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ADAPTIVE MANAGEMENT AND ITS POTENTIAL TO PROTECT BIODIVERSITY IN CHILE

EL MANEJO ADAPTATIVO Y SU POTENCIAL PARA PROTEGER LA BIODIVERSIDAD EN CHILE

ARTÍCULO INÉDITO DE INVESTIGACIÓN

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Abstract

Adaptive management is a useful tool to improve resource management decisions in the face of uncertainty. An active concept of adaptive management privileges the use of controlled experimentation with management practices, to obtain valuable information that may improve management through feedback loops. This notion defies the slow-changing mechanisms of Environmental Law. In the context of an ongoing discussion within the Chilean Congress about a new agency oriented towards biodiversity conservation and recovery, this article explores the advantages and risks of introducing adaptive management as a tool that may improve knowledge about endangered species and optimize management practices.

Keywords: adaptive management, Environmental Law, biodiversity, conservation, endangered species.

Resumen

El manejo adaptativo es una herramienta útil para mejorar las decisiones de manejo de recursos ante la incertidumbre. Un concepto activo de manejo adaptativo privilegia el uso de la experimentación controlada en las prácticas de manejo, para obtener información valiosa que pueda mejorar el manejo mediante ciclos de retroalimentación. Esta noción desafía los mecanismos aletargados del derecho ambiental. En el contexto de la discusión actual desarrollada en el Congreso chileno, respecto a un nuevo servicio orientado a la conservación y reparación de la biodiversidad, este artículo explora las ventajas y los riesgos de introducir el manejo adaptativo como una herramienta que puede mejorar el conocimiento sobre las especies protegidas y optimizar las prácticas de manejo.

Palabras clave: manejo adaptativo, derecho ambiental, biodiversidad, conservación, especies protegidas.

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I. Introduction

Adaptive management is considered to be a useful tool to face uncertainty when taking decisions that affect natural resources and ecosystems. When there is a lack of information affecting the capacity of decision-makers to make sound management choices, experimentation can sometimes allow feedback to improve future decisions.

This can be particularly useful when trying to improve the status of flora and fauna. Whether it is for managing protected areas, figuring measures to preserve the diversity of genes, species or ecosystems, expanding their superficial coverage, or dealing with the impact of human behavior on biodiversity, adaptive management can be quite helpful. Maybe there is little understanding of the reasons for the loss of a particular habitat, or about the specific causes that are decimating the population of a species; in many cases, experimenting can beat theorizing, as a means to figure out what practices can improve biodiversity outcomes.

However, this tool clashes directly with the usual way the legal system responds to threats on biodiversity. Under a classic command and control scheme, rules that protect biodiversity generally avoid any sort of experimentation. There is a good reason for that: in many cases, the value of what is being protected, which increases along with its scarcity, is too great to allow for any sort of tampering. Also, flexibility may end up allowing the very behaviors that are meant to be avoided by the rules.

This situation is sort of common for environmental law. One of the main complexities for the discipline is how to deal with change, and experimentation needs, by its very definition, the possibility of changing isolated variables to get different results. The stability of administrative decisions is a fundamental element to prevent human behavior that significantly affects the environment, while also granting regulated parties legal certainty. Even if agencies may find ways in which adaptability can benefit the environment, it is hard to determine when such flexibility is admissible or desirable. If decisions are being made in the dark, this stability may have a high price. If rules are rigid, but they do not prevent a species population from declining, they are failing in their mission. In such circumstances, rules should not prevent managers from taking possible measures to better determine what is going on and improve their management practices.

Adaptive management may be used in a wide variety of aspects –such as fisheries, forestry or mining, for instance– with equally varying levels of success. The use of adaptive management when dealing with biodiversity presents some specific burdens and risks that will be analyzed in the context of a new legal framework for biodiversity protection that is being currently discussed in the Chilean parliament and should become law in the foreseeable future.

After facing heavy reform in 2010, Chilean environmental institutions have taken an important leap towards a comprehensive regime that allows for reasoned policy, developing thus a relatively efficient permit system and effective enforcement mechanisms. However, a final step is still pending, as the 2010 reform left pending the creation of a new agency. The Biodiversity and Protected Areas Agency (BPAA) would have the authority to manage protected areas, and also to develop management plans and enforce provisions that protect endangered species and biodiversity *ex situ*. The bill that creates this new agency is currently under discussion in the Chilean Congress.

The creation of the BPAA is a pressing matter, as zoning changes and the loss of habitats worldwide is precipitating a global loss of biodiversity, and Chile is not immune to this trend. The BPAA will need to address these issues using several regulatory and enforcement tools. The use of adaptive management, and the extent to which it may be employed, could provide relevant alternatives to deal with situations of uncertainty.

This paper addresses the benefits and risks of adaptive biodiversity management, considering both its domestic and international treatment. We will thus consider adaptive biodiversity management as a way to assess the early application of the concept in Chile, first accounting for existing forms of adaptive management as applied in the environmental assessment of mining projects and in the management of fisheries and forestry. Considering the specific characteristics of biodiversity management, the paper will propose a meaningful and cautious application of adaptive management by the new BPAA.

II. What we talk about when we talk about adaptive management

a. General overview

Before considering how adaptive management can be used to protect biodiversity, a first concern is to properly define adaptive management and its key elements. This is a particularly important task when translating and applying the tenets of the institution in compared regimes so as to distinguish whether what is being used is effectively adaptive management or instead an *ad hoc* method loosely employing said title.

Adaptive management is based on the proposal that the object of protection of environmental law is inherently chaotic and dynamical, and agencies should consider that when they make decisions that may affect the environment. As opposed to a more colloquial understanding of ecosystems as harmonic and peaceful, the subject matter of environmental law is a web of interlinked, complex adaptive systems.[1] Ecological systems perform

1 J.B. Ruhl, "Thinking of Environmental Law as a Complex Adaptive System: How to Clean Up the Environment by Making a Mess of Environmental Law," *Houston Law Review* 34, no. 4 (1997): 933–1002.

according to complex, large-scale behaviors that emerge from the aggregate interactions of less complex agents, whose interactions present unpredictable, non-linear relationships. These properties manifest in a self-organizing critical-state behavior, through which change in ecosystems is transformed into a stabilizing rather than disrupting force.[2]

The legal system can face serious difficulties when regulating human behavior in relation with the environment, or rather when regulating human behavior as part of an ecosystem. The focus of establishing a set of rules to protect the environment from human activity starts from the assumption that the environment is reducible, linear and predictable.[3] This traditional focus "is based on a conception of nature as uniformitarian, a nature in which change takes place, but in the form of trends that are capable of extrapolation and prediction which lead toward an ordered state of equilibrium."[4] The regulated field can be quite opposite, as "[e]cological systems are complex, dynamic, and non-linear, consisting of numerous mutually interdependent components and processes, interacting in complex and hard-to-calculate ways, and exhibiting numerous threshold effects and high levels of 'inherent stochasticity' [or randomness]."[5]

Facing these complexities, adaptive management is proposed as a tool that uses increased flexibility to reach environmental policy goals. One of the key institutional challenges to apply adaptive management lies in combining the required flexibility with the long-term certainty that is sought for through legal and political institutions.[6] In broad terms, it is said that adaptive management is based on the principle of "learning by doing,"[7] and as such promotes experimentation to determine the best management policies. The objective of this approach is to reduce uncertainty over time through the systematic incorporation of gathered information into management.[8]

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2 Ibid, 942.

3 Ibid, 967.

4 Ibid, 968.

5 Reed F. Noss, Michael A. O'Connell and Dennis D. Murphy, *The Science of Conservation Planning: Habitat Conservation Under the Endangered Species Act* (Washington, DC: Island Press, 1997), 64,quoted in Bradley C. Karkkainen, "Whither NEPA?," *New York University Environmental Law Journal* 12 (2004): 333–344.

6 Holly Doremus, "Adaptive Management, the Endangered Species Act, and the institutional Challenges of "New Age" Environmental Protection," *Washburn Law Journal* 41 (2001): 50–55.

7 Carl J. Walters and C.S. Holling, "Large-Scale Management Experiments and Learning by Doing," *Ecology* 71 (1990): 2060.

8 Holly Doremus et al., "Making Good Use of Adaptive Management," Center for Progressive Reform, White paper no. 1104 (April 2011), http://progressivereform.org/articles/Adaptive_Management_1104.pdf.

Adaptive management, in its ideal conception, is also known as "active" adaptive management, and employs active experimentation. In an ideal scenario, different management practices for a specific resource take place simultaneously in various locations, and their outcomes are monitored over time. These differences allow to fill the information gaps that prevent management policies from achieving management goals.[9]

In addition to that ideal form of active management, another use of adaptive management "might rely on historical data to produce rigorous models about how environmental systems function, use those models to identify a single best-practice for management, and implement that practice."[10] This is known as "passive" adaptive management. Depending on the flexibility we may wish to grant the concept from a theoretical standpoint, passive adaptive management may or may not also consider trial and error, that is, simply monitoring results and make adjustments if the results are not achieving the desired management goals.[11]

b. Costs and risks of adaptive management

Adaptive management does not come without costs. Also, it can be unsuccessful when it comes to fulfilling management goals. Indeed, "[t]he learning needed to make adaptive management successful will often be difficult, even with the right motivation. It will typically be costly, requiring added modeling, monitoring, and data evaluation. The extra resources adaptive management requires will not be well spent unless they produce useful information."[12] It is essential to carefully analyze the need for adaptive management in a particular case and the aspects that it must fulfill to work properly. Beyond a commitment to learning and a systematic approach to doing so, there are three prerequisites necessary in order to apply adaptive management successfully: significant information gaps, opportunities for learning, and opportunities for adjustment.

The necessity to use adaptive management emerges from a lack of information; therefore, considering the sizable costs of gathering and interpreting data, it is essential to identify specific information gaps and exactly how adaptive management can improve our current understanding of whatever resources or populations we are managing. Only if learning is

9 Eric Biber, "Adaptive Management and the Future of Environmental Law," *Akron Law Review* 46 (2013): 933–934.

10 Ibid.

11 Ibid., 935.

12 Holly Doremus, "Adaptive Management as an Information Problem," *North Carolina Law Review* 89, no. 5 (2011): 1455–1459.

needed, it makes sense to apply adaptive management. If decision-makers already have the necessary certainties at the moment of taking management choices, they should rely on that information and move forward without any need for a "learning by doing" approach.

The definition of "what is to be found" is relevant, as the environment carries a level of complexity that prevents complete certainties. The sole existence of uncertainty is not enough to justify adaptive management. Information gaps must be determined in relation to some sort of previously set goals, on the basis of what needs to be accomplished by using this strategy. Without identified management goals, it is impossible to understand what relevant information is missing.[13]

Once the information gaps are defined, the next issue at hand is to determine whether there are any opportunities for learning. It is often the case that environmental management gathers additional information as time goes by; availability of cumulative data is not by itself an argument to adopt adaptive management as a strategy. Encouraging prospects for learning are related with the speed of such learning, or how effectively can knowledge improve in order to fill the specific information gaps that need to be addressed. Adaptive management makes sense if the experimentation will yield results at a faster rate than it would in other circumstances.

