



American Fisheries Society

Western Division

President Dan Dauwalter, President-Elect Todd Pearsons, Vice-President Dan Brauch, Secretary-Treasurer Travis Rehm,
Past-President Jackie Watson, Student Representative Emily Chen

Executive Committee March Call: Wednesday, March 11, 2020

Start Time: 11:00 am AK time/ 12:00 pm PT / 1:00 pm MT

To join call, dial 1-800-582-3014 and enter passcode: 837490314# Leader passcode 567446688#.

Notes

- 1:00 PM Roll call (5 min) (Determination of quorum)
 - Participants:
 - Dan Dauwalter, WD President
 - Jackie Watson, WD Past-President
 - Todd Pearsons, WD President-Elect
 - Dan Brauch, WD Vice President
 - Emily Chen, WD Student Rep
 - Jason Burckhardt, CO-WY Chapter
 - Rob Titus, CA-NV Chapter
 - Alton Livingstone, AZNM Chapter
 - Steve Dalby, MT Chapter
- 1:05 PM **Motion:** Approve February call notes (Attachment B)
 - Todd moved, Rob Titus second, no discussion, motion passes
- 1:10 PM Treasurers briefing (Travis) (Attachment C)
 - Travis was not able to attend the call. Dauwalter asked if there were any questions on the most recent budget spreadsheet, there were none. Dan also mentioned there will be a lot of transactions with travel reimbursements occurring presently.
- 1:15 PM 2020 WDAFS Vancouver (Dan D.)
 - COVID-19 (see webpage: <https://wa-bc.fisheries.org/2020-meeting/covid-19/>)

Dauwalter covered an update on meeting planning and COVID-19. The Vancouver planning team will be having a call Friday 3/13 to discuss this further, for now the meeting is still a go. Currently 42 abstracts, of 257, have been pulled, two vendors have backed out, a few people have requested refunds on registrations but there are also still people currently registering. Shawn Johnston, Brittany, and Dan have been working with the venue and hotel to negotiate the contract in preparation of a smaller meeting than planned. Sponsorship is

currently at a break even, perhaps a slight loss, so the Chapters should be seeing a request from WD to sponsor our meeting.

Rob Titus: Has there been any discussion on the option of providing video or remote viewing of the meeting? This will be discussed on the Friday call with the planning team.

Excom meeting is scheduled for Thursday 4/16, 1:20-5:30pm, room TBD

Steve Dalby joined late, Dauwalter covered the update again for Steve's benefit.

- Early registration extension – now March 20
- Abstracts – 257 submitted
- Registration – slightly over 100 as of 3/6 – update?
- Sponsorship – Chapter forthcoming request
- Other
- 1:30 PM Chapter Updates
 - CA-NV (Rob): Upcoming annual meeting, “Reno Hangover Meeting”, Sunday March 15 through Tuesday. Smaller meeting, currently about 100 registrants. A few people have backed out because of COVID-19 concerns. There was an option to postpone the meeting until later this year, but dates that might work were not available from the venue so they are proceeding as planned. Approximately 40 oral presentations. The two most active subunit universities are having finals next week so participation from those units is nil.
 - AZ-NM (Alton): Annual meeting was the last week of Jan, with AZ & NM TWS, AZNM AFS hosted in Prescott. Just over 300 attendees. Workshops included an annual piscicide training. Approved a new student subunit, Northern Arizona University. Last week the chapter hosted a electrofishing training with Jim Reynolds, the chapter made a profit off this training.
 - MT (Steve): Kalispell meeting was successful with attendance around 240, a 30-40 person increase over last year in Billings. They had 70 oral presentations which meant they had to run concurrent sessions – MT members do not like concurrent sessions. Ten posters, lot of student participation, great raffle, and corporate sponsorships were also up this year compared to last year.
 - COWY (Jason): Annual meeting Feb 25-27, Laramie, WY. Travel was impacted by weather, interstates were closed in and out of Laramie, and therefore attendance at CE courses was impacted. One course, Ecological Sampling and Study Design, was recorded and streamed and should be available. Overall attendance was down from the record high of last year (260) with 168 this year. This was likely due to the inability to get out-of-state travel approval for CO members. Meeting was still profitable. Eventbrite charged tax and the Chapter is trying to recover around \$2,000. 51 oral presentations and 19 posters, climate change plenary topic.
 - UT (Jackie): Annual meeting Feb 25-27, St. George UT, Jackie was unable to provide attendance or numbers for presentations/posters. Recently Utah Chapter has taken a unique approach by planning the plenary session around a meeting

sponsor. This year the Virgin River Program was a meeting sponsor, the focus of the meeting plenary, and hosted a half day symposium. There were two CE courses 1) How to write and publish a manuscript in a scientific journal taught by Phaedra Budy, USU co-op and 2) Telling our story – working with media and developing our own media content taught by Brett Prettyman, TU. Both seemed to be pretty popular, biologists especially liked the tips from Prettyman regarding taking and use of pictures highlighting fisheries work. There was also one field trip – Virgin River tour.

- ADDITIONAL Agenda Item: GB Update (Dan)
 - Guidance on how various units should and could be implementing the Society’s Strategic Plan. Also, how do Units integrate with the current President’s plan of work to provide continuity between the Society and the various Units. Dan reviewed Brian Murphy’s proposed plan of work and he will share with the group.
 - There was a lot of discussion on AFS rebranding and potential renaming
 - GB voted to dissolve the Mexico Chapter. There were a couple of “no” votes – these people would have liked to see a more concrete plan for the future of Mexico Chapter members
- 1:40 PM AFS, Science, Advocacy (Dan D., Todd) (Attachments D, E)
 - Statement of world aquatic societies on climate change (Attachment F)
 - Current edits are largely due to WD comments on the statement and AFS stance on advocacy, policy, etc. Thanks to Todd for representing the WD on this topic. GB did not vote on the current statement and edits, however the GB did approve Scott’s plan of work so he is moving forward with sending this statement to the list of 200+ societies.
 - Lower Snake River dams

Cleve Steward (RPCC Chair) joined the call to provide some background on the resolution. Cleve was unable to download the 2011 resolution on this topic so could not provide much information on the past resolution.

Gov Brown letter – ExCom approved and letter was sent March 7th. Attn G, Memo Gov Brown Letter, outlines the ExCom vote, timeline, and final draft of the letter.

Dauwalter briefly reviewed the DEIS and some of the alternatives. Through conversations with the officers and RPCC Chair it was decided that WD will not comment on the DEIS but we may consider commenting on the BiOp. Cleve requested a straw-poll to determine if the ExCom is interested in commenting on the BiOp. Dauwalter mentioned that commenting on the BiOp will be within our wheelhouse.

Cleve: AFS policy statement on dam removal – the Society is looking for knowledgeable people who would be willing to participate in the process. Cleve would like to invite ExCom members or Chapter Presidents to nominate members who would have the expertise to participate.

- Gov Brown Letter (Attachment G)
- [DEIS](#) and Oregon Chapter membership request to WD

1. Near future motion(s)?
2. Comment period for DEIS closes 13 April

- 1:55 PM New or other business
 - Next issue of the Tributary will be coming out mid-March
If anyone has any late submissions or announcements please get them to Dan Dauwalter ASAP
- Adjourn



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AGENDA

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- 1:05 PM **Proposed Motion:** Approve February call notes (Attachment B)
- 1:10 PM Treasurers briefing (Travis) (Attachment C)
 - Key updates
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Executive Committee February Call: Wednesday, February 12, 2020

Start Time: 11:00 am AK time/ 12:00 pm PT / 1:00 pm MT

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Notes

Participants:

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- Jackie Watson, WD Past-President
- Todd Pearsons, WD President-Elect
- Dan Brauch, WD Vice President
- Emily Chen, WD Student Rep
- Travis Rehm, WD Secretary-Treasurer
- Jason Burckhardt, CO-WY Chapter
- Brett High, ID Chapter
- Rob Titus, CA-NV Chapter
- George Weekley, UT Chapter
- Brittany Jenewein, WA-BC Chapter
- Jeff Falke, AK Chapter
- Luke Schultz, WNF Committee
- Tim D'Amico, WNF Committee
- Zach Beard, ECP Committee
- Anna Lavoie, D&I Committee

Roll call

Determination of quorum (majority of elected officers, 1/3 Chapters)

A quorum was present

Motion: Approve January call notes (Attachment B)

Moved to approve- Todd

Move to second- Jackie

No one opposed. Notes Approved.

