TO: PRRIP GOVERNANCE COMMITTEE (GC)

FROM: EXECUTIVE DIRECTOR

SUBJECT: HONEST BROKER MANUSCRIPT

DATE: NOVEMBER 11, 2020

We are soliciting Governance Committee (GC) feedback on the attached science-policy manuscript titled *An Honest Broker Approach to Adaptive Management Implementation: Principles to Avoid Anchoring at Adjust.* The article attempts to identify specific principles that facilitated PRRIP success where other large recovery programs have failed. As such, it reflects our experience in the Platte as well as other systems and programs. Because of the scope of the article, we are asking GC feedback on the following items:

1. Does the GC have comments, concerns or feedback on the manuscript itself?
2. It may be most appropriate for this article to be submitted and paid for (assuming it is published) by Headwaters instead of PRRIP. Does the GC object to that approach?

An Honest Broker Approach to Adaptive Management Implementation: Principles to Avoid Anchoring at Adjust

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1. Abstract

Adaptive Management (AM) is the science framework of choice for many ecosystem restoration and endangered species recovery programs. It provides a path forward in the face of disagreement and uncertainty, with the promise of learning by doing. Unfortunately, many programs anchor at the final adjust stage, failing to operationalize learning by adjusting management. The Platte River Recovery Implementation Program (PRRIP) is one endangered species recovery program that has successfully navigated the science-policy nexus, achieving consensus to adjust management for two threatened and endangered bird species. Herein, we hypothesize that Stealth Issue Advocacy (Pielke 2007) is a major reason programs fail to operationalize learning. We then describe principles of PRRIP's Honest Broker approach to AM implementation, which buffered against anchoring.

2. Introduction

In nearly five decades of discussion and application, examples of successful adaptive management implementation at large scales are few and conflict remains over how to achieve the most essential elements of a true adaptive management approach (Gregory et al. 2006; Walters 2007) – a rigorous process of learning by designing management actions as experiments. In the case of large-scale ecosystem restoration and species recovery program efforts, the application of adaptive management as a guiding framework for science has had mixed success at best (Lee 1999; Walters et al. 1992; Lee 1993; Allan and Curtis 2005; Zellmer and Gunderson 2009; Allen and Gunderson 2011; Scarlett 2013; Murray et al. 2015).Though widely prescribed, AM has settled into more of a formulaic policy prescription rather than a repeatable approach to complex problems in social-ecological systems (Ostrom 2007; Young et al. 2018)

Definitions of AM vary, but typically involve a cyclical series of steps (assess, design, implement, monitor, evaluate, adjust) focused on learning by doing (Holling 1978; Walters 1986; Smith 2011). We observe that many AM programs can navigate the cycle until the adjust step where they become anchored. Here at the science-policy nexus, scientists and decision-makers fail to agree on the reliability and meaning of science learning. Instead of adjusting management, decision-makers get caught in a science "do-loop" where more and more learning gets added to a "science pile" that they never use.

The Platte River Recovery Implementation Program (PRRIP) is one large-scale endangered species recovery program that has not anchored at the science-policy nexus. In 2016, PRRIP's Governance Committee (GC) successfully completed a full loop of the AM steps, culminating in a consensus decision to shift interior least tern and piping plover management to focus on creation and maintenance of off-channel habitats (Compass 2016). This article presents our hypothesis of a major cause of AM failure at the science-policy nexus and describes principles that helped stakeholders to succeed on the Platte.

3. Anchored at Adjust

Why do programs fail to use science learning to adjust management? Pielke (2007) presents a science-policy framework that illuminates a fundamental issue contributing to failure. Pielke describes four main

roles that scientists play in policy and politics including that of Pure Scientist, Issue Advocate, Science Arbiter and Honest Broker of policy options. Pure Scientists focus on research with no connection to policy or politics. Issue Advocates view science through the lens of their interests, using research to influence decision-makers towards their policy goals. Science Arbiters seek to impartially resolve policy issues through the application of science to narrow choice (IE, hypothesis testing). Honest Brokers engage with decision-makers, employing science to clarify and even expand the scope of policy choices. Pielke also describes a fifth hidden role, that of Stealth Issue Advocate (Stealth Advocate). Stealth Advocates present as impartial Science Arbiters while (often unconsciously) advocating for their policy goals. We hypothesize that Stealth Advocacy is a major cause of AM failure at the science-policy nexus. We also observe the organizational framework of many programs increases the potential for real or perceived advocacy.