Even if all these conditions are met, adaptive management may not be necessarily a useful tool. When common management criteria do not seem to give an adequate response to the concerns of the managers, it makes sense to employ adaptive management as a way to improve their knowledge and management choices. However, associated costs are imposed on agencies and actors on a short-term basis with the intention of achieving long-term goals.[14] The decision to use adaptive management involves tradeoffs, which should be analyzed on the basis of the prospects of learning and how this learning can aid management practices.[15]

Finally, there is also a risk that adaptive management may be used as an excuse to avoid obtaining all possible information necessary to comply with substantive regulations, under the pretext that these gaps can be filled with future management experience. The flexibil-

13 Ibid., 1469.

14 It is often the case that present day or short-term benefits are privileged by stakeholders over long-term benefits. Short-term costs of using adaptive management may divert decision-makers to prefer alternatives that maximize a present-day benefit, even when the long-term learning benefits of adaptive management may significantly out-weight the present-day costs.

15 See *supra* note 12.

ity that may arise from adaptive management practices should not be used to precipitate decisions lacking the necessary information, but rather to obtain valuable information that cannot be gathered by normal management practices.[16]

c. Elements to achieve proper adaptive management

Based on its general benefits and risks, there are certain elements that should be met for proper adaptive management. These elements are: (i) explicitly stated goals and measurable indicators of progress; (ii) an iterative approach to decision-making; (iii) systematically monitoring outcomes and impacts; (iv) feedback loops, where monitoring and assessment produce continuous and systematic learning; (v) explicitly acknowledging and characterizing risks and uncertainties, and; (vi) an overarching goal of reducing uncertainty over time.[17]

Considering these elements, the main rationale that supports proper adaptive management is for it to be based on specific and concrete goals, rather than be a generic provision that allows unguided flexibility. The mentioned requirements for proper adaptive management avoid its more apparent risks, because "in the absence of a workable definition and clearly delineated procedures, 'adaptive management' could become an excuse not to adequately analyze or fully disclose environmental impacts in advance of the decision, thereby giving agencies license to delay or avoid such inquiries by asserting a lack of ex ante scientific certainty."[18]

As such, the practical application of adaptive management has been most successful when aimed at environmental policy objectives that guide management practices. A 2010 study of litigation related with the use of adaptive management by natural resources gives three key lessons: (1) larger-scale plans are more likely to incorporate successful adaptive management plans than smaller ones; (2) the practice of tiering site-specific environmental impact analyses to an earlier, overarching, cumulative study is well suited to adaptive management, and adaptive management can reduce the need for a supplemental EIS; and (3) adaptive management procedures, no matter how finely crafted, cannot substitute for showing that a plan will meet the substantive management criteria required by law.[19]

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16 See *supra* note 6, 71. Note that "[w]here nothing we do can assure the safety of the resource, adaptive management may be the least risky alternative. But if the status quo poses little risk to the species or ecosystem, inaction will be safer."

17 See *supra* note 8.

18 See *supra* note 5, 356.

19 J.B. Ruhl and Robert Fischman, "Adaptive Management in the Courts," *Minnesota Law Review* 95 (2010): 424–426 *et seq.*

Lastly, it is relevant to consider the institutional context in which adaptive management is being applied. The opportunities for adjustment need to be available during management. Adaptive management cannot improve the management choices if there is no possibility to implement changes as learning takes place. Only if managers can periodically reconsider and reevaluate their decisions in light of their improved understanding of the ecosystems it is possible to successfully apply adaptive management.[20]

In order to apply even passive forms of adaptive management, some minimum degree of flexibility and low transaction costs are basic requirements. If modifying management practices as a reaction to learning outcomes is difficult, or requires complex proceedings, or is riddled with statutory requirements, it makes little sense to apply adaptive management in the first place. One example of how the law might deter adaptive management is the costs that are imposed by front-end analytic and public participation requirements, such as those imposed by the National Environmental Policy Act (NEPA), which deter the public administration from reconsidering and/or reevaluating past decisions.[21] Adaptive management can only play a very limited role if the regulatory framework does not allow proper consideration to the output of management practices and the possibility to react accordingly.

d. Adaptive management as a tool in biodiversity management

There are many ways in which adaptive management has played a role in protecting biodiversity in practice. This section will consider some specific cases in which managers have used adaptive management as a source of relevant findings to better lead their conservation efforts.

i. Biological opinions on the Central Valley Project

One such example is how biological opinions about the Central Valley Project of the Sacramento—San Joaquin River, issued by the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (FWS), respectively, have required alternative action for proposed long-term operations. These agencies issue their opinions to the Bureau of Reclamation pursuant to §7 of the Endangered Species Act (ESA), to provide Reasonable

20 See *supra* note 12, 1470.

21 See *supra* note 9, 937.

and Prudent Alternatives (RPAs) in the management of the Central Valley Project in order to prevent events that will jeopardize the continued existence of listed species or adversely affect their habitats.[22]

In December 2008, the FWS issued its biological opinion, determining that the proposed long-term coordinated operations of the Central Valley Project with the State Water Project would jeopardize the delta smelt, an endangered small fish. Instead, the FWS proposed RPAs to improve the delta smelt's population and the conservation purposes of critical habitats within the Sacramento—San Joaquin River Delta.[23] The biological opinion of the NMFS that was issued in 2009 determined that the proposed long-term operations of the Central Valley Project would put some fish species in jeopardy and adversely modify critical habitats, thus issuing RPAs to "alleviate jeopardy" over Chinook salmon, steelhead, sturgeon, and Southern Resident killer whales.[24]

The FWS's opinion was to apply an "adaptive approach," favoring the use of monitoring data to improve management practices in the Central Valley Project. Accordingly, "[t]he specific flow requirements, action triggers and monitoring stations prescribed in the RPA will be continuously monitored and evaluated consistent with the adaptive process. As new information becomes available, these action triggers may be modified without necessarily requiring re-consultation on the overall proposed action."[25] The RPA establishes four specific objectives that guide these efforts: preventing/reducing entrainment of del-

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22 "Reasonable and prudent alternatives refer to alternative actions identified during formal consultation that can be implemented in a manner consistent with the intended purpose of the action, that can be implemented consistent with the scope of the Federal agency's legal authority and jurisdiction, that is economically and technologically feasible, and that the Director believes would avoid the likelihood of jeopardizing the continued existence of listed species or resulting in the destruction or adverse modification of critical habitat." 50 CFR §402.02.

23 United States Department of the Interior, Fish and Wildlife Service, "Formal Endangered Species Act Consultation on the Proposed Coordinated Operations of the Central Valley Project (CVP) and State Water Project (SWP)" (December, 2008), https://www.fws.gov/sfbaydelta/Documents/SWP-CVP_OPs_BO_12-15_final_OCR.pdf.

24 National Marine Fisheries Service, Southwest Region, Endangered Species Act Section 7 Consultation, "Biological Opinion and Conference Opinion on the Long-term Operations of the Central Valley Project and State Water Project" (June 4, 2009), http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/Water%20Operations/Operations,%20Criteria%20and%20Plan/nmfs_biological_and_conference_opinion_on_the_long-24term_operations_of_the_cvp_and_swp.pdf.

25 See *supra* note 23, 279.

ta smelt, providing adequate habitat conditions that will allow the adult delta smelt to successfully migrate and spawn, allow larvae and juvenile delta smelt to rear, and allow successful recruitment of juvenile delta smelt to adulthood. These objectives are measured by monitoring delta smelt abundance and distribution.

The opinion of the NMFS required the agency, along with the Bureau of Reclamation, to celebrate a yearly workshop to determine if the RPA should be altered in light of information learned from the prior year's operations or research. Although not a requirement in the FWS's biological opinion, the workshop was later expanded to cover the delta smelt.[26] After the workshop is concluded, "NMFS may initiate a process to amend specific measures in this RPA to reflect new information, provided that the amendment is consistent with the Opinion's underlying analysis and conclusions and does not limit the effectiveness of the RPA in avoiding jeopardy to listed species or adverse modification of critical habitat."[27]

The workshops have included independent science reviews that have brought relevant analysis over the results of the monitoring of the RPAs. The Delta Stewardship Council that took place in 2016 recognized that the discussions were especially complex during the drought years starting in 2012. Among other benefits, the gathered information helped to emphasize the importance of locating redds (salmon spawning beds) within water courses. The process has allowed the FWS to improve their incidental-take methodologies.[28] As a sort of 'work in progress,' the adaptive management approach of the Central Valley Project seems to allow for meaningful scientific interpretation of the collected data to improve management practices, but it lacks active experimentation elements.

ii. Adaptive Management for the Columbia River Basin

The Columbia River Basin is an early example of adaptive management applied to fisheries. Similarly to the Central Valley Project, the main concern leading to the application of this approach is a wide variety of Pacific Salmon species which have suffered a massive decline over the decades since the first Western settlements.

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26 *Maven's Notebook*, "Delta Stewardship Council: Independent science review panels and the biological opinions," blog entry by Chris Austin, May 19, 2016, https://mavensnotebook.com/2016/05/19/delta-stewardship-council-independent-science-review-panels-and-the-biological-opinions/.

27 See *supra* note 24, 583.

28 See *supra* note 26.

As with the prior case, the ESA required the NMFS to issue a biological opinion to determine whether the dams of the Columbia River jeopardized the salmons and steelhead and/or adversely affected their habitats. The jeopardy levels found, along with RPAs, date back to 1995 in this case, with the use of adaptive management tools starting in the year 2000. The latest biological opinion from 2008 considered a series of RPA actions that would serve as "an initial starting point for the RPA actions and may adaptively change as new information is obtained."[29] The biological opinion determined that "it is possible to accept higher uncertainty in the ability of the Prospective Actions to avoid short-term extinction risk if a monitoring program will ensure that unexpected reductions in species status are detected in a timely manner so that contingent adaptive management actions can be implemented in response."[30]

The adaptive management approach for the Columbia River Basin has been widely regarded as a failure, mainly due to its departure from sound principles and the extensive litigation that thwarted the conservation efforts. This prompted President Obama's Administration to issue an Adaptive Management Implementation Plan (AMIP), in order to "move out of the courtroom and get to work recovering salmon and preserving the region's unique way-of-life."[31] Most interestingly, the AMIP implements "intensively monitored watersheds" (IMW), which are defined as "a formal cause and effect experiment designed to clarify the connections between restoration actions and the fresh-water survival of salmonids. The findings from the IMWs will inform the future selection of the type, location, and intensity of restoration actions to achieve improvements required by the RPA or to efficiently implement rapid responses to significant declines."[32]

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29 National Oceanic and Atmospheric Administration, National Marine Fisheries Service, "Endangered Species Act Section 7(a)(2) Consultation Biological Opinion And Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation" (May 5, 2008), https://pcts.nmfs.noaa.gov/pcts-web/dispatcher/trackable/NWR-2005-5883?overrideUserGroup=PUBLIC&referer=/pcts-web/publicAdvancedQuery.pcts?searchAction=SESSION_SEARCH at 4-3.

