

Using the boundaries of science to do boundary-work among scientists: pollution and purity claims

Brendon Swedlow

The primary purpose of this article is to demonstrate how the boundary between science and non-science gets used to do boundary-work among scientists. Claims that scientists have been polluted by breaches of this boundary, or, conversely, claims that scientists remain pure and unpolluted, are effectively ways to construct boundaries within science, between more and less authoritative scientists. A secondary purpose of this article is to identify sources of pollution and purity claims. Examples are taken from a case study of the role owl and forest scientists played in constructing nature and environmental policy in the Pacific Northwest.

A SOCIOLOGIST APPOINTED BY President Bill Clinton to a scientific advisory committee developing management alternatives for federal lands resigned when he came to believe that:

“scientists” involved in making recommendations for Pacific Northwest forests adopted the role of philosopher-kings, circumvented pluralistic democracy, placed themselves above the rule of law, and mixed moral and scientific judgments when defining problems, selecting evidence, and formulating management options. (Lee, 1990: 22)

In other words, this sociologist claimed that scientists who were offering policy advice had assumed political roles, and particularly inappropriate ones in a pluralistic democracy where, he implied, they

should at most be only one of many actors and stick to the rules of the game. Second, he claimed that scientists allowed politics to influence their research and policy recommendations by “mixing moral and scientific judgments”.

This asserted “mixing” of scientific considerations with moral ones is an example of how the boundary between science and non-science gets used to do boundary-work *among* scientists. Claims that scientists have been polluted by breaches of this boundary, as the sociologist claimed here, or, conversely, claims that scientists remain pure and unpolluted, are effectively ways to construct boundaries *within* science, between good and bad, competent and incompetent, and more and less authoritative scientists. The examples of pollution and purity claims found in this study are taken from the struggle for scientific authority that began in the mid-1980s and is still on-going among owl and forest scientists and their allies and opponents in the Pacific Northwest.

The primary purpose of this article is to demonstrate how the boundaries of science are used by both scientists and non-scientists to distinguish *among* scientists via pollution and purity claims. A secondary purpose is to identify sources of these claims. That is, what particular non-scientific elements or activities are claimed to *pollute* and what scientific elements or activities are claimed to *purify*

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science? The extent to which answers to these questions are specific to owl and forest scientists or generalizable across cases will depend on further studies employing these concepts. Identifying and analyzing pollution and purity claims in other scientific controversies — some intersecting political and policy disputes and some more distant from these — will contribute to understanding how the internal ordering of science is achieved, and with it, our understanding of and policies toward nature.

While *not* a case study of the role owl and forest scientists played in constructing nature and crafting land use and wildlife management policies in the Pacific Northwest, the following examples of pollution and purity claims are taken from such a study (Swedlow, 2002a, 2003) and from related research done by others (Lee, 1990; Dietrich, 1992; Yaffee, 1994; Luoma, 1999). Readers interested in a fuller understanding of the role scientists played in these policymaking processes or readers looking for further evidence to support the interpretations that follow should consult these and other studies (eg Chase, 1995).

The research reported here is based on interviews with approximately 60 participants in and observers of the struggle for scientific authority among owl and forest scientists and their allies and opponents, most of whom were scientists, as well as on archival research and secondary sources. Unless otherwise indicated, all reports on or quotes from participants are taken from tape-recorded, in-person or phone interviews, or email or regular correspondence I had with them in the period 1995–2001. If respondents are identified by name, it is because they gave me permission to use their names or because quotes come from publicly available sources. Otherwise, respondents were promised confidentiality, and so are not identified by name.

Scientists, judges, and President Clinton's Northwest Forest Plan

In part as a result of some scientists winning and others losing struggles for scientific authority in this case, forests and wildlife in the Pacific Northwest are currently managed as interconnected parts of ecosystems with much reduced timber harvests. The policy instrument that seeks to implement the outcome of this struggle is the Northwest Forest Plan.

Pursuant to the NWP, President Bill Clinton placed more than 24 million acres of federal lands in Washington, Oregon, and Northern California under ecosystem management, seeking to protect old growth forests and over 1,000 species associated with them. The NWP also reduced federal timber sales by more than 75%, adversely affecting an estimated 300 timber-dependent rural communities. In adopting the NWP, the President was acting on the advice of a scientific committee, the Forest Ecosystem Management Assessment Team (FEMAT), which he had appointed to develop options for managing federal lands in the Pacific Northwest.