Treasurers briefing (Travis) (Attachment C)

- The student colloquium earned \$982.02, after all expenses. Travis congratulated Emily on a great job fundraising and inquired if these funds will roll over into next year's student colloquium budget. The group was in agreement on rolling over the funds.
 - Rob asked Travis if CA-NV sent WDAFS a check for the student colloquium and Travis said he would check and follow up with him.
- Travis also reminded the group that we have \$505 reserved for the Mexico chapter when they reestablish. This money originally came from the BLM and we split between the chapters. These funds are represented in the encumbered section of the balances-by-month sheet.

Action item: Travis will check and get back to Rob on CA-NV check to student colloquium.

WDAFS Committee Updates

Western Native Fishes (Luke, Tim)

- Luke gave an overview of their activity of the Western Native Fishes committee.
 - WNF is currently planning a symposium at Vancouver for western native fishes.
 - They are also currently updating the WNF database. Working with Kyle Gatt (student).
 - Luke stated that if anyone had anything they would like to be included in the WNF newsletter to send it to him.

Early Career Professional (Zach)

- Zach gave an overview of activity of the Early Career Professionals committee.
 - ECP is currently focusing on fundraising for a future ECP Travel award and has collected 5 donations to date.
 - ECP is performing a raffle at the annual WDAFS meeting in Vancouver. Zach will not be in attendance himself, but Jeff Johnson has volunteered to run the raffle.
 - Zach also stated that funds allocated by WDAFS have been used for travel awards.
 - ECP has stopped putting out their own monthly newsletter and currently have a section within the Tributary.
 - Brittany brought up an email discussing the need to obtain a gambling license for the raffle at the Vancouver meeting. Zach said he was aware and would do the required paperwork however, that it may require a Canadian resident.

Diversity and Inclusion (Anna)

- Anna gave an overview of activity of the Diversity and Inclusion committee.
 - D&I is currently organizing a symposium for the Vancouver meeting. They are making an effort to recruit individuals to participate in the symposium.
 - D&I is also working to develop webpage and social media footprint.

Financial Sustainability Committee (Dan)

- Dan D. stated that he sat in on FS call last month.
- With the markets currently doing well Dan D. said the portfolio is in good shape.

Chapter Updates

ID (Brett)

- Brett said that they will have a couple retirees to assist with the ID Chapter exhibit for 150th anniversary display in Columbus.
- ID Chapter just closed early registration and the abstracts deadline for their annual meeting. There has been a lot of interest with 67 oral presentations planned.
- Brett will not be able to attend the Vancouver meeting but Ryan Hardy and Drew Suchomel (ID Excom) will be in attendance.

CA-NV (Rob)

- Recently hosted their annual midyear had a good turnout.
- Rob expects a smaller annual meeting this year after hosting the Society meeting this September in Reno. Shooting for ~150 people.
- CA-NV will be contributing to 150th anniversary display in Reno and there is a committee setup for contribution.
- Rob will be attending Vancouver.

UT (George)

- UT Chapter is currently focused on their annual meeting coming up in two weeks, with Excom call tomorrow.
- George said they have had discussion on 150th anniversary display, but waiting until after Chapter meeting to work on contribution.
- Both George and President-Elect Sarah Seegert will be attending Vancouver.

AZ-NM (Dan B.)

- Dan B. recently attended the AZ-NM Chapter meeting and it did not sound like they will be sending a representative to Vancouver.
- However, he said they are planning a 150th anniversary display.

WA-BC (Brittany)

- WA-BC is currently busy preparing for the upcoming 2020 meeting.
- They are also working on updating the Chapter procedures manual.
- Brittany said that they are currently researching why student subunits are struggling within the Chapter. It sounds like lack of faculty support may be the underlying cause.
- Brittany also said that the University of Washington subunit did not dissolve (like previously reported), however the subunit is currently inactive.

MX (Dan D.)

- Dan D. said the Chapter is still under WD and official dissolution will occur at Governing Board in February (Little Rock).

CO-WY (Jason)

- CO-WY Chapter is finishing touches on 2020 meeting, it is shaping up to be a large meeting.
- The meeting will feature a plenary session on climate change.
- Jason said due to interest they may have multiple concurrent sessions or have to extend meetings in future.
- CO-WY Chapter will contribute to 150th display.
- They nearly have threshold for an endowment to provide scholarships for fisheries students at Colorado Mesa University.
- CO-WY currently does not have representation at the Vancouver meeting.

AK (Jeff)

- Currently in full swing of planning for the Chapter meeting.
- Does not know if the AK Chapter will have attendance at Vancouver.
- AK Chapter will be participating at 150th display, likely in form of poster.

AFS Management Committee (Todd)

Statement from World Societies on Climate Change

- A statement on climate change is currently being prepared by the Society (President Bonar) for other aquatic science societies to potentially sign on to. The Governing Board has reviewed the initial draft. One more draft will come to the Governing Board for comment and then it will go to those aquatic societies for signing (possibly comments/edits). Then it will come back to AFS Governing Board for final vote.
- Jackie asked that if those on the Governing Board feel comfortable voting without others comments. Jackie is still interested in seeing the statement.

Mexico and Hawaii Chapters

Mexico

- There have been discussions on formation of Latin American Chapter and also the MX Chapter joining with the Puerto Rico Chapter.

Hawaii

- There has been an effort to reinstate the Hawaii and Pacific Islands Chapter. Tim Grabowski of the Hawaii Cooperative Fish and Wildlife Research Unit leading. There is a potential issue with number of signatures needed is equal to about the number of AFS members in Hawaii and Pacific Islands (~25)

Updates

ScCS (Dan D.)

- WD is currently handling ScCS funds. Dan D. voiced concerns on amount of work this poses for Travis (S-T).
- The current arrangement is to handle their funds and adjust if things get too complicated.

2020 WDAFS in Vancouver (Brittany)

- Everything is on track for the Vancouver meeting.
- Abstracts are due today (due 2/12; Extension 2/26). To date they have received about 200 abstracts and are considering extending the deadline.
- Early registration ends on March 12th and the room block also closes that day.
- WD Excom on 4/16 Thursday (likely ½ day, in the afternoon).

Outstanding Unit and Subunit Awards (due 2/14)

New or other business

150th Celebration (Dan B.)

- Dan received a few very good videos from Chapters, for the WD video Dan is putting together.
- Dan B. sent out the info on renting equipment associated with displays at 150th celebration.

Adjourn- 12:58

Summary of Action Items

Action item: Travis will check and get back to Rob on CA-NV check to student colloquium.

Science, Scientists, and Policy Advocacy

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Citation: Lackey, Robert T. 2007. Science, scientists, and policy advocacy.
Conservation Biology. 21(1): 12-17.

Available on the web:

<http://fw.oregonstate.edu/content/robert-lackey>

Science, Scientists, and Policy Advocacy

ROBERT T. LACKEY

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Introduction

I am concerned that we scientists in conservation biology, ecology, natural resources, environmental science, and similar disciplines are collectively slipping into a morass that risks marginalizing the contribution of science to public policy. Advocating personal positions on ecological policy issues has become widely tolerated as acceptable professional behavior and is even encouraged by a substantial fraction of the scientific community (Marris 2006; Scott et al. 2007). Scientists are uniquely qualified to participate in public policy deliberations and they should, but advocating for their policy preferences is not appropriate.

Despite an extensive debate in the literature on the proper role of science and scientists in policy deliberations, points of general agreement and specific differences often get lost amid the semantic confusion caused by inconsistent definitions for key words or concepts (Trudgill 2001). Table 1 provides the precise definitions I have used throughout this essay.

