

Applicability of management guidelines for surfing resources in California

By

Edward A. Atkin,¹ Dan R. Reineman,² Jesse Reiblich,³ and David L. Revell⁴

1) *eCoast Marine Consulting and Research, 18 Calvert Road, Raglan, Aotearoa New Zealand. University of Waikato, Knighton Road, Hamilton 3240, Aotearoa New Zealand; e.atkin@ecoast.co.nz, +64 2108 200 821*

2) *Environmental Science and Resource Management Program, California State University Channel Islands, 1 University Drive, Camarillo, California 93012, USA*

3) *Virginia Coastal Policy Center, William & Mary Law School, Williamsburg, Virginia, 23187 USA*

4) *200 Washington Street, Suite 201, Santa Cruz, California 95060 USA*

ABSTRACT

Surf breaks are finite, valuable, and vulnerable natural resources, that not only influence community and cultural identities, but are a source of revenue and provide a range of health benefits. Despite these values, surf breaks largely lack recognition as coastal resources and therefore the associated management measures required to maintain them. Some countries, especially those endowed with high-quality surf breaks and where the sport of surfing is accepted as mainstream, have recognized the value of surfing resources and have specific policies for their conservation. In Aotearoa New Zealand surf breaks are included within national environmental policy. Aotearoa New Zealand has recently produced Management Guidelines for Surfing Resources (MGSR), which were developed in conjunction with universities, regional authorities, not-for-profit entities, and government agencies. The MGSR provide recommendations for both consenting authorities and those wishing to undertake activities in the coastal marine area, as well as tools and techniques to aid in the management of surfing resources. While the MGSR are firmly aligned with Aotearoa New Zealand's cultural and legal frameworks, much of their content is applicable to surf breaks worldwide. In the United States, there are several national-level and state-level statutes that are generally relevant to various aspects of surfing resources, but there is no law or policy that directly addresses them. This paper describes the MGSR, considers California's existing governance frameworks, and examines the potential benefits of adapting and expanding the MGSR in this state.

Surf breaks are discrete coastal locations where waves break in a manner that is conducive to the sport of surfing (Walker *et al.* 1972; Walker 1974; Mead 2000); they are finite, valuable, and vulnerable natural resources (Lazarow *et al.* 2008; Scarfe *et al.* 2009a; 2009b; Reineman *et al.* 2017; Mead and Atkin 2019) that can span very large areas (Mead 2000; Mead and Black 2001a,b; Mead *et al.* 2003; Atkin and Greer 2019), and are often little understood due to a lack of site specific data (Atkin *et al.* 2017).

Managing surf breaks requires careful consideration of a variety of factors that operate across a range of spatial and temporal scales, and transcend beyond just the breaking of waves, including: unique coastal geomorphology; coastal, estuarine and riverine processes; coastal access; water quality; ecosystem processes; social/cultural dynamics; and almost always, episodic metocean phenomena (Corne

2009; Reineman *et al.* 2017; Reineman and Ardoin 2018; Atkin *et al.* 2019; Reiblich and Reineman 2019). As coastal resources, surf breaks are susceptible to a variety of alterations, both natural and anthropogenic, that can impact surfing wave quality and/or surfing resource use and enjoyment.

The attention surf breaks receive in resource management varies at local, national and international scales (Farmer and Short 2007; Short and Farmer 2012; Reiblich 2013; Reiblich and Reineman 2019; Scheske *et al.* 2019; Orchard *et al.* 2019; Orchard 2020). Some countries such as Peru, Australia, and Aotearoa New Zealand (hereafter Aotearoa), those especially endowed with high-quality surf and where the sport of surfing is mainstream, have provided management and legal frameworks for the conservation of surfing resources.

KEYWORDS: Coastal, environmental, governance, policy, legislation, surf breaks.

Manuscript submitted 24 March 2020, revised & accepted 17 July 2020.

Aotearoa was the first country to include surf breaks within a legal framework. Orchard (2020) provides a detailed description of the management strategy developed in Aotearoa. In summary, under the Resource Management Act 1991 (RMA), a ground-breaking piece of legislation that prioritized environmental objectives through the promotion of sustainability, all regulatory authorities are subject to the New Zealand Coastal Policy Statement 2010 (NZCPS; Department of Conservation 2010). Several sections of the NZCPS are directly or indirectly relevant to surfing resources. Policy 16 of the NZCPS identifies 17 *Surf Breaks of National Significance* (SBNS) that are protected by *ensuring that activities in the coastal environment do not adversely affect the surf breaks; and avoiding adverse effects of other activities on access to, and use and enjoyment of the surf breaks*. Policy 13, *Preservation of natural character*, and Policy 15, *Natural features and natural landscapes*, in combination with Policy 16, have led to a surfing resource management setting in Aotearoa that transcends management of just the SBNS (Perryman, 2011; Perryman and Orchard 2013; Skellern *et al.* 2013; Atkin *et al.* 2017; Mead and Atkin 2019; Orchard *et al.* 2019).

Despite the NZCPS, there are numerous cases of surf breaks being affected by activities in the coastal environment (Skellern *et al.* 2013; Atkin *et al.*, 2017; Atkin, 2019; Atkin *et al.*, 2019a; Mead and Atkin 2019). In many of these cases, a lack of data and clear methodologies led to

drawn out disputes with resource managers struggling to implement the purpose of the RMA and effectively uphold the intent of the NZCPS (Atkin, *et al.* 2017). In 2018, *Management Guidelines for Surfing Resources* (MGSR; Atkin *et al.* 2018; 2019a) were published in Aotearoa to help clarify the regulations and with the goal of reducing disputes between community groups, development interests, and coastal industries. The NZCPS provides a description of a *surf break*, based on geomorphic and physical parameters. However, managing surf breaks requires careful consideration of a variety of factors, including physical characteristics that can be spatially removed from the location of the surf break itself (Atkin and Greer 2019; Atkin *et al.* 2019b; Mead and Atkin 2019; Orchard *et al.* 2019). Atkin *et al.* (2018; 2019a) use the term *surfing resources* in Aotearoa, noting that components such as the rarity and uniqueness, naturalness, level of use, economic value, and historical and cultural associations all contribute to the surfing experience (Orchard *et al.* 2019), in addition to physical processes and attributes (the surf break itself). The use of “resource” is in alignment with terminology used in legislative and regulatory frameworks managing other asset classes, including, for example, fisheries and minerals.