3.1. Stakeholder Stealth Advocacy

In AM contexts of high uncertainty and disagreement, stakeholder scientists act as Issue Advocates during assessment and design phases of AM. In fact, they are *expected* to effectively advocate for management actions that align with their constituent's values. Put another way, the beginning steps of AM involve the transformation of stakeholder institutional science-policy narratives into a testable experimental framework. Once an AM program progresses to implementation, stakeholder scientists are expected to pivot out of their advocacy role, put their values and interests aside, and act as unbiased arbiters of the science produced by the program. We believe this is an unrealistic expectation.

Most scientists understand the need for dispassionate arbitration of scientific uncertainty. They also feel immense pressure to protect the science narrative of their organization, especially if failure of that narrative results in negative repercussions for their constituency. In situations where AM is used to arbitrate conflicting science-policy narratives, the stakeholder scientist seems to have no choice but to play the role of deserter or defender (Platt, 1964). The tension between their science-arbiter role and the pressure to protect a narrative forces advocacy underground, disguised as objective scientific disagreement.

AM implementation fundamentally focuses on uncertainty reduction as a path to arbitrating disagreement and improving management. It follows that uncertainty is a focal point for Stealth Advocacy. We view varying tolerance for uncertainty depending on the policy implications of science learning to be an indicator that stakeholder scientists are trapped in advocacy positions. Trapped stakeholder scientists (or group of aligned stakeholder scientists) alternate between conformation bias and theory tenacity (Loehle 1987) depending on learning outcomes. Specifically, they are willing to adjust management despite a high degree of remaining uncertainty when non-threatening confirmatory evidence emerges while tenaciously refusing to accept a much lower degree of uncertainty when evidence supports policy changes that do not align with their organizational narrative. This tug-and-pull may be temporarily beneficial as it allows for a program's science program to mature (Loehle 1987). However, unwillingness to desert a strategy in the face of robust disconfirming evidence will ultimately end in a program becoming anchored.

3.2. The Organizational Independence Problem

A lack of independence in science implementation amplifies the potential for real or perceived Stealth Advocacy. In most programs, leadership and program staff are employed by a stakeholder or funding agency that actively takes positions on science issues to be arbitrated via AM (Smith 2011; Thom et al., 2016). Likewise, it is common for program science to be conducted by stakeholders or funding agencies that take policy positions on science issues. The Missouri River Recovery Program relies on funding and partner agencies to conduct research and monitoring for its Integrated Science Program (ERDC, 2018). The

Comprehensive Everglades Restoration Program (CERP) is implemented jointly by the U.S. Army Corps of Engineers and the South Florida Water Management District and employees of those and other government agencies are the members of interagency project teams that develop and implement projects on the ground (Thom et al., 2016). The Trinity River Restoration Program (TRRP) is governed by the Trinity Management Council (TMC) made up of voting members from the Bureau of Reclamation, Hoopa Valley Tribe, Yurok Tribe, and the State of California among others (Headwaters, 2018). At the same time, the TRRP is staffed primarily by Reclamation personnel with TRRP funding supporting staff time and project work by the two Tribes and State of California (Headwaters, 2018).

We believe it is unlikely that program staff and/or stakeholder scientists can reliably function as Pure Scientists or unbiased Science Arbiters when they are principally accountable to an organization that advocates for preferred policy outcomes (Messick and Sentis 1979; Breslow 2014). Regardless of ability to set aside self-serving bias, stakeholder or agency-driven science will be viewed with skepticism by those with opposing viewpoints (Miller et al. 1994; Clark 2002; Kuehn 2017). That skepticism may prohibit a program from moving science forward to decision-makers or, in the extreme, result in stakeholders viewing program learning as a "science charade" whereby self-serving policy decisions are camouflaged as science (Wagner 1995, Adler 2017).