Those of us who provide scientific information to decision makers and the public should strive to be more vigilant, precise, demanding, and rigorous in distinguishing between policy-neutral and policy-inculcated scientific information. Science is only one element of the complex deliberations over major ecological policy questions that take place in a democracy, but science is critical, and scientists can and do play an important role (Sarewitz 2004; Lackey 2006).

My unequivocal overall view on the role of scientists in ecological policy and management is, first, that scientists should contribute to the policy process. This is not only the right thing to do, but we are also obligated to do so, especially if our work is funded by public resources. I do not hold with the notion that it is sufficient for scientists to publish their findings solely as scholarly papers. The assertion that scientists should be involved in providing

and explaining the underlying science to help resolve important policy questions is, for me, a given.

Second, when scientists contribute to policy analysis and implementation, they must exercise great care to play an appropriate and clearly defined role. The interface between science and policy can be bewildering for many of us who develop, provide, or interpret scientific information. Working at the interface is also where many of us mislead or confuse decision makers and the public because we let our personal policy preferences color our science.

The formidable challenge of developing and providing technical and scientific information to inform policy deliberations in an objective and relevant way is not unique to ecological fields (Rykiel 2001). Whether one is working as a stock analyst in the research unit of a brokerage firm (Boni & Womack 2003), a medical expert testifying in malpractice trials (Caldwell 2005), a funding officer at an international development agency that might finance a proposed shrimp-farming operation (Béné 2005), or an intelligence analyst within a government national security agency (Armstrong 2002), the job of providing accurate, relevant, and policy-neutral information is always a challenge.

Policy Context

Most of today's ecological policy issues are politically contentious, socially wrenching, and replete with scientific uncertainty (Pielke 2004; Robinson 2006). Examples include reversing the decline of salmon in western North America; deciding on the proper role of logging on public lands; ameliorating the effects of human-caused climate change; avoiding the extinction of species; and making sense of the confusing policy choices surrounding notions of sustainability.

Paper submitted August 16, 2006; revised manuscript accepted September 28, 2006.

Table 1. Definitions of keywords used in this essay.

Normative science: science developed, presented, or interpreted based on an assumed, usually unstated, preference for a particular policy or class of policy choices.
Policy: a decision or plan of action for accomplishing a desired outcome.
Policy analysis: formal assessment of the consequences and implications of the possible options for addressing a policy problem.
Policy advocacy: active, covert, or inadvertent support of a particular policy or class of policies.
Politics: process of debate, negotiation, and compromise for achieving a desired policy goal.
Preference: the preferred option from among a set of policy choices or alternatives.
Science: information gathered in a rational, systematic, testable, and reproducible manner.
Scientist: a person who generates or interprets scientific information or science.
Value: a core belief that tends to determine or shape personal or group policy preferences.

Ecological policy issues are inherently complex and are often described by political scientists as being “wicked” and “messy” (Salwasser 2004). All these issues share several qualities: (1) complexity (they have multiple options and trade-offs); (2) polarization (clashes between competing values are routine); (3) winners and losers (for each policy choice, some interests will clearly benefit, some will be harmed, and the consequences for others are uncertain); (4) delayed consequences (the policy options often provide no immediate “fix” and the benefits, if any, of painful concessions may not be evident for decades); (5) decision distortion (advocates often appeal to strongly held values and distort or hide the real policy choices and their consequences); (6) national versus regional conflict (national priorities often differ substantially from those at the local or regional level); and (7) misuse of scientific information (science can end up an inappropriate battleground because arguments over science are often actually a surrogate venue for arguments over values and preferences) (Lackey 2006). As if ecological policy issues were not muddled enough, they often become further clouded by skepticism about the motivation of scientists and the accuracy of the scientific information they provide (Mills 2000; Pielke 2004). Most science is funded by government agencies, businesses and corporations, and myriad public and private interest and advocacy groups (Sarewitz 2004). Each arguably has a vested interest in the outcome of the debate and often promulgates “science” that appears to support its favored position (Doremus 2005).

Science and Scientists

What is the appropriate role for scientists in policy making? Our role is not described adequately under the current and simplistic rubric of providing the best available science or good science (Doremus & Tarlock 2005; Sullivan et al. 2006). Furthermore, scientists are often asked to contribute scientific information in the midst of clashing values, differing preferences, and opposing, often mutually exclusive, societal priorities (Lach et al. 2003; Pielke 2004). The public and bureaucratic discourse surround-

ing wicked, messy ecological policy issues is not for the psychologically sensitive, those with thin skins, or anyone with an aversion to being challenged scientifically or professionally (Lackey 2006). Regardless of the reasons, many scientists are reluctant to contribute beyond publishing their scientific contributions in scholarly journals (Lach et al. 2003).

One common concern about the science-policy interface is that some so-called science is imbued with policy preferences (Trudgill 2001). Such science is labeled as normative and its use is potentially an insidious kind of scientific corruption (Lackey 2004). What separates normative science from “regular” science is that normative science is developed, presented, or interpreted based on a tacit, usually unstated, preference for a particular policy or class of policy choices. Normative science often is not perceptibly normative to policy makers or even to many scientists. The use of such science by scientists, however, is stealth policy advocacy even if its use is not intentional. As is argued by postmodernists, because all science is socially constructed, science is value driven and is, therefore, normative. My discomfort, however, is not with the notion that science is a human enterprise and therefore reflects the values of the participants, but with science influenced by policy preferences.

Attempting to be both the provider of policy-neutral science and an advocate for one’s personal policy preferences is laden with conflicts of interest and, if not carefully communicated, is potentially unethical (Mills 2000). The same types of conflicts are present when one organizational unit attempts to serve as both the provider of science and the regulator or manager of environmental or natural resource (Sullivan et al. 2006). In government bureaucracies, it is an old and ongoing challenge to keep the research and/or science enterprise independent and policy neutral rather than manipulating it to help sell or defend the agency’s policy decisions (Cohn 2005; Doremus 2005).

Many writers who muse over the proper role of science in ecological policy concentrate on the philosophical notion of positivism and the fact-value distinction (Roebuck & Phifer 1999). I subscribe to the view that science is not free of values. It is, after all, a human enterprise, but this fact does not make all science normative (Odenbaugh

2003). Policy-neutral science strives to describe the world accurately and is characterized by transparency, reproducibility, and independence.

Using the terminology of philosophy, but without becoming mired in the nuances of philosophical analysis, consider the simple but fundamental difference between *is* (i.e., fact) and *ought* (i.e., preference) statements. Science deals with the “is” world (facts about the past, present, or future). For example, consider the distribution of a hypothetical bird found only in a limited geographic area and with an overall population level that appears to be declining at 5% per year. Such an observation (the decline) is a scientific “is” statement. Whether this fact documenting the population decline is something that warrants a change in policy would be an “ought” statement—a policy question. The policy world deals legitimately and appropriately with the oughts and shoulds (i.e., preferences): Should the decline of the bird population be reversed? Science is restrained to statements of *is*: The population is declining at 5% per year.

A current example that vividly illustrates the *is/ought* dichotomy is the case of declining salmon populations in the Pacific Northwest (U.S.A.). Many dams have a measurable effect on these populations. One oft-debated policy option to help restore salmon runs is to remove or breach dams. It is common for scientists to be asked to gauge the likely effects of removing, or preserving, a particular dam or set of dams—a legitimate and appropriate role for scientists. There is, however, no scientific imperative to remove, or maintain, any dam for any ecological reason, including salmon recovery. All of the policy options would have ecological consequences, some of which may even be catastrophic from a salmon perspective, but ecological consequences are simply one element that the public and decision makers must weigh in choosing from a set of options. Understanding the likely ecological outcomes of each choice is what the public and decision makers need from scientists as they weigh policy alternatives. They do not need personal opinions from scientists on which policy option ought to be chosen.

How should scientists explain to the public and decision makers the relevant scientific information pertaining to the likely effects of dam construction or removal? There are obviously many ecological changes that will take place when a dam is removed but what words should be used to describe those changes? What point of ecological reference should be used, if any? Should benchmarks of any kind be used?