30 Ibid., 7-35.

31 National Oceanic and Atmospheric Administration, "NOAA Strengthens 2008 Columbia River Salmon Protection Strategy" (September 15, 2009), http://www.westcoast.fisheries.noaa.gov/publications/news_releases/2009/2009_0915.pdf.

32 Federal Columbia River Power System Biological Opinion, "FCRPS Adaptive Management Implementation Plan" (September, 2009), 24, http://www.westcoast.fisheries.noaa.gov/fish_passage/fcrps_opinion/fcrps_biop_adaptive_management_implementation_plan.html.

Along with Sections 7 and 9 of the ESA, the Pacific Northwest Electric Power Planning and Conservation Act establishes other important statutory requirements that seek to balance hydropower with fish and wildlife resource conservation in the Columbia River. The Statute authorized Idaho, Montana, Oregon, and Washington to develop a regional power plan and fish and wildlife program to balance the Northwest's environment and energy needs,[33] overseen by the Northwest Power and Conservation Council (NPCC). The NPCC Columbia River Basin Fish and Wildlife Program of 2014 announced "an adaptive management approach that uses research and monitoring data to understand, at multiple scales, how program projects and measures are performing, and to assess the status of focal species and their habitat."[34]

This case is a good example of the importance of specific objectives and a correct understanding of adaptive management in order for the strategy to work. The generic reference to adaptive management and, most importantly, the use of adaptive management as a tool —which may be used to react in case approved practices regarding fish species result in a decline of their populations— can explain the failure of the approach in its initial stages. The problem, however, has gotten out of hand due to intensive litigation and nowadays it may seem difficult to restore a proper use of adaptive management in the Columbia River Basin. However, the experimental approach for intensively monitored watersheds seems interesting as a way to obtain concrete results from active adaptive management that may favor conservation efforts.

iii. Northwest Forest Management Plan and the Northern Spotted Owl

A third example of adaptive management as a tool to improve conservation efforts can be found in the workings behind the Northwest Forest Management Plan (NFMP) to protect the Northern Spotted Owl. The Forest Ecosystem Management Assessment Team (FEMAT) was created during President Clinton's Administration in 1993 to address the growing tensions between conservation efforts related with old forests and associated species (such as the Spotted Owl, protected under the ESA) and forest industry concerns due to declining timber harvests, focusing on the federal lands of western Oregon and Washington and northern California.[35]

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33 *Conservation,* U.S. Code 16 § 839-839h.

34 Northwest Power and Conservation Council, "Columbia River Basin Fish and Wildlife Program" (October, 2015), 101, https://www.nwcouncil.org/media/7148624/2014-12.pdf.

35 George H. Stankey et al., "Adaptive Management and the Northwest Forest Plan, Rhetoric and Reality," *Journal of Forestry* 101, no. 1 (2003): 41, https://andrewsforest.oregonstate.edu/sites/default/files/lter/pubs/pdf/pub3236.pdf.

The NFMP that was issued by FEMAT acknowledged key uncertainties and called for an assessment that "should include suggestions for adaptive management that would identify high priority inventory, research, and monitoring needing to assess success over time, and essential or allowable modification in approach as new information becomes available."[36] In what seems an active approach, the NFMP established Adaptive Management Areas (AMA) for about 6% of the planned lands, to be used "for the development and testing of technical and social approaches to integration and achievement of desired ecological, economic, and other social objectives. The overarching objective is to improve knowledge of how to do ecosystem management [...]."[37]

This approach was subject to criticism over time. A 1998 evaluation determined that there were "conflicting conceptions and expectations regarding the definition, purpose, and objectives of adaptive management and the AMA."[38] The leadership role expected from officers was undercut by limited organizational support and a lack of preparation and resources. There were conflicts over resources and priorities within and across local management units. Officers argued that experimentation and risk-taking were not standards measured within the institutional framework, especially within a risk adverse institution and considering that the burden of proof regarding absence of adverse effects over endangered species lays on the land managers.[39]

Notwithstanding the fact that there have been relevant concrete results from the adaptive management approach, it is unclear if these efforts have led to a "scientifically credible conservation strategy" for the Northern Spotted Owl.[40] Even considering the active experimentation conducted within AMAs, it seems that these attempts have been little more than "rational planning coupled with trial and error learning", rather than a formal fundamentally different approach based on experimentation.[41] To this day, there still is a great

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36 Forest Ecosystem Management Assessment Team, "Forest Ecosystem Management: An Ecological, Economic and Social Assessment" (July 1993), 5, https://www.blm.gov/or/plans/nwfpnepa/FEMAT-1993/1993_%20FEMAT-ExecSum.pdf.

37 Ibid., 16.

38 See *supra* note 34, 43.

39 Ibid., 44.

40 United States Department of Agriculture, Forest Service, Pacific Northwest Research Station, "Learning to Manage a Complex Ecosystem: Adaptive Management and the Northwest Forest Plan" (August 2006), 24, https://www.fs.fed.us/pnw/pubs/pnw_rp567.pdf.

41 Ibid., 39.

deal of uncertainty in the management of the Northwest Forest and the numbers of the Northern Spotted Owl are still declining. Several deficiencies can explain this outcome, such as a lack of resources devoted to the strategy, a loss of vision and innovation in the translation from science to policy and management,[42] institutional hurdles that prevent adequate learning, lack of willingness to assume risks and a perceived asymmetry between the costs and benefits of adaptive management.[43]

iv. Main lessons regarding adaptive biodiversity management

The three cases that have been reviewed point to a rather common-place assertion about adaptive management: that the cases of failure surpass the cases of success. This should come both as a warning and as an invitation.

Adaptive management can imply an important waste of money and other resources for the administrative state. It can also put the managed resource at risk, which can be unacceptable when dealing with critically endangered species. But uncertainty is still a pervasive factor in all of these cases, and the need to find solutions for the global decline of biodiversity provides thus an invitation to use adaptive management as a method to obtain much needed answers. This explains why, rather than abandoning adaptive management, decision-makers are still figuring out how to use it adequately. Even when adaptive management has been unable to provide results throughout the decades, as is the case of the Columbia River Basin, the approach is still being preferred and alternative applications are being put in practice.

Adaptive management has achieved some victories when devoted to the goal of improving the population and habitats of specific endangered species. There is scientific knowledge that may be gathered, specially with an active approach like with IMWs in the Columbia River or AMAs in the NFMP. This knowledge can out-weight the costs, hurdles and conflicts of adaptive management, as long as the goals and mechanisms are specified and constantly reviewed by experts. Also, an accountable superior officer needs to take responsibility for management practices, as the sort of risk assessment that is implied in adaptive management practices can exceed the possibilities of lower level officers and liability can easily be diluted among the agency hierarchy.

On the other hand, the setting of adaptive management as a general tool only seems to cause confusion among the different stakeholders and agency officers, even prompting, as was the case during the earlier years of the Columbia River case, excessive litigation. The assessment of the NFMP shows that even officers applying adaptive management

42 Ibid., 144.

43 Ibid., 151.

have different interpretations of what it means and what kind of management practices are endorsed by this approach. Therefore, adaptive management should be established with a narrow focus and realistic goals, preferably through an active approach, and with a constant expert review of the outcomes.

e. International recognition of adaptive management as a tool to protect biodiversity

Adaptive management has also been recognized as an important tool in certain international treaties that have been ratified by Chile. This international recognition can certainly be conceived as an additional argument to consider adaptive management as part of the set of tools required to improve the situation of endangered species and degraded ecosystems.

i. Convention on Biological Diversity

One very important treaty that considers adaptive management as an important feature is the Convention on Biological Diversity (CBD), which was signed by 150 nation leaders at the 1992 Rio Earth Summit along with the Framework Convention on Climate Change (UNFCCC). As one of the tools to promote and achieve the objectives of the Agenda 21 — a non-binding action plan of the United Nations, established during the Rio Earth Summit about sustainable development —, the CBD has three main goals: (i) the conservation of biodiversity; (ii) sustainable use of the components of biodiversity, and; (iii) sharing the benefits arising from both commercial and non-commercial utilization of genetic resources in a fair and equitable way.[44]

The CBD was ratified by Chile in 1994 and came into force on December 29, 1994. The United States remains, to this day, the only country in the world that has not ratified the international treaty. However, the U.S. has participated actively but informally in CBD meetings and agreed to adopt and finance most of CBD proposals, an attitude that can change depending on the visions of the current Administration.[45]

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[44] Secretariat of the Convention on Biological Diversity, "Sustaining life on Earth: How the Convention on Biological Diversity promotes nature and human well-being" (April, 2000), https://www.cbd.int/doc/publications/cbd-sustain-en.pdf.

[45] Gloria Dickie, "The US is the only country that hasn't signed on to a key international agreement to save the planet," *Quartz* (blog), December 25, 2016, https://qz.com/872036/the-us-is-the-only-country-that-hasnt-signed-on-to-a-key-international-agreement-to-save-the-planet/.

- **General provisions**

As a general principle, the preamble of the CBD points out that the parties are "[a]*ware* of the general lack of information and knowledge regarding biological diversity and of the urgent need to develop scientific, technical and institutional capacities to provide the basic understanding upon which to plan and implement appropriate measures."[46] The CBD requires the parties to share the information and knowledge they gather about biological diversity.

The treaty requires that countries take measures to conserve the biodiversity. Article 6(a) of the CBD establishes that "[e]ach Contracting Party shall, in accordance with its particular conditions and capabilities [...] Develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity or adapt for this purpose existing strategies, plans or programmes [...]."[47]

The CBD also sets some parameters regarding the management practices that may be adopted by the parties. Within its provisions related with in-situ conservation, article 8 of the CBD establishes that "[e]ach Contracting Party shall, as far as possible and as appropriate: [...] [d]evelop, where necessary, guidelines for the selection, establishment and management of protected areas or areas where special measures need to be taken to conserve biological diversity [...] [r]ehabilitate and restore degraded ecosystems and promote the recovery of threatened species, *inter alia*, through the development and implementation of plans or other management strategies".[48]

- **COP 13 and the Aichi Targets**

Beyond specific provisions, the CBD establishes the Conference of the Parties (COP), the highest governing body of the CBD, which holds meetings on regular intervals.[49] The last time the parties got together was for COP 13, on December, 2016.

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46 "Convention on Biological Diversity," preamble, opened for signature June 5, 1992, *United Nations Treaty Series* 1760: 144.

47 Ibid., 148.

48 Ibid., 148–149.

49 Ibid., 157.

On October 2010, COP 10, which was celebrated in Nagoya, Aichi Prefacture, Japan, issued Decision x/2, which set forth a Strategic Plan for Biodiversity 2011–2020 and 20 global biodiversity goals known as the Aichi Targets.[50]

Among the Aichi Targets that are considered under Strategic Goal B —reducing the direct pressures on biodiversity and promoting sustainable use—, Target 6 states that "[b]y 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits." Target 7's aim lies in that "[b]y 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity."[51]

Under Strategic Goal C, which requires to improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity, Target 11 sets the goal that "[b]y 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes."[52]

Finally, among the Aichi Targets which are relevant to adaptive management, Strategic Goal E is to enhance implementation through participatory planning, knowledge management and capacity building. As a part of this strategic goal, Target 19 establishes that "[b]y 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied."[53]

▪ The Ecosystem Approach

As a central aspect, the CBD puts forth "an ecosystem based approach" to the conservation of biodiversity. Decision V/6 of the COP 5 defines the ecosystem approach as "a strategy for the integrated management of land, water and living resources that promotes

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50 "Conference of the Parties of the Convention on Biological Diversity," UNEP/CBD/COP/DEC/X/2, 10th Meeting, October 29, 2010.