The NWP was precipitated by judicial injunctions of federal timber sales in the region. Environmental lawyers and scientists convinced federal judges that continued timber sales threatened legally protected wildlife. Specifically, a public interest law firm, the Sierra Club Legal Defense Fund, had alleged and federal judges had agreed that federal land and wildlife managers were not doing enough to protect the northern spotted owl, violating the National Environmental Policy Act, the National Forest Management Act, and the Endangered Species Act. Federal judges went further than this, however, reading these laws to require management of 'biological communities' or ecosystems rather than individual species. In this reading of the law, judges were heavily influenced by the interpretations offered by scientists. Judicial rulings in the owl cases frequently relied on the testimony and affidavits of federal and university scientists, while largely ignoring industry scientists, which was also true of the FEMAT process that developed the NWP ratified by these judges. Pollution and purity claims contributed to the differential attention and policy consequences some scientific views were given as compared to others.

Scientific boundary-work and pollution and purity claims

As Thomas Gieryn explains in a seminal article, scientific boundary-work occurs when scientists seek to distinguish their form of intellectual activity from other kinds they consider pseudo-scientific or non-scientific. As Gieryn notes,

Construction of a boundary between science and varieties of non-science is useful for scientists' pursuit of professional goals, such as acquisition of intellectual authority and career opportunities; denial of these resources to "pseudoscientists"; and protection of the autonomy of scientific research from political interference. (Gieryn, 1983: 781, 1995, 1999; Gieryn *et al*, 1985)

Gieryn's conception of scientific boundary-work helps us understand how and why scientists make common cause against others, but is less useful (and

Gieryn's analysis of the claims of conservation biologists provides a useful point of departure for contrasting his conception of scientific boundary-work with that employed in this article

has been less used) in analyzing whether, how, or why scientists (and non-scientists) construct boundaries *among* scientists. Gieryn recognizes that "the same rhetorical style [as is used to distinguish science from non-science] is no doubt useful for ideological demarcation of disciplines, specialties, or theoretical orientations *within* science", but he does not really develop this insight or apply it much analytically (Gieryn, 1983: 792; emphasis added; see, for example, Gieryn, 1999).

Gieryn's analysis of the claims of conservation biologists provides a useful point of departure for contrasting his conception of scientific boundary-work with that employed in this article. Relying on David Takacs's *The Idea of Biodiversity: Philosophies of Paradise* (1996), Gieryn writes:

[C]onservation biologists convinced that declining biodiversity imperils human existence will either have their claims dismissed as wails from a politicized and misdirected Cassandra or see them translated from fact into environmental policy — depending upon where they and their claims are positioned in the culturescape by legislators, the press, corporate executives, foundation officials, social movement organizers, and citizens. Evidence, models, and theories are not sufficient for these biologists to move policy and save the earth: a cartographic case for the credibility and reliability of these claims must also be put forth to persuade audiences that "our" nature (but not theirs) is the way it is really ... Losers see their claims moved out from fact to illusion, lie, ulterior motive, or faith while they (and their methods, practices, organizations, and institutions) get marginalized or excluded fully from the domain of epistemic authority reserved for science and its genuinely licensed practitioners ... Epistemic authority exists only to the extent that it is claimed by some people (typically in the name of science) but denied to others (which is exactly what boundary-work does). (Gieryn, 1999: 13–15)

In this passage, Gieryn uses the concept of "boundary-work" the way he usually does: to describe the

social construction of the boundary between science and non-science. There are also hints here, as there are in other places in his work (see eg Gieryn and Figert, 1986; Gieryn 1992), that attempts at "boundary-work" may yield something less than exclusion from science, perhaps only marginalization within it. Further, there is the suggestion here that exclusion or marginalization is achieved through pollution claims: by persuading relevant others that rivals' factual claims are illusions or lies, the result of ulterior motives or faith, for example, not scientific investigation. As indicated, the concept of boundary-work employed in this article encompasses Gieryn's most common usage but also seeks to include these implicit uses, showing how the science/non-science boundary is used to marginalize scientists, distinguishing more from less authoritative scientists through pollution and purity claims.

Sheila Jasanoff defines boundary-work in the more encompassing way the concept will be employed here, a conception that is shared with some other scholars (eg Taylor, 1991, 1996; McOmber, 1996). Jasanoff conceives of scientific boundary-work as:

a communally approved drawing of lines between "good" and "bad" work (and, not trivially, between "good" and "bad" *workers*) within a single discipline, between different disciplines, and between "science" and other forms of authoritative knowledge. (Jasanoff, 1995: 53; emphasis in original)

In other words, for Jasanoff boundary-work is not just a way to distinguish scientists from non-scientists, but a means to distinguish among scientists. Scientific boundary-work is used not only to halt the barbarians at the gates of science (or to cast out barbarians who have managed to get past the gates), but to conduct and resolve struggles for scientific authority within the scientific community, sometimes with the assistance of outsiders.

