



## Chesapeake Bay Program

*Science. Restoration. Partnership.*

## Forestry Workgroup Minutes January 8th, 2025 | 9:00 am - 12:00 pm

[Meeting Materials](#)

### Attendees

<p>Alanna Crowley, MD DNR FS Alisha Mulkey, MDA Anne Gilbert, MFS DNR Angel Valdez, MDE Anne Hairston-Strang, MD DNR Bay Hanson, USFS Ben Alexandro, CCP Cassie Davis, NYS DEC Celine Colbert, PA DCNR Chris Miller, DE FS Chris Peters, PA NRCS Craig Highfield, ACB Craig Larcenaire, USFS Dan Coy, MD DNR Derrick McDonald, PA DCNR Emily Heller, EPA CBPO Carlsson, Erica, DC DOEE Emily Shosh, DCNR BOF Frank Rodgers, Cacapon Inst. George Doumit, DE DNREC Helen Golimowski, Devereux Consulting Jeremy McGill, WV DOF Joel Cockerham, Cacapon Inst. Julie Mawhorter, USFS Kalaia London, PA DCNR Katie Brownson, USFS Keith Bolt, EPA CBPO</p>	<p>Kesha Braunskill, USFS Lara Johnson, VA DOF Lorenzo Cinalli, USFS Lydia Brinkley, Upper Susquehanna Coalition Marilyn Yang, CRC Matt Keefer, PA BOF Ned Brockmeyer, PA DCNR Orsolya Lazar, PA DCNR Patti Nylander, VA DOF Rob Schnabel, CBF Robert Corletta, DDOT Urban Forestry Robert Gentry, USFS Taryn Davidson, DE FS William Byrum, NRCS Ruth Cassilly, UMD Caitlin Bolton, MWCOG Emily Beach, CC CIC Heidi Bonnaffon, MWCOG Jake Reilly, NFWF Jeremy McGill, WV DOF Judy Okay, J&amp;J Consulting Matt Keefer, PA BOF Patricia Nylander, VA DOF Philip Bogdonoff, Bio4Climate Sally Ross, USFS Teddi Stark, PA DCNR Jenna Talbot, DNREC</p>
--	---

<b>9:05</b>	<p><b>Announcements – Katie Brownson (USFS, FWG Coordinator)</b></p> <ul style="list-style-type: none"> <li>Chesapeake Bay Program Webinar: <i>Addressing Urban Tree Supply Challenges in the Chesapeake Bay Watershed</i>: Wednesday Jan 22nd 12-1 PM. <a href="#">Register Here</a></li> <li>USFS Watershed Forestry Webinar: <i>Emerald Ash Borer and Riparian Forest Management</i>: Thursday Jan 16th, 12-1 PM (date has been updated). <a href="#">Register Here.</a></li> </ul>
<b>Part 1: Laying the Groundwork</b>	

<p><b>9:10</b></p>	<p><b>Framing the Meeting – Katie Brownson (USFS, FWG Coordinator)</b></p> <p>To open the meeting, Katie provided an overview of the meeting’s objectives and agenda structure.</p>
<p><b>9:15</b></p>	<p><b><a href="#">Crash Course on the 2014 Watershed Agreement</a> – Katie Brownson (USFS, FWG Coordinator)</b></p> <p>To lay the groundwork for the outcome assessment discussions, Katie provided a brief history of the 2014 Watershed Agreement, covering its mission, goals, and outcomes.</p> <p><b>Discussion:</b></p> <p><b>Anne Hairston-Strang:</b> Emphasized the importance of making the goals more relatable to the public as a priority in this revision of the Watershed Agreement. Based on the recent Executive Council meeting, the sense is not to overhaul the agreement and start over, but rather to make adjustments.</p> <p><b>Rob Schnabel:</b> In today's climate, we should not take EPA jurisdiction or the Clean Water Act for granted. He refers to a significant lawsuit filed in 2014-2015 by the American Farm Bureau and other industry groups aiming to remove EPA jurisdiction, which made it to the Supreme Court in 2016. The Court ultimately decided to step back and side with the lower court's ruling, but given the current environment, we cannot assume that this will always hold.</p> <p><b>Anne Hairston-Strang:</b> This makes the communication task even more critical and we need to be clearly conveying to the public the value of the Bay Program to illustrate, to show that if we didn’t have the program, the laws, or voluntary cooperation, we wouldn’t be looking anywhere near the conditions that the Bay is at today.</p>
<p><b>9:25</b></p>	<p><b><a href="#">Framing the Beyond 2025 Effort</a> – Katie Brownson (USFS, FWG Coordinator)</b></p> <p>Katie outlined the next phase of the Beyond 2025 effort, including roles and responsibilities, the timeline, and the process for reviewing current outcomes.</p> <p><b><a href="#">FWG Letter to the B25 Steering Committee for reference</a></b></p> <p><b>Discussion:</b></p> <p><b>Matthew Keefer (in chat):</b> Hi Katie! Quick question, where does elevating conservation fit into this revision framework?</p> <p><b>Rob Schnabel (in chat):</b> Perhaps in "Outcomes" for long term goals, but put in "Goals" for the short term, 2 yr milestones.</p> <p><b>Katie Brownson:</b> We haven't received specific direction yet but she suggests we can consider how to approach it within the context of their existing outcomes. Ideally the PSC will consider</p>