51 See *supra* note 18, Annex ¶13, 8.

52 Ibid., 9.

53 Ibid.

conservation and sustainable use in an equitable way." The ecosystem approach is "based on the application of appropriate scientific methodologies focused on levels of biological organization, which encompass the essential structure, processes, functions and interactions among organisms and their environment."

Most importantly, decision V/6 established that "[t]he ecosystem approach requires adaptive management to deal with the complex and dynamic nature of ecosystems and the absence of complete knowledge or understanding of their functioning. Ecosystem processes are often non-linear, and the outcome of such processes often shows time-lags. The result is discontinuities, leading to surprise and uncertainty. Management must be adaptive in order to be able to respond to such uncertainties and contain elements of 'learning-by-doing' or research feedback. Measures may need to be taken even when some cause-and-effect relationships are not yet fully established scientifically."[54]

Later, during COP 7, the parties issued Decision VII/11 looking to ensure an effective implementation of the ecosystem approach,[55] annexing the CBD Guidelines named "The Ecosystem Approach." The foreword of these Guidelines asserts that "[t]he ecosystem approach requires adaptive management to deal with the complex and dynamic nature of ecosystems and the absence of complete knowledge or understanding of their functioning." The Guidelines establish 11 principles, the most relevant being:

- **Principle 6.** "Ecosystems must be managed within the limits of their functioning," recognizing that "our current understanding is insufficient to allow these limits to be precisely defined, and therefore a precautionary approach coupled with adaptive management, is advised."[56] The Principle determines that, "[g]iven the pervasiveness of uncertainties in managing ecosystems, management will need to be adaptive, with a focus on active learning derived from monitoring the outcomes of planned interventions using a sound experimental approach that allow the effects of the intervention to be accurately determined."[57]

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54 Res. V/6, "Conference of the Parties of the Convention on Biological Diversity.", 5th Meeting, October-November, 1999, https://www.cbd.int/decision/cop/default.shtml?id=7148.

55 "Conference of the Parties of the Convention on Biological Diversity," UNEP/CBD/COP/DEC/VII/11, 7th Meeting, April 13, 2004.

56 See *supra* note 27, 13.

57 Ibid., 14.

- **Principle 8.** "Recognizing the varying temporal scales and lag-effects that characterize ecosystem processes, objectives for ecosystem management should be set for the long term." This principle recommends that "[a]daptive management processes should include the development of long-term visions, plans and goals that address inter-generational equity, while taking into account immediate and critical needs (e.g., hunger, poverty, shelter)," as well "as take into account trade-offs between short-term benefits and long-term goals in decision-making processes" and "the lag between management actions and their outcomes." Monitoring systems ought to "be designed to accommodate the time scale for change in the ecosystem variables selected for monitoring."[58]

- **Principle 9.** "Management must recognize that change is inevitable." Recognizing the dynamics that characterize ecosystems, "[t]he ecosystem approach must utilize adaptive management in order to anticipate and cater for such changes and events and should be cautious in making any decision that may foreclose options, but, at the same time, consider mitigating actions to cope with long-term changes such as climate change."[59] The focus should be on management that is both flexible and adaptive; "[a]daptive management should generate new knowledge and reduce uncertainties, thereby allowing the manager to anticipate and cater for change," and "should be encouraged when there is a risk degradation or loss of habitats, as it can facilitate taking early actions in response to change."[60] The Principle also warns that "[m]onitoring systems, both socio-economic and ecological, are an integral part of adaptive management, and should not be developed in isolation from the goals and objectives of management activities. [...] Adaptive management must identify and take account of risks and uncertainties."[61]

Furthermore, in the Second Annex of Decision VII/11 ("Consideration of the Relationship between Sustainable Forest Management and Ecosystem Approach, and Review of, and Development Strategies for, the Integration of the Ecosystem Approach into the Programmes of Work of the Convention"), it is established that "[m]onitoring systems that can provide on-the-ground feedback and verify sustainability are essential for implementing adaptive management, a central concept within the ecosystem approach. These monitoring systems support the management-feedback process and allow it to evolve through time."[62]

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58 Ibid., 15.

59 See *supra* note 27, 16.

60 Ibid., 16.

61 Ibid.

62 Ibid., 21.

▪ **Implementation**

An assessment that was performed in the midterm of the path towards the Aichi Targets considered the advances of the different states in implementing its key principles. Among many issues, the 2013 report mentions the challenges of improving biodiversity protection in environmental impact assessments and strategic environmental assessments, determining that adaptive management should be gradually implemented towards an Ecosystem Approach and a recognition of Ecosystem Services.[63] Adaptive management is determined to be useful in guiding agri-environment schemes to protect biodiversity in Europe.[64] The report also explains the importance that traditional knowledge places on adaptive decision-making in local practices while providing feedback information.[65]

An example of a successful application of adaptive management under the CBD is The Great Barrier Reef in Australia. The most notorious aspect is the zoning plan, which has enabled an experimental approach among a large-scale network of marine reserves, determining major benefits of no-take areas for targeted fish and sharks.[66] Agricultural practices near the Great Barrier Reef have also increased the levels of sediment, nitrogen and phosphorus, affecting the ecosystems and biodiversity status of the reef. The Reef Plan has developed a tracking system for ecosystem and biodiversity changes as a way to relate them with changes in the farming activities.[67]

ii. Food and Agriculture Organization

In general terms, the FAO adopts the ecosystem approach that is endorsed by the CBD. Following this general direction, adaptive management has been recognized as an im-

63 Secretariat of the Convention on Biological Diversity, *Progress Towards the AICHI Biodiversity Targets: An assessment of biodiversity trends, policy scenarios and key actions*, Global Biodiversity Outlook 4 (GBO-4) Technical Report. CBD Technical Series No. 78 (Montreal: Secretariat of the Convention on Biological Conservation, 2013), 25, https://www.cbd.int/doc/publications/cbd-ts-78-en.pdf.

64 Ibid., 44.

65 Ibid., 412.

66 Laurence J. McCook et al., "Adaptive management of the Great Barrier Reef: A globally significant demonstration of the benefits of networks of marine reserves," *Proceedings of the National Academy of Sciences of the United States of America* 107 (2010).

67 See *supra* note 63, 451.

portant tool in fisheries management. The FAO Technical Guidelines for Responsible Fisheries "proposes adaptive management and structured decision-making as managerial philosophy."[68]

The Guidelines determine that adaptive management is a strategic approach to sustainable fisheries management, and as such can face pervasive uncertainties as well as risks related with the exploitation of fisheries and management actions. To do so, the approach appeals for passive forms of adaptive management, rather than active experimentation, calling for "the circular, rigorous, open and inclusive management process that AM advocates"[69] as an element of core importance to manage fisheries successfully.

The reason to advocate for adaptive management is that relations in a complex socio-ecological system such as fisheries will always have inherent uncertainty and unpredictability. Precisely because of that, "the outcome of any management action can rarely be predicted with certainty, motivating variants of AM for natural resource management;"[70] in such context, adaptive management can recognize and confront uncertainties by monitoring the reaction of the fishery to any intervention.

The Guidelines recognize time, financial and political limitations of adaptive management, pointing out that it "involves time-consuming stakeholder processes, contested management decisions, computer model building/analyses, and field testing of alternatives [that] will not be a viable option for understaffed recreational fisheries management systems."[71] In attention to its significant costs, the Guidelines propose, as alternatives to an active, experimental adaptive management, three forms of passive active management, each of which increases the possible knowledge and degree of information gain: (i) with no feedback, just to see what happens; (ii) trial and error, return to development if management option is unsuccessful, and; (iii) step-wise, develop alternatives and follow them in sequence.[72]

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68 Food and Agriculture Organization of the United Nations, *Technical Guidelines for Responsible Fisheries* 13, (Rome: Food and Agriculture Organization of the United Nations, 2012), http://www.fao.org/docrep/016/i2708e/i2708e00.pdf.

69 Ibid., 26.

70 Ibid.

71 Ibid., 29.

72 See *supra* note 68, 28.

III. Biodiversity protection in chile and the uses of adaptive management

a. Overview of Biodiversity Law in Chile

As explained in the previous chapter, the requirements, uses and limitations of adaptive management have been studied in depth. Adaptive management has been recognized as a tool both in domestic resource management law and in several instruments of international law. This general framework allows for an informed approach to adaptive management as a potentially useful mechanism in the new Chilean biodiversity institutions that are being currently discussed in Congress.

There is no comprehensive biodiversity protection system in Chile. The current scheme is mostly preventive, requiring that activities that affect endangered species and their habitats previously obtain a specific permit. It does not consider protected areas and biodiversity as an integrated whole, as the protected public lands system is laid down by a different set of regulations. Most importantly, it does not set substantive requirements or criteria to avoid harms or to improve the conservation status of endangered species

The current preventive biodiversity protection mechanisms are based on a qualification proceeding required by Article 38 from the General Basis of the Environment Act (GBEA),[73] which establishes that regulations shall set a proceeding to classify, on the basis of scientific and technical data, the species of plants, algae, fungi and wild animals in the categories determined by the International Union for Conservation of Nature (UICN) or other international organisms. The latest version of the Regulations for the Classification of Wild Species by Conservation Status (RCWSCS)[74] adopts the UICN categories and corresponding selection criteria: Extinct, Extinct in the Wild, Critically Endangered, Endangered, Vulnerable, Near Threatened, Least Concern, Data Deficient and Not Evaluated. The RCWSCS determined that the Department of Environment shall propose lists of classified species to the President of the Republic, who shall officially issue them after revision by a Council of Secretaries for Sustainability. During the task of proposing these lists, the Department of the Environment is provided with technical support by a Classification Committee. In addition to the resulting listings of these proceedings, certain Natural

73 Law 19300, March 9, 1994, O.G. (Chile).

74 Supreme Decree No. 29-2011, April 27, 2012, O.G. (Chile).

Monument proclamations of the Department of Agriculture have protected specific sites and species of flora and fauna.[75] Each specific proclamation determines special rules for management and authorizes the use of the protected Natural Monument.

Based on these qualifications of endangerment, two mechanisms prevent harm to biodiversity:

(i) Different types of legislation require that a sector-specific permit is obtained for the intervention of protected species and their habitats. For instance, removal of any category of protected fauna requires a prior permit from the Agriculture and Livestock Agency, with the substantive requirement of ensuring a sustainable use, which is determined on a piecemeal basis.[76] Cutting native forests to enable any sort of activity requires a permit by the National Forestry Board, also requiring the reforestation of surfaces at least equivalent to those being affected.[77] Failure to comply with these requirements is generally subject to administrative penalties;

(ii) All private or public projects that fall within predetermined categories and magnitudes undergo environmental impact assessment under the GBEA. The administrative process of the Environmental Impact Assessment System (EIAS) requires all agencies with related authority to review an Environmental Impact Study that is submitted by the owner of the proposed project. In order to be approved, the project must comply with substantive environmental regulations and provide mitigation, reparation and/or compensation measures to deal with its significant impacts.[78] If a project affects any protected species, the specific impacts and its possible offsets are discussed thoroughly in the assessment proceedings.