In the United States, surfing first spread from its Polynesian origins in the State of Hawaii to Santa Cruz in California in the late 1880s, and then beyond in the early 20th century (Warshaw 2010). Surfing now occurs in every coastal state in the U.S., including the Great Lakes states. In these, and in some land-locked states, hydraulic jumps or standing waves in rivers are also surfed. While it was considered a fringe activity and counterculture in the 1960s, surfing has now

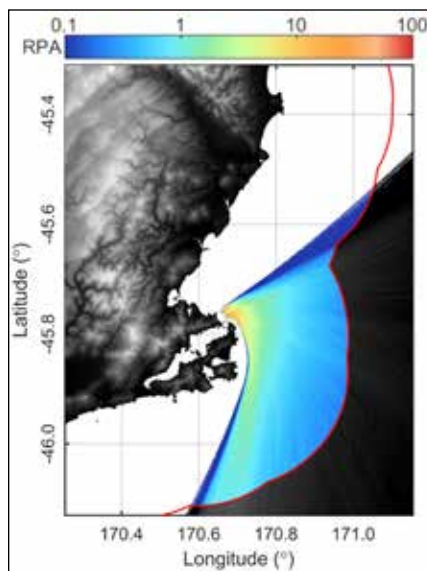


Figure 1. Relative Percentage Activity (RPA) to show swell corridor footprint for Aramoana, Otago, South Island, Aotearoa including the territorial sea limit (red line).

entered the national consciousness, with an international professional competition circuit, a multibillion-dollar surf industry, intensive travel and recreation opportunities, and it has shaped the cultural identities of coastal communities. Despite the consistent growth and popularity of surfing, management of surfing resources in the U.S. is virtually non-existent; the result is surfing resources, or accessibility to them, becoming threatened, degraded, or destroyed (e.g. Killer Dana and Trestles in Southern California and Ruggles in Rhode Island; Nelsen *et al.* 2013).

While the United States lacks the legal foundation and specific policy framework adopted by Aotearoa, a variety of laws at the national and state level are relevant to surfing resource management. This paper describes the MGSR, considers California’s existing governance frameworks,

and examines the potential benefits of adapting and expanding the MGSR in this state.

MANAGEMENT GUIDELINES FOR SURFING RESOURCES

The *Management Guidelines for Surfing Resources* (MGSR; Atkin *et al.* 2019a) were developed over the course of a three-year research project (Atkin *et al.* 2017) that leveraged local knowledge collated through stakeholder engagement, detailed reviews of existing literature, and the collection of social and physical data. Table 1 provides the primary section headings of the MGSR. The MGSR were written to be accessible to a broad audience, including stakeholders and decision makers, but are underpinned by detailed technical information and supporting appendices.

There is crossover between the practical steps in *Section 2: Guidelines for Authorities* and *Section 3: Guidelines for Resource Users and Consent Applicants*. Here these steps are presented jointly.

1. Identify surf breaks

The identification of surf breaks reduces disputes and increases awareness around surf break management and accessibility (Department of Conservation 2017a, b). The process for effective identification of surf breaks should include:

- A thorough literature review, likely to include written surf guides and web based resources;
- Meaningful stakeholder engagement with interviews, workshop sessions, and/or surveys, that should aim to:
 - Understand surf break parts/sections and basic dynamics, including common and colloquial names,
 - Delineate the Surf Break Area (SBA) (Atkin and Greer 2019),
 - Understand access routes and points to the SBA,
 - Discuss observed changes in the coastal environment considered relevant to the surfing resource;
 - Compilation of the information in a database, along with additional information such as photographic evidence, that can be freely and readily accessible to authorities and the public;
 - Understanding the significance of surfing resources in a management context (Orchard *et al.* 2019).

2. Swell corridors

The NZCPS defines a swell corridor as “the region offshore of a surf break where

Table 1.

Abridged table of contents of Atkin *et al.* (2019a).

Section 1.	Introduction
Section 2.	Guidelines for Authorities
Section 3.	Guidelines for Resource Users and Consent Applicants
Section 4.	Additional Information for Users
Section 5.	Summary and Outlook
Appendix A.	Physical Surf Science
Appendix B.	Surfing Resources
Appendix C.	Engagement with Māori
Appendix D.	Remote Sensing, Classification and Management Guidelines for Surf Breaks of National and Regional Significance
Appendix E.	Consent Conditions and Monitoring

ocean swell travels and transforms to a 'surfable wave.'" Spatially defining a SBA's swell corridor and producing a georeferenced feature (Atkin and Greer 2019) creates a planning tool that allows users to assess whether activities could block or modify waves travelling through the swell corridor of a surf break; ultimately this aids the resource management decision making process. Proposed activities falling within the bounds of a swell corridor should trigger further investigation or detailed assessments. Figure 1 provides an example from Atkin and Greer (2019) who used Relative Percentage Activity to describe the swell corridor at seven surf breaks in Aotearoa. This method highlights the offshore areas of importance to the functionality of the surf break.

3. Threats and risk assessment

The threat and risk assessment process reveals the potential for impacts to surfing resources. A risk assessment requires an understanding of all the elements that contribute to the use and enjoyment of a surfing resource. The *Surf Break Sensitivity* rating (Table 2) draws on technical literature to provide a tool that allows for an evaluation of a surf break's sensitivity. It categorizes surf breaks using geomorphological categories (Mead 2000; Scarfe 2008; Atkin *et al.* 2019a) and considers both the size and mobility of the material that comprises the seabed and the reliance of surfing wave quality on any sediment transport regime. The sensitivity assessment ties into the *Likelihood of Impact* assessment (Table 3). The *Consequence of Activity* (Table 4) ratings are framed around NZCPS terminology. The Likelihood and Consequence ratings are used to establish a risk rating (Table 5).