3.3. The Science Pile

We observe that many programs appear to generate an ever-growing body of science learning that is never used by decision-makers to adjust management (science pile). We hypothesize that this anchoring is the natural end point of Stealth Advocacy exacerbated by organizational-level mistrust. Specifically, as a program accumulates disconfirming evidence, stakeholder scientists are confronted with the choice to desert or defend. As the program nears the science-policy nexus, advocacy emerges disguised as objective disagreement about the quality and reliability of learning for decision-making. Aligned stakeholder scientists strongly urge either action or caution depending on the nature of learning. Faced with scientific discord, policymakers understandably conclude that engaging in more/better science provides the only path forward. However, it is highly unlikely that the new learning will be sufficient to compel stakeholders to desert their values. A science "do-loop" thus emerges, generating a growing body of learning that is never quite good enough to arbitrate disagreement.

4. Principles to Successfully Navigate the Science-Policy Nexus

Negotiations to form a recovery program in the Platte occurred against a backdrop of decades of stakeholder conflict (Freeman 2010). Negotiators sought to diffuse this mistrust by embracing organizational independence and consensus decision-making. Formation of an independent financial management and land interest holding entities placed program assets under the control of a Governance Committee (GC) that operates on a consensus decision-making model. Selection of an independent Executive Director (ED) accountable to the GC extended this collaborative decision-making model to day-to-day operations of PRRIP implementation (Smith, 2011).

Even with this focus on collaboration, the PRRIP was a prime candidate to get anchored at the science-policy nexus. AM was introduced into PRRIP negotiations when progress stalled due to long-standing, deeply held disagreement over the appropriate strategy to contribute to the recovery (in part) of the piping plover and interior least tern, two threatened and endangered shorebird species. During program negotiations, environmental and regulatory agency stakeholders advocated for a recovery strategy of

managing river flow to create and maintain riverine sandbar nesting habitat for the species. State and federal water user stakeholders advocated for mechanical creation and maintenance of off-channel sandpit nesting habitat. AM provided a path forward in the form of a head-to-head experimental test of these very different management strategies (PRRIP 2006, Freeman 2010). This commitment to scientific arbitration of fundamental management disagreements allowed the PRRIP to move forward to implementation. It also set the expectation that science learning would compel decision-makers to adopt a winning management strategy.

Early in PRRIP implementation, staff were exposed to Pielke's (2007) cautions about the probable failure of scientific arbitration under the context of high uncertainty and conflicting values. These issues were discussed with stakeholders during development of the program's AM Implementation Plan (PRRIP 2011). As a result of those discussions, the final plan specified several principles to buffer against to Stealth Advocacy and assist decision-makers in identifying and assessing potential management adjustments instead of focusing on arbitrating a winning management strategy.

We have come to identify the resulting combination of organizational and implementation principles as PRRIP's Honest Broker approach to AM. Specific principles include:

- Carving space for independent science implementation. Independent implementation buffers science from Stealth Advocacy.
- Clarifying the purpose for using AM. Science implementation without focus generates information that is not useful to decision-makers.
- Employing an experimental design that generated multiple lines of evidence. Multiple lines of converging evidence are more robust to advocacy-arguments.
- Explicitly including important non-science metrics when deciding how to adjust management actions. This short-circuits advocacy by bringing values disagreements to the surface and giving them weight in decision-making.

4.1. Carving Space for Independence

Stakeholder commitment to independent implementation and oversight reduces the potential for real or perceived Stealth Advocacy. In the Platte, stakeholders committed to a high degree of independent implementation achieved by hiring an outside Executive Director (ED) to staff and implement the PRRIP on behalf of all stakeholders. The PRRIP Executive Director and staff are not employees of any program signatory; rather, they are employees of a private company contracted to the program's financial management entity. As a result, staff do not work for a specific stakeholder and instead are equally accountable to all stakeholders. This arrangement reduces the skepticism that accompanies stakeholder-aligned administration and/or science implementation. Despite this layer of independence, there are still situations where the ED believes that staff involvement in decision-making may inappropriately influence the outcome. In these cases, they request assistance from a third-party neutral and staff assume a secondary technical support role.