Often I hear or read in scientific discourse words such as *degradation*, *improvement*, *good*, and *poor*. Such value-laden words should not be used to convey scientific information because they imply a preferred ecological state, a desired condition, a benchmark, or a preferred class of policy options. Doing so is not science, it is policy advocacy. Subtle, perhaps unintentional, but it is still policy advocacy. An argument is sometimes made that

such terms as *degradation*, *good*, and *healthy* can be used in scientific reports if the terms are clearly defined, measured, and monitored. Why use them unless you are conveying the impression that one particular condition is preferred policy wise? A forest that has been clearcut is *degraded* habitat from the perspective of Spotted Owls and red tree voles, but it is *improved* habitat from the perspective of other species such as White-crowned Sparrows and black-tailed deer. The science is exactly the same, only the policy context differs. The appropriate science words are, for example, *change*, *increase*, or *decrease*. These words describe the scientific information in ways that are usually considered policy neutral. In short, they convey no policy preference and convey science in a policy-neutral manner. Be clear, be candid, be brutally frank, but be policy neutral when providing science to the public, policy makers, and others.

Scientists have a responsibility to correct misinterpretations of science, especially if it is being conveyed in ways that imply support for particular policies. Even though scientific information alone does not carry a policy imperative, making sure that policy *advocates* and policy *makers* understand and use scientific information accurately and honestly is essential (Doremus & Tarlock 2005). Some scientists believe that not speaking up when science is being misinterpreted or misused in policy deliberations is tantamount to dereliction of duty (Karr 2006). Conversely, scientists have an obligation to avoid conveying overtly or covertly *any* policy preference. Using normative science is a case of covertly advocating a policy preference. Among some conservation biologists, ecologists, and those from similar professional disciplines, the implicit policy preference is assumed to be that ecosystems unaltered by humans are inherently good, or at least preferable to ecosystems altered by humans (Houtan 2006). Unstated, but implied, is that the less altered an ecosystem the better. But science leads to no preferred state or to any inherently good condition. In short, there is no scientific imperative for adopting any policy option (McCoy & Atwood 2005).

There is no universally accepted list of implicit policy preferences that is typically imbedded within normative science in ecological and environmental disciplines. The following policy preferences are common: human-caused extinctions are inherently bad and should be avoided; unaltered ecosystems are preferable to altered; reducing complexity in ecosystems is undesirable; natural evolution is good, human intervention is not; more biological diversity is preferable to less biodiversity; and native or indigenous species are preferable to non-native species. These examples (and their converses) are each valid policy preferences, but not one is a scientific imperative (Matsuda 1997).

How widespread is normative science in disciplines such as conservation biology, ecology, fisheries, wildlife, and forestry? In my experience with a number of different

ecological policy issues, normative science is frequent. I often observe biological diversity or ecological integrity calculated solely on the number of native species. Except for someone doing truly basic, independent, or nonapplied research, the decision to include, or exclude, exotic or non-native species in biodiversity calculations is a policy choice and not a choice for scientists to make. That is not to say the native species and exotic species are interchangeable; they are not, but neither native species nor exotic species are inherently preferable in a scientific sense.

Some scientific societies and other professional organizations assert that biological diversity is inherently good. Understanding the role of biological diversity may be important to explaining ecosystem structure and function and even essential for sorting out evolutionary processes, but a value judgment must be invoked to define certain levels of biological diversity as inherently good or that increasing biodiversity is preferable, policy wise, to decreasing biodiversity (Meine et al. 2006). Such a value judgment reflects a specific policy preference, but there are competing policy preferences that are also valid. Furthermore, how should those scientific and professional societies that promulgate explicit ecological policy preferences promote those preferences? Should their journals only publish papers that accept their policy preferences? Should the society accept advertising that does not explicitly support their stated policy positions? Is it realistic to expect outsiders to accept science published in their journals as being policy neutral? Once policy preferences are rooted in the core of the scientific enterprise, it is not clear to me how scientific independence and credibility can survive over the long term.

Another example of the inappropriate blending of science and policy preference is the application of the metaphor of ecosystem health—a common, even pervasive, use of normative science (Lackey 2003). To most proponents of ecosystem health, the alluring feature of the human health metaphor is that people have an inherent understanding of personal health. We each have an idea of what constitutes a healthy person in contrast to a sick person. By extension most people envision instinctively a healthy ecosystem as being pristine or at least appearing to be minimally altered by human action (e.g., a primordial forest, a wilderness lake, or perhaps a pastoral landscape). Thus, it is often argued that ecosystem health is intuitively grasped by the general public, policy officials, and scientists.

Applying the notion of human health to ecosystems provides a simple paradigm for viewing ecological policy questions. By implication, adopting the metaphor also defines what type of information (i.e., scientific) is necessary to help decision makers (Lackey 2003). When I am sick, I seek the technical expertise of a medical practitioner. Therefore, applying the same metaphor, when an ecosystem is sick it follows that an ecosystem health

professional ought to be consulted. Ecosystem health is a value-driven policy construct. Yet often it is passed off as science to unsuspecting policy makers and the public.

Who decides what is the preferred state of an ecosystem? Arguably there is a consensus that a healthy human is preferable to a sick one, but what is the analog for ecosystems? Sometimes and in acknowledgment of the intellectual weakness of the notion of ecosystem health, scientists assume a preferred state but hide behind a cloak of scholarly precision with statements such as “We used a precise definition of ecosystem health to analyze the ecosystem, but others misused or misinterpreted the results.” and “We cannot be responsible for how others use the results.” True, but why use the metaphor if people are likely to misuse the scientific information?

Think what the average recipient of scientific information actually hears when data or assessments are packaged or presented under the rubric of ecosystem health. As with humans, healthy is good. The opposite condition must be unhealthy, which is surely undesirable in ecosystems as it is in humans. Is this a fair way to describe policy alternatives? One person’s damaged ecosystem is another person’s improved ecosystem. A healthy ecosystem can be either a malaria-infested swamp or the same land converted to an intensively managed rice paddy. Neither condition can be seen as healthy except through the lens of an individual’s values and policy preferences (Freyfogle & Newton 2002).

Should a healthy ecosystem be defined as the ecological state that existed a 1000 years ago, just prior to 1492, or at the end of last week? The answer is a value judgment, a policy choice, perhaps the product of political deliberations, but it is not solely a scientific decision (Hunter 1996). Scientists can and should assess the ecological consequences of adopting each possible policy or management goal (i.e., various alternative definitions of “healthy” ecosystem), but the choice of which state of the ecosystem is the desired goal is a societal one (Rykiel 2001).

Politically, from what I observe, the use of normative science cuts across the ideological spectrum. It seems no less common coming from the political Left or Right, from the Greens or the Libertarians. Regardless of the virtue of the policy preference, normative science is a corruption of science.

Fair or not, it is true that some scientists, at least as perceived by many people, appear to operate as policy advocates, not as unimpeachable providers of policy-neutral information. They are observed, for example, publicly arguing for, or against, the Kyoto Protocol, the Convention on Biological Diversity, legislation to protect marine resources, or a controversial housing development. In my own area of research, for example, many scientists sign petitions to remove, or preserve, a particular salmon-killing dam for reasons that sound like science, read like science, are presented by people who cloak themselves in the accouterments of science but who are actually

offering nothing but policy advocacy masquerading as science.

Conclusion

We must achieve within ecological and natural resource professions a clear understanding of the distinctions between science and policy and an understanding of the appropriate roles and responsibilities of science, scientists, and policy advocacy. So, what specifically should a vigilant scientist do to assure that the proper roles of science, scientists, and policy makers are understood and followed? First, be sensitive to the boundary between scientific or technical issues and value judgments. The boundary between policy neutrality and policy advocacy may not always be a bright line, but be especially vigilant when the line becomes dim.

Second, when the major points of dissent in a policy debate are over values and preferences (the usual case), try to exhort decision makers to focus on these often fractious elements of the decision making process rather than the technical and scientific aspects. Debates of questions of science often end up serving as a surrogate polemic for the inability (or unwillingness) of decision makers to adjudicate unpleasant value and preference trade-offs. Do not fall into the trap of substituting debate over scientific information and interpretation of data for debate over which values and preferences will carry the day.