Examples of applying the risk assessment methodology for the cases of Mangamaunu and Takapuna in Aotearoa are presented in Table 6. At Mangamaunu, a SBNS, a rock revetment with reclamation was proposed for construction along the foreshore adjacent to the point break. The consenting process for this proposal was fast tracked under emergency legislation (Rennie 2018; Rennie *et al.* 2018). Applying the threat and risk assessment methodology indicated that the risk rating for this activity would be extreme. In contrast, at Takapuna the risk rating for a fiber optic cable installation, requiring trenching through the intertidal zone and offshore, was found to be low.

Table 2.

Surf break sensitivity rating tool replicated from Atkin *et al.* (2019a).


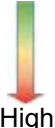
Surf break type	General material size	Wave quality reliance on sediment transport regime
1 Rock ledge; reef		
2 Reef; point		
3 Point; beach; delta		
4 Beach; delta		
5 Delta		

Table 3.

Likelihood of impact rating tool replicated from Atkin *et al.* (2019a).

Likelihood of impact	Category	Definition
Very likely (permanent/frequent)	A	Will obviously occur frequently and/or permanently, activity being undertaken in SBA; examples exist of impact; and/or a sensitivity rating: 5
Likely (frequent)	B	Potential for activity to occur frequently, activity being undertaken in or near to SBA; and/or similar examples exist; and/or sensitivity rating: 3-4
Moderate (occasional)	C	Potential for activity to occur, activity being undertaken near to SBA or within catchment; and/or examples exist; and/or sensitivity rating: 2-3
Unlikely (remote)	D	Activity unlikely to occur, activity being undertaken outside of catchment and/or embayment; no examples exist; and/or sensitivity rating: 1-2
Highly unlikely (rare)	E	Activity unlikely to occur, activity being undertaken outside of catchment and/or swell corridor no examples exist; and/or sensitivity rating: 1

4. Surfing resources in policy and plans

In Aotearoa, resource management is implemented by subnational authorities (regional, district, and city councils) through the drafting of policy instruments and plans (e.g. Regional Coastal Plan). Incremental reviews of policy instruments and plans by authorities provide the opportunity to incorporate surfing resource relevant terminology.

5. Baseline studies and monitoring

Sustainable management of resources, especially those as dynamic as surf breaks, relies on an understanding of the resource itself. A thorough understanding of the resource underpins adaptive resource management and the development of the MGSR (Atkin *et al.* 2017). Establishing a long-term environmental baseline is critical to understanding natural variation and both differentiating it from and detecting, managing and mitigating,

anthropogenic change. Furthermore, a thorough understanding hedges against the risk of shifting baseline syndrome for these resources (Reineman *et al.* 2017).

Datasets that benefit baseline studies and ongoing monitoring (Atkin *et al.* 2019a) include, but are not limited to: collation of local and existing knowledge (via stakeholder engagement and literature reviews); remote video imaging systems; hydrographic surveys (bathymetry); and, Geographical Positioning System (GPS) data of surfers whilst riding and accessing waves (Borrero *et al.* 2019). Specific aims of baseline studies and ongoing monitoring are to establish wave breaking characteristics such as peel angle (Walker *et al.* 1972; Hutt *et al.* 2001; McIntosh *et al.* 2018), breaking intensity (Mead and Black 2001c), ride lengths (Mead and Borrero 2017), access points (Reiblich and Reineman 2019), functional components (Mead and Black 2001a, b), mechanics

Table 4.
Consequence of activity rating tool replicated from Atkin *et al.* (2019a).

Consequence of activity	Category	Definition	Example
Catastrophic	1	Permanent/irreparable damage to/loss of the whole surf break(s)	Occupation of SBA Major reclamation Port construction
Major	2	Activity permanently affects access to and/or enjoyment of a surfing resource; and/or activity results in on-going health and safety issues; and/or potential for physical changes to a large part of the SBA; and/or a permanent change to the natural character, aesthetic or wilderness attributes of the surfing resource.	Complete loss of access Reduced ride length Reduced wave quality Wastewater outfall Coastal protection works Coastal landscape altered by coastal development Turbid water
Significant	3	Activity temporarily affects, for sustained periods of time, access to and/or enjoyment of a surfing resource; and/or activity results in health and safety issues. No physical impacts	Contamination Regulated access Ski-lane
Minor	4	Activity temporarily affects access and/or enjoyment to a surfing resource for relatively short periods of time (e.g. <24 hours). No physical impacts	Beach closure for events

Table 5.
Risk rating tool modified from Atkin *et al.* (2019a) with consequence ratings on the top row and likelihood ratings in the first column.

	1	2	3	4
A	Extreme	Extreme	Extreme	High
B	Extreme	Extreme	High	Moderate
C	Extreme	Extreme	High	Low
D	Extreme	High	Moderate	Low
E	High	High	Moderate	Low

(Mead and Black 1999; Mead and Black 2001a,b,c; Atkin *et al.* 2019b; Mead and Atkin 2019) and any maintenance mechanisms (e.g. Liria *et al.* 2009; Atkin *et al.* 2013; Mead and Atkin 2019).

In summary, the MGRS provides a science-based, adaptive, stakeholder-engaged process for surfing resource management. Identifying surf breaks and their respective swell corridors provides the basis for conducting comprehensive threat and risk assessments of the impact a proposed activity poses to surfing resources and equips decision-makers with tools to aid the consenting process. Developing policy and planning documents that target surfing resource protection at multiple levels of government can provide adequate consideration and protection of the resource. Lastly, collecting baseline data on surfing resources establishes the critical checkpoint against which any future changes, natural or human-caused,

can be compared, guards against the risk of shifting baselines, and increases general and specific understanding of the resource.

U.S. FEDERAL SETTING

The U.S. lacks a comprehensive framework for ocean management and preservation (Crowder *et al.* 2006). Instead, a host of federal laws (greater than 100) and dozens of federal agencies all share complex and overlapping jurisdictions for different activities and resources in marine and coastal environments (U.S. Commission on Ocean Policy 2004). While several national-level statutes are generally relevant to various aspects of surfing resources, there is no national-level interpretation for how surfing resources should be managed.

