

Comments to the “Response to Forest Heritage Planning Process and the STAC Final Report” of February 5, 2013

March 15, 2013

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Introduction

I have reviewed the STAC Final Report of November, 2012 and the “Response” document of February, 2013 in great detail, read a large number of scientific articles that bear on the issues raised, and spoken to several scientists with expertise in forest management, forest biodiversity and ecosystem services, carbon sinks, Lyme disease, and other relevant topics.

They include:

Dr. David Foster, Director of the Harvard Forest, Senior Lecturer on
Biology, Harvard University

Duncan Stone, Bullard Fellow in Forest Research, Harvard Forest

John Roe, Bullard Fellow in Forest Research, Harvard Forest

Dr. Stuart Pimm, Doris Duke Professor of Conservation Biology, Duke
University

Dr. Rick Ostfeld, Disease Ecologist, Cary Institute of Ecosystem Studies

Dr. William Moomaw, Professor of International Environmental Policy,
Tufts University, A Lead Author of the IPCC and the Millennium
Ecosystem Assessment

While my comments have been informed by these discussions, the views expressed below are mine and mine alone, and do not intend to represent in any way the positions of the Center for Health and the Global Environment or of Harvard University, or the opinions of any of the scientists mentioned above.

I am grateful to Secretary Bowles and Commissioner Sullivan for ordering a moratorium on logging in DCR watersheds in 2010, and to STAC for its review of DWSP’s logging practices and for its policy recommendations going

forward. I also appreciate the opportunity to provide comments on the DWSP's "Response" document, and by extension on the STAC Report, and I look forward to engaging, along with my colleagues, in conversations with Secretary Sullivan of the Executive Office of Energy and Environmental Affairs and DCR Commissioner Lambert, to help inform their decisions about the proposal to re-start commercial logging in Massachusetts' watershed lands.

I need to say at the outset that I have many friends in DCR and admire them and their work greatly, particularly Jim French, whose efforts to protect land from development in the Quabbin Watershed are legendary; Paula Packard, whose tireless work to understand the dynamics of Commonwealth surface waters and wetlands and to preserve them deserves special praise; and Caroline Raisler, who was enormously helpful and diligent with all the details involved in my wife's and my Watershed Protection CR. I also want to recognize the hard and dedicated work of the STAC and of those in DWSP and DCR in general, who put in long hours and give it their all, despite perhaps sometimes having the feeling that they have a thankless job.

But in spite of these friendships and this admiration, I feel very strongly that it is my responsibility to question scientific conclusions when I disagree with them, particularly when it comes to critically important environmental and public health questions such as logging in Massachusetts' watersheds. In what follows, I will restrict my comments to logging in the Quabbin Reservoir Watershed, for, as the largest reservoir of surface drinking water in the world, the Quabbin merits the greatest attention and the greatest care.

First, some general comments about the STAC Report and the "Response" document.

- Any scientific report should present a range of opinions and should go out of its way to reveal uncertainties in its conclusions and possible unanticipated impacts, especially when the issues covered are so multi-faceted and complex, and when the systems involved are so poorly understood. Both of these conditions apply to the Quabbin Watershed. There is no serious attention paid in the STAC Report, nor in the "Response" document, to scientific opinions that may call their conclusions and recommendations into question, and no admission of such uncertainties, creating the impression that both of these documents are defensive and dogmatic in nature, and raising serious

questions about their open-mindedness and objectivity. What is just as worrisome is that those who may disagree with the assumptions on which these reports are based are characterized, I am sorry to say, in a dismissive and patronizing way, as if they were misguided and uninformed, not getting the big picture, and motivated by ideological and aesthetic, rather than by valid scientific, concerns. This is hardly the way to win friends and influence people.

