current operations? Should be a scenario and should be variations on that scenario to improve upon DNR's management.
 - i. BPP: New scenario: optimizing DNR operations.
 - ii. DNR: All revenue considerations will be handled by Evergreen Economics.
- e. WGQ: Including thinning in long-term cover? Are we going to propose things in scenarios that would require DNR to get an amendment on its Habitat Conservation Plan (HCP)? Taking HCP as a given?
 - i. DNR: In general, amendments to the HCP are unlikely, would be challenging. May not be the best use of a scenario. Funding – know that some things aren't possible because of a funding constraint. But, funding is easier to ask for from the Legislature, lower hanging fruit for potential changes.
 - ii. DNR: Do have 16 scenarios, could propose 1 scenario with that and could go into the report, it just wouldn't be a near-term operating possibility. Could take 10+ years.
- f. WGQ: Considering the short time limitations – agree with current DNR operations to compare against. More discussions needed on what current operations are. Concerned with things – will carbon analysis drive the wood basket study? Chicken and the egg situation. Where does the discount rate fit into this?
 - i. DNR: Model configurations for the management scenarios will be provided to Evergreen for the wood supply study.
 - 1. WG: Could have scenarios that are economically unviable.
 - ii. (chat) ESSA: Discount rate is relevant to the Evergreen study
 - iii. Evergreen: Discount rates – will estimate NPV for each scenario. Not sure if there's a standard that DNR uses but will figure that out. Certainly, future revenue will have to be discounted to make sense today.
- g. WGQ: Ok with greater harvest intensity standing in for revenue but need revenue in these scenarios. Can't invest revenue in any way other than school construction.
- h. Scenario 2
 - i. DNR: Proposed scenario 2 – variation could be shortening rotations, and another variation is increasing deferrals
 - 1. WGQ: Uplands restricted by HCP, and General Ecological Management (GEM) lands. Ending up with net carbon emissions.



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2. DNR: Shorten rotations on DNR GEM lands. Just like modelers, not going into scenarios with any assumptions of what will ultimately have increased or decreased sequestration or revenue, will let the models bear that out.
3. Also- changing rotations based on land allocations
- ii. (chat) WG: On what land allocations would changing rotations occur. Some landscapes (i.e. Uplands) can see timber harvest, including VRH (think Rain on Snow). That means some lands could be harvested at age 40 and others limited to 80+
- iii. (chat) WG: I assume NRCAs, and NAPs will be included in the carbon analysis. These lands contribute to the HCP goals and should be included in carbon analysis.
- iv. (chat) WG: Under "DNR Current Mgmt." Scenario, potential variations that could provide carbon benefits: - increase investments in forest health and fire resiliency, to avoid emissions, on all land classifications (e.g. GEM, deferrals), scaled as appropriate to the objective of the land classification - on GEM lands, analyze improved/increased silvicultural treatments, as compared to DNR Current Management, that increase carbon sequestration and storage such as: seed/seedling improvement; planting density/species; increased investment in seedling survival and competition control; PCT age/acres treated/density/species selection; CT age/acres treated/density/species selection; timeline for reforestation post-fire; increasing/improving prescribed burning/post-harvest fuel utilization;
- v. WGQ: What is the planning horizon for this process?
 1. DNR: Depends on the model that we end up choosing. FVS model can do analysis at 5–10-year increments, with max of 40 increments. CBM model has no max at a yearly interval.
 2. (chat) ESSA: Q about the time period... If FVS is the model of choice, it goes to 2090
 3. (chat) WG: Is that a contractual limit or, model choice?
 4. (chat) ESSA: The Climate Extension to FVS uses GCM climate projections, and those projections only go to 2090. If climate change is off the table then that restriction goes away
- vi. (chat) WG: Adding a "What If" variation: What would the carbon benefits be if there was research and market development in small diameter wood and harvest and mill byproducts, that could help to avoid carbon emissions, increase community wildfire protection while also generating revenue and jobs, increase sequestration.
- vii. (chat) WG: For "Current DNR operations" will the expectations of the SHC (VRH, Commercial Thinning, Pre-Commercial Thinning) output from the Forest Estate



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Model or will it be from actual performance which tends to underperform, especially on PCT and CT acres?