No federal U.S. law standardizes the boundary between public trust tidelands, where recreational activities like surfing

are often protected by law, and private property areas above the waterline, where the public trust does not apply. In California and Florida, the private/public property boundary is Mean High Water (MHW) and therefore access to the near-shore is legally permissible. MHW is the 19-year average of high tide elevations. Oregon law is more expansive, featuring beaches that are accessible to the public up to the vegetation line (Oregon Beach Bill 1967). Maine allows property ownership down to the Mean Low Water Mark, and while Maine courts have relied on the public trust doctrine to protect fishing, hunting, and SCUBA diving, surfing resources are not offered protection (Reiblich and Reineman 2019).

The National Environmental Policy Act (NEPA) requires evaluation of the environmental effects of any federal governmental activity or action through environmental assessments and environmental impact statements. The review process considers impacts to biological, ecological, historical, cultural, archaeological, and other protected resources, as well as to water and air quality. Critically, the review allows for public comment and participation. NEPA provides the opportunity to challenge federal coastal activities that may impact surfing resources, such as breakwater and harbor construction (Oram and Valverde 1994).

Table 6.**Application of the risk assessment methodology for the cases of Mangamaunu and Takapuna.**

Site	Mangamaunu	Takapuna
Activity	Rock revetment and reclamation directly adjacent to surf break, in the SBA. Permanent change.	Trenching of telecommunications cable through intertidal zone and offshore. Temporary activity
Break type	Point Break	Beach and reef breaks
Seabed composition	Boulder/Sand	Sand and rock
Descriptive summary	Exposed, very high-quality points. Surf Break of National Significance. Multiple sections offering high performance maneuvers. Easily accessible. Wilderness value.	Sheltered beach and reef breaks. Inconsistent, poor to average wave quality, however highly valued and utilized urban surf break. Suitable for learners to competent surfers. Good facilities and access.
Surf break sensitivity	3	3
Consequence of activity	Major — 2	Minor — 4
Likelihood of impact	Very likely — A	Moderate — C
Risk rating	Extreme	Low

Section 303 of the Clean Water Act (CWA) regulates pollution of the waters of the U.S., including a discharge permit system, water quality standards, and the regulation of pollution loads on water bodies used for recreational activities. These CWA provisions aim to reduce pollution in waterways which offers downstream benefits to surfing resource users. CWA Section 404 limits dredging and filling of water bodies, including during projects such as breakwater construction which can threaten the integrity of a surf break (Reiblich 2013; Oram and Valverde 1994).

The National Historic Preservation Act (NHPA) is a federal law protecting structures and areas of historical and cultural significance. The NHPA provides a process for adding sites to a National Register of Historic Places, supervised by the National Park Service, and policies to “contribute to the[ir] preservation.” The NHPA was invoked in the case of Malibu’s Surfrider Beach, which was added to the National Register of Historic Places under the NHPA (Blum 2015) in 2018.

The Coastal Zone Management Act (CZMA) enacted in 1972 seeks to protect public access to, and the environmental quality of, the nation’s coastlines, including for recreational opportunities, though these protections are balanced against economic development. The CZMA provides states the right to review federal actions that can potentially impact a state’s coastline. Federal actions are evaluated by the state for consistency with the state’s own coastal protection laws. However, this “federal consistency review” is only

allowed prior to federal action (in states with approved coastal zone management plans) and cannot be initiated after the harmful action is underway. The CZMA incentivizes states to determine for themselves those resources and management priorities that are significant to their coasts through the development of state coastal plans.

CALIFORNIA STATE SETTING

In 2018, California declared surfing the “official state sport” with the passage of Assembly Bill 1782 (AB 1782). AB 1782 recognizes the historic, cultural, and economic significance of surfing in California and the role California has played in surfing globally. The bill identifies six “world-famous surf breaks” in California — Malibu, Trestles, Mavericks, Rincon, Steamer Lane, and Huntington — and notes surf events at Hermosa Beach, Manhattan Beach, Redondo Beach, Torrance, Huntington Beach and Mavericks. The bill does not, however, address the vulnerability of these or any other surf breaks, nor provide any policies or processes for their preservation or management.

California laws generally implement, and in most cases strengthen, their federal “parent” versions (Dana 2008) and this includes *inter alia* the California Environmental Quality Act (CEQA; state version of NEPA) and Porter-Cologne Water Quality Control Act (Porter-Cologne; state version of CWA).

The California Coastal Act (CCA) is the state’s implementing legislation for the CZMA. The CCA, enacted in 1976,

defines and guides management of the state’s Coastal Zone, with public access to the shoreline as its fundamental goal. The CCA protects “Coastal areas suited for water-oriented recreational activities that cannot readily be provided at inland water areas.” The CCA does not protect surf breaks specifically for surfing, however, the CCA’s precursors sought to do so. In 1972, the interim California Coastal Commission (CCC) completed the California Coastal Plan which identified surfing resources worthy of protection, including: Trestles, Steamer Lane, San Onofre, Cardiff Reef, Hollister Ranch, and Black’s Beach (California Coastal Zone Conservation Commissions 1975), and called for acquiring specific parcels for surfing and other recreational uses (e.g. Hammonds Meadow). This interim coastal plan was never adopted, and the final CCA does not include these provisions. The CCC has exercised its permitting authority (via Coastal Development Permits [CDPs]) for several surfing related purposes, including to protect surf break-relevant watersheds (e.g. blocking the Hwy 241 Toll Road extension to San Onofre State Beach upstream of the Trestles complex of surf breaks), to protect surfing-relevant access (e.g. opening the restrictive access measures at the Dana Point Strands), and to address gender equality in surfing (requiring the Mavericks surf contest organizers to admit female surfers as a condition of obtaining their event permit).