Mary Douglas's conception of pollution and purity claims fits well with Gieryn's conception of boundary-work and, as further developed by David Bloor, with Jasanoff's more encompassing conception (Douglas, 1966; building on Durkheim, 1915).¹ Stated most generally, and in accord with Gieryn's most common usage of boundary-work, pollution claims are claims that some social boundary, such as that between law and politics, religion and politics, or science and politics has been breached, impermissibly allowing activity in one sphere to intermingle with activity in another, polluting it. Purity claims are claims that such social boundaries remain intact, that no boundary has been breached, no pollution has occurred. In the way these concepts are applied here, scientific pollution claims are effectively attempts to use contamination by some aspect of non-science to lower the standing of scientists. Purity claims are claims not to have been polluted or contaminated by contact with non-scientific elements.²

Scientific pollution and purity claims can be and are used to construct and maintain boundaries between science and non-science. But this is not the only possible purpose or result of such claims. As can be inferred from David Bloor's work, which extends Durkheim and Douglas's concepts to the study of science, people contrast sacred, pure versions of scientific activity with profane, polluted ones to make distinctions not just between scientists and non-scientists, but among better and lesser scientists (Bloor, 1986: 47).³

In other words, pollution and purity claims also can and do use the boundary *between* science and non-science to help create and maintain boundaries *within* science, allowing distinctions to be made *among* scientists. Thus, the boundary-work that creates and maintains the boundary between science and non-science becomes a rhetorical resource for constructing further boundaries within science, differentiating scientists by the extent to which they have been polluted or compromised by contact with non-science. In a different way of putting it, pollution and purity claims allow the boundary-work that achieves distinctions *between* science and non-science to serve a second purpose as a resource for making distinctions *among* scientists. Of course, every time pollution and purity claims are made, even where their primary purpose is to distinguish *among* scientists, they also do double-duty reaffirming the location and nature of the boundary between science and non-science.

Pollution and purity claims may be understood as elements of what Nigel Gilbert and Michael Mulkey call the "contingent repertory" of scientific discourse, where scientists claim that scientific findings are contingent on "personal inclinations", "social positions", and other "factors outside the realm of empirical ... phenomena" (Gilbert and Mulkey, 1984: 57; for analysis relying on "contingent repertories" that recognizes the concept of "social pollution" see Kerr *et al.*, 1997).

But what kinds of pollution and pollution claims are there? What kinds of non-scientific influences are sources of pollution claims? And what aspects of science are the basis for purity claims? Pollution claims most frequently reference timber industry affiliations, but also reference ideological and politi-

cal influences, as well as religion, love, money, venality, geography, and incompetence. Some pollution claims rely on analogies to or metaphors of pollution from these sources, rather than claiming direct pollution. Purity claims reference university affiliations, great scientists of the past, and particularly esteemed professional achievements. Pollution claims designed to expel a scientist from the community are distinguished from those that are merely designed to degrade a scientist's position within it.

Constructing authoritative owl and forest scientists through boundary-work relying on pollution and purity claims

Pollution and purity claims were first encountered when attempting to define the population of scientists to be included in this study. Who was an owl or forest scientist for the purposes of this research? The literature suggested that the best way to build this kind of sample was to identify a few people known to be part of the sample and ask them to help you identify others. This is called referral or snowball sampling. The idea is that when you keep coming up with the same names, you have defined the population you want to study (see eg Luker, 1984: Appendix).

Industrial pollution

Owl and forest scientists were identified from government planning documents and public critiques of them by industry and environmental groups. These scientists were then asked to help "identify other scientists who were knowledgeable and differed about forests and spotted owls in the Pacific Northwest". For some scientists these turned out to be mutually exclusive categories. One claimed that scientists who were knowledgeable did not differ, and that those who differed were not scientists. "There might be six or seven PhDs who disagree", he conceded, "but of course I don't count them because they work for the timber industry." That is, for this scientist, the scientific status of these nominal colleagues was irretrievably compromised by their industry affiliations. This claim of industrial pollution was intended to place these scientists outside the relevant scientific community, not just lower their standing within it.