- viii. WGQ: Leakage – if intensity of management is reduced, will that be addressed?
 - 1. Evergreen: Yes that will be addressed.
 - ix. WGQ: Don't need to include increase deferrals on #2 – would be repeating what happens when you defer. Might change balance of harvest levels in different rotation lengths.
 - x. Raise hand if it should be included and combined – extra scenario that combines shorten rotations and increase deferrals?
 - 1. WG: Duplicative, don't need increase deferrals. Will be existing deferrals. Will get same sorts of values per acre as we are already going to get out of the HCP modeling.
 - a. DNR: Will put this in the potentially eliminate category
 - xi. (chat) WG: Since these are still trust lands and there is a fiduciary duty for DNR to manage them. I would suggest a rotation age that maximizes NPV. And then there is the HCP limitations on some lands.
- i. Scenario 3
- i. (chat) WG: Lengthen rotation could be adding 20 years
 - ii. WGQ: No one rotation age on DNR lands, would be talking about shorter or longer on the average. Would let the modeling show what makes the most sense, where the best outcomes are – is that possible?
 - 1. DNR: for Scenarios – different rotation length based on site classes; Should start from different place and ask model to optimize things? Don't think that is feasible.
 - 2. ESSA: Referring to optimization models, a bit out of scope of what the carbon model does. Carbon model attaches to back of the optimization models.
 - iii. (chat) WG: Shorter or longer on GEM lands.
 - iv. WGQ: Most of this conversation is based on whether carbon stored in forests will increase or decrease – putting cart before the horse? Will be looking at the net carbon cycle, driven by products – whole carbon cycle
 - 1. DNR: Whole carbon cycle will be included. Welcome to propose management change that will have the outcome one is looking for. Can't have a scenario that says, "maximize carbon stored in wood products," need the "how"
 - 2. WG: Depending on how it's looked at, also way to increase structural complexity of forest without being deferred.



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3. DNR: The recommendations that the group comes up with will be looked at by the DNR Board, which could then recommend that to DNR to change their sustainable harvest calculations
- v. (chat) WG: Carlisle C, Fitzgerald S, Temesgen H. Modeling above-ground carbon dynamics under different silvicultural treatments on the McDonald–Dunn research forest. *Forests*. 2023;14(10):2090. This paper found optimal rotation ages for carbon in western OR ranged from 60-120 depending on site class. Also had different number of intermediate thinnings.
- vi. (chat) WG: Much research to the contrary to what they just said.
- j. Scenario 4
 - i. Value in a scenario that only looks at deferrals?
 1. WG: Dependent on what the other scenarios are, but important to have a sense of the carbon impacts of the structurally complex forests, as instructed by the proviso
 - a. DNR: No specific need for just deferrals?
 - i. WG: Yes, and want complete picture of impacts
 2. (chat) WG: I agree that the #4 scenario should be along the line of the work group member's suggestion for structural complexity in managed stands.
 3. WG: Would be interesting to have a scenario focused on deferrals, but, does that affect the long-term capacity of DNR's land base?
 - a. DNR: But, might be valuable to have one with just deferring, have a comparison against other scenario results
 4. WG: Potential variations for 4 – should include 'not currently structurally complex'. Forests are constantly moving along to different stand types
 - a. DNR: Another potential scenario could be just deferring additional acres of forest that already is structurally complex, or just defer additional acres of forest that could become structurally complex
 5. (chat) WG: Scenario #4 - Would that only look at carbon impacts on DNR trust lands? Would it ignore the wood products portion of the carbon picture?
 6. (chat) DNR: The economic study should capture leakage, substitution, etc. of that scenario too.
 7. (chat) WG: I think all types of impacts will be analyzed for all these scenarios: harvest volume, income, regional wood production reactions...