this as they review the goals and visions. How can we further integrate land conservation into the CBP? Ultimately, it will be up to the partnership to decide.

**Anne Hairston-Strang:** In 2006-2007, we adopted a forest conservation goal for the Forestry Workgroup that got rolled up into the land conservation goal, which is where the inclusion of 695,000 acres of forest conservation, along with wetlands in the land conservation goal came from. One key takeaway from today's meeting is gathering more input on what forest conservation should look like as a goal and how it should be tracked and supported.

**Katie Brownson:** That speaks to the interconnected nature of the outcome review and Bay Program structure, since the forest conservation work is situated under the the protected lands workgroup due to it falling under the land conservation goal, the forestry workgroup has thus become disconnected, so this is a good thing to consider when we think about this outcome review.

**Rob Schnabel:** When will the land use/land cover data be released? It will be critical to determining our outputs and goals once we can look at the forest cover database and crunch those numbers.

**Katie Brownson:** The timeline from the USGS team is unclear, however they seem to be willing to work with us and provide draft data until it's ready for public release.

**Craig Highfield:** Asked about whether the FWG would be willing to consider other outcomes and suggested forest resiliency as an area to focus on, given that forest conservation does not capture all these elements and the opportunities from increased funding and towards this topic.

**Katie Brownson:** Agreed that's a great point and something we should keep in mind. Mentioned that time at the end of the meeting will be reserved for discussing the possibility of new outcomes.

**Rob Schnabel (in chat):** Perhaps share the letter you/the group pulled together and sent to the Bay Program team as we move beyond 2025. Good language in there concerning conservation of forests through existing agriculture preservation programs.

**Katie Brownson (in chat):**

[https://d18lev1ok5leia.cloudfront.net/chesapeakebay/documents/B25\\_FWG\\_ReportComments.pdf](https://d18lev1ok5leia.cloudfront.net/chesapeakebay/documents/B25_FWG_ReportComments.pdf)

## **Part 2: Review of Current Outcomes and Consideration of New Outcomes**

**9:45**

**Tree Canopy** – Julie Mawhorter (USFS)

Julie began the session with a presentation on the Tree Canopy outcome, covering its history and evolution, how it's measured, the current progress, and key insights into the challenges and successes from the past 10 years. To kick off the discussion, she walked through the

Management Board's prompt of whether the outcome is SMART (Specific, Measurable, Achievable, Realistic, Time-bound) and offered considerations for improving the outcome through this review process.

**Current Tree Canopy Outcome:** "Continually increase urban tree canopy capacity to provide air quality, water quality and habitat benefits throughout the watershed. Expand urban tree canopy by 2,400 acres by 2025."

The discussion was guided by the following questions using a [Mentimeter poll](#):

- What is the value-add of having this as a Chesapeake Bay Program outcome?
- What should we recommend to the Management Board for this outcome in a revised watershed agreement?
  - Options: Update, Consolidate, Remove, Replace
- Could this outcome be improved? If so, how?

[Link to Mentimeter Results](#) (Tree Canopy results on pages 4-14)

**Discussion:**

**Matthew Keefer (in chat):** This is where we need to assert some leadership and connect our specific outcomes to conservation.