California’s Coastal Zone jurisdiction extends from 3 nm offshore to ~1,000 yards inland from MHW (though with

many deviations). Chapter 3, Article 2 of the CCA protects access to public trust tidelines and therefore access to many surfing locations. This part of the CCA also provides for other relevant amenities such as parking or showers but does not explicitly state the protection or management of surfing resources themselves. The Coastal Zone is managed by several state agencies including the CCC (open, Pacific coast), the Bay Conservation and Development Commission (San Francisco Bay), the California State Lands Commission (CSLC; offshore below mean high water), and the State Coastal Conservancy (SCC; non regulatory).

The location of MHW determines the jurisdiction of these state agencies, California's local city and county governments and the boundaries between public trust and (potentially) private property). The CCC has the primary coastal management regulatory authority for land above MHW within the Coastal Zone (of the open coast) and evaluates projects based on consistency with the CCA. Below MHW, the CSLC also regulates subtidal and intertidal lands and manages these areas for public trust uses. In some areas, CSLC grants public trust authority to other entities, such as city or port authorities for navigation, commerce and fishing purposes. Under permit by CSLC, grantees can develop infrastructure suitable to those uses (e.g. jetties or wharves).

Below MHW, the CCC retains coastal development permit authority. Above MHW, and outside of the CCC area of original jurisdiction, local governments (cities and counties) can set coastal management policy and obtain permit-granting authority, provided that they prepare a Local Coastal Program (LCP) under the CCA and have it certified by the CCC. Furthermore, the CCC provides guidance and support to local governments as they prepare and update their LCPs; in 2018, for example, the CCC released updated Sea Level Rise (SLR) Policy Guidance, which acknowledges the vulnerability of surf breaks by calling for "*policies to promote research on sea level rise impacts to recreational activities like surfing*" (CCC 2018).

The Marine Managed Areas Improvement Act (MMAIA) of 2000 defines six marine protected area categories: state marine reserve; state marine park; state marine conservation area; cultural

preservation area; recreational management area; and water quality protection area. Each category addresses specific resources that are generally focused on marine biota. Currently, there are not any marine protected areas that specify surf breaks. However, the terminology used in describing how State Marine Conservation Areas, State Marine Parks, State Marine Cultural Preservation Areas and State Marine Recreational Management Area may be established is extremely relevant to surfing resources. For example, State Marine Conservation Areas may be established for the preservation of "*outstanding or unique geological features.*" High-quality surf breaks are atypical on most coastlines, and the geomorphology of these surf breaks are likely comprised of unique geological features. State Marine Parks may be established to preserve areas with geological and recreational value. One of the goals of establishing State Marine Cultural Preservation Areas and State Marine Recreational Management Areas is to protect "*sites of historical, archaeological, or scientific interest*" and "*provide, limit, or restrict recreational opportunities... while preserving basic resource values for present and future generations,*" respectively. Many of California's surf breaks meet several, if not all, of these criteria.

LOCAL-LEVEL COASTAL MANAGEMENT IN CALIFORNIA

At the sub-state level, local jurisdictions have limited authority over management of coastal resources. Under the Coastal Act, local governments are charged with preparing and implementing LCPs. Once the CCC has certified an LCP, local governments assume responsibility for permitting. The jurisdiction of LCPs is limited to MHW and above. LCPs are required to be periodically updated to remain effective (CCC 2013) and amendments to LCPs are evaluated under the Coastal Act. The state guidance on updates encourages local governments to more thoroughly consider the threats posed by sea level rise along with preferred adaptation strategies along shorelines.

The CCC's 2013 LCP Update Guide provides the information under 11 sections. All sections of the guide are relevant to surfing resources and/or describe activities that can impact surfing resources. LCPs are stated as essential to reaching the goal of maximum public

access to coastal and public recreation areas. The LCP Update Guide recommends areas to be addressed in an LCP, the following points within the guide relate to surfing resources:

- Full mitigation of the impacts of development on public recreation (Section 1).
- Inventories of recreational areas and zoning for adequate recreation (Section 2).
- Watershed management policies that identify potential pollutant sources and changes in watershed hydrology that may adversely impact coastal resources (Section 3).
- Mapping, inventories and monitoring of Environmentally Sensitive Habitats and Other Natural Resources (Section 4).
- Measures to preserve the special values and character of the community (Section 7).

The last point comes from Section 7. Scenic & Visual Resources. Surf breaks have aesthetic values that are recognized by those both in and outside the surfing community (Atkin *et al.* 2019a).

Surf breaks in Malibu, CA and Santa Cruz, CA were designated as World Surfing Reserves (WSRs) in 2010 and 2012, respectively. The WSR designation is awarded by Save The Waves Coalition, an international environmental not-for-profit organization. The designation offers no formal legislative protection; it is however a community driven program that acknowledges the international significance of surfing resources. Local Stewardship Councils (formed through the WSR designation process) have been shown to catalyze dialogue, and eventually action, in formal governmental settings. For example, in Santa Cruz, a working group facilitated by Save the Waves in cooperation with the city and other stakeholders was formed to address chronic poor water quality issues at Cowells Beach. In 2020, after substantial efforts to track and address sources of pollution, Cowells was removed from a statewide list of beaches with poor water quality. The CCC passed a resolution supporting the designation of WSRs in California (CCC 2010). As of March 2020, dialogue with the City of Santa Cruz has included consideration for: the mapping of specific surf breaks; identification of optimal and marginal conditions through local knowledge interviews; the application of local knowledge to interpreting the impact of coastal

Table 7.**Linkages between practical MGSR components and legislation and/or policies in California. The first MGSR component, 1. Identify Surf Breaks, is broken into four subcomponents**