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- k. Scenario 7 and 8 – bookends
 - i. DNR: Want to get a sense if scenarios 7 and 8 are valuable as bookends, even though they won't move forward as recommendations. Keep in mind how we treat climate change, which would potentially limit the number of management changes. Might be valuable as an overall comparison, but also are somewhat polarizing
 - ii. (chat) WG: We feel 7 and 8 would be important to include
 - iii. WGQ: Why did ESSA think No Harvest should be a scenario, if they also don't recommend it.
 - 1. DNR: ESSA proposed it when they thought the timeline would be longer. No longer have time to do any pre-analysis of the scenarios.
 - iv. WGQ: Would be interesting to have the two, maybe make the decision after we know more about the climate change scenario number.
 - v. WGQ: Want to clarify – seems like tiny straw poll before lunch already made a decision about climate, haven't had a discussion on it yet. Will we discuss that?
 - 1. DNR: Yes, will discuss at the next meeting. Then could finalize the number of scenarios based on the outcome.
 - vi. WGQ: While informative to have them as scenarios, would be a waste of effort. Do think that Scenario 6 and 5 – could be woven into the DNR current operations scenario. Also, defer additional acres would be a waste of effort.
 - 1. DNR: All of those things would be treated as additional scenarios
 - vii. (chat) WG: I don't know if this is possible, but if there were any materials ESSA could send out about their climate factors they include would be useful before a vote!
 - viii. (chat) WG: Regarding Csenka's invitation to put in the chat some suggestions on how to model/define structural complexity: It seems like that warrants a larger discussion and perhaps it would be good to invite Dr. Donato to attend that discussion. I also wonder if he could give some suggestions for how to model the different stages of structural complexity: botanical diversity, niche diversification, and fully functional.
 - 1. (chat) WG: https://4603c126-866d-4078-8fcb-3a1119f437ba.usrfiles.com/ugd/4603c1_259392fe2e534b05b8a6538a186dff65.pdf
 - ix. WGQ: Thinks that 7 and 8 would be useful, especially 7. From a modeling standpoint, easy to just turn off management activity. Does use a scenario but would give us some instructive input. Scenario 8 could be dropped, maybe. Mostly interested in 5 and 6.



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- x. WGQ: Including Scenario 8 – how feasible would it be to dial back DNR practices? Scenario 5 variation no final harvest, impossible to figure out, not meaningful.
 - 1. DNR: Scenario 8 is an impossible scenario. Scenario would be managing under state forest practice rules only. But, not something that can be recommended to the board.
 - xi. (chat) WG: I suggest if one bookend is provided (Scenario 7), both should be provided.
 - xii. WG: I differ on that.
 - xiii. (chat) WG: Dropping the HCP is possible. Challenging but possible. There is a legal mechanism in the contract with USFWS to exit the HCP. And the PSF likely would only need to be modified. Much still fits with Forest Practices rules.
 - 1. (chat) WG: There would be massive pushback on such a proposal, but good to know that this is something you want.
 - 2. (chat) DNR: I think to DNR, both no harvest and state legal minimum are equally impossible scenarios
 - 3. (chat) DNR: Both are LITERALLY possible, but overall infeasible
8. Next Meeting Planning
- a. Possible homework for the work group, so many questions to cover in such a short amount of time.
 - i. Will check with DNR on this.
 - b. Question for the work group: Creating some straw dog definitions for the next meeting.
 - i. DNR: Understand that this is important to everyone, need to come prepared to the meetings and might have to do some homework. Please send ideas not captured in these discussions via email in the interim before next meeting.
 - ii. WGQ: Have questions about different factors that could be included in the modeling.
 - 1. DNR: Want to get those questions captured and could talk to the modelers, should share the questions so that everyone can see the questions and the answers. Will streamline the question answering.
 - iii. (chat) WG: Will Evergreen be doing an analysis of emissions and costs associated with those emissions? If so it would be helpful to have the methodology and assumptions they would be using for that analysis.
 - c. (chat) WG: A break out of all the variations we just went through as individual scenarios in advance would be very helpful.



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9. Other topics

- a. Ideas on other topics are still welcome, please share via email.
- b. Will get meeting summary and scenario discussion out to the work group within about a week.
 - i. Important to look at the meeting summary and make sure that things are documented correctly.