Further examples of industrial and other pollution claims are provided by a confrontation federal wildlife biologist Jack Ward Thomas had with one of three statisticians hired by an industry group to critique his committee's owl protection plans.⁴ As Thomas recounted it, that confrontation went like this:

I asked, "Have you ever been to the Pacific Northwest?" Thomas recalled. He said no. I asked, "Have you ever seen a spotted owl?" He

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said no. I asked if he was paid. He said he spent five days on his report for six thousand dollars and six hours reading our plan. I said, "You're a pimp." (as quoted in Dietrich, 1992: 73)

Thomas's questions are good examples of the variety of ways in which scientists who lent their support to industry were deprived of their scientific authority. None of these questions, it should be noted, addressed the methodological criticisms made by these scientists, which might have resulted in boundary-work and pollution and purity claims geared to the "internal politics" of science. Rather, Thomas's questions are examples of boundary-work based on claims that science had been polluted by breaches of the science/non-science boundary. These claims were intended to place these scientists outside the relevant scientific community, or at least severely degrade their authority within it.

First, Thomas suggested that these scientists were literally outsiders, and that they were therefore not part of the relevant, regionally defined scientific community that had the authority to speak on behalf of the owl. They had never been to the area and had never seen the owl. Here is an instance where the cartography that Gieryn (1999) uses as a metaphor to develop the concept of boundary-work in science is used to make a real geographic distinction among scientists. In pointing to these facts and by noting that this scientist (only) spent six hours reading Thomas's owl plan and five days preparing his critique, Thomas was also implicitly making a claim that these scientists had a substantially lesser understanding of the owl than those who had prepared the plan — and perhaps even were incompetent. The clincher, however, was Thomas's asking whether this scientist had been paid. The implication here was that this scientist had sold out to timber interests. His statistical skills were a prostitute pimped to industry for thousands of dollars. Thomas's metaphorical reference to prostitution, an illegal activity in most states and an immoral activity for many people, also helps suggest compound boundary violations and sources of pollution.

During the course of the owl controversy, Thomas became an increasingly consequential figure in developing science-based policy recommendations and directing their implementation. He chaired the first interagency scientific committee on the owl, the so-called "Thomas Committee", leading President Clinton to appoint him to head his Forest Ecosystem Management Assessment Team (FEMAT) and then the Forest Service, the first time a wildlife biologist and not a career forester had led the agency. Thomas's vigorous pollution-claim-laced defense of the Thomas Committee's efforts on behalf of the owl, proudly recounted by Thomas, suggests that pollution and purity claims were indeed central to the process of building an authoritative scientific community with policy-making power.

It is worth noting that the concept of a "pollution claim," while not explicitly discussed, is intuitively understood by at least some scientists, helping to validate it. For example, when I asked an academic scientist who consults for industry to comment on a rebuttal a government scientist had written to criticism of President Clinton's management plan, the academic scientist responded much as a sociologist or anthropologist might. "I've circled certain words [in the government's rebuttal] that form a very interesting pattern," he noted.

Whenever they refer to [the critique by the industry-affiliated scientist], they refer to it as an "industry report" ... the implication [being] that something related to industry is therefore tainted and not ecologically sound.

Industrial pollution claims were the ones most frequently heard. Their constitutive effect for the scientific community, and consequently their constructive effect on nature and environmental policy, were very important in this case. By excommunicating industry-affiliated scientists, or at least severely degrading their authority, the rest were able to constitute themselves as the scientific community that counted for purposes of characterizing owl populations and habit and forest history and processes, as well as for deciding which land management policies to pursue.

University and other sources of purification

If the most polluted scientists were seen as the ones who worked for industry, the purest were those who worked for universities, according to the scientists and non-scientists who helped construct the scientific community in this case. Former academics-turned-industry scientists noted that academic scientists were treated "like gods" and were "the arbiters of this thing". Since he had begun working for industry, one said, he did not experience the same level of deference accorded him as a professor; his work was questioned much more once he became a timber company biologist.

Government scientists tried to establish their purity or "independence" through university affiliation

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the same way timber companies did by hiring academics. An interview that Gordon Orians, editor of the *Northwest Environmental Journal*, did with Jerry Franklin began by establishing Franklin's purity through university affiliation:

Orians: "Jerry, you've been a research scientist for the Forest Service all of your career. How many such independent research scientists does the Forest Service have?"

Franklin: "I take it that's a question not on how many scientists we have, but on how many *independent* ones?"

Orians: "In this position I gather that you are a free agent?"

Franklin: "A very small percentage of Forest Service scientists have that level of independence. I would guess that it doesn't amount to more than 35 or 40 in an organization that has 600 or 700."

Orians: "Are they all associated with a university?"

Franklin: "Essentially all of them are associated with some university." (Orians, 1990: 446; emphasis in original)

In making "purity claims", scientists tried to associate themselves with aspects of scientific activity that conferred scientific authority while dissociating themselves from aspects that did not. Thus, because academic scientists were assigned greater scientific authority than government and industry scientists, these latter emphasized academic affiliations whenever possible.