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75 For instance, the *Araucaria araucana* is protected by Supreme Decree No. 43-1990, April 3rd, (ii) 1990, O.G. (Chile), the *Fitzroya cupressoides* is protected by Supreme Decree No. 490-1977, September 5th, 1977, O.G., several species of mammals are protected by Supreme Decree No. 2-2006, June 30th, 2006, O.G. and the Puñihuil Islands are protected by Supreme Decree No. 130-2000, October 14th, 2000, O.G. All of these decrees have been issued by the Department of Agriculture.

76 Law 19473, September 27, 1996, O.G., Hunting Act (Chile).

77 Law 20283, July 30, 2008, O.G., Native Forests Recovery and Forestry Promotion Act (Chile).

78 See *supra* note 73. Article 11(b) requires all projects that have significant impacts over renewable natural resources or biodiversity to perform an Environmental Impact Study that provides measures to neutralize said impacts.

On the other hand, protected areas found in public and private lands are part of a disperse National System of Wild Protected Areas (NSWPA), and its units are managed by a number of different agencies. Protection categories for land find their legal base on numerous dispersed and incomplete sources. Management criteria for each category of protection depend directly on the statutory or regulatory provisions that rule the area. The overall determination of protected areas shows a disbalance in the representability of ecosystems with regard to the national reality, with 12% of the types of ecosystems in Chile lacking any sort of official protection.[79]

The main shortcomings of these mechanisms are the lack of an organic systemic purpose and the lack of substantive management criteria that establish a clear standard for agency action.[80] The generally low administrative penalties and the lack of effective enforcement mechanisms are also a concern. The statutory requirements for granting specific permits are left to broad agency discretion, and while intervention of severely endangered species will probably be avoided, there is no general statutory ban related to the removal of species under conservation categories. Under EIAS, significant impacts will generally be the consequence of unregulated aspects of a project, providing thus the agencies with technical discretion to determine if the measures to deal with these significant impacts are enough to approve the project. When it comes to endangered species, this means that it is very rare that a project will not be approved because of these impacts, as they are mostly offset by specific management commitments offered by the project owner.

From an international standpoint, the evaluations performed by the Organization for Economic Cooperation and Development (OECD) have criticized the biodiversity framework, requiring that Chile takes action to face uncertainties in biodiversity management. Chile became a part of the OECD in 2010 and thus became subject of the continuous environmental reviews performed by the international organization. One of the key objectives that is identified in the 2016 environmental review is to improve knowledge about the status and value of biodiversity, targeting financing to "focus on filling gaps in the scientific knowledge base; improving information on biodiversity pressures; and expanding linkages to social science research to improve biodiversity outcomes and address competing interests."[81]

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79 Bill 9404-12, June 18, 2014, First Constitutional Procedure, 9 (Chile), http://www.senado.cl/appsenado/templates/tramitacion/index.php?boletin_ini=11.175-11#.

80 Robert L. Fischman, "The National Wildlife Refuge System and the Hallmarks of Modern Organic Legislation," *Ecology Law Quarterly* 29 (2002): 510.

81 Organization for Economic Cooperation and Development, "OECD Environmental Performance Reviews: Chile 2016," accessed November 16, 2018, 216, http://www.oecd.org/chile/oecd-environmental-performance-reviews-chile-2016-9789264252615-en.htm.

Among the recommendations on biodiversity conservation and sustainable use, the review recommends to accelerate the effort to build the knowledge base on the status and trends of biodiversity, and "further engage academic and research centers in filling knowledge gaps and support policy development."[82] Regarding protected areas, it is recommended that Chile accelerates the development and update of management plans and systematically review their implementation, ensuring that the plans set clear priorities, targets and progress indicators.[83]

Considering the framework of adaptive management abroad and internationally, as well as the mandate of the OECD, adaptive management could be used as a helpful mechanism for biodiversity conservation in Chile. The current biodiversity and protected areas provisions do not grant adequate spaces for the use of adaptive management, mainly considering its mostly reactive approach: the piecemeal granting of taking and cutting permits for private action does not address general biodiversity loss as a factor. The question of how to conserve or recover biodiversity in a given scenario requires a systemic purpose of legislation and a comprehensive planning by an agency, elements that are currently lacking. In the current scenario, adaptive management would probably be used by private project owners to determine the best impact-offsetting measures and to convince agencies to approve proposed changes of an otherwise unaltered *status quo,* rather than to improve decision-maker knowledge about the ways to solve current challenges for biodiversity as a specific public interest.

That notwithstanding, adaptive management is not a new concept in the Chilean law, and it has been used mostly for the management of natural resources. Among other examples, manifestations of adaptive management in the Chilean legal system can be found in the environmental impact assessment of investment projects, as well as in the management practices of agencies involved with regulation of fisheries and forestry. The examples will be explored in this section, so as to determine the scope and limitations of adaptive management in its practical application within Chilean borders, in particular if applied in the context of management practices approved by the new BPAA.

b. Adaptive management in the Environmental Impact Assessment System

Although it is arguably not a proper adaptive management approach, the Chilean EIAS (which grants detailed permits to private and public activities that have significant impacts on the environment) contemplates a relatively new procedure allowing authorities to review an already granted permit if environmental variables do not evolve as planned.

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82 Ibid., 236.

83 See *supra* note 81.

The mechanism was not explicitly oriented to introduce adaptive management when introduced by the new legislation in 2010, but it can be seen as a form of passive adaptive management of some importance for biodiversity management, particularly when dealing with mining projects.

i. General aspects of the EIAS

Under the Chilean Constitution, the right to a pollution-free environment is a Constitutional Right for every person, and it is a duty of the Chilean State to ensure that this right is not affected and to guide the preservation of nature.[84] In compliance with this duty, the GBEA was dictated in 1994. Among other aspects, the GBEA created the EIAS, which started functioning during 1997, as the first expression of a preventive approach to deal with environmental damages.[85]

As required by GBEA, the duty to prepare an Environmental Impact Statement (EIS) falls upon any private or public entity who wishes to construct and execute certain types of projects.[86] Project assessments of the EIS are conducted by public agencies — coordinated by the Environmental Assessment Agency (EAA) — which ultimately decide whether to grant an environmental permit, based on project compliance with environmental laws and regulations. If approved, projects are given a permit (an Environmental Qualification Resolution, or EQR), which provides mandatory project design specifications and also establishes mitigation, reparation and/or offsetting measures for environmental impacts.

ii. The revision process

In 2010, Law No. 20417[87] introduced massive reforms to GBAE, modifying environmental agencies and introducing several changes to EIAS. Among other changes, Law No. 20417 introduced a specific Revision process, that allows for prudential revision of an environmental permit by the issuing agency when variables considered at first during environ-

84 Political Constitution of the Chilean Republic, art. 19, no. 8.

85 National Congress Library, *Legislative History of Act* 19,300 157. As stated in the Presidential Message on the GBEA, its objective was to prevent the generation of environmental damages, as it was not possible to continue with an environmental management seeking to solve environmental problems once they are produced.

86 See *supra* note 73, Article 10.

87 Law 20417, January 26, 2010, O.G. (Chile).

mental assessment have changed. Upon concluding the process, the EAA can modify aspects of an approved project to improve environmental management. The revision may be activated *ex officio* by the EAA or at the request of the project owner or third parties, and it also includes a notice and comment period.[88]

The revision process was not implemented with the explicit intent of using adaptive management, but rather came from a 2003 rule of the Comptroller General,[89] which established that an EQR may be modified if a follow-up plan presented changes in its main variables. The introduction of Revision proceedings can be seen mainly as a statutory enactment of this administrative ruling. However, during legislative review of Law No. 20417, the revision process was said at one point to be an application of adaptive management,[90] as a response to the perceived rigidness of EIAS.

Notwithstanding the reasons to implement the Revision process, it is a fact that it introduces a certain flexibility to EIAS in order to respond to the complex dynamics of ecosystems, which may not evolve according with reasonably foreseeable circumstances originally considered during environmental assessment. The mechanism deals with uncertainty in a very straightforward and case-by-case fashion.

iii. Some projects that have faced Revision proceedings

For the purposes of this paper, the EAA Revision cases are of main interest when dealing with the impacts on biodiversity, so that will be the main focus. For each case, there is a brief project description, an analysis of the specific variables that have been subject to change, the mechanism that activated the process, relevant issues encountered and the final decision of the EAA.

88 See *supra* note 73, Article 25 *quinquies.*

89 Among other powers, the General Comptroller of the Republic can determine the correct interpretation of legal statute and regulations concerning public law and the functioning of public agencies. See Law 10336, July 10, 1964, O.G. (Chile).

90 National Congress Library, *Legislative History of Law 20,417,* at 157.

- **Modification of the management and processing of Sulfurized Minerals Project**

The project introduced changes to the 'Escondida' mining project, mainly a new copper-concentrate plant and a new sludge reservoir, as well as a new filtering plant for the industrial sector and a new mineral duct.[91] The environmental permit was granted during 1998.

The process was activated by a complaint filed by the Agriculture and Livestock Agency, which informed the EAA that a flock of 180 Andean flamingoes *(Phoenicoparrus andinus)* had been detected living in the sludge reservoir during 2012.[92] The project permit considered the monitoring of fauna population, but did not set any measures to face unexpected behavior of endangered species.

Several working panels took place with participation of public agencies and the company involved in the project, with no comments from the public. The main concern was to avoid the presence of the endangered species near the sludge facilities, which continued to be an issue throughout subsequent inspections.

The revision process ended in 2013, introducing changes to the permit, requiring the project to install a Long-Range Acoustic Device to deter flamingoes from the sludge reservoir. Also, a monitoring requirement was implemented to look for the presence of diatoms (algae), which provide nourishment to flamingoes in the effluent, and eventually apply control measures depending on the results. The results were required by March, 2014. Finally, it was stated that if any specimen found in the sludge reservoir displayed deterioration, strange behavior or was found dead, the project owner was required to report immediately to the authorities.[93] According to the latest reports that accounted for the flamingo census near the sludge reservoir, the measures appear to have displayed at least some degree of success, as there were no further sightings of flamingoes as of 2017.[94]

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91 Environmental Assessment Commission, Antofagasta Region, Res. 048/1998.

92 General Directorate of Water Resources, Antofagasta Region, Ord. 072, December 17, 2012 (Chile), http://www.sea.gob.cl/sites/default/files/migration_files/1._denuncia_dga.pdf.

93 Environmental Assessment Commission, Antofagasta Region, Res. 0327, November 5, 2013 (Chile), http://www.sea.gob.cl/sites/default/files/migration_files/35._res._no_0327-2013_culmina_procedimiento.pdf.