- It also seems unwise in the STAC Report and in the “Response” document to hold up DWSP’s receiving the first Forest Stewardship Council’s (FSC) “Green Certification” for public land management in North America, without also mentioning that the Commonwealth’s application for re-certification in 2009 was denied, as its forestry practices were not in compliance with FSC standards. Now, four years later, the Commonwealth is still not FSC “Green Certified.” Anyone who knows this history will raise eyebrows when reading these documents.
- Finally, it goes without saying that when you are causing major disturbances to large, critically important ecosystems, the burden of proof is up to you to demonstrate conclusively and convincingly that the potential benefits derived from such disturbances, both short-term and long-term, are greater than the potential risks. Otherwise, such disturbances cannot be justified. In my view, this principle applies very strongly to forest management of the Quabbin Watershed, which, while not an old growth forest and not “pristine,” nevertheless has been in large part undisturbed, outside of intensive harvesting, for 80 years or more.

I will argue below that the STAC Report and the “Response” document have not provided conclusive and convincing evidence that the potential benefits from DWSP’s forest management plans for the Quabbin Watershed outweigh the potential risks, and, therefore, that there be a continuation of the Moratorium on logging in the Quabbin (as well as in the Ware and Wachusett Watersheds). I have included several primary references from the literature at the end of my comments so that readers can follow my argument and decide for themselves.

Specific Comments

1. Loss of Carbon Storage and Carbon Release

Carbon sequestration is mentioned just one time in the entire 72 pages of the STAC report. Carbon release from harvesting is not mentioned at all. It is hard to understand why this issue does not seem to be worthy of any consideration, given that “forests and their soils contain the majority of the Earth’s terrestrial carbon stocks” (a), that deforestation is thought to account for about 20% of total global CO₂ emissions (IPCC, 2007), and that forests in the U.S. are said to sequester some 10% of total annual U.S. CO₂ emissions (1). There is an extensive literature that uncut forests compared to those that are logged store the greatest amount of carbon, and that the loss of carbon sinks, both in trees and in the soils, is proportional to the extent of harvesting (e.g. see 2, 3, 4, 5). What’s more, there is significant soil carbon release from harvesting (5, 6). Forest soils are the largest active terrestrial carbon pool, with over 69% of the total C in forest ecosystems stored in soil (7). While the regeneration of the forest after cutting will eventually result in a sequestering of carbon at an increasingly rapid rate, it may take 20 years or more before it begins to catch up in rate to the amount of carbon sequestered by uncut forests (3), and longer still until the total amount of carbon sequestered is the same.

The plans to cut up to 25% of some areas of the Quabbin Watershed forests over 10 year periods, which will total many thousands of acres over 20 years (judging from past harvesting), will amount to a massive loss of carbon sequestration for the Watershed, and massive soil carbon release. The fossil fuel costs of the chain saws, trucks, and all the other heavy equipment, plus the transport of the logs to their final destinations must be added to these carbon emission calculations as well.

While the release of carbon from soils and the reduction of carbon sinks secondary to DWSP’s harvesting operations in the Quabbin Watershed will not push the world towards a climate catastrophe, the fact that the STAC Report does not even discuss this issue, and has not studied carbon storage or release from harvesting activities in the Watershed at all to my knowledge, at a time when we are rapidly increasing atmospheric CO₂ concentrations and causing more and more frequent and extreme, wildly fluctuating, and increasingly unstable changes to the global climate, when the major academies of medicine around the world, including our own American College of Physicians, have called climate change “the biggest global health threat of the 21st Century”, when we need to reduce every

possible source of CO₂ emissions and increase every possible carbon sink, when we need to plant more forests, not cut down those we already have, does not inspire confidence.

And given that in 2008, Governor Patrick signed into law the Global Warming Solutions Act for Massachusetts, which requires the Executive Office of Energy and Environmental Affairs, in consultation with other state agencies and the public, to achieve greenhouse gas emissions reductions for the Commonwealth of between 10 and 25% below 1990 statewide emissions levels by 2020, and 80% below 1990 by 2050, it is hard to understand how DWSPs current proposals for massive cutting in the Quabbin and other Massachusetts watersheds will do anything but make it more difficult for the Commonwealth to achieve these goals.

