Running Tide Science Advisory Board Final Report

Context

Shortly before Running Tide shut its doors on June 14, 2024, we kicked off an effort to evaluate the efficacy and structure of the Running Tide Science Advisory Board (SAB). The SAB, an independent entity managed by Ocean Visions, was approaching its 2nd anniversary. Now, after the company's closure, it seems more important than ever to reflect on the successes, structure, and shortcomings of our collective experience between Running Tide, Ocean Visions and the SAB to benefit future CDR practitioners and the carbon removal industry.

Strong scientific governance will continue to be essential to successful CDR projects, especially projects with open scientific questions pertaining to environmental impact and efficacy. Assessing positive and negative impacts in an open system is complex and requires investment in research. With limited resources, startups need to make hard decisions and tradeoffs regarding the extent of scientific research they can fund. Science boards can help companies understand these tradeoffs and build efficient research experiments. They can also help companies keep their operations on track, ensuring that project designs are based on the best available science and done efficiently.

Currently, the CDR industry lacks rigorous, mature, standardized mechanisms for scientific oversight and CDR-specific permitting to provide CDR companies with science-based benchmarking. In these early days, startups are investing in their own mechanisms for gathering expert feedback about project designs, identifying gaps in knowledge, and developing research strategies.

For Running Tide, Ocean Visions pioneered an advisory board structure that facilitated objective and impartial feedback regularly from a diverse panel of experts. Directly or indirectly (through industry connections), the SAB provided Running Tide with the expertise to fine-tune and rationalize research plans and scope out impact studies. Their insights were invaluable for Running Tide, and the Science Advisory Board model could be adopted and improved upon broadly by other CDR practitioners.

Since June 14th, 2024, we have had the opportunity to talk with members of the Running Tide Science Advisory Board and reflect internally within Ocean Visions and the Running Tide teams. We have compiled this report to summarize their reflections and suggestions.

Establishing the Scientific Advisory Board

In the spring of 2022, Ocean Visions established a Science Advisory Board (SAB) for Running Tide as a mechanism for scientific review and expert advising. Ocean Visions, in collaboration with the Running Tide team, defined the board's purpose “to create a panel of external advisors and experts that can review and ‘sanity check’ Running Tide’s technical progress” and codified the following top-line goals in collaboration with Running Tide’s science leadership:

I. Review Running Tide’s foundational scientific assumptions, and the application of external basic research to Running Tide’s project. This encompasses both project efficacy and the ecological implications of the project interventions.
II. Review of Running Tide’s techno-economic, lifecycle modeling and quantification reports.
III. Review of Running Tide Environmental Impact Assessments, including both positive and negative potential externalities associated with scale.
IV. Review of Running Tide’s methods to quantify sequestration efficiency and duration.

Based on the Running Tide science team's needs, Ocean Visions staff recruited experts within their network with a breadth of applicable scientific expertise and appointed them to the SAB. They communicated role definitions and responsibilities to the board members, managed the board directly, and compensated board members with a small honorarium per quarter, all with funding provided through the generosity of its philanthropic donors. Although members of corporate advisory boards frequently receive equity grants, this was not a consideration in this case. During this process, several SAB members said that they would not have taken on the role if there was such a structure. The small honorarium, from an independent non-profit organization, Ocean Visions, helped ensure their scientific independence.

After its inception, the board met for a kick-off workshop with the Running Tide team and Ocean Visions. The board subsequently convened on video calls at least quarterly and most recently met more frequently—almost monthly. Some SAB meetings were private with only SAB members participating; most involved SAB members, Running Tide staff and Ocean Visions advisors. The SAB also participated in a week-long on-site meeting in Iceland with a broad group of company stakeholders and an extended group of board members and scientific advisors at Running Tide’s facilities in the spring of 2023, around the board's one-year anniversary. In Iceland they also attended a public meeting with a variety of government and private sector participants to discuss the Running Tide initiative from multiple perspectives.

Members of the Running Tide Science Team, the Science Advisory Board, and Ocean Visions enter the Iceland project production site in Grundartangi for a tour and discussion during the Spring 2023 on-site.

Throughout their two-year engagement, the SAB worked with Running Tide during meetings and on an ad-hoc basis to provide independent scientific insight and review. They reviewed several foundational and research documents available on the Running Tide website - docs.runningtide.com - and Running Tide incorporated feedback from board members to consistently improve system and methodology design. A sampling of a few specific, high-impact documents below:

- Framework Protocol
- Responsible Sourcing Strategy
- Running Tide's Carbon Removal Research Roadmap
- Catalog of Potential Environmental Exposures

Role of the Board

The role of Running Tide's Science Advisory Board (SAB) – and similar boards at private companies – was a focal point of discussion, even following the company's closure. Primarily, board members provided scientific review and drew on their depth of knowledge to help

Running Tide improve intervention designs. Some cited the SAB's independence as key to its effectiveness and its ability to provide unbiased critical feedback. Everyone agreed though that the role of the SAB was to provide advice and that only Running Tide was responsible for the final content of the documents and any decisions, with no requirement to act upon the SAB's recommendations.