Component	Policy	Relevance in California
1. Identify surf breaks — general	Assembly Bill 1782 CCA>CCC>LCP	Specifically references 11 surfing locations in CA. Specify appropriate location, type, and scale of new or changed uses of land and water.
	NRHP	Identifies cultural/historical areas and provides for their consideration if an impact is pending; used to designate Surfrider Beach, Malibu, CA.
	WSR	Designations are made by an NGO and lack formal govt. protections.
1. Identify surf breaks — access	Public Trust Doctrine	Protects access to water, tidelands, and resources below MHW; codified generally in Coastal Act.
	Coastal Act CWA/ Porter-Cologne	Enshrines protection of public coastal access for recreational, other purposes Works to maintain and improve coastal water quality and thus ensure safe accessibility of the ocean; focus on beneficial uses, which can include immersive, recreational activities, like surfing.
	National parks, monuments, marine sanctuaries CCA>CCC>LCP	Area-based protections provided by these federal laws can target areas of historic, cultural, or recreational significance, including coral reefs, seamounts, and beaches; currently not explicitly applied to protect any surfing resources. Specify appropriate location, type, and scale of new or changed uses of land and water and can identify surfing areas; LCP policies regarding resources below MHW are not binding on CCC decision-making jurisdiction there.
1. Identify surf breaks — delineation	MMAIA	Several Marine Managed Areas types could be used to create protected areas of recreational and cultural significance but have not yet been designated to protect surfing resources.
	WSR	Program/designation process includes mapping of surfing areas.
	NEPA/CEQA	Require review of potential impacts of proposed activities or actions and consideration of many factors, including cultural and recreational impacts; also provide pathways for public engagement.
1. Identify surf breaks — surf break dynamics	CWA	Section 404 stipulates a regulatory and permitting process for the dredge and fill of materials in the nation's waters, including in the coastal ocean; process could provide a check on activities with the potential to interrupt coastal process, including sediment import, transport, and export from the nearshore.
	CCA>CCC>LCPs	Provides clear guidance on permitting for proposed activities in the coastal zone and nearshore that likewise could impact coastal processes, including, e.g. coastal armoring.
2. Swell corridors	CZMA	Provides California with review of federal activities beyond 3 nm for consistency with Coastal Act.
	CCA>CCC	Defines Coastal Zone in California, gives CCC authority to permit activities in Zone that are consistent with Act's provisions to protect access and resources.
	CCA>CSLC	Subject to additional CCC review, the CSLC grants permits to modify and leases to utilize public trust seafloor below MHW, also subject to CCA policies. The Coastal Zone hosts a range of seabed features that contribute to the functionality of surf breaks on the California coast.
3. Threats and risk assessment	NEPA/CEQA	Risk assessments form part of any comprehensive environmental assessments; public participation allows stakeholders interested in surf break protection to air concerns through formal process; this is ad hoc, does not ensure surf protection, and is contingent on engaged stakeholders.
4. Surfing resources in policy and plans	CCA>CCC>LCP	Updates to Local Coastal Programs provide the opportunity for surfing resources to be identified and protections and evaluation methods incorporated into LCP permitting with the caveat that LCPs lack jurisdiction below MHW.
5. Baseline studies and monitoring	CCC Sea Level Rise Policy Guidance NEPA/ CEQA	Recommends LCP "policies to promote research on sea level rise impacts to recreational activities like surfing;" this language is non-binding. Environmental review under both laws requires some amount of documentation of baseline conditions and, depending on proposed project and mitigation, monitoring during/after completion. For certain resources, e.g. an endangered bird or stream turbidity, study/monitoring protocols are well established; less so for surfing resources.

activities, hazards and/or climate change adaptation strategies on each surf break; and a recreational cost benefit analysis to inform decision-makers as to the consequences of future adaptation pathways.

DISCUSSION

The following considers the five MGSR components previously described in the context of a California resource management framework. Table 7 provides a summary of the practical components from the MGSR and the legislation and/or policies in California to which they relate and under which they could be implemented.

Surfing resources in policy and plans

There are multiple policy instruments relevant to the management of surfing resources in California. Determining which entities have jurisdiction over an activity is critical to effectively applying law and policy. Local governments (e.g. cities and counties) with certified LCPs have jurisdiction on the coast down to MHW; the CCC and/or CSLC have jurisdiction of the coastal zone to 3 nm offshore; the federal government has jurisdiction from 3 nm to 200 nm offshore. This straightforward delineation of jurisdiction is nuanced through consistency review provided by CZMA and CCA specifications for the CCC's areas of original jurisdiction, as well as the certification status of a local government's LCP. Because they can encompass large areas and are susceptible to modifications from the upper reaches of a watershed to the continental shelf, surfing resources implicate multiple jurisdictions and multiple levels of government.

There is no direct mention of surfing in any resource management legislation at either the California state or U.S. federal level. However, some of California's local governments have prepared LCPs that specifically recognize important surfing resources. For example, the City of Santa Cruz's LCP characterizes Steamer Lane as a "prime surfing point" (City of Santa Cruz 1992). This characterization should be strengthened to better reflect not only Steamer Lane's significance, but the historical, cultural and recreational significance of all surf breaks in the City of Santa Cruz, many of which are enumerated in the WSR designation of certain surfing areas within the city. More local jurisdictions could take the approach of identifying surfing resources

in their coastal management policies and legislation.

Summarily, there is no mention of surfing at the national statutory level in Aotearoa; the Resource Management Act only refers to amenity, aesthetic, recreational, scientific, historical, spiritual, and cultural values. However, the New Zealand Coastal Policy Statement, a compulsory national policy, explicitly identifies surfing through Policy 16: Surf Breaks of National Significance, which identifies 17 surf breaks listed in Schedule 1 of the NZCPS. The degree of management conferred on all surf breaks in Aotearoa has been effected through the clear mandate in the NZCPS recognizing all coastal resources but also through the interpretation of other relevant Policies considering, *inter alia*, natural character, natural features, natural landscapes, natural elements, processes and patterns, public open space, and walking access. These coastal resource terms are broadly consistent with the terminology in the federal CZMA and the CCA, and with the CCC's mandates and recent Sea Level Rise Policy Guidance.

While the NZCPS provides guidance for subnational authorities, it is the policy instruments created at the regional, district and city level that are most relevant to the applied management of surfing resources. The legal framework in the U.S. allows for surfing resource-specific terminology to be incorporated into policy at state and lower levels. Doing so would be a step toward proactive surfing resource management, where a localized version of the *Guidelines for Authorities* (Atkin *et al.* 2019a) could be applied either through amendments to state legislation or through local ordinances in the form of LCPs. The most comparable equivalent to Aotearoa's Regional Coastal Plans in California are LCPs. However, the jurisdiction of LCPs generally ends at MHW, compared to an NZ Regional Coastal Plan which extends 12 nm offshore. Despite this, LCPs still have a vital role in sustainable surfing resource management as they address key issues surrounding coastal access, water quality, sediment and watershed management, and the enjoyment and aesthetic value of recreational resources that can be defined and prioritized at local scales.