Third, be brutally honest with decision makers about the technical feasibility of each possible policy option and the uncertainties associated with the resulting ecological consequences. Often, the most useful input scientists can provide is to identify the estimated probability of success (for achieving the stated policy goal) for each of the various competing policy options.

Many of today's ecological policy issues are contentious, socially divisive, and full of conundrums. They are, however, typical of those that professional ecologists will confront for the foreseeable future. Those of us who provide information to help inform the participants involved in ecological policy debates must be cognizant of and appreciate the importance of scientific information, but in a democracy we also must recognize the reality that scientific information is just one element in complex political deliberations.

To policy makers, I say be alert. Call our hand when you observe us overstepping our role as scientists and slipping into stealth policy advocacy. Scientific information is too important to the resolution of vital, divisive, and controversial ecological issues to allow some scientists to marginalize science through its misuse. Do not allow the overzealous among us to corrupt the entire science enterprise.

To scientists, I say get involved, but play the appropriate role. If you choose to advocate your personal policy preferences, make it clear to everyone involved that you have stepped out of a scientific role and into the role of policy advocate. In playing the role of policy advocate, be aware that your values and preferences inherently are no more (or less) important than other participants in the policy debate. To do otherwise is to corrupt both the political process and scientific enterprise.

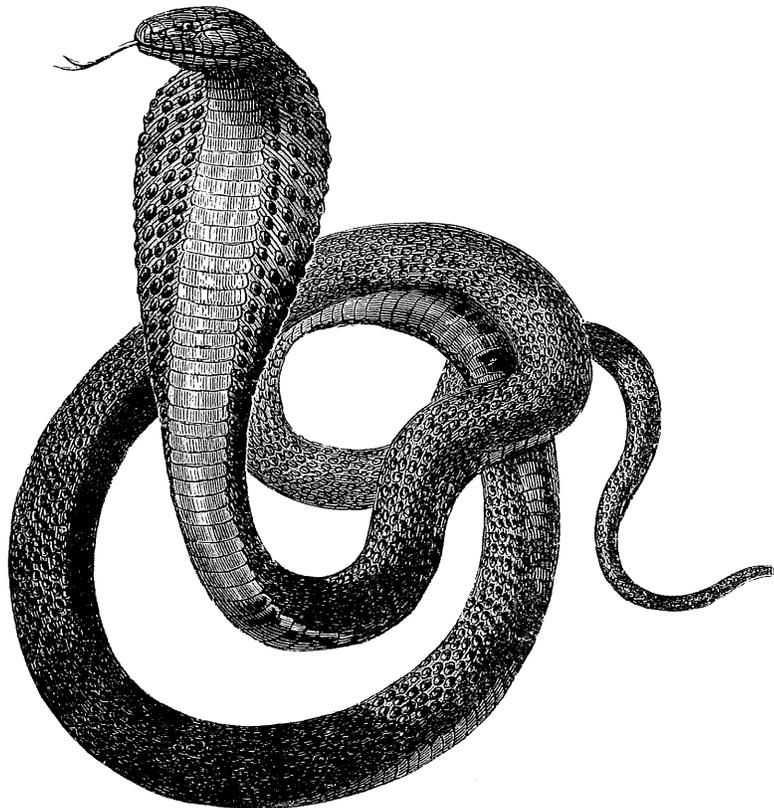
Acknowledgments

Over my career in government, academia, and the private sector, many colleagues helped shape my current views about the proper role of science and scientists in ecological policy. Several colleagues reviewed versions of this essay. Particularly helpful were the suggestions provided by K. I. Ashley, M. Bagdovitz, L. L. Bailey, S. M. Bartell, G. A. Bisbal, G. W. Boehlert, R. D. Cardwell, T. H. DeWitt, S. L. Duncan, J. M. Emlen, A. K. Fitzsimmons, E. T. Freyfogle, S. J. Grabowski, M. Healey, G. M. Hidy, M. L. Hunter, J. Hurley, G. Ice, S. J. Jordan, P. L. Kennedy, E. E. Knudsen, D. H. Lach, J. J. Lawler, D. F. Markle, B. M. Matsuda, A. G. Maule, J. H. Michael, A. T. Morzillo, D. L. Noakes, R. A. Pielke Jr., C. E. Peterson, D. Poon, J. H. Power, J. L. Rachlow, H. A. Regier, R. B. Rettig, H. J. Salwasser, J. R. Scarce, J. M. Scott, C. L. Smith, B. B. Stout, A. J. Talbot, N. S. Urquhart, R. L. Vadas Jr., and D. White. Some of these reviewers maintain different views than those expressed in this essay; thus being acknowledged as a reviewer does not constitute an endorsement.

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The Science-Policy Interface:

What Is an Appropriate Role for Professional Societies?

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Citation: Scott, J. Michael, Janet L. Rachlow, and Robert T. Lackey. 2008. The science-policy interface: what is an appropriate role for professional societies? *Bioscience*. 58(9): 865-869.

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The Science-Policy Interface: What Is an Appropriate Role for Professional Societies?

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Scientists and their professional societies are seeking to increase their influence in shaping policy decisions. A recent call for natural resource professional societies to endorse position statements on economic growth raises questions about how scientific societies can and should effectively contribute to policy development. Taking a stand on policy issues is akin to serving as a policy advocate. We believe that natural resource professionals can most constructively contribute to policy development by conducting rigorous research that is policy relevant and by effectively conveying the results and policy implications of that research to all parties interested in the issue. By actively engaging decisionmakers and providing information on pressing policy issues, professional societies can increase opportunities to be recognized as sources for reliable, unbiased information about natural resources and their management.

Keywords: advocacy, policy, professional societies, scientists, science

Professional societies in the natural resource disciplines (e.g., American Fisheries Society, Society for Conservation Biology, Ecological Society of America, The Wildlife Society, and Society of American Foresters) have diverse missions and goals, but most include professional development, continued education of members and the public about wise stewardship of natural resources, and promotion of the use of science in policy development. Professional societies represent the collective knowledge of thousands of scientists with expertise to inform decisionmaking on natural resource issues.

More recently, natural resource societies have moved beyond providing information to decisionmakers and have sought to exert greater influence in shaping policy decisions (Brown 2000, Kaiser 2000, Blockstein 2002). Although scientific organizations have a long tradition of engagement in policy matters, their activities have expanded during the last 20 years, which is reflected in the hiring of policy personnel and the establishment of public affairs or policy offices (figure 1). The growth of the American Institute of Biological Sciences (from 21 member societies in 1958 to 196 today), which provides policy services for its member groups, is indicative of greater interest among scientific organizations in influencing policy development.

What is the appropriate role for scientists in shaping policy? Do the roles and responsibilities of professional societies differ from those of individual scientists, and if so, how? In various forms, these questions have been debated for decades (e.g., Noss 1996, Wiens 1997, Rykiel 2001, Scott et al. 2007).

Given the current climate of mistrust among scientists, politicians, and segments of the public, as well as growing competition for scarce natural resources and the emergence of natural resource issues with far-reaching implications for society, these questions are even more pressing today.