2. Biodiversity Loss and Ecosystem Impacts

The STAC Report devotes a great deal of attention to its claim that biodiversity will increase as a result of its harvesting policies, and indeed there are studies that support the finding that many species depend on early successional habitat and will do better with the creation of more open spaces and edges in the forest (b). But it all depends on what one takes as a baseline in talking about the populations of different species, and about what species or family of species one looks at. The species that are said to have declined in New England starting from a century ago, such as field sparrows and cottontail rabbits, thrived in the widespread open fields still present then, as the forests had not yet grown back from cutting done throughout the 18th and 19th and even into the early 20th centuries. If the baseline, however, is the original forests in New England, then it is the deep forest species, like Pileated Woodpeckers, Wood and Hermit Thrushes, Barred Owls, and Fishers that one should be measuring now, not the populations of those species present in greater numbers a century ago.

There is also a substantial literature about how widespread timber harvesting in our forests is devastating for many species—such as for salamanders (8, c, d), which play highly important roles in forest food webs (9) and which are among the most abundant group of vertebrates, both in numbers and in biomass, in New England forests (10), and for other amphibians (e, f). Given the threat of extinction for many amphibian species, it should be important for these species to be considered in any

forest management plan. Saying that logging operations will avoid vernal pools is certainly a worthwhile objective, but one that will be very difficult, if not impossible, to accomplish given the extent of logging proposed, but it is the destruction of the forest itself that is the main threat to amphibians.

There are, in addition, threats from timber harvesting, to many other species, including small snakes (g), wood ants (h), some lichen species (i), and understory plants which may not recover for decades (11). [One has to wonder whether Mountain Lions sighted in the Quabbin Watershed in the 1970s and 1980s by extremely reliable sources, with scat confirmation done some 15 years ago, are still around after all the extensive logging and human incursions, such as from the widespread patch clear-cutting done in the Prescott Peninsula.]

But what may be the most significant, and the least well studied and understood, impact of timber harvesting in the Quabbin Watershed is the effect on the forest floor and the structure and functioning of forest soil ecosystems. The loss of nutrients by removing the harvested timber, the changes in temperature and moisture levels in the soils from opening up the canopy, the compacting and destruction of forest floor organisms by the heavy equipment and the creation of roads (j), the inevitable spilling of gasoline and oil from the heavy equipment, these and other stresses resulting from logging operations all will have drastic effects on soil organisms, both in terms of complexity and abundance, including the mycorrhizae and other soil microbial life, affecting soil fertility, water retention and flow, water filtration, gas exchange (k), nutrient cycling, the flow of aluminum, nitrates, calcium, and other ions into surface waters (l), and other soil processes. These major impacts on soil biodiversity and ecosystem services, some of which may not recover for decades following timber harvesting (12), are barely considered in the STAC Report.

3. Lyme Disease and Invasives

Lyme disease is the most common vector-borne disease in the U.S., with close to 25,000 confirmed cases nationwide in 2011, as reported by the CDC, and close to 10,000 additional cases that are considered probable. There are also a large number of cases that never show up at a doctor's office. From 2004 to 2008, Massachusetts had the third highest incidence of Lyme Disease of any state in the country, with close to 61 confirmed cases per 100,000 population.

Lyme is a major public health threat for Massachusetts residents, and may be a particular threat for those who live in and around the Quabbin Watershed, particularly for loggers and hikers and hunters who frequent the forest and its edges. While it is very rarely fatal, Lyme can cause, when undetected and untreated (which is common, as the early symptoms of Lyme resemble a bad flu, as the infected ticks may not cause a local skin reaction and are often too small to be seen, as only about $\frac{3}{4}$ of people get the characteristic “bull’s eye” rash, and as early blood titers for Lyme are often negative) significant long term cardiac, joint, and neurologic problems. It is totally anecdotal on my part, but two of my good friends, both Petersham residents, both very healthy, very strong young men who work outdoors, contracted severe acute Lyme disease in the past few years—one had severe meningitis requiring hospitalization, the other encephalitis, from which, after several years, he has not yet fully recovered!

It is well studied and documented that the fragmentation of forests increases the risk of human Lyme disease, a result of creating habitat where the most competent host for Lyme in our region, the White-Footed Mouse, can thrive, and where its competitors and predators cannot (13, 14, 15), thereby increasing White-Footed Mouse populations.