Among academic scientists, some kept mentioning their research projects at the prestigious Harvard University Forest to elevate themselves over academic rivals. Among government scientists, research biologists were accorded greater authority than field biologists or naturalists. Some scientists tried to associate themselves with great scientists of the past, including Isaac Newton, Charles Darwin, and Max Planck, to establish their scientific purity and authority.

To establish scientific authority through purity claims, analogies to authorities in other spheres were also used.

Franklin, for example, became known as the "the guru of old-growth" for his proselytizing activities regarding the ecological value of older forests. Thus, when he walked into a meeting chaired by his long-time colleague and friend, Jack Ward Thomas, Thomas greeted him with "Ah, here's the Pope now!"

Not to be outdone, and since Thomas had chaired most of the government's major scientific committees on the owl, Franklin rejoined, "Yes, I've come here to get the word from God!" (as quoted in Dietrich, 1992: 111).

As we will see, such religious analogies of course also ran the risk of provoking a claim that science had been polluted by religion.

But the ivory tower is not necessarily ivory soap

A rare purity claim by an industry-affiliated scientist attempted to distinguish more scientific from less scientific forms of industry research:

It is important to know the difference between research support via an industry association and [the National Council on Air and Stream Improvement]. The former is a lobbying group; NCASI, started in the 1940s, has always maintained a strict scientific rigor and independence.

Translated, this scientist was conceding that some industry research might be polluted by industry affiliations, but the industry research with which he was associated was not, it was pure. Industry-affiliated scientists also found ways to level pollution claims against their university and government critics. One former academic-turned-industry scientist questioned the independence of university scientists, accusing them of manufacturing species "extinction crises" to secure government funding. Here, the implication was that research interests or findings were being polluted by financial incentives.

Another industry-affiliated scientist suggested that "government-type ecologists ... bought into current theory because it [provides] research money, a steady job in a tenured position, and makes you popular with the girls". Some of "these older professors", he intimated, "have gotten onto these popular issues and left their wives." This, of course, is another example of a compound pollution claim, with pollution arising from financial and job security considerations, not to mention pollution by baser, more venal urges or affairs of the heart. These pollution claims are not designed to transform university and government scientists into non-scientists, but rather use these claimed breaches of the science/non-science boundary to try to deprive these scientists of their authoritative and policy-consequential positions within this scientific community.

These claims were not successful, nor were claims of political and ideological pollution sufficient to overcome industrial pollution claims. Reasons for this include assessing whether claimed breaches of the science/non-science boundary had actually occurred, evaluations of the evidence and arguments put forward by contending scientists, the number of scientists making various claims (scientists sympathetic to the timber industry were vastly outnumbered by scientists opposed to the industry), and the legal and political cultural environment in which these claims were made (Swedlow, 2002a,b, 2006a).

Political and ideological pollution

Industry scientists also claimed that the work of government scientists was polluted by political or ideological considerations. "I think their statements are highly debatable, inaccurate, and they're politically

motivated, rather than scientifically derived,” an industry-affiliated scientist said of scientists defending President Clinton’s Forest Ecosystem Management Assessment Team (FEMAT). “I think it’s pretty politically motivated, bad, bad science [that] we’re seeing in action here.” In addition to claiming pollution from political sources, scientists referenced a number of political concepts, such as ideology, philosophy, myth, bias, beliefs, and “group think” when making pollution claims about rivals’ work. Thus an industry-affiliated scientist claimed that FEMAT was:

a group of biased scientists that ... made a bunch of unsubstantiated statements that got the public all excited [and] the President all excited ... and now one of them is Chief of the Forest Service, so they achieved the political ends they were looking for ...⁵

“Assuming that because you have a bunch of experts they’ll come up with a rational, balanced solution”, another claimed, citing the book, *Groupthink*, is “what’s brought us such things as the Vietnam War and the Bay of Pigs invasion” (referencing Janis, 1972). Such analogies to political events widely perceived as debacles were of course attempts not only to color the FEMAT effort as political, but as a political debacle.

A further example of a political and ideological pollution claim is provided by forestry professor Bill Atkinson’s critique of Franklin’s “New Forestry” ideas. Atkinson analogized “New Forestry,” which he called “politically correct forestry” (quoted in Luoma, 1999: 169) to China’s Cultural Revolution, where Mao Zedong had proclaimed flowerbeds an ideological distraction. “The next morning everyone is outside, pulling up flowerbeds. Of course, we don’t have Chairman Mao. We’ve got Jerry” (quoted in Dietrich, 1992: 111).