Our thinking on this topic was stimulated by a recent essay in *BioScience* (Czech 2007) that called on natural resource professional societies to become more involved in policy and to adopt formal position statements on economic growth. Czech (2007) wrote: "A collective position on economic growth by the professional natural resources societies will empower reform in virtually every relevant venue." We wholeheartedly agree with the call for professional societies to become more relevant to policy discussions that can and should be informed by science, to use science to evaluate policy alternatives, and to share results with all interested stakeholders. These activities, however, are very different from "taking a stand" on a policy issue as Czech urged in his

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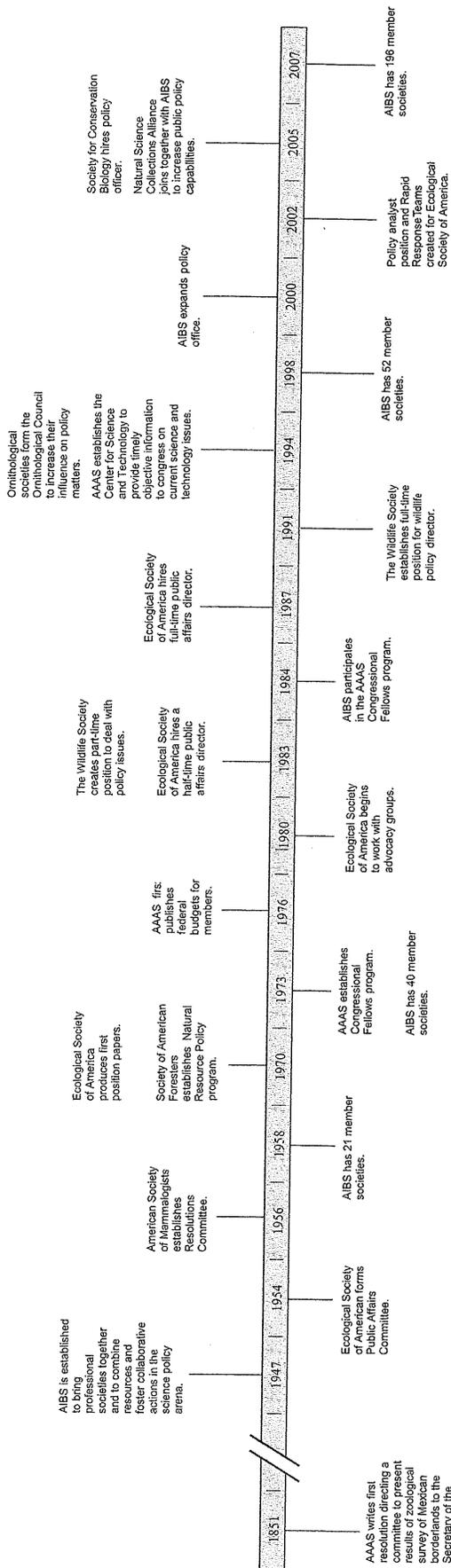


Figure 1. Policy science time line with examples of policy-related actions taken by several professional scientific societies in the natural resource disciplines. Engagement of professional societies in the policy process has expanded markedly during the past two decades.

essay (Czech 2007, Tomasso 2007). In this article, we explore this distinction and argue that it is important for scientists and professional societies to be cognizant of how they can and should engage in policy development. In our opinion, the question is not whether scientists can or should engage in the policy process (they should), but how best to do so effectively and collectively through professional scientific societies.

We restrict our discussion to natural resource issues and professional scientific societies. Some professions—for example, those that advance human health and medicine—have obligations to advocate for human well-being, about which there is little controversy (Lackey 2001, Pielke 2007). An argument could be made that natural resource societies and scientists have similar obligations for their charges (e.g., clean air, endangered species, biodiversity; Noss 1996, Kaiser 2000). We acknowledge that the issue is important, and we will return to the concept of scientific responsibility in the natural resource profession.

Science and policy development

One important point often overlooked in discussions of science and policy is that science alone does not dictate policy (Lackey 2004). In a democracy, decisionmakers create policies in response to competing societal values and interests (Wells 1996, Blockstein 2002). Societal values are translated into policy goals, a policy is selected, management strategies are adopted, and actions are taken. Each step of this process can and should be informed by science. The findings of science help shape societal values on issues as diverse as when life starts, the importance of biodiversity, and how much is enough with respect to conservation actions. But although science can play a significant role in the development of policies (Wagner 2006), it is only one factor that decisionmakers consider, and others—such as economics, religion, and culture—also must be taken into account (Lackey 2001, Tear et al. 2005, Wilhere 2008). For example, recovery goals for endangered species, when met, must result in a determination that the species is “no longer threatened with endangerment over all or a significant portion of its range for the foreseeable future.” If “a significant portion of its range,” “the foreseeable future,” “endangerment,” and acceptable risk are defined, then science can stipulate the minimum number of individuals that meets these requirements. Short of that—as we often are—other factors, such as how much we value the species or how much it conflicts with other interests, will influence recovery goals (Scott et al. 1995, Vuetch et al. 2006). This could explain why the gray wolf (*Canis lupus*) was delisted when it occupied less than 5 percent of its historical range (USFWS 2008), but the bald eagle (*Haliaeetus leucocephalus*) was not delisted until it had reoccupied 100 percent of its historical range (USFWS 2007).

Too often, discussions about how scientists might engage in the policy process are framed as simplified dichotomies; scientists can either act as advocates for particular issues or policies, or they can shun the policy realm and focus only on

science. In fact, this characterization represents the end points of a continuum for how scientists might interact with policy-makers. Pielke (2007) defined four roles that scientists might play when seeking to contribute to policy development. These include the extreme positions at the end points of the continuum as well as two others in the middle ground: one role involves serving as a provider of scientific information on policy-relevant issues when such information is requested, and the other serves to evaluate the full range policy options in light of scientific information and scientific uncertainty.

In contrast, acting as an advocate for a particular issue or stipulating a preferred policy can undermine the value of the distinctive contribution that scientists and professional societies can make toward policy development. Many interests are involved in natural resource policy debates, but scientists and their professional societies are unique among these interests because they can bring what is perceived as relatively unbiased information to the discourse. If scientists stipulate preferred policies, then their scientific data and analyses risk being viewed as biased (Lach 2003, Lackey 2007). Our contribution is then on a par with those of any other special interest group. Pielke (2007) argued that scientists can serve policy development as issue advocates when the issues are noncontroversial, but we argue that natural resource issues are seldom, if ever, so. Although we might agree that species conservation and clean air and water are important, there is likely to be marked disagreement about the acceptable standards, how much human activity should be curbed to meet those standards, and how much risk we are willing to tolerate (Svancara et al. 2005, Tear et al. 2005).

A role for professional scientific societies

Most natural resource societies were founded because of members' interest in a particular group of species or conservation of natural resources. If those members perceive a threat to the survival of species or to the sustainability of resource use, they can and should, as professionals, speak to the issues. Indeed, many scientists have expressed the belief that it is their professional responsibility to do so, especially if their research is supported by public funds (e.g., Noss 1994, Wiens 1997, Safina 1999, Blockstein 2002). By extension, professional societies also share this responsibility, a notion imbedded in the mission statements of many scientific professional societies.

How can we be more effective in influencing policy as scientists? As individual scientists, we can first choose to conduct research that is relevant to factors that threaten the species or resources. We can frame research questions, design studies, gather and analyze data in value-neutral ways, and provide objective, unbiased interpretation of results (Roseau 1992, Wiens 1997). In addition to publishing our work in peer-reviewed venues, scientists could provide white papers or synthesis papers documenting implications of threat factors; forcefully bring that information to the attention of the largest possible number of relevant advocacy groups, decision-makers, and those in a position to reduce or eliminate the

threats; or even take out full-page ads in newspapers to publicize the issue and the available science that informs that issue. For example, one might ask about the consequences of urbanization on genetic diversity, demography, and behavior of a narrowly distributed and endangered species. In discussions of the impact of urbanization on wildlife, research results should be reported in scientific publications and concurrently in other outlets in easily understood language, with policy implications clearly stated, and they should be brought to the attention not only of the National Wildlife Federation (a conservation group that has lobbied extensively on the issue) but also the National Association of Home Builders, the American Planning Association, and the relevant governmental entities such as city councils and county commissions. In other words, the information should be provided to all who have or potentially have an interest in the issue. None of these actions crosses the line between science and advocacy if we are careful to discuss the policy implications of our research without stipulating a preference for a particular policy decision.