Compounding this problem in the Quabbin Watershed is the fact that it is infested with invasives like Japanese Barberry, which thrive when there is a disturbance of the canopy (16), and there is growing evidence that Japanese Barberry provides a habitat favorable to the Eastern Blacklegged Tick and to the White-Footed Mouse, further increasing the risk of human Lyme disease (17, 18 19).

The STAC Report acknowledges that increased gap formation in the forests by management activities can facilitate the spread of invasive plants, and the “Response” document of Feb. 2013 says that it will address invasive plants through the “Terrestrial Invasive Plant Strategic Management Strategy” without really explaining how it will achieve this goal. Creating gaps in the forest through their logging practices will do just the opposite, increasing the spread of invasives, including Japanese Barberry.

The fact that Lyme disease and its relation to forest fragmentation and to the spread of invasives is not mentioned in the STAC Report or in the “Response” document indicates that the authors are either unaware of this

major public health threat or that they do not consider it important enough to address.

4. Money and Jobs

DWSP insists that its commercial logging operations on public watershed lands are not about the money, and quotes 10 year revenue figures for its operations, from 2000-2009 at \$6,940,762, so around \$700,000 a year. It is not clear whether these are total receipts or net profits. But the MWRA Advisory Board does seem to be concerned about the money, for in its comment on the STAC Final Report, it angrily decries that “nearly \$1.5 million in potential forestry revenue” has been lost since the Moratorium was imposed in 2010. If it is not about the money, and the DWSP is interested in causing the least amount of disruption to the forest while achieving its goal of creating a mixed age, mixed structure and species forest, and not reducing nutrients from removing the harvested trees, then why hasn’t it proposed leaving the trees on the ground after they are cut? That would then leave the tree nutrients in the forest, and would avoid the massive destruction to the forest floor caused by the skidders and trucks and dozers and forwarders and roads, as individuals with chain saws could do all the work on their own?

There is another issue here, and that is that the harvesting creates jobs for those who make their living cutting trees and for those who use the timber products. Clearly loggers have one of the most demanding, and most dangerous, jobs of all, akin to commercial fishing, and they have been very hard pressed by this economy, often barely making ends meet. Like commercial fishermen (and fisherwomen), they have to buy or lease their enormously expensive equipment. I suspect that many have been hurt by the Moratorium, and in my view, the Commonwealth, which has implicitly promised them endless work in harvesting trees in Massachusetts watersheds, including the Quabbin, has a responsibility towards them. Perhaps there needs to be a state bond issue for Massachusetts watersheds, to offset the revenue lost by a continued Moratorium, to provide assistance to loggers who are in need (as Federal programs do for fishermen), and to do all the necessary research and monitoring that has not been done but that must be done. Is there a more worthwhile investment in the future of the Commonwealth, in the long-term security of our drinking water and the forest ecosystem that sustains it? No-one, including loggers and others who have profited from wood harvesting in the watersheds, if they fully understood the risks involved, to themselves and their families, would sacrifice the Quabbin

Watershed for a job. Tragically, such trade-offs have been all too common in our country, presented as the only choices available, to the detriment of both the environment and human health.

5. Resilience of the Forest to Large Scale Natural Disturbances

The major rationale in the STAC Report and the “Response” document for resuming large-scale logging in the Quabbin, Wachusett, and Ware Watersheds is that we must plan for the “perfect storm” where there is a massive loss of forest cover in the watersheds by a natural disturbance, at the same time as that there is a massive drought. The contention is that an even-aged forest is highly vulnerable to such a disturbance, whether it be a hurricane or another severe weather event, or an outbreak of pests or disease. And so the argument is that we must create gaps in the forest for regeneration so that there will be a greater diversity of trees, both in type, structure, and in age, so that if most of the older trees die at the same time, then there will be diverse stands of younger trees to take their place.

As the Quabbin Watershed is a fairly even aged forest, this argument would appear to have merit, as there is an increased danger of such losses with the spread of pests such as the Asian-Longhorn Beetle, the Emerald Ash Beetle, and Hemlock Woolly Adelgid and diseases like Ash Dieback, all arriving to our region at the same time, and with the prospect of larger, more frequent, more destructive, more long-lasting storms and other extreme weather events secondary to climate change.