94 Environmental Enforcement Agency, Inspection Report, DFZ-2017-273-II-RCA-EI (Chile), http://snifa.sma.gob.cl/v2/Fiscalizacion/Ficha/1006190.

- **"Esperanza" Project**

The "Esperanza" mining project is designed to extract minerals and produce copper and gold concentrates. The project included ducts to transport minerals and water. Among the several requirements to grant the permit, the project owner had to conduct a micro-routing through the ducts' easement areas in order to pinpoint and relocate specimens of an endangered cactus *(Eulychnia iquiquensis)* and to collect seeds from a bush species *(Alona balsamiflua)*. The relocation had to be monitored for 2 years, a rather arbitrary time-lapse that was proposed by the project owner and accepted by the environmental authority without further questioning.[95]

In the final report of this 2-year monitoring, the company points out that the relocation efforts have been unsuccessful, as environmental conditions and the presence of plagues have risen the natural mortality of the species to 90%. This seems as quite an inevitable outcome only 2 years into reforestation efforts. On the other hand, there was no finding of seeds from the bush species that could be located in the micro-routing. Therefore, the project owner submitted a request to open a Revision process, arguing that these were not the foreseen variables of the project assessment.

The proceeding led to a significative number of letters between the EAA, the local office of the Ministry of the Environment and the Agriculture and Livestock Agency, as well as some work panels. It was determined that the cactus would require a new management plan, including replantation from existing nursery gardens, an autonomous irrigation system and continuous vigilance. With regard to the seeds, the project owner was required to make a contribution to the National Institute of Agrarian Innovation seed bank, regardless if any seeds were to be found in the future.[96] Unfortunately, neither of the three inspections that have been conducted within the mine installations have focused on the compliance of these requirements.

- **"Algorta" Mining Project**

The "Algorta" mining project considers a total area of roughly 34,000 acres to exploit and produce iodine. The environmental permit considered the presence of the "Garuma" gull

95 Esperanza Mining Company, Requests revision process, Letter, October 23, 2014 (Chile), http://www.sea.gob.cl/sites/default/files/migration_files/solicitud_25_quinquies_eperanza.pdf.

96 Environmental Assessment Commission, Antofagasta Region, Res. 0266, August 8, 2016 (Chile), http://www.sea.gob.cl/sites/default/files/adjuntos/paginas-estaticas/res_0266_25_quinquies_esperanza.pdf.

(Leucophaeus modestus) within the mining area and provided mitigation measures, but the extraction program approved in 2012 expected to reach the nesting areas only after 5 years (2017).[97]

The Agriculture and Livestock Agency filed a complaint to the EAA on December, 2012, after the mining company had informed that some specimens and nesting areas of the gull had been found within the vicinity of the extraction area, pointing out the Vulnerable status of the species.[98] The EAA responded by starting a revision process, where the mining company presented a document with additional mitigation and management measures.

Considering the lack of any previous non-compliances with their environmental permit and the relatively small gull community, the EAA found the impact to be contained. As a result of the Revision proceedings, the project follow-up program was updated, extending its life cycle, adding several additional vantage points and establishing a specific isolation procedure in case any new gull specimens or nesting areas would be found in the future.[99]

An inspection that took place on July, 2013 determined the presence of a gull nesting place within the extraction area, but the isolation procedure had not been implemented. The project owner was able to prove that the specific area of the nesting ground was no longer a part of the project, as it was part of the original water duct route that had been changed with a supplemental EIS.[100] There is no further available data regarding inspections or reports filed on these matters.

iv. The Revision process as adaptive management

After considering some Revision cases, it is clear that the proceeding does not represent proper adaptive management, either in its active or passive approach. Mainly, there are no explicitly stated goals or measurable indicators, nor specific managing objectives. The Revision process is triggered on a case-by-case, piecemeal basis, without setting any management objectives, other than modifying the EQR to face notorious shortcomings of the original impact assessment.

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97 Environmental Assessment Commission, Antofagasta Region, Res. 0174, 2009 (Chile).

98 Agriculture and Livestock Agency, Antofagasta Region, Ord. 735, December 26, 2012 (Chile), http://www.sea.gob.cl/sites/default/files/migration_files/1._denuncia_sag.pdf.

99 Environmental Assessment Commission, Antofagasta Region, Res. 200, July 30, 2013 (Chile), http://www.sea.gob.cl/sites/default/files/migration_files/37._res._200_termino_procedmiento.pdf.

100 Environmental Enforcement Agency, Inspection Report DFZ-2013-721-II-RCA-IA (Chile), http://snifa.sma.gob.cl/v2/Fiscalizacion/Ficha/4005415.

Furthermore, the particular usefulness of the process for biodiversity management is not apparent. The Revision process just makes minor adjustments on a complex maze of environmental permits, without giving any priority to the errors of the environmental assessment and assigning no additional resources or instruments to follow-up on the newly adopted measures. The focus remains at all times on the revised project, rather than on the species that is being adversely affected by it.

It is possible to find concrete information gaps that are being addressed by the Revision proceedings, and these gaps are being dealt with in the context of project impact management over different environmental features. However, the Revision process fails to display opportunities for learning and adjusting that can benefit from an adaptive approach. The focus is put on the continued execution of the specific project that is being revised, rather than on the environmental features and how to deal with the novel uncertainty. The learning is not focused on improving towards previously set goals, but rather centers on finding adequate technical responses that enable the project to proceed with its operation. The adjustment is equally constrained by these objectives, as any changes are limited to this sole purpose.

Also, the nature of the process does not allow feedback loops, as the administrative process just operates on a single finding that provides a tight timeframe to address a specific issue. The involved agencies are limited to commenting on the specific issue and within the material and temporary boundaries of their authority. Once the process is closed, there is no space for further assessing the feedback and producing systematic and continuous knowledge. Furthermore, the time period considered for some measures is insufficient when it comes to biodiversity knowledge: the 2-year time frame for the replantation of cacti in the "Esperanza" project is a good example of this. Biodiversity management measures require longer-term commitments to assess their effectiveness. Otherwise, modifying the original measures should be qualified as simple non-compliance. As determined by the Environmental Enforcement Agency, reforestation commitments include attachment of the specimens to the ground. Attachment can be verified as early as the second year, and the verification of successful reforestation requires to go beyond that time-lapse and for a couple of years.[101]

Instead of proper adaptive management, the Revision process improves the assessment system by including a modification of the approved proposed action, on the basis of pre-existing follow-up requirements. The mechanism is similar to what Bradley Karkkainen

[101] Environmental Enforcement Agency, Res. 489-2014, August 29, 2014 (Chile).

has proposed for the NEPA process, in which a follow-up and reassessment of mitigation measures that lead to FONSI can provide for "an ongoing, dynamic process of learning and adjustment of mitigation plans in light of actual revealed impacts,"[102] as well as other forms of adaptive mitigation.

The limitations of the Revision proceedings make sense in light of the specific projects in question, which correspond to long-term, high-risk, capital-intensive mining investments which are not meant to handle biodiversity impacts on a regular basis as a means to sustain their continuity. Sustainable yield is neither a prime concern or part of the main production strategy of mining companies. The nature of the projects plays a role in explaining the outcome of the Review proceedings, as the focus on non-renewable mineral resources makes biodiversity management a strictly secondary aspect of project development, which will only be complied with under strict statutory or regulatory constraints. The key aspect of mining activities is the expected life of the mineral deposits, which are primarily affected by the amount of mineral and the rate of extraction, rather than by adequate management practices. Therefore, it seems that mining may not be an adequate scenario for the use of adaptive management, as the mining industry has little economic incentives to employ an adaptive approach and there are higher risks of it being used as a tool to argue a way around non-compliance.

c. Regulation of fisheries and their availability for adaptive management

As opposed to mining, successful exploitation of fisheries crucially depends on adequate management practices, and fishing activities are a main cause for a number of detrimental effects on sea species and ecosystems. Exploiting fishing stocks beyond their maximum annual yield can irreversibly damage a fishery, thus putting an end to the activity very quickly. The short term of the investment in this case does seem more apt to implement adaptive management, as the actors involved in this industry are more likely to be open to assume the short-term costs of adaptive management to harness the down-the-road benefits of better management practices.

The regulation of fisheries in Chile seems suitable for adaptive management, as the current framework provides for a zoning system of "Areas for the Management and Extraction of Benthic Resources" (AMEBR). The Fishing and Aquaculture General Act gives the Fisheries Agency considerable discretion to determine extraction quotas and provide for management plans that can comprise sectors of two or more AMEBR in order to ensure the sustainable exploitation of benthic resources.[103]

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[102] See *supra* note 5, 351.

[103] Law 18892, January 21, 1992, O.G., Article 55A (Chile).

Using this discretional authority, the Fisheries Agency is in a position to use adaptive management to improve the results of current exploitation, transitioning to a system of Territorial Use Rights in Fisheries (TURF). The Nature Conservancy has suggested that the AMEBR use a system for monitoring and assessing their economic, ecological and social performance. The regulations should provide for experimentation in management, including the use of non-fishing areas, fishing rotations, multi-species plans, etc. Through this implementation, "[a]s the TURF system evolves, it provides the opportunity to incorporate lessons learned, to revise and re-shape the system, and to make it a true adaptive management system."[104]

The implementation of these strategies should also include the collaborative efforts between different organizations of small-scale fishermen and other AMEBR. Additionally, the use of these tools should be complemented with other mechanisms, such as individual management plans for each fishing unit, investigation leases and zoning for the ocean surface.[105] The mechanism clearly allows for a sort of adaptive management mechanism, as the Fisheries Service can address specific cases with a more flexible approach. In this way they can identify TURF subsections that can be subjected to different experimental management practices and then recording and interpreting the results. Both the transition to an adaptive management system and the introduction of an ecosystem approach that considers management plans for entire species are current challenges for the Chilean agencies,[106] which would surely be guided and subject to legal amendments once the BPAA bill is enacted.

d. Adaptive management in forest management

As with fisheries, forests play both an economic and an environmental role. While forestry activities depend on forest resources to obtain timber, native forests can have a huge diversity of vegetation and provide essential habitats for countless species. As an economic resource, forests are somewhere in between mining activities and fisheries: successful forestry exploitation depends heavily on adequate management practices, but on a longer time lapse than fisheries. This implies that forest managers will have at least some incentives to apply adaptive management; these incentives increase when forests provide valuable habitats, as the interest to gather knowledge and improve management practices that can balance both aspects is even greater.

104 Andrea Moreno and Carmen Revenga, "The System of Territorial Use Rights in Fisheries in Chile," *The Nature Conservancy* 8 (2014), https://www.nature.org/media/chile/system-of-TURFs-in-Chile.pdf.