In Aotearoa, surfing resources were first considered in national policy during

a review of the NZCPS, and it has been during the redrafting of short- to long-term Coastal Plans that surfing resource management has been considered at a local to regional level. Intermittent revisions of policy, policy instruments and plans provide an opportunity to incorporate surfing resources into the existing coastal resource management framework. In Aotearoa, by 2020, nine out of 16 regions have identified Surf Breaks of Regional Significance (Atkin *et al.* 2015; Atkin and Mead 2017; Orchard *et al.* 2019; Orchard 2020), with one region, the Waikato, also considering their potential Surf Breaks of Local Significance (SBLS) and/or "secret spots," by designating Known Surfing Coastlines (Atkin 2017; Atkin and Mead 2017; Orchard *et al.* 2019).

One of the key differences between Aotearoa and California is the division of jurisdictions over coastal, nearshore, and ocean environments. The Coastal Zone in California extends 3 nm offshore, and ~1,000 yards inland from MHW, with substantial width deviations to encompass significant resource areas (e.g. estuaries) and for other reasons. In comparison, the NZCPS covers the Coastal Environment, which generally extends from the summit of the first dominant ridge to the limit of the territorial sea (12 nm offshore). The importance of this is that it includes catchment or watershed management (with critical implications for sediment management, i.e. the "sandshed"; Revell *et al.* 2007), which has significance for surfing resources as the surf break itself may be a function of watershed and estuarine processes (e.g. a delta-type surf break, Liria *et al.* 2009; Atkin *et al.* 2013). Furthermore, surfing resource users are exposed to potential water quality issues for much longer periods of time than the average water user and in critical locations, such as the entrance to tidal inlets. For multiple aspects of surfing resources, the mismatches in scale and jurisdiction within the U.S. system can thus provide management challenges.

Identification of surf breaks

The identification of surf breaks in an official list or catalogue is a low-cost, proactive exercise that could be executed at local (city or county) or state levels. The CCC's coastal access program is a database of coastal access points in the state, including their locations and amenities (CCC 2019). Surf breaks are occasionally

included as amenities at coastal access points listed in the database. This practice is not systematic, many databases are informal, and where mentioned, any specific detail about the surfing resource is limited.

Lacking an overarching policy framework for the explicit consideration and management of surfing resources, designating surf breaks and SBAs through existing policy mechanisms is a reasonable approach. For example, management policies of National Parks and Monuments are underpinned by comprehensive management plans designed to protect resources while also providing for their enjoyment. Development and promulgation of management plans (as federal actions) are themselves subject to environmental review under NEPA and a similar situation exists at the state level in California through CEQA.

In California, the MMAIA creates several categories of marine managed areas for the explicit purposes of protecting cultural and recreational resources. Surfing resources in California have not yet been targeted for designation under MMAIA, though it seems like an applicable policy vehicle, particularly as surf breaks meet many of the criteria enumerated as worthy of protection under the Act, including their location on, relatively, geologically-unique sections of coastline that are often associated with terms such as rarity, wilderness and naturalness, and hold historical and cultural associations that contribute to the surfing experience (Orchard *et al.* 2019). Furthermore, they can be found in areas of significant biodiversity, and may be a product of particular terrestrial landscapes (e.g. a transverse dune field) or riverine and estuarine processes (e.g. an ebb tidal delta), or other natural processes. Including a surf break as a natural resource component in an application for a marine managed area designation under MMAIA, would likely strengthen the case for designation in a number of area categories.

Listing surf breaks on the Register of Historic Places under the NHPA does not provide the highest level of legal protection, but does add recognition to the importance of the resource during any environmental review process (e.g. Malibu, CA; Blum 2015). NGO-led designation, like the World Surfing Reserve program, can also add recognition to the

importance of a surfing resource (e.g. Santa Cruz; CCC 2010), though in the latter case of these non-governmental designations, such consideration would be entirely optional. Likewise, the WSR designation of Surfrider Beach in Malibu may have contributed to its successful bid for listing on the Register of Historic Places.

Surf breaks are valued as a coastal resource in most surfing nations for their health, social and economic benefits to people and communities, despite a general lack of legislative and policy frameworks to sustainably manage them. Yet the value of a surfing resource to different sectors can quickly diminish if they are not accessible. Chapter 3, Article 2 of the CCA provides for other coastal amenities such as parking, showers, beach volleyball courts and coastal trails, but does not explicitly identify surf or surfing. The public trust doctrine mirrors the CCA's goal of providing maximum public access to and along the coast, LCPs should reflect this goal. When authorities or experts are charged with identifying, mapping or making inventories under LCPs (e.g. delineating surf break areas) the identification of access points and access methods (e.g. boat, ATV, foot, bike etc.) should also be included. The documentation of surf break access points and methods could contribute to the Coastal Act's fundamental goal of providing maximum public access.

Swell corridors

The NZCPS considers a swell corridor as a critical part of the surf break and which should be considered during any permitting process. Understanding the relevant boundaries of this area informs the decision-making process as activities within a swell corridor can affect the integrity of a surfing resource. In Aotearoa swell corridors have been established out to the 12-nm territorial sea boundary, in line with regional authority jurisdiction; by contrast, state authorities in the U.S. have jurisdiction to 3 nm. This difference has several ramifications. Firstly, a 3-nm offshore extension of a surf break area still falls under the resource-protective policies of the CCA and authority of the CCC and/or CSLC. Secondly, surfers tend to utilize longer period waves which can interact with the seafloor far from the shore (e.g. a wave with a 12 s period will interact with the sea floor in ~112 m depth; at 18 s, this is ~250 m). Effective precondition-

ing of waves has been shown to operate at continental shelf scales down to surf break-specific focusing (Mead and Black 2001a, b; Mead *et al.* 2003; Atkin and Greer 2019; Atkin *et al.* 2019b), so it is likely, given that the continental shelf of California ranges from ~0.2 nm to ~13 nm, with an average of ~3 nm (Emery 1952), that surf break-relevant processes in the swell corridor will exceed the 3 nm jurisdiction in some cases. State-level enumeration of and protections for surfing areas could support state-level consistency determinations of potential actions in federal waters from 3-200 nm.