But how has DWSP tested this assumption, that creating human disturbances in the forest by cutting thousands of acres of trees is less destructive than the natural disturbances that may occur? The STAC Final Report refers to the ice storm of December, 2008, the tornado of June, 2011, the late-October snow storm of 2011, and Hurricanes Irene and Sandy. There is also reference to the 1998 ice storm. What were the impacts of these events on the Quabbin Watershed? What was the level of damage on intact areas of forest versus those that had been harvested? Were larger, older trees more vulnerable during these events? How did the forest respond in areas where trees were blown down, and over what period of time did it regenerate from these natural disturbances? What studies were done in harvested areas versus those that were untouched on forest soils and soil ecosystem functions?

From 1980 to 2009, more than 44,000 acres of forest have been cut by DWSP in the Quabbin, Ware, and Wachusett Watersheds, (and in the Sudbury Forest). What experiments have been done to test the hypothesis that regeneration in these areas of thinning, patch clear-cutting, and “shelterwood” cuts has resulted in a diverse forest with multiple species represented? How have invasives, deer and moose browse affected this regeneration?

The STAC Report and the “Response” document both refer to their cutting practices as following “state-of-the science” Best Management Practices that have always been followed, and yet these practices seem to be constantly changing—from thinning during the period of the 1960s to the 1990s to a mixture of “cookie-cutter” patch clear-cuts and “shelterwood” cutting until 2009 to only “shelterwood” cuts being proposed from now on. There is little explanation about why these changes have been made and how each of these practices achieved, or did not achieve, the goals set out by DCR.

We are told that 90% or more of the cut areas of forest, according to the new proposal, will be below 2 acres in size (which will, of course, create even-aged forests up to 2 acres) but there is no figure about the total amount of acreage that will be cut per year or for a 10 year period, only that the total will not exceed 25% of a watershed forest over 10 years. What experiments have been done in the Quabbin Watershed to demonstrate that openings up to 2 acres are necessary? How was the figure of 25% of the watershed forest arrived at? For the Quabbin Watershed, which has some 85,538 acres of forested land, we are talking about cutting down more than 21,000 acres over the next 10 years. Is this what is being planned?

One would think that with such a proposal, there would have been an ongoing large-scale research program in the Quabbin and other watersheds to determine whether the harvesting program DCR is proposing is absolutely necessary. Since this is not mentioned, one can only assume that such studies have not been done.

One such study that has been done, by Dr. David R. Foster, Director of the Harvard Forest in Petersham, Massachusetts and one of the foremost forest biologists in the world, and Dr. David A. Orwig, a Forest Ecologist and Senior Investigator at the Harvard Forest (20), looked at the

immediate and long-term consequences of two major disturbances to forests that they created in test plots—one by wind and one by insects—and compared them to the effects of salvage and pre-emptive harvesting, such as has been done in the Quabbin Watershed. The study was done in Petersham, one of the towns in the Quabbin Watershed. What is instructive about this seminal study is that it showed the great resilience of such forest systems to large natural disturbances and concluded that the negative impacts on forest ecosystems are greater with harvesting regimes than they are with leaving the forests alone and allowing them to recover from natural disturbances.

6. Air and Water Quality

Destroying large areas of the forest canopy will serve to lessen air quality, as the canopy is a filter of small and large particulates in the air—from cities, industrial sites, incinerators, cement production, and other sources, binding them so that they do not enter our lungs and cause and exacerbate asthma and other chronic pulmonary diseases. The leaf surfaces of the canopy also serve as chemical reaction sites that detoxify air pollutants like nitric oxides, the precursor of ground level ozone, into harmless compounds (21). Thus the air in and around the Quabbin and other heavily forested areas is healthier for those who live there.

Similarly forest soils act like blotters for pollutants such as inorganic nitrogen (in the form of ammonium or nitrates) and other inorganic and organic compounds. As rain carrying these chemicals falls on the Quabbin Watershed, it percolates through the soil of the