105 Ibid., 57.

106 Ibid., 59.

Forestry is a very important industry in Chile, providing a relevant national production of papers and cardboards. Forestry facilities in the Chilean south are also recognized to cause significant social upheaval, as the loss of biodiversity that is replaced by monoculture plantings and the environmental impacts of the industry, particularly over soil and groundwater, are not perceived to have significant socioeconomic tradeoffs for common Chilean citizens or the Mapuche indigenous tribes that inhabit neighboring lands.[107]

Such a context certainly calls for innovative ways to improve management practices of forest assets. A sustainable model for the exploitation of the forest requires a detailed diagnosis of the social, environmental and economic aspects of the territories, in order to detect problems and analyze options and possible solutions with a strategic long-term perspective. As solutions are implemented on the basis of a binding notice and comment process, their results should be carefully monitored, in order for the plan to adapt and benefit from feedback loops of scientific research in order to improve or change the path taken by a particular forestry enterprise.[108]

Scientific research is considered key to understand the structure and functioning of ecosystems. Monitoring environmental variables such as changes in land use, land erosion as well as quantity and quality of water, provides indispensable information to perform adaptive management.[109] The final goal of this adaptive management approach is for the forestry model to increase and optimize the social, economic and environmental benefits (multiple uses) that are generated by forest ecosystems.

The National Forestry Corporation (NFC) is currently in charge of managing inland protected areas in Chile, effectively merging native forest protection and timber harvest in a multiple-use sustainable-yield approach. The Planning Guidelines that have been issued by the NFC recognize that the protected areas form a system that needs to work coordinately through management plans, with a two-tiered, sixteen-phase sequence that

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107 For a general overview of the conflict between the forestry industry and the Mapuche indigenous tribes, *see* José Aylwin, Nancy Yáñez and Rubén Sánchez, "Pueblo Mapuche y Recursos Forestales en Chile: Devastación y Conservación en un Contexto de Globalización Económica," IWGIA Citizen Watch, White paper (2013), https://www.iwgia.org/images/publications//0625_Pueblo_mapuche_y_recursos_forestales_en_chile.pdf.

108 Cristián Frêne and Mariela Núñez, "Towards a new Forestry Model in Chile," *Revista Bosque Nativo* 47 (2010): 33, http://www.bosquenativo.cl/descargas/Revista_Bosque_Nativo/RBN_47_art_op2web.pdf.

109 Ibid., 32.

includes implementation, analysis of results and sharing learning outcomes, forming an adaptive management cycle.[110] A pioneering project that has implemented this adaptive management cycle is the management plan for the Yendegaia National Park, which also seeks to harmonize conservation uses with sustainable resource use by indigenous communities.[111] It is uncertain whether this methodology will subsist once the BPAA bill is passed, as timber production, which will remain the NFC's main concern, will be separated from the biodiversity and protected lands management authority. Management of the latter will be bestowed on the BPAA.

IV. How can the BPAA harness the full potential of adaptive management, while avoiding its main risks?

a. Current bill and references to adaptive management

So far, this paper has explored the use of adaptive management in a number of scenarios, always in relation with the protection of biodiversity. Beyond a comprehensive general understanding of adaptive management as a response to uncertainty, the domestic approach to protect endangered species within the United States has justified the use of an adaptive approach for many years now, usefully highlighting the main benefits and limitations for that specific purpose. The international framework also provides a useful background to guide its application and to impulse reforms within the Chilean legal system. But there is a lack of a systematic application of adaptive management in Chile, which may stem from the scarce reference to adaptive management in laws or regulations, not to mention that the possibility of finding any cases of success this early seems remote, for that matter.

But the new act that creates the BPAA could be an opportunity to implement such a systematic adaptive approach. As with natural resources like fisheries and forests, the management of areas or species with the goal of increasing biodiversity may clearly benefit from adaptive management. Higher overarching goals when managing considerable areas of vast ecosystems are entirely possible. A tiering approach allowing for the application of adaptive management in smaller parcels to find optimal practices can easily be achieved. In most cases, the population decline of a species, or the decrease of its geographical cov-

110 National Forestry Corporation, *Manual para la planificación del manejo de las áreas protegidas del SNASPE* (Santiago, 2017), 19, http://www.conaf.cl/wp-content/files_mf/1515526054CONAF_2017_MANUALPARALAPLANIFICACI%C3%93NDELASAREASPROTEGIDASDELSNASPE_BajaResoluci%C3%B3n.pdf.

111 "Avanza elaboración del plan de manejo en Parque Yendegaia," *El Pingüino,* August 21, 2017, http://elpinguino.com/noticia/2017/08/21/avanza-elaboracion-de-plan-de-manejo-en-parque-yendegaia.

erage, is either caused or made worse by the lack of knowledge about that species. The success in management is not only tied to better outcomes in that sense, but the outcome itself is the very wellbeing of the species.

The use of adaptive management as a tool to improve the situation of natural resources in Chile has been scarce, and the same can be said with regard to biodiversity management. The National Biodiversity Strategy of 2003, one of the main policy instruments to provide for the protection of biodiversity in Chile, does not mention adaptive management.[112] The strategy was supposed to be updated in 2015, but this update never happened.[113] Therefore, adaptive management has not been included as a relevant strategy for biodiversity conservation within the policy objectives of the Chilean Executive Branch.

A brief mention of the concept is made in the Climate Change Biodiversity Adaptation Plan of 2014, where one of the recommendations is to increase the resiliency (or capacity to recover) of biodiversity to overcome future climate change effects. One of the proposed actions to reach that goal is to enable adaptive management through monitoring and the strengthening of assessment systems.[114]

The bill that will create the BPAA is currently being discussed in Congress. After being approved by the Environment Commission of the Senate on October 25th of 2017,[115] it passed to the Treasury Commission on November 23rd, where it remains ever since. The original project of the bill does not mention adaptive management, but it provides for general management authority that may give the agency a degree of discretion to apply experimental approaches in management practices. The BPAA is given the authority to prepare, execute and coordinate the implementation of plans to recover, conserve and manage species and threatened ecosystems.[116]

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112 National Commission for the Environment, "Estrategia nacional de biodiversidad, diciembre, 2003," accessed November 17, 2018, https://www.cbd.int/doc/world/cl/cl-nbsap-01-es.pdf.

113 See *supra* note 81.

114 Department of the Environment, "Climate Change Adaptation Plan for Biodiversity," 9, available at http://www.mma.gob.cl/1304/articles-55879_Plan_Adaptacion_CC_Biodiversidad_Final.pdf.

115 Ministry of Environment, "Comisión de Medio Ambiente del Senado aprueba en forma unánime proyecto que crea el Servicio de Biodiversidad y Áreas Protegidas," accessed November 17, 2018, http://portal.mma.gob.cl/comision-de-medio-ambiente-del-senado-aprueba-en-forma-unanime-proyecto-que-crea-el-servicio-de-biodiversidad-y-areas-protegidas/.

116 Bill No. 9404-12, June 18th, 2014, First Constitutional Procedure (Chile), at 16, http://www.senado.cl/appsenado/templates/tramitacion/index.php?boletin_ini=11.175-11#.

All BPAA actions need to enable the general objectives of the NSWPA, which are: (i) to ensure the conservation of a representative sample of the national biodiversity; (ii) to improve the representativeness and the management efficiency of inland and aquatic ecosystems, and of species and varieties, in the National System; and, (iii) to encourage the integration of the ecosystem services provided by protected areas in national, regional and local development strategies. All protected areas will need to have a mandatory management plan, which must be consistent with the protection objectives of the area.[117] The bill allows the BPAA to authorize activities within protected areas that have a management plan, but only with the objectives of ecotourism, scientific research, and education.[118]

Though not considered in the initial project, adaptive management was introduced during the Congressional discussion. The Secretary of Environment, representing the Government and its improved vision of the project, explained that the management plans for the protected areas will incorporate scientific and technical criteria, will have an adaptive character and their content will need to be consistent with the category, the object and the protection goals of the area.[119]

Additionally, the representative of the Environmental NGO "Así Conserva Chile" argued that the national community should be able to manage all national ecosystems through adaptive management, advocating also for a form of ecosystem management based on scientific research and permanent monitoring. The representative complained that the bill should determine which institutions would be in charge of scientific research.[120]

The definite impulse of adaptive management in the bill is concretized by the additions and amendments proposed by the government in December, 2016. The document submitted by the Executive Branch to Congress includes two provisions that consider adaptive management:

- **Definition for management plan:** the new definition considers management plans as an instrument to set goals, principles, objectives, criteria, measures, time-lapses and responsibilities for the adaptive management of biodiversity at the level of genes, species and ecosystems (article 3(n)). [121]

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117 Ibid., 18.

118 Ibid., 40.

119 Bill No. 9.404-12, First report from Environment and National Assets Commission, 155 (Jan 6, 2015) http://www.senado.cl/appsenado/templates/tramitacion/index.php#.

120 Ibid., 56.

121 Bill No. 9.404-12, Executive Motion with Modifications of the Bill, 5 (Nov 2, 2016) http://www.senado.cl/appsenado/templates/tramitacion/index.php#.

- **Ecological restoration plans:** the BPAA will determine the areas that contain deteriorated ecosystems and shall prepare ecological restoration plans for such areas. These plans shall include restoration measures or actions which can either be active or passive; restoration goals and objectives; location of the ecosystems subject to restoration; degraded components; threats that have caused the degradation and the requirements to eliminate or limit them; the estimated period to implement them; and the design of monitoring and follow-up measures, including pointers to assess the effectiveness of the measures and actions, and an estimation of related costs, in a frame of adaptive management (article 34).[122]

Therefore, in its current form, the bill expressly provides the BPAA with authority to employ adaptive management both in management plans for protected areas and in ecological restoration plans. In these circumstances, the understanding of adaptive management is of great importance for two reasons. The first reason is that, under Chilean law, the Executive Branch may later exercise its regulatory authority to pin down and further elaborate the requirements to apply adaptive management, without exceeding the boundaries of the statutory mandate. The second reason is that, with a pending discussion still taking place in the Chilean Senate, there may still be more amendments and additions to the bill that can further elaborate the authority of the BPAA to apply adaptive management.

b. How the BPAA should use adaptive management to learn about biodiversity

As discussed previously, there are certain key elements that ensure the proper use of adaptive management. With a better understanding of the different uses of adaptive management in the Chilean law, and after reviewing the specific treatment that the BPAA bill gives to adaptive management, it is possible to draw some ideas about the direction that the new agency can take when using this modern tool, and also with regard to the limits that need to be considered.

The BPAA bill displays the hallmarks to provide an organic public lands management statute.[123] The systemic purpose of the BPAA bill is to unify the so far dispersed NSWPA — a group of numerous protected areas, each of them classified under different categories of protection established in dispersed legislation —, into a coherent system,[124] providing also for comprehensive planning. The authority of the BPAA ought to be interpreted within the

122 See *supra* note 79, 29.

123 See *supra* note 80, 510.

124 Ibid., 516.

broader jurisdiction of the Department of the Environment, which has general authority to determine policy objectives and planning. The BPAA is charged with the execution of public policy, plans and programs dictated by the Secretary of Environment that establish basic criteria and preventive measures to favor the recovery and conservation of hydric and genetic resources, flora, fauna, habitats, landscapes, ecosystems and natural spaces, especially the frail and degraded among them.[125]

All managed units under BPAA authority need to have a management plan. These plans are being defined by the bill as the regulatory framework for the protected area, aiming at their adequate handling and at defining the activities that are allowed or banned within it.[126] The uses established in the management plans must comply with a compatibility standard,[127] as they need to show coherence with the purposes and designated uses that are expressly determined for each protected area.[128] Furthermore, Article 74 of the bill allows the BPAA to establish a Manager for each protected area, which will have the authority to enforce the management plan and to assess the performance of rangers and other officers, among other functions.