(Context for the following chat comments: During the presentation, Julie shared a table (slide 10) presenting a draft preliminary analysis of the tree canopy net change in the Chesapeake Bay watershed census places across three time periods: 2013/2014, 2017/2018, and 2021/2022. The data revealed a consistent trend of increased loss of tree canopy in each period.)

**Ben Alexandro (in chat):** Were there any assessments to parse out forest cover vs. tree cover over the watershed?

**Julie Mawhorter:** The numbers in table are really just produced for the tree canopy indicator where we try to delineate an area that is more of the urban communities indicated by the census places, but those data sets can be crunched in a lot of different ways to look at the total picture of forest cover and tree canopy cover change not just limited to these census places. Later we worked with the data to look beyond just urban developed areas, but for now this is the latest look into the data since it's not fully released yet.

**Katie Brownson (in chat):** This just looks at total tree cover in communities. We do a deeper dive into forests vs. tree canopy (at least with the older data) in the [State of Chesapeake Forests Storymap](#)

**Ben Alexandro (in chat):** does this parse out what loss might be from working lands so a snapshot in time that would be replanted vs. permanent loss from land use changes of forest area being converted into development?

**Katie Brownson (in chat):** Since this is just looking at loss within communities (more developed areas) we do not think much of this loss is on working lands- so mostly loss to development

**Ben Alexandro (in chat):** FYI back in 2022, Maryland did an in-depth Forest Technical Study that has a lot of data on the reasons for loss:

<https://cicgis.org/portal/apps/storymaps/stories/b519e88ccc8c4c4c8d4c870f64e210ed>

**Matthew Keefer:** Asked whether assessing the achievement towards the 2,400 acres was new acres or trees planted or relative to the net numbers.

**Julie Mawhorter:** Explained the goal was set to be a net gain goal, so we planted more than 2,400 acres but we haven't achieved the goal because there's been so much net loss.

**Erica Carlsson:** Asked if there was an analysis to the loss found in DC. (In response to the table on slide 10 in Julie's presentation)

**Julie Mawhorter:** We don't have an analysis, but we know there are a lot of factors causing loss, but more analysis would need to be done to see what the biggest drivers of this loss are.

**Robert Corletta (in chat):** Here is a link to a StoryMap describing the Canopy Change Analysis in DC: <https://trees.dc.gov/pages/land-cover#utc>

**Julie Mawhorter:** Also mentioned that something we always have to note is that these land use cover/land use change data are biased towards showing loss because it can pick up the losses more readily, while new plantings have a lag time before being picked up in the imagery.

**Judy Okay (in chat):** We should also consider the ecosystem service losses in TC situations and consider the social aspects of health. Loss of ecosystem services are actually a cost issue to localities.

**Judy Okay (in chat):** Shorter timelines for goals are better to monitor and gives more opportunities to rethink and present newer technologies.

**Philip Bogdonoff:** Brought up the biotic pump theory, which highlights how forest transpiration helps draw moist air from oceans to replenish inland water cycles. He also mentioned the cooling effect of intact forests, the growing role of food forests in urban environments, and the importance of Miyawaki Forests in engaging people with environmental caretaking. He suggested that expanding awareness and participation in these areas could help increase funding and planning for forest programs.

**Julie Mawhorter:** Thanked Philip saying these innovative approaches are things they definitely want to be thinking about as they develop the new outcomes and management strategies.

10:45

**Forest Buffers** – Katie Brownson (USFS, FWG Coordinator)

Katie began the Forest Buffer session with a presentation on the outcome's history and evolution, how it's measured, the current progress, and key insights into the challenges and successes from the last 10 years. To kick off the discussion, she also walked through the Management Board's prompt of whether the outcome is SMART (Specific, Measurable, Achievable, Realistic, Time-bound) and offered considerations for improving the outcome through this review process.

**Current Forest Buffers Outcome: "Continually increase the capacity of forest buffers to provide water quality and habitat benefits throughout the watershed. Restore 900 miles per year of riparian forest buffer and conserve existing buffers until at least 70 percent of riparian areas throughout the watershed are forested."**

The discussion was guided by the following questions using a [Mentimeter poll](#):

- What is the value-add of having this as a Chesapeake Bay Program outcome?
- What should we recommend to the Management Board for this outcome in a revised watershed agreement?
  - Options: Update, Consolidate, Remove, Replace
- Could this outcome be improved? If so, how?