The diverse tools that professional scientific societies have at their disposal for contributing to policy development are potentially more powerful than those available to individual scientists (table 1). In addition, professional societies can convene issue-review boards or advisory panels that serve to evaluate science on particular issues and to provide policy-makers with relevant information and analysis of policy options. The recent report by the Intergovernmental Panel on Climate Change (IPCC 2007) provides an example of how professional societies might effectively contribute to policy in this manner (Pielke 2002). One would be hard-pressed to identify a phenomenon with more potential to affect natural resources and society than human-caused climate change. The IPCC report represents the efforts of hundreds of scientists to evaluate the scientific evidence on this policy-relevant issue. The report, which includes data analyses and syntheses and possible outcomes of climate change, also notes the uncertainties associated with those outcomes. The authors of the report do not, however, prescribe what, if anything, should be done to address the issue. Other groups, such as the one organized at the request of the United Nations, use the scientific information to make recommendations (Bierbaum and Raven 2007). In an interview in the *New York Times* (Revkin 2007), Susan Solomon, coleader of the IPCC, shared her views on science and policy, saying that "science does have a duty, when called upon, to provide information that's important to society." She distinguished, however, between making "policy-prescriptive statements" and "policy-relevant statements." This distinction is a key one for both individual scientists and professional societies.

Because natural resource issues are dynamic, the timing of the public's and decisionmakers' engagement can affect the ability of professional societies to influence policy development. Our information is more credible when it is peer reviewed (Faigman 2002), yet scientists can share results early and often using the tools discussed above (table 1).

Table 1. Tools used by professional societies in the natural resource disciplines to contribute to policy development.

Professional society	Congressional visits	Letters or testimony for policymakers	Newspaper commentaries or news releases	Policy briefs or white papers	Policy position statements	Policy office, program, or center	Symposia or forums on science and policy	Resolutions
American Association for the Advancement of Science	X	X	X	X	-	X	X	X
American Fisheries Society	X	X	-	X	X	-	X	X
American Institute of Biological Sciences ^a	X	X	X	X	X	X	X	-
American Society of Mammalogists	-	X	X	-	-	-	-	X
Ecological Society of America	X	X	X	X	X	X	X	-
Ornithological Council ^b	X	X	X	X	X	X	X	-
Society of American Foresters	X	X	X	X	X	X	X	-
Society for Conservation Biology	X	X	-	X	X	X	X	-
Society for Rangeland Management	-	-	-	X	X	-	X	X
The Wildlife Society	X	X	X	X	X	X	-	-

Note: "Congressional visits" are personal visits by individual society representatives with members of Congress or their staff to discuss science and policy issues. "Letters or testimony for policymakers" are letters or written testimony submitted to members of Congress or other policymakers, or oral testimony presented to congressional committees. "Policy briefs or white papers" are summaries of important science and technology issues with references to key resources (e.g., AAAS; www.aaas.org/spp/stmt/docs/). "Policy or position statements" comprise statements of a society's position on important issues that provide scientific background and an evaluation of alternative actions; they may include science-based policy recommendations (e.g., ESA; www.esa.gov/pao/policyStatements/); TWS; http://joornia.wildlife.org/index.php?option=com_content&task=view&id=117&Itemid=187). "Policy office, program, or center" are offices or programs that promote science in policy by providing analysis and communication with Congress, nongovernmental organizations, agencies, and the public (e.g., AAAS Center for Science, Technology, and Congress; AIBS Public Policy Office; TWS Government Affairs Program; ESA Public Affairs Office). "Symposia or forums on science and policy" are organized presentations or panels that discuss the interface between science and policy (e.g., Symposium on Advocacy in Conservation Science, 2006; AAAS Annual Forum on Science and Technology Policy). "Resolutions" are statements of a society's views on an issue that tend to be more concise and less analytical than position or policy statements; resolutions are usually written in a formalized style with "whereas" and "therefore be it resolved" statements.

a. The American Institute of Biological Sciences represents a coalition of 196 member societies.

b. The Ornithological Council represents a coalition of 11 ornithological societies.

Additionally, if policymakers or managers are involved in the framing of research questions, information sharing starts before the research is conducted, and channels for communicating results in a timely manner are already open.

Concluding thoughts

Many of the ecological policy issues that our professional societies address are politically contentious and socially divisive, and they need unbiased scientific information. How scientists or scientific societies choose to speak out about issues that threaten resources is critical to their effectiveness in the policy forum. Scientists who provide information to help inform the participants involved in ecological and natural resource policy debates must appreciate the importance of scientific information, but in a democracy, we also must recognize the reality that scientific information is just one element in complex political deliberations. Lack of communication between scientists and policymakers can hinder the use of the best available science in decisionmaking. It is important that both groups strive for better communication through congressional workshops, hearings, informal brown-bag discussions, and other venues at which information can be exchanged.

Professional societies are uniquely situated to serve as bridges between scientists, science, and the policy forum. Scientists and their professional societies can play the strongest possible role for natural resources by doing what they do best: high-quality, policy-relevant science followed by aggressive efforts to bring the results of their work, and the policy and management implications of those results, to decisionmakers and to those who lobby decisionmakers on the issues. By doing so, professional societies can broaden their sphere of influence and, correspondingly, their potential impact on policy decisions.

Acknowledgments

We appreciate the many colleagues with whom discussions have stimulated our thinking on advocacy, policy, and science. The policy tools table was reviewed by Laura Bies, Albert Teich, Robert Gropp, Nadine Lymn, Karen Launchbaugh, Christine Moffitt, and Steve Scheffield. Gina Wilson drafted figure 1. Earlier drafts of this manuscript were reviewed by John Fitzgerald, Dale Goble, Michael Nelson, James Witham, and three anonymous reviewers who all challenged our thinking on these topics.

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doi:10.1641/B580914

Include this information when citing this material.

Statement of World Aquatic Societies on Human-Caused Climate Change

Global climate change caused by human activities deserves immediate and concerted attention to address this real and imminent threat to humankind and our aquatic resources.

- ~~The impacts from increased atmospheric concentrations of greenhouse gases from fossil fuels and deforestation are already occurring.~~ Thousands of peer-reviewed studies by tens of thousands of scientists around the world have documented evidence for climate effects on aquatic systems that are already occurring and are extensive.
- Multiple sources including the American Geophysical Union, National Academies of Science from dozens of countries, the Intergovernmental Panel on Climate Change and the 4th U.S. National Climate Assessment cite thousands of studies that increased atmospheric concentrations of greenhouse gases from fossil fuels and deforestation are driving current climate change.
- Impacts range from intensification of droughts, heat waves, floods, wildfires, increased frequency and severity of storms, melting glaciers, destabilization of major ice sheets, rising sea level, ocean acidification, shifts in species ranges including expansion of invasive species, and more, with a mounting toll on vulnerable ecosystems, societies and local and global economies.
- These events are precursors of even more damages to fisheries, biodiversity and society at-large.
- Delaying action to address climate change will increase the economic, environmental and societal consequences.
- ~~Thousands of peer reviewed studies by tens of thousands of scientists around the world have documented evidence for climate effects on aquatic systems that are already occurring.~~
- Scientific predictions of climate impacts on aquatic systems project a dire future unless immediate action is taken.
- We are near the tipping point. If we wish to avoid calamitous consequences for our aquatic ecosystems and society, the time to control greenhouse gas emissions is now.

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All life on Earth is dependent on water and depends directly or indirectly on aquatic resources. Changes in aquatic ecosystems are affecting human society now.

- The need for clean and sufficient water is something all life-forms share.
- Fisheries provide quality protein sources not easily replaced by terrestrial sources. According to the Food and Agriculture Organization of the United Nations, fish accounts for 17% of animal protein consumed globally, fishing and aquaculture directly employ almost 60 million people, and global trade in fish products has reached USD \$152 billion per year, with 54% originating in developing countries.
- In the short-term, new fisheries may appear in some newly formed ice-free areas; however, overall fisheries catch is projected to decline related to increasing declines in water quality and primary production as a result of climate change, with corresponding effects on food security.