This level of independent implementation is likely not transferable to many programs where one or more federal agencies serve as decisionmakers, staff the program and fund outside research and monitoring conducted by academics and private contractors. However, we argue that efforts to carve space for independence are more (not less) important in situations of agency or stakeholder-aligned implementation. These types of programs could foster independence by creating a cohesive implementation staff that identifies with the program instead of their respective agency/stakeholder employers. This could be as

simple (or complex) as establishing a program office that provides physical and organizational space for staff to align around program implementation.

Independent science review is another tool to foster independence. Most large programs have some form of independent science advisory or review panel. It is important to avoid situations where independent science panel members conduct program science or are aligned with a stakeholder group. Likewise, the science panel should not be under the direct funding control of one stakeholder. These conflicts of interest invite charges of manipulation, providing grounds to object to panel recommendations (Ruhl 2004). Use of a third neutral party to identify, vet, and retain science panel candidates is one way to protect independence (Murphy and Weiland 2019).

4.2. Clarifying Purpose

It is imperative for decision-makers to wrestle with the purpose of AM before scientists delve into the mechanics of how to employ it and ultimately, what will be done. Without clarity of purpose, an AM program is divorced from decision-making before implementation begins. Decision-makers can begin clarifying purpose by agreeing on a definition of AM and identifying objectives and scope for their AM program. Top-down guidance helps stakeholder scientists constrain an AM program to uncertainties that are relevant to decision-makers.

PRRIP stakeholders developed an AM Plan (AMP) with a clearly defined purpose of testing two competing management strategies (PRRIP 2006). Even with that clarity, the Program's final AMP identified 41 priority hypotheses, several which had no clear policy linkages. We were able to further refine AM activities via the exercise of developing a set of "Big Questions." (PRRIP 2012). These were science-related questions decision-makers needed to answer to make management adjustments. The PRRIP's Big Questions focused AM implementation on a constrained set of hypotheses and provided structure to science communication.

4.3. Generating Multiple Lines of Scientific Evidence

Implementation of an experimental design that generates multiple lines of evidence can buffer against uncertainty-based advocacy. This process of collecting, evaluating, and weighing lines of evidence is conceptually similar to the weight of evidence approach used in ecological risk assessment (Weed 2007, Linkov et al. 2009). Each line of evidence carries differing degrees of reliability and uncertainty. As multiple lines of evidence begin to converge on similar findings, the science becomes more robust to values-based criticism. Put bluntly, it is easy to challenge the results of any single management experiment. Consistent criticism of multiple converging lines of evidence is more easily identifiable as advocacy.

The PRRIP placed a strong emphasis on development of multiple lines of evidence both in implementation of management actions as well as assessment of target species response. During AM development, there was more information related to the off-channel sandpit habitat strategy, so the plan was focused towards testing the ability of short-duration high flow (SDHF) releases to create on-channel nesting habitat. Instead of focusing solely on developing the infrastructure to conduct SDHF releases, the PRRIP chose to also conduct retrospective investigations of natural flow events, developed predictive modeling tools, mechanically created a range of on-channel sandbar nesting habitat in proximity to off-channel sites to compare selection and productivity, and conducted compare/contrast studies with other segments and river systems that support target species nesting. These studies approached the experimental objective from different perspectives, generating separate but converging lines of evidence.

Ultimately, the results of the various studies were combined into a single synthesis document that was subjected to peer review by a multi-disciplinary panel selected via a third-party neutral. The final document (EDO 2015) includes peer review materials as well as a statement of GC acceptance of the findings for use in PRRIP decision-making.