As such, the explicitly stated goals and measurable indicators of progress that enable proper adaptive management should be present in this planning function of the BPAA and the Secretary of Environment, requiring to first set and explicitly regulate the possible goals for all uses of adaptive management in the context of biodiversity management. In this way, they enhance accountability by forcing the managers to explain how they expect adaptive management to help them achieve those goals.[129] In principle, the goals should relate, at least partially, to the overall objectives of reducing uncertainties and learning about the best management practices that enable population growth and overall representativeness of genes, species and ecosystems nationwide.

Of course, these policy determinations are left to the Secretary of Environment: the overarching goal of adaptive management as a tool to reduce uncertainty over time is not formally acknowledged by the BPAA, and as such, references to adaptive management

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125 See *supra* note 116, 32. The provision actually mandates the BPAA to execute public policy, plans and programs defined in Article 70 (i) of the GBEA, which in turn establishes one of the numerous functions that are within the scope of authority of the Secretary of Environment.

126 Chilean Senate, Comparative Table – Bill No. 9404-12 as passed by Environmental Committee, November 21, 2017, 116, http://www.senado.cl/appsenado/index.php?mo=tramitacion&ac=getDocto&iddocto=2445&tipodoc=compa.

127 See *supra* note 80, 457.

128 See *supra* note 126, 94 *et seq* (Articles 57–67).

129 See *supra* note 12, 1461.

are still lacking substance. These objectives could be laid down by the BPAA under the current statutory language — management plans are explicitly enabled to establish principles —, [130] but the generic treatment of adaptive management could be improved by a more specific policy orientation.

The decision-making process of the BPAA seems open enough to provide for iteration. Under the general legal framework of the Chilean Administrative Procedure Act of 2003 (APA),[131] all administrative agencies can generate conditions for repetitive interaction and public participation within any procedure, as long as the acts are somewhat formalized.[132] The proposed bill does require the systematic monitoring of outcomes and impacts. Article 26 determines a general duty regarding biodiversity monitoring, with the purpose of generating systemic information about biodiversity, which will be publicly available in a biodiversity information system.[133] Therefore, the information about the outcomes of management practices will be available. In spite of this, exactly how this information will be reassessed through feedback loops for continuous and systematic learning is still to be determined. The fact that the information is available to the public determines an important role of stakeholders in ensuring the BPAA responds to the data.

These notions can also be tied to a much more general risk that accompanies all kinds of statutory architecture: if general concepts are only stated within the bill and there seems to be a lack of substantive criteria with regard to adaptive management, then the concepts can just provide some general pretext or work as a hollow shell to justify inaction in the face of uncertainty.[134] In its current abstract use, this seems to be a risk, as the BPAA is instructed to consider adaptive management when crafting two very important instruments. The bill generally bestows an important part of management and decision-making to the discretion of the agency, but no provision further explains what adaptive management means in the context of conservation and restoration of biodiversity.

130 See *supra* note 126, 16 (Article 3, no. 21).

131 Law No. 19880, May 29, 2003, O.G. (Chile).

132 As a result of the interaction of a principle of written expression, which requires all administrative action to be expressed in written form (Article 5, APA), and the authority to require as many reports as deemed necessary to give a ruling (Article 37, APA), agencies can develop a fully ground-based public record.

133 See *supra* note 126, 50.

134 See *supra* note 8, 5.

V. Conclusions

When it comes to environmental protection, adaptive management is a double-edged sword that can greatly improve our knowledge through experimentation, but, if left unchecked, it can also open the door for irresponsible decision-making. As a risky and resource-intensive strategy, adaptive management should only be allowed when pursuing explicitly stated goals, in an iterative decision-making context, with a capacity for data gathering and feedback, and always identifying risks and uncertainties. The overarching goal always needs to be the reduction of uncertainties.

Adaptive management has been extensively applied in the United States, with few success stories. Nevertheless, the approach is still playing out an important role in major aspects, helping to deal with the impacts of the colossal water projects connecting California, improve the biotic conditions of the Columbia River, and obtain answers for a better Northwest Forest Management Plan. In Chile, the concept is only beginning to emerge, with discrete applications in fishing and forestry management, and will probably continue to unfold in numerous fields.

Biodiversity management regulation can benefit from applying adaptive management. In its current form, the BPAA bill would create organic statutes for protected areas management and biodiversity conservation. Analyzing the possibility that the BPAA uses adaptive management in this context, these are the main conclusions:

- The existing forms of adaptive management of natural resources in Chile could evolve towards an ecosystem approach that privileges biodiversity, but this seems unlikely for two main reasons. First, the agencies in charge of natural resources respond to predominantly exploitation-oriented statutory mandates, which conflict with an internal division of functions.[135] Second, the future creation of the BPAA would require the transference of authority related to biodiversity conservation from natural resource management agencies, which would eventually thwart the efforts of implementing an ecosystem approach

[135] Eric Biber, "Too Many Things to Do: How to Deal with the Dysfunctions of Multiple-Goal Agencies," *Harvard Environmental Law Review* 33, no. 1 (2009): 6. Note that part of the dilemma of multiple- goal agencies lies in that they will have systematic incentives to privilege certain goals over others, specifically, to privilege goals that are easily measured over conflicting goals that are difficult to measure.

- The inherent risk of any loose reference to adaptive management in a statutory provision is related with the commandeering nature of traditional biodiversity conservation measures. To provide a general frame that will allow feedback loops and adaptation can seriously impair the effectiveness of substantive regulations and add unquantified risks to management practices. Also, the acknowledgement of uncertainty as a starting point can create incentives to avoid costly front-end information gathering by delaying data gathering until feedback loops fill in the gaps.

- In the BPAA bill, the use of adaptive management is specifically considered for recovery plans and management plans, which will determine the measures and regulations that will allow for the recovery and/or conservation of biodiversity.[136] As damaged ecosystems go beyond the boundaries of protected areas, recovery plans can extend beyond the NSWPA. Both kinds of plan can be issued by the BPAA and enforced by individually appointed managers. The bill is lacking further content in defining what adaptive management is and how it should be used, opening chances for its misuse, and thus creating a potential risk for the diversity of ecosystems, species and genes found both within and beyond the NSWPA.

- The aforementioned risk of adaptive management can be faced by a proper use of the policy and planning authority of the Secretary of Environment,[137] which could determine either via general policy statements or rule-making the specific adaptive management requirements and methodologies that can be accepted in the different categories of protected areas. Also, all BPAA action needs to respect the underlying official classification of species.

- In general terms, the bill systematizes the categories of protected areas and determines their different characteristics, along with a set of purposes and allowed and banned uses.[138] The regulation of a particular protected area by issuing a management plan needs to be compatible with these substantive statutory criteria. This seems to impose natural limits to the use of adaptive management, which will always need to be justified and related to these criteria. This is not the case, however, of recovery plans, which can extend beyond the boundaries of protected areas. The lack of statutory criteria and a generic reference to adaptive management for recovery plans appear as the greatest risk of misuse of adaptive management. ■

136 See *supra* note 126, 61.

137 See *supra* note 116, 32.

138 See *supra* note 126, 94.

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BIBLIOGRAPHY

- Aylwin, José, Nancy Yáñez and Rubén Sánchez. "Pueblo Mapuche y Recursos Forestales en Chile: Devastación y Conservación en un Contexto de Globalización Económica." IWGIA Citizen Watch, White paper, 2013. https://www.iwgia.org/images/publications/0625_Pueblo_mapuche_y_recursos_forestales_en_chile.pdf.
- Biber, Eric. "Too Many Things to Do: How to Deal with the Dysfunctions of Multiple-Goal Agencies," *Harvard Environmental Law Review* 33, no. 1 (2009): 1–63.
- ———— . "Adaptive Management and the Future of Environmental Law." *Akron Law Review* 46 (2013): 933–962.
- Doremus, Holly. "Adaptive Management, the Endangered Species Act, and the institutional Challenges of "New Age" Environmental Protection." *Washburn Law Journal* 41 (2001): 50–89.
- ———— . "Adaptive Management as an Information Problem." *North Carolina Law Review* 89, no.5 (2011): 1455–1498.
- Doremus, Holly, William L. Andreen, Alejandro Camacho, Daniel A. Farber, Robert L. Glicksman, Dale D. Goble, Bradley C. Karkkainen, Dan Rohlf, A. Dan Tarlock, Sandra B. Zellmer, Shana Campbell Jones and Ling-Yee Huang. "Making Good Use of Adaptive Management." Center for Progressive Reform, White paper no. 1104, 2011. http://progressivereform.org/articles/Adaptive_Management_1104.pdf.
- Fischman, Robert L. "The National Wildlife Refuge System and the Hallmarks of Modern Organic Legislation." *Ecology Law Quarterly* 29 (2002): 457–622.
- Frêne, Cristián and Mariela Núñez. "Hacia un nuevo Modelo Forestal en Chile." *Revista Bosque Nativo* 47 (2010).
- Karkkainen, Bradley C. "Whither NEPA?" *New York University Environmental Law Journal* 12 (2004): 333–344.

- McCook, Laurence J., Tony Ayling, Mike Cappo, J. Howard Choat, Richard D. Evans, Debora M. De Freitas, Michelle Heupel, Terry P. Hughes, Geoffrey P. Jones, Bruce Mapstone, Helene Marsh, Morena Mills, Fergus J. Molloy, C. Roland Pitcher, Robert L. Pressey, Garry R. Russ, Stephen Sutton, Hugh Sweatman, Renae Tobin, David R. Wachenfeld, and David H. Williamson. "Adaptive management of the Great Barrier Reef: A globally significant demonstration of the benefits of networks of marine reserves." *Proceedings of the National Academy of Sciences of the United States of America* 107, no. 43 (2010): 18278–18285.
- Moreno, Andrea and Carmen Revenga. "The System of Territorial Use Rights in Fisheries in Chile." *The Nature Conservancy* 8 (2014), https://www.nature.org/media/chile/system-of-TURFs-in-Chile.pdf.
- Ruhl, J.B. "Thinking of Environmental Law as a Complex Adaptive System: How to Clean Up the Environment by Making a Mess of Environmental Law." *Houston Law Review* 34, no. 4 (1997): 933–1002.
- Ruhl, J.B. and Robert Fischman. "Adaptive Management in the Courts." *Minnesota Law Review* 95 (2010): 424–484.
- Stankey, George H., Bernard T. Bormann, Clare Ryan, Bruce Shindler, Victoria Sturtevant, Roger N. Clark and Charles Philpot. "Adaptive Management and the Northwest Forest Plan, Rhetoric and Reality." *Journal of Forestry* 101, no. 1(2003): 40–46.
- Walters, Carl J. and C.S. Holling. "Large-Scale Management Experiments and Learning by Doing." *Ecology* 71 (1990): 2060–2068.