- Shifts in fish distribution and decreases in fish abundance are affecting incomes, food security and livelihoods of resource dependent communities.
- Species shifts are affecting traditional fisheries from the tropics to the polar regions through reduced access to fish stocks, fishing areas and loss of local knowledge.
- Climate change compounds impact of other practices such as pollution, overfishing and unsustainable coastal development. These combined impacts are projected to drive many small-scale fisheries and economies out of existence.
- Warming affects seafood safety through elevated bioaccumulation of heavy metals and toxicants and an increased prevalence of waterborne pathogens affecting both human and animal health.
- Tourism is being affected in many areas that are dependent on local ecosystems, most markedly in polar and tropical regions. Diving, snorkeling, angling, marine mammal and bird watching, and other recreational activities and businesses depend on maintenance of healthy aquatic resources.
- Intact shoreline ecosystems such as mangroves protect coasts from erosion, storms, flooding, provide habitat and sequester carbon.
- Intact riparian ecosystems protect streams from flooding, provide shade and habitat, and sequester carbon and store water during high flow events.
- The level of fisheries impacts will be governed by the level of protective limits our nations place on future emissions combined with riparian and coastal zoning, and changes in fisheries management practices.

Changes in human society are driven by marine and freshwater ecosystems already being affected by climate change.

In marine ecosystems:

- Shifts in species composition, behavior, abundance and biomass production are now occurring.
- Lobster, cod, herring, coral reef fishes and others important to fisheries are either moving poleward or declining.
- Coastal ecosystems, warm-water corals, seagrass meadows and kelp forests continue to decline.
- Effects of altered species compositions are cascading through entire ecosystems.
- Carbon emissions are linked to global ocean acidification which is affecting the survival of organisms, especially shellfish.
- Climate change is interacting with other stressors such as excess nutrient input, over harvest, and novel species interactions to further suppress marine ecosystems.
- Global production of marine animals continues to decrease and shifts in species composition will increase unless emissions are reduced.

In freshwater ecosystems:

- Climate change is altering abundance, predator-prey dynamics, expansion of invasive species, growth, recruitment of species and novel species interactions leading to declines in the number and taxa of freshwater aquatic organisms.
- Increased evaporation in drought-prone areas is affecting the amount and quality of freshwater available for both aquatic organisms and humans.
- Increased flooding provides a vector for the expansion of invasive species that is affecting recreational and commercial harvest of native fishes. This expansion threatens world economies and industries.
- Geographic ranges of many plants and animals have moved poleward and to higher altitudes, and invasive species expand with the expansion of warmer habitats.
- Temporal shifts in seasonal cues such as spring runoff or monsoon seasons affect spawning success resulting in poor survival.
- Higher incidents of wildfire are affecting aquatic systems by making watersheds more susceptible to flooding and by reducing water quality.
- Higher temperatures and precipitation runoff have resulted in harmful algae blooms.
- Organisms dependent on snow melt and glacial streams are shifting distribution.
- Release of heavy metals such as mercury, currently stored in glaciers and the permafrost is projected to further affect freshwater organisms.
- These seemingly diverse and small-scale changes combine to create multiple, cumulatively stressful challenges to aquatic species.

Our aquatic scientific societies from around the world urge immediate action of government, industry, and others to address the climate crisis, prioritizing action against the major underlying cause, greenhouse gas emissions, if we are to avoid dire consequences to aquatic ecosystems on which all humankind depends.

- We assert that immediate action is necessary to drastically curtail release of greenhouse gas emissions; and remove and store CO₂ from the atmosphere to prevent the most calamitous consequences of human-caused climate change to aquatic ecosystems on which all humankind depends.
- Simply believing that climate change is occurring is not enough. Governments, the public, industry, academia and all other sectors of society must prioritize actions to halt human-caused climate change if they are to prevent dire consequences.
- We call for a rapid transition towards non-greenhouse gas emitting energy sources, other products and services that do not release greenhouse gases, and research and policies that favor an efficient transition if the considerable effects on aquatic systems described above are to be slowed.
- We call for robust adaptation measures to provide habitat for vulnerable aquatic organisms; additional research to better understand potential impacts and to arm natural resources agencies with the tools to help ease these impacts; and significant resources for data collection if we wish to help aquatic managers to better understand and plan for changes in aquatic ecosystems.

It is time to acknowledge the imminent need to act to address climate change. Delaying action to control greenhouse gas emissions is negligent, ~~and concerted efforts to curb greenhouse gas emissions are necessary~~ if we wish to conserve our aquatic resources and our world society that depends on them.

Draft



American Fisheries Society

Western Division

President Dan Dauwalter, President-Elect Todd Pearsons, Vice-President Dan Brauch, Secretary-Treasurer Travis Rehm,
Past-President Jackie Watson, Student Representative Emily Chen

Memorandum:

11 March 2020

Re: Letter to Oregon Governor Brown Kate Brown regarding Snake River dam removal

The Western Division of AFS's Resource Policy and Environmental Concerns Committee recommended that the Division write a letter in response to Oregon Governor Kate Brown's comments on the removal of the lower Snake River dams. A letter was drafted, and on 27 February 2020, the following motion was put on front of the Western Division AFS Executive Committee by electronic mail:

Motion: Submit attached letter (WDAFS_GovBrownLetter_20200227.docx) to Oregon Governor Brown Kate Brown speaking to the Western Division's 2011 resolution and science related to Snake River dams and sustainability of Snake River basin fishery resources.

A request was made by President Dauwalter for Excom members to vote 'Yes' or 'No' for the motion by close-of-business (5pm MST) on March 2nd, 2020. Excom member votes were as follows:

Excom member:	Vote:
President – Dan Dauwalter:	Yes
President Elect – Todd Persons:	Yes
Vice President – Dan Brauch:	Yes
Past President – Jackie Watson:	Yes
Secretary-Treasurer – Travis Rehm:	Yes
Student Representative – Emily Chen:	Yes
Oregon Chapter – Becky Flitcroft:	Yes
Montana Chapter – Steve Dalbey:	Yes
CO-WY Chapter – Jason Burkhardt:	Yes
Cal-Neva – Rob Titus:	Yes
WA-BC Chapter – Brittany Jenewein:	Yes
Alaska Chapter – Joel Markis:	Yes
AZ-NM Chapter – Alton Livingstone:	Yes

Idaho Chapter – Brett High

Abstain

Utah Chapter – George Weekley

No response

The letter was submitted to Governor Kate Brown on 7 March, 2020.



Daniel C. Dauwalter, Ph.D.

President, Western Division American Fisheries Society

Attachment: Letter to Oregon Governor Kate Brown
(WDAFS_GovBrownLetter_20200227.docx)



American Fisheries Society

Western Division

President Dan Dauwalter, President-Elect Todd Pearsons, Vice-President Dan Brauch, Secretary-Treasurer Travis Rehm,
Past-President Jackie Watson, Student Representative Emily Chen

27 February 2020

Kate Brown
Office of the Governor
900 Court Street, Suite 254
Salem, Oregon 97301-4047

Dear Governor Brown:

The Western Division of the American Fisheries Society (WDAFS) represents scientists and natural resource managers from the states of Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming; U.S. associated entities in the West Pacific Ocean; and the Province of British Columbia and the Yukon Territory in Canada. Our mission is to advance sound science, promote professional development and disseminate science-based fisheries information for the global protection, conservation and sustainability of fisheries resources and aquatic ecosystems. Our members, some 3,000 strong, represent a tremendous array of fisheries experts involved in all aspects of the fisheries profession and employed in academia, government agencies, nongovernmental organizations, and private consulting.

With respect to your recent recommendation to breach the four Lower Snake River dams, the WDAFS agrees that if society-at-large wishes to restore wild Snake River salmon, steelhead, Pacific lamprey, and white sturgeon to sustainable and fishable levels, the best-available science suggests that a significant portion of the lower Snake River must be returned to a free-flowing condition by breaching of the four lower Snake River dams. We have long supported this stance as indicated in the resolution passed unanimously during our 2011 annual meeting (see: <https://wdafs.org/download/archive/resolutions/2011-Final-WDAFS-Snake-River-Resolution.pdf>).

The WDAFS stands ready to assist with this issue by providing the best-available science on sustainability and conservation of Snake River fishery resources as well as with public outreach.

Regards,
Dan Dauwalter, Ph.D.
President, WDAFS
Daniel.Dauwalter@tu.org