Other industry-affiliated scientists characterized FEMAT scientists as subscribing to a “philosophy” or “ideology” or perpetuating a “myth” by characterizing pre-settlement forests as stable, old-growth ecosystems uninfluenced by humans — implying pollution from political and ideological sources. “I would flat out call [this] their mythology,” one said. Another industry-affiliated scientist joined this criticism, writing that the “FEMAT assessment reflects a dangerous myth [and] ideology [that] have led some people to believe that humans are not part of nature” (Bonnicksen, 1993: 14).

Another industry-affiliated scientist claimed that the

large “reserves” approach [adopted by FEMAT] is based on the “steady state” approach and other philosophies: that humans can not/should not try to interfere with natural processes to promote their values; [and] that humans do not understand enough to intervene in natural processes. (Oliver, 1993: 3)

FEMAT scientists countered that the emphasis industry-affiliated scientists placed on natural disturbances “was political”, that is, politically motivated, and that more active forms of management were “like a religion” to them, the analogy suggesting a dogmatic faith that some would associate with religion, thus serving as a claim of pollution from those sources.

A different industry-affiliated scientist offered these observations about the FEMAT effort at a congressional hearing:

In preparing this testimony, I was overwhelmed with frustration over the extent to which [the FEMAT Report] is being portrayed as both the voice of the scientific community and even more categorically as “science”. I want to state in the strongest possible terms that the FEMAT Report is not a scientific document. (Taylor, 1992: 2)

Based on his count of how infrequently FEMAT scientists were cited in the scientific literature, the industry-affiliated scientist testified that he was “forced to conclude that the team was overwhelmingly dominated by below-average scientists and non-scientists”. “What we have here”, he surmised, “is a collection of policy-makers, biological bureaucrats, and below-average scientists cloaked in a false mantle of scientific certainty that they have not earned the right to wear” (Taylor, 1992: 5–6). This compound set of pollution claims suggested that some FEMAT scientists really were non-scientists, placing them outside the science/non-science boundary, while the rest were characterized as administrators and lesser scientists, lowering their standing and authority within science. Making “biological” into an adjective for “bureaucrats” is an especially pungent and efficient pollution claim in a political cultural environment where bureaucracy is generally only seen as a necessary evil (Wildavsky, 2006).

Jack Ward Thomas, the leader of the FEMAT effort, tried to give these pollution stains a good laundering. The FEMAT Report, he said, was a management document produced by scientists, not a scientific product, implying that its failure to have been produced by scientific methods should not soil

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the reputations of FEMAT scientists. With this boundary-work he attempted to allow FEMAT scientists to lend their scientific authority to the Report while preventing the Report from tarnishing the very authority from which it drew its strength. "Our work as scientists, economists, analysts, and technicians is complete," the executive summary stated, performing boundary-work relying on subtle purity claims. "Whatever decisions ... may emerge from this work are now, most appropriately, in the hands of elected leaders" (FEMAT Report, 1993: I-3).

Pollution and purity claims made by non-scientists

Being a non-scientist and therefore a potential source of scientific pollution created no apparent barriers to making scientific pollution and purity claims in this case. Interest groups and institutional actors, from environmentalists, to timber associations, to federal judges, and President Clinton's administrators, all participated in making scientific pollution and purity claims and in doing scientific boundary-work. In so doing, they helped elevate some scientists and their views to prominence and policy consequence, while contributing to the marginalization of others.

"The decisions of this plan do not have a solid grounding in biology; they are entirely political in nature," environmentalist Cameron LaFollete wrote in the first public evaluation of the first agency owl plan (quoted in Yaffee, 1994: 47). Andy Stahl, a resource analyst for the Sierra Club Legal Defense Fund, criticized the Forest Service's Regional Guide on similar grounds. "I set myself to finding out what was behind the biology of the plan," he recalled, which turned out to be "nothing more than the consensus of a number of agency bureaucrats: midlevel state and federal wildlife biologists who were now in administrative positions ... They were accustomed to political expediency" (quoted in Yaffee, 1994: 75-76). Again, in a bid to degrade the authority of government scientists, "biological bureaucrats" are claimed to be polluting science. In a previous example, this claim was levied by an industry-affiliated scientist, here by an environmentalist.

Meanwhile, this is how Stahl characterized one of the scientists he recruited to criticize government owl plans: "This guy is now the world's top population geneticist. His only interest is science. He's a total babe in the woods when it comes to politics or people. He's been in the ivory tower all his life. Heck, I'm amazed he's married. But he's a total genius" (quoted in Dietrich, 1992: 220). The compound purity claim here is that despite working for an environmental group, this scientist was the top scientist in his field, untouched by politics or people, someone so secluded in the ivory tower of academia that he was unswayed by such worldly concerns as sex or marriage.