Board meetings usually focused on a series of topics related to Running Tide's latest research, and some members commented that proceedings often felt like a PhD dissertation defense. Board members reviewed presentations and research reports by Running Tide staff, asked probing questions, and made recommendations about research strategy and tactics. With broad expertise across the board, the SAB was able to address a wide range of topics or point the team to relevant specialists for feedback. Some members of the board felt like these sessions should have been more action-oriented with the board taking on greater responsibility to drive the conversation and set research direction. A contrast was drawn here by one board member between technical boards at companies where that is often the case.

For Running Tide, the SAB's value grew as members became involved in communications and community-building. As SAB member Kristen Davis noted in a recent conversation, "A science board serves an important role in translating information between the company and the scientific community." Individual members can broaden scientific stakeholder engagement and foster collaborative research by acting as liaisons - more akin to facilitators than ambassadors - by sharing their deep insights into company research, roadmap, and risks. Collaborations that arose from SAB connections strengthened Running Tide's scientific foundation, expanded its network, and pushed important company insight out into the scientific community.

Before Running Tide's unexpected closure, there were plans to leverage the SAB's network for monitoring and ecological impact research alongside future deployments out of Nova Scotia, Canada or other potential locations. They wanted to invite researchers aboard deployment vessels, sharing ship time and increasing community engagement with project operations. The SAB also recommended advertising field trials in advance, which would have allowed researchers with vessels to engage with the project opportunistically. For many, these ideas represented an exciting new phase in expanding the SAB's potential – a promise cut short by the company's unfortunate and abrupt end.

Board Operations

A science advisory board needs a process to function effectively: rituals to establish continuity between meetings and objectives with follow-through to maintain accountability between the company and the board. It may sound simple; it was a learning experience. Meetings evolved over time to include a consistent agenda, and the involvement of a broader group of company representatives, which improved accountability and helped to fill gaps in information sharing.

As things got busy at Running Tide and teams juggled multiple priorities, it was challenging to communicate company timelines and decisions upfront to contextualize the work *and* make time for in-depth scientific topics to maximize use of the board's expertise. The SAB echoed this

challenge in our recent conversations, citing the need to optimize the meeting structure for the sake of efficiency, and we came up with a few structural changes we would want to test in the future:

- Alternating meetings between company updates and science reviews, which would allow for more focused information-sharing sessions and scientific workshops;
- Engaging on scheduled scientific topics in advance of meetings with members of the SAB individually, which would take more board member time but allow for regular in-depth discussions; and,
- Holding special sessions for forward-looking plans, even if those plans would be subject to change.

The SAB, Ocean Visions, and the Running Tide team all provided feedback and worked to iterate and improve board meetings throughout the two years. At the one-year mark, Ocean Visions worked with the SAB to reassess how the board could be most effective in helping Running Tide with their scientific goals, and the Running Tide team doubled down on improving communication with the board.

Transparency and Science Communications

Of course, transparency came up frequently during board meetings and retrospective conversations. We discussed information sharing strategy, acknowledging Running Tide's need to retain intellectual property while furthering the team's desire to build trust and give back to the scientific community.

The board suggested ways to maximize the impact of science communications associated with the Running Tide effort. Based on these suggestions, Running Tide was able to double down on papers or reports with exhaustive sources, improve the structure of our public-facing web presence to include more timely information, or communicate real-time updates frequently on social media. These are good ideas, and what would have made the most impact on improving company transparency is still unclear. The Running Tide team made considerable effort to attend and present at scientific conferences, revamp the website, build an online Document Library, step up a presence across LinkedIn and other social media platforms, collaborate with research institutions on peer-reviewed publications, and publish updates to MRV documents throughout the deployment season as things changed.

Clearly a lot of company transparency and communications work is beyond the scope of a Science Advisory Board. On a regular basis companies need to close the feedback loops: gather advisor feedback and new information, test communications strategies, and act on their findings. However, as discussed above, the SAB was a useful resource to facilitate direct engagement with the scientific community, enhance transparency, and, given more time, Running Tide could have worked with the SAB to build on and expand these efforts.

Benefits to the Scientific Advisory Board Members

Several members of the SAB also pointed out benefits to the members from this experience. It allowed the SAB members to learn a lot more about mCDR, sourcing issues for raw materials used in the Running Tide interventions (e.g., woody biomass, calcium dust, etc.), identify the most pressing research questions, and further develop the international research agenda. The information flow and information gain were bi-directional, despite the limitations discussed earlier. Bringing together experts from startups and independent research organizations can speed up knowledge generation by identifying the most relevant scientific questions, sharing information as widely as possible and allow research on mCDR to move forward more quickly.

Conclusions

Carbon dioxide removal must be informed by the best available scientific knowledge to ensure its efficacy as we march towards a future where scalable open-system interventions are critical tools in our climate intervention arsenal. The need for scientific governance is especially acute today, as researchers and entrepreneurs develop interventions, operational capability, and Earth system understanding simultaneously to hit ambitious international climate goals.

Ocean Visions established the Science Advisory Board as a starting point, a launchpad for future iterations. In facilitating its independent structure, assembling the right team, defining the role, and experimenting with meeting structures, cadence, and organization, Ocean Visions helped Running Tide institute and improve an effective system for scientific feedback and review.

Finally, both Running Tide and Ocean Visions wishes to thank the Science Advisory Board members for their dedication to developing effective mCDR interventions, thoughtful and constructive commentary, scientific contributions, and connections with research institutions. We remain grateful for their help.