[Link to Mentimeter Results](#) (Forest Buffers results on pages 16-23)

**Discussion:**

[Lydia Brinkley](#): Should the outcome be 70% coverage of riparian areas? Rather than focusing on 900 miles per year, which sounds more like an output.

[Katie Brownson](#): That's a great question and something I think we'll dive into more detail in this next section. [Anne Hairston-Strang](#): Mentioned the need to review the forest conservation goal in the protected lands goal.

[Katie Brownson](#): Responded saying that's a great point. She then continued addressing whether the outcome is SMART and mentioned it would be good to revisit whether the outcome will get us the change we need, since the target set a while ago by the partnership was 70% of riparian areas be forested as a minimum for maintaining watershed health and based on the 2017/2018 data, we would need 4440 miles restored to achieve this, assuming there's no more additional loss.

[Frank Rodgers](#): Chimed in saying as we are looking at these goals and our progress with the outcomes/outputs, it's important to remember this is the only watershed in the world that manages its zone and what we're doing is working.

[Judy Okay](#): What is the timeframe for these revised outcomes?

**Katie Brownson:** We haven't been given a set timeline yet, but the most recent discussions have been that we can consider it outcome by outcome. 10 years could be a happy medium for achieving this goal, but that doesn't account for the loss that could occur during then.

**Judy Okay:** Maybe we need to be heavier on conservation then.

**Katie Brownson:** This could look more like specific goals for conservation in the FWG outcomes or having them embedded in other outcomes like the protected lands goal.

**Anne Hairston-Strang (in chat):** CREP was a big part of meeting 2010 miles early, a new program in 1997.

**Judy Okay (in chat):** The lag time in getting Farm Bills approved has always been a problem. There were some years with no CREP in some areas. Not sure what can be done to include or make up for this issue.

**Anne Hairston-Strang (in chat):** Not seeing rapid progress to a new Farm Bill now either. At least got an extension of a sort with the Continuing Resolution.

**Judy Okay (in chat):** We have seem more collaboration between NGOs and environmental groups. James River Consortium has been very successful and is a good model to develop in other river basins across the states. They started with mitigation funds and have expanded their funding.

**Ben Alexandro (in chat):** I think that what MD is doing for permanent CREP is very interesting and could make sure that the buffers are protected and maintained into perpetuity. Has that program been successful and if so, is that a model that could be replicated elsewhere?

**Angel Valdez (in chat):** I don't know much about CREP. Is there a list of persons interested in the buffer program that is accessible by the public? Just curious because during the course of looking for Tier II mitigation, connecting people who are willing to have their land forested and conserved with developers is difficult.

**Anne Hairston-Strang (in chat):** Maryland's recent expansion of eligibility for CREP easements should be helpful, and it is successful for protecting new and nearby riparian forest. The key ingredient is reliable funding, which MD does through Program Open Space and 0.5% real estate surcharge.

**Ben Alexandro:** Referring to the CREP comments in the chat, he recalled a memory when commodity prices were skyrocketing around a decade ago, particularly for corn, which led to the implementation of riparian buffers for CREP and expressed interest in Maryland's example of a permanent CREP program for example.

**Judy Okay:** Mentioned that the Maryland CREP program has penalties for taking things before the contract period of 10-15 years, and it's the only program where we have control over

keeping that buffer in for a certain time. Wondered what it would look like to have Bay wide legislation like this.

**Erica Carlsson (in chat):** I find planting goals to meet canopy cover not effective due to the time it takes for canopy to grow. I personally think canopy goals should be canopy only. It's ok to have planting goals, but it misses A LOT.

**Philip Bogdonoff (in chat):** Soil fertility can be improved to accelerate growth 2-3 fold.

**Anne Hairston-Strang (in chat):** Planting goals were emphasized because there was ability to implement them. Conservation goals on a largely privately owned landscape involve a lot of different people not currently engaged in the Bay Program.

**Lydia Brinkley (in chat):** Reach and maintain riparian forest cover within 70% of the riparian area- this goal could lead to maintenance and conservation outputs

**Katie Brownson:** Navigated to the Mentimeter question asking: "What should we recommend to the Management Board for this outcome"

**Philip Bogdonoff (in chat):** Takoma Park now has a disincentive in place for homeowners who exceed a certain area of impervious surface. Is that something that is or could be promoted more widely. Loss of upland forests due to development is a key issue in runoff into Sligo Creek, etc.