"In large measure the [Interagency Scientific Committee] report presents a facade of science to create the appearance that the ISC Strategy is firmly

grounded in objective, verifiable science when in fact it is not," an industry law firm wrote, in attempting to de-legitimize the scientific planning process that preceded FEMAT:

Every component of the ISC strategy is primarily the product of ... "professional judgment" ... [that] is untested, unexplained and represents, in the words of one committee member, a "management exercise" rather than a scientific effort ... [The] aura of objective science that has been cast over the ISC report is not justified, and should not inhibit close scrutiny of every component of the ISC strategy by policy makers, administrative officials and legislators. (Preston *et al*, 1991: 2)

Here the pollution claim is that the ISC had engaged in management rather than scientific activities, and that since the ISC was not doing pure science, politicians and administrators should not fear entering its realm. Or, in another way of putting it, the pollution claim was that the ISC's activities were already outside the realm of science, so no harm to science would occur if non-scientists participated in these activities, which were properly in their sphere of authority, not the ISC's.

Federal judges also contributed significantly to scientific boundary-work relying on pollution and purity claims. Despite industry views to the contrary, Judge William Dwyer wrote that "The ISC report is widely regarded as thorough, careful, and scientifically credible". It "has been described by experts on both sides as the first scientifically respectable proposal to come out the executive branch". Still, he noted, "The ISC strategy may or may not prove to be adequate. While it is endorsed by well-qualified scientists, it is criticized by others, equally well-qualified, as over-optimistic and risky."⁶

President Clinton's appointees also did their share of scientific (and legal) boundary-work relying on purity and pollution claims. "The land allocations and standards and guidelines that are adopted here satisfy all of the objectives set forth by the President," wrote the Secretaries of Agriculture and Interior, in signing off on Clinton's management plan. "They comply with the requirements of federal law ... They are based on the best available science and are ecologically sound" (Espy and Babbitt, 1994: 3). Not surprisingly, the President's plan was immediately subject to boundary-work relying on pollution claims. "This is war," declared Brock Evans, vice-president of the National Audubon Society. "It's political science, not biological science."

Federal judges put an end to this war, at least temporarily. Judge Dwyer swept aside challenges to President Clinton's Northwest Forest Plan from both industry and environmentalists. On their way to doing so, Judge Dwyer and other judges did their own boundary-work among scientists, lending an especially sympathetic ear to expert witnesses for

environmentalists. Only one federal judge gave any space in her opinions to the opposing views of a professor testifying on behalf of the timber industry. Ninth Circuit appellate panels provided strong support for the rulings of Judge Dwyer and other district court judges (see Swedlow, 2002a, 2003). Moreover, they did their own very significant boundary-work very early in the litigation. Before any fact-finding had been done by the lower courts, a Ninth Circuit panel asserted that “Bird experts generally agreed that the continued logging of old growth fir would probably exterminate the species in the logged off areas”.⁷ This suggested that those who disagreed either were not “bird experts” or held marginal, minority views within the scientific community.

Reprise and conclusions

Examples of boundary-work relying on pollution and purity claims among owl and forest scientists and their allies and opponents suggest that such claims were significant elements of the political struggle for scientific authority that constituted these scientific communities and distinguished them most from their least authoritative members. Claims that science has been polluted by co-mingling with non-scientific or less scientific elements, such as timber industry interests, or political or ideological influences, among others, were clearly efforts to deprive targeted scientists of their scientific authority. Disagreeing scientists resorted to pollution and purity claims to enhance their scientific authority relative to their scientific rivals. Those who were clearly non-scientists — interest group representatives, administrators, politicians, and judges — participated in these processes to gain (or diminish) scientific authority or to assign it to some other party. These processes, independently and jointly, helped to constitute scientific communities and to distinguish them most from least authoritative members, thereby helping to construct nature and environmental policy.

This case involved extraordinary levels of political conflict, with interest groups and politicians, including three US presidents, seeking to influence science and policy through every one of the three federal branches of government. These extraordinary pressures probably heightened efforts at boundary-work

and pollution and purity claim-making and increased actual breaches of scientific boundaries as compared to more routine instances of regulatory science, such as the ongoing activities of standing scientific advisory committees to environmental, health, and safety agencies (Jasanoff, 1987, 1990).

However, it is highly unlikely that pollution and purity claims are only important among owl and forest scientists and their allies and opponents in the Pacific Northwest. Such claims probably help determine not only where the inside and outside of science are, but where the most authoritative elements within science are, more generally. These processes likely play significant roles in constituting many if not all scientific communities and hence in constructing nature. They probably are used to put closure on scientific controversies, and on political and policy conflicts relying on scientific expertise. They likely help empower some scientists, politicians, interest groups, and institutions at the expense of others.