4.4. Giving Values Weight in Decision-making

Incorporating values into decision-making frees stakeholders from the science-as-arbiter paradigm. We have found structured decision making (SDM) to be a tool that allows decision makers to explore and balance the importance of both quantitative and non-quantitative metrics (Gregory et al. 2012). Early in the SDM process, decision-makers identify "things that matter" as they navigate the science-policy nexus. Inclusion of important value-oriented objectives brings those issues into the open and gives them weight.

SDM also increases the scope of policy options available to decision makers. During the SDM process, stakeholders are asked to clarify their objectives and performance measures, develop a range of management adjustment alternatives, and then estimate the consequences of implementing those alternatives. AM-derived science is used to estimate science-oriented consequences of alternatives but does not drive decisions. Once consequences of actions have been estimated, stakeholders evaluate trade-offs and select one (or more) to implement. The act of first expanding (instead of reducing) the choice of policy options creates room for creativity and consensus building in order to reach a consensus decision.

The PRRIP GC brought in an independent third party (Compass Resource Management) to facilitate SDM for interior least tern and piping plover management. Platte stakeholders considered quantitative SDM decision objectives like species reproductive success as well as values-oriented objectives such as preference for naturally formed versus constructed habitat. Stakeholders collaboratively developed prioritization rankings of both quantitative and value-based objectives, providing clarity to the relative importance of these objectives in the decision-making process (Compass 2016). PRRIP science learning was used to develop models to score alternatives against quantitative objectives. Scores for values-oriented objectives were developed collaboratively by stakeholders. Alternatives were then score-ranked and stakeholders worked together to refine them, ultimately reaching a consensus decision to adjust management to focus on creation and maintenance of off-channel sandpit nesting habitat with a small amount of ongoing vegetation clearing on existing in-channel sandbars to improve their suitability for nesting (Compass 2016).

5. An Honest Broker Approach to Adaptive Management Implementation

Under Pielke's Honest Broker model, science learning is valued as one input in a decision-making process focused on broadening (instead of narrowing) the scope of policy choices. The organizational and implementation principles described above focused Platte AM implementation, protected the integrity and utility of program science, and ultimately removed science from the role of choice-limiting policy arbiter. This freed decision-makers to explore a range of policy options and transparently advocate for their values, weighing them alongside science learning. Ultimately, use of science to broaden policy choice (instead of arbitrate disagreement) removed the benefits of uncertainty-based anchoring, allowing the PRRIP to successfully navigate the science-policy nexus.

PRRIP's independent implementation structure emerged through more than a decade of intensive negotiations. We do not expect it to be easily transferable to existing programs. However, they can take an initial step towards independence by creating an implementation office that is program centered. Additional efforts to identify and communicate program staffing roles would also be helpful given the opacity of most

programs. For example, the public-facing websites for most major North American restoration and recovery programs provide no information on implementation staffing structure, staff members, their roles and responsibilities, or their affiliations. Clarifying purpose and expanding experimental design to generate multiple lines of evidence can be implemented at any point in the AM process, although they are most easily and effectively incorporated at the assess and design steps. Giving values weight in decision-making is likely the most important principle. Often avoided due to inherent subjectivity, tools like SDM can be incorporated at the evaluate stage of AM to transparently include stakeholder values in the AM process.

A broader implication of our hypothesis is the conclusion that many anchored AM programs may not actually have a science sufficiency problem at all. Applying tools like SDM to existing science could facilitate rapid AM progress. However, rapid progress comes with its own set of challenges, including the disposition of program science apparatus organized around legacy research and monitoring programs (Ruiz-Miranda et al. 2020). We again use the Platte as an example. Applying AM evaluate and adapt principles in response to success, we anticipate that the PRRIP will shift to a maintenance paradigm following the current AM cycle. Consequently, its science program will transition from high intensity research to low intensity surveillance monitoring, resulting in a reduction in both science effort and complexity. PRRIP EDO science staff are therefore engaged in working themselves out of a job. This is a challenging but ultimately rewarding goal for all restoration and recovery programs.

6. Acknowledgements

TBD

7. References

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