**Judy Okay (in chat):** Consider update including more climate change and sustainability.

**Anne Hairston-Strang:** If we're moving to a new hydrology layer in the Bay Program, there is a potential for it to be a finer scale. There may be areas with less defined stream corridors where there's not as much existing tree canopy. It would be good to have Matt Baker or Louis from the Chesapeake Conservancy at a future meeting to discuss the new mapping.

**Katie Brownson:** That's a great point and gets at what we are evaluating 70% of and making sure we're all in alignment about what we're trying to buffer.

**Joel Cockerham (in chat):** If we achieve 900mi/yr, how many years until we have forested all available space in the watershed? How much forestable space is there? I know this has come up in the past, but i thought it was worth bringing up in the big scope of things

**Katie Brownson (in chat):** We are going to be doing an evaluation of plantable space in the watershed and will overlay that with riparian areas

**Anne Hairston-Strang:** Mentioned one thing we haven't talked about yet is this outcome and the linkages to the million plus tree initiatives which has provided more state funding, but that could be affected with administrative changes.



**Katie Brownson:** Responded we do have to think about what potential cuts in BIL and IRA funding may mean for our work.

**Anne Hairston-Strang:** Mentioned we're also kind of at capacity for tree planting contractors for maintenance needs, so tying this all back to workforce development.

**Philip Bogdonoff (in chat):** Are folks aware of the DC-centered Blue-Green Wildlife Corridors Working Group? It has been meeting for not quite a year, and will be having a visioning charrette in Jan or Feb. Many of the corridors follow streams, of course.

**Philip Bogdonoff:** Following up on his comment in the chat, Philip notes there is potential overlap with topics discussed during these meetings and the FWG's efforts on riparian buffers.

**Ben Alexandro:** Is the Bay Program giving enough credit to the benefits of repairing buffers and forests? i

**Katie Brownson:** Forest buffers are among the most favorable practices in the watershed model to credit, which is why the States put so many of them in their WIPs likely since they get both land use conversion credit and upstream efficiency credit. What's missing is the acknowledgement of the long term maintenance and stewardship aspect because we don't credit conservation in a meaningful way, such as having a healthy riparian forest versus one that's planted.

**Judy Okay:** When looking at the model, it looks like you could take out an acre of trees but still get more credit if you were to implement various stormwater BMPs or new technologies. If I am perceiving this correctly, we need a better argument for the value that the trees hold because the ecosystem services are overwhelming which you can't get with many of these manufactured BMPs.

**Katie Brownson:** Responded I think you are referring to the stream restoration BMPs, which you are right, treat forest buffers and wetlands basically as equivalent in the model, so if someone clears our a forest and puts in a stream restoration they in addition to getting that credit for the land use conversion they also get the in stream benefits.

**Jake Reily:** Mentioned that not every riparian buffer is created equal from a water quality and habitat perspective, which makes it difficult to credit and prioritize them over other BMPS, so there is a need to better evaluate and quantify the benefits especially connected to some of the other habitat benefits and how they work on the landscape.

**Judy Okay (in chat):** again, the ecosystem services for RFBs is positively overwhelming and could really help promote forest buffers in suburban and ag areas as well as developed jurisdictions.

**Angel Valdez (in chat):** I think that net loss isn't taken into account with regards to the crediting system. For example even some stream restoration projects remove acres of trees

**Ben Alexandro (in chat):** That is heartbreaking, Judy! More credit for removing forests is devastating and a perverse incentive to get rid of forested land use

**Angel Valdez (in chat):** Agreed. I shouldn't have to be requiring forest mitigation for stream restoration projects, but here we are.

**Judy Okay (in chat):** TAKE a look at the values FEMA value update 2022, gives for the services RFBs provide and the cost to replace them the dollar values are impressive.

**Anne Hairston-Strang:** Responded there are certainly tools out there for ecosystem services valuations and proper accounting, as Judy mentioned, but when we tried to put that into programs, land owners wanted more clarity of what they would receive in the program rather than signing up and seeing what they would get.

**Katie Brownson:** Mentioned one of the recommendations in the Phase 1 B25 report was to develop approaches to be able to better incentivize practices that will deliver multiple benefits other than just water quality and deciding which practices to prioritize.

11:35

**Consideration of New Outcomes** – *Katie Brownson (USFS, FWG Coordinator)*

Katie led an initial exploratory discussion to evaluate whether there are other forestry outcomes we should consider to advance our efforts in meeting the mission and goals of the Watershed Agreement. Additionally, she reviewed the feedback from the November meeting on forest management and dynamic forest block restoration to frame the discussion.

The discussion was guided by the following question using a [Mentimeter poll](#), enabling attendees to record and share their responses in real-time.

- Are there other forestry outcomes we should consider to advance our efforts to meeting the mission and goals of the Watershed Agreement?

[Link to Mentimeter Results](#) (New Outcome results on page 25)

**Discussion:**

**Julie Mawhorter (in chat):** In addition to stewardship, "forest conservation" should also include more than just permanent protection programs which can only go so far, but other policies and incentives to reduce unnecessary loss related to removal/development.

**Philip Bogdonoff:** We could include considerations for resilience, mentioning that forests play a key role in producing bio aerosols that allow rain to precipitate sooner which helps to reduce the intensity of storms and helps with stormwater management and soil health. This region was harvested multiple times affecting the nutrients and soil health, so having amendments to restore the fertility and productivity growth rates would be beneficial. The

potential for restoring beaver habitats in certain areas for the ecosystem benefits, in light of a study from the last 6 months that predicted this region would have stressed water resources and with the increase in the water demands from data centers from the Potomac.

**Judy Okay (in chat):** Be careful what you ask for with more beaver,. The ponding aspect creates warmer water and is a door open for invasives to the unshaded water.

**Anne Hairston-Strang:** We could also consider fire resiliency alongside conservation and water quality.

**Robert Gentry (in chat):** To Phillips point on soil amendments, wondering about biochar opportunities as pyrolysis equipment improves??

**Philip Bogdonoff (in chat):** Biochar is good but isn't minerals or nutrients

**Jake Reilly:** Forests are about  $\frac{2}{3}$  of the watershed and they are all treated the same, so from the water quality side, I don't know if there's a way to improve our land use change modeling to consider forest condition and to incentivize better management of forests. The big issue here is that there is a gap in considering upland habitat and there's a good question about what the Bay Program should own in terms of outcomes, but if forests are  $\frac{2}{3}$  of the watershed this is a huge issue. NFWF is going through this process to refresh their program like the Bay Program and they will be including upland management and maybe there's a way to use this to create momentum in the Bay Program. Having the FWG under the WQGIT may be part of the problem.

**Anne Hairston-Strang:** Mentioned percentage of forests are one of the metrics in the watershed goal team, but it doesn't have the level of visibility that the tree canopy outcome has.

**Ben Alexandro (in chat):** Anne brought up a good point. Previously, land protection meant protected from land use change- so working lands that are permanently protected from being converted into development counts as protected/conserved. There are some efforts of some folks to change the definition leading to conservation not being defined in the beyond 2025 efforts. I think the biggest threat to forests are sprawling development (e.g. parking lots, McMansions, data centers, energy infrastructure, etc.) so that should be the focus of conservation.

**Matt Keefer:** Responding to Jake's comments, he argued that having the FWG under the WQGIT instead gives our work more credibility and funding. He mentioned that at a PSC meeting, they addressed nonpoint source pollution as if it were a new discovery despite being a key issue for decades and stressed the importance of elevating forest conservation in the broader conversation and the need for higher-level discussion at the management board and PSC to advance efforts to protect and expand forests.

**Katie Brownson:** People are welcome r to directly reach out with their thoughts to help us move forward with these issues.

<b>11:50</b>	<b>Recap and Next Steps</b> – <i>Katie Brownson (USFS, FWG Coordinator)</i>  To close out the meeting and summarize the next steps, Katie presented the timeline for completing the draft outcome assessment review templates.  A reminder of the <a href="#">Management Board meeting schedule</a> was provided, along with an outline of the goals and objectives for the <a href="#">February 5th FWG meeting</a> .
<b>12:00</b>	<b>Adjourn</b>

**Supporting Documents and Links:**

- [2014 Watershed Agreement](#)
- [Phase 1 Beyond 2025 Steering Committee Report](#)
- [Executive Council Beyond 2025 Charge](#) (Final 2024 Version)