Exactly how pollution and purity claims operate more generally needs further study, however. Research on “regulatory science” (Jasanoff, 1987, 1990), “intermediary agencies” (Braun, 1993), “research councils” (Rip, 1994), “co-production of knowledge and social order” (Jasanoff, 1996, 2004), “hybrid management” (Miller, 2001), and “boundary-organizations” (Guston, 1999, 2000, 2001; Keating, 2001; Cash, 2001; Agrawala *et al.*, 2001) suggests that there are a variety of ways that science intersects politics and policymaking (see Jacob, 2005, for a review; see also Lamont and Molnar, 2002).

Two symposia in *Science and Public Policy* on boundary-organizations and boundary-work at the science/policy interface further underscore the need for careful investigation of the importance, operation, and efficacy of pollution and purity claims (Hellstroem and Jacob, 2003; Davenport *et al.*, 2003; Hellstroem *et al.*, 2003; Sonnenwald, 2003; Rod and Paliwoda, 2003; Raman, 2005; Leinhos, 2005; Watterton, 2005; Zehr, 2005; Halffman, 2005).

In most of these cases, the mixing of science, politics, and policymaking is viewed positively by participants and by those studying them (but see Hunt and Shackley, 1999; Halffman and Hoppe, 2005). In other words, there are organizations and situations in the science/policy interface that encourage and are constructed on breaches of the boundary between science and non-science.

This suggests that further research employing the concepts of pollution and purity claims needs to specify conditions under which breaches of the science/non-science boundary, particularly between science, politics, and policymaking, are valued as well as not valued. It does not suggest that boundary-work or pollution and purity claims are less important in constituting these new relationships than they were in constituting previous ones. To the contrary, “In this hybridized world, apparent boundaries

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between science and politics break down and, perhaps paradoxically, boundary-work becomes even more important” (Zehr, 2005: 455). Still, the prevalence, types, and significance of pollution and purity claims remains to be established by further systematic study of these topics.⁸

Notes

1. Douglas adapts Emile Durkheim's concepts of the *sacred* and *profane* (developed for the study of western religions) to the study of primitive religions, where they become *purity* and *pollution*. Douglas identifies four sources of social pollution: (1) danger pressing on a group's external boundaries, (2) danger from transgressing the internal boundaries, or lines, of a group, (3) danger in the margins of the boundaries, a sort of no-man's borderland, and (4) danger from internal contradiction, when some of the basic organizing principles are denied by or clash with other such basic principles, so that the group seems to be at war with itself. Douglas further develops these ideas in *Natural Symbols* (1970) and (with Aaron Wildavsky) in *Risk and Culture: an Essay on the Selection of Technical and Environmental Dangers* (1982).
2. These are not the only ways that Douglas's concepts of pollution and purity can be extended to the study of science. Related but different uses can be found in Bloor (1978), Bloomfield and Vurdubakis (1995), and Mody (2001).
3. "Science is not all of a piece," Bloor writes, echoing Gieryn. "It is subject to a duality of nature which (sic) is signalised by many distinctions, e.g., that between pure and applied, science and technology, theory and practice, popular and serious, routine and fundamental. In general we may say that knowledge has its sacred aspects and its profane side ... Its sacred aspect is whatever we deem to be highest in it ... [T]he sacred aspects of science can be thought of as informing or guiding the more mundane, less inspired, less vital parts."
4. The so-called "Thomas Committee" or Interagency Scientific Committee (ISC) was created by Congress as part of "Northwest Timber Compromise" legislation to assess the owl's population decline and habitat needs and to develop a plan to protect it (Thomas *et al*, 1990).
5. The reference here is to President Clinton's subsequent decision to appoint Jack Ward Thomas, the wildlife research biologist he had appointed to head FEMAT, to head the US Forest Service.
6. *Seattle Audubon Society v. Evans*, 771 F.Supp. 1081, at 1091-93 (W.D. Wash. 1991).
7. *Portland Audubon Society v. Hodel*, 866 F.2d 302, at 305 (9th Cir. 1989).
8. For a framework within which to pursue case studies allowing an assessment of the generality of scientific boundary-work relying on pollution and purity claims, see Hammitt *et al* (2005) and Swedlow (2006b). While the universe and sample of cases in this ongoing comparative study are particularly well-suited to studying regulatory science, not all of the risks have been regulated, and not all of the risks have been regulated for the entire period under study. This variation in cases provides an opportunity to study scientific assessments of risk that are divorced or relatively distant from the regulatory process and related politics.

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