Threats and risk assessment

A significant avenue for considering surfing resources through environmental management in the U.S. is through the environmental review process codified in NEPA and, in California, CEQA. However, environmental review is still conducted on a case-by-case basis with no systematic inclusion or evaluation of surfing resources. In such cases, the *Guidelines for Resource Users and Consent Applicants* can be referenced by those seeking to undertake activities in the coastal environment — as well as by stakeholders and the surfing resource user community seeking to ensure that surf breaks implicated during environmental review processes are appropriately considered. The MGSR Guidelines could be adapted to the policy framework of the U.S. to support consideration of surf breaks and the formalization of a protocol for evaluating and monitoring in the environmental review processes. There is a clear mandate for environmental review from NEPA and CEQA, and a Threats and Risk Assessment of surfing resources per the MGSR, fits well within that process. The Threats and Risk Assessment methodology in the MGSR is based on a coherent understanding of a surf break's geomorphological setting, maintenance mechanisms, and surf break dynamics. This type of understanding would come from identification steps and baseline studies, which would constitute a key component of environmental review. This is however, assuming that a surf break is recognized as a valued resource within a management context. Recognition as a valued resource often relies on public participation and comment, both of which are provided for but not guaranteed by the NEPA/CEQA environmental review process.

The terminology used in the *Consequence of Activity* designation in the MGSR's Threats and Risk Assessment may well require adaptation to be consistent with U.S. policies and/or documentation.

Baseline studies and monitoring

Part of the impetus for developing the MGSR and the underlying research project through which they were developed, was to address the requirements for baseline data (Atkin *et al.* 2017; Atkin *et al.* 2019a; Mead and Atkin 2019). The CCC's LCP Guidance (CCC 2013) and SLR Guidance (CCC 2018), as well as both NEPA and CEQA, reference monitoring and/or baseline conditions in relation to natural resources. Those surfing locations recognized in AB 1782, designated as World Surfing Reserves (Santa Cruz and Malibu), and/or listed on the Register of Historic Places (Malibu) could prove a good starting point. Monitoring is a key element in the environmental review process required under NEPA and CEQA and has the potential to be initiated on a case-by-case basis, should the surfing resource be implicated during a permit application process. Transitioning to a directed, systematic, data-driven approach is critical in establishing proactive surfing resource management. The monitoring of surfing resources, in theory, requires no government approval and can be implemented by any individual or group. In Aotearoa, the bulk of surfing resource monitoring is undertaken by the Aotearoa New Zealand Association for Surfing Research, a charitable trust charged with maintaining the monitoring stations, datasets, and the MGSR.

Other considerations

The MGSR certainly have applicability outside of coastal California, including in other coastal states where surfing is significant. Application in other states will necessarily involve adaptation to those states' specific coastal governance settings. The MGSR could be redrafted in more generic terms to provide more direct relevance to a wider user group. A

benchmark to strive for within a coastal context for such generic guidelines is the U.S. Army Corps of Engineers' Coastal Engineering Manual, which is used globally. The MGSR are underpinned by Aotearoa's legislation and unique culture, leading to the use of specific terminology, which will likely limit uptake.

CONCLUSION

Surfing resource management in California is currently bereft. Shifting to a proactive approach where surfing resources are explicitly identified and managed under policies at all levels of government, including Local Coastal Programs under the California Coastal Act and the state marine managed area system under the Marine Managed Areas Improvement Act, would be a first step toward implementing management guidelines like those in Aotearoa. Until this proactive shift occurs, the *Guidelines for Resource Users and Consent Applicants* can serve as a reference guide of Best Management Practices (BMPs). Such BMPs are most relevant during the environmental review process and of value to both proponents and opponents for all proposed activities in the coastal zone.

To date, protection of surfing resources has resulted primarily from the engagement of surfing stakeholders represented by not-for-profit conservation groups. Recent actions in California — including the establishment of two World Surfing Reserves, listing of Malibu on the Federal Register of Historic Places, designation of surfing as the official state sport, and the high-profile defeat of coastal development proposals that threatened surf breaks — together suggest a broad shift in the collective attitude towards recognizing the importance of surfing resources in California. This shift is driven by a variety of factors, including increased participation in surfing state- and world-wide and an associated increase in our understanding of the economic, social, cultural, mental, physiological, and other benefits that surfing provides, combined with a

growing recognition that surf breaks are vulnerable, finite natural resources.

The MGSR were developed within Aotearoa's unique cultural setting and legislative framework. However, the MGSR's consideration of multiple socio-economic factors and physical processes at a range of scales are key to effectively and sustainably managing surfing resources and can be applicable to surfing resources in many other global settings. They are, therefore, beneficial to jurisdictions outside of Aotearoa whose governance structures lack surfing-specific guidance.

Despite the parochial and complex development history of the MGSR in Aotearoa, there is clear relevance to surfing resource management within a California setting as demonstrated here, despite the jurisdictional mismatches implicating multiple federal, state, and local policies. Incorporating surf specific terminology into Aotearoa policy took place during a national-level review of the nation's Coastal Policy Statement, followed by the development and subsequent review of subnational policy instruments. A similar effort aimed at the clear and explicit articulation of surfing values, vocabulary, and surfing resources within the U.S. and/or California policy frameworks would likely be necessary to facilitate comprehensive planning approaches to surfing resource management and the development of targeted, local guidelines.

ACKNOWLEDGEMENTS

This work has been undertaken as one of the first pieces produced from the newly established International Association for Surfing Research. The original research project that produced the Management Guidelines for Surfing Resources was funded by Aotearoa New Zealand's Ministry for Business, Innovation and Employment. The Aotearoa New Zealand Association for Surfing Research continues to maintain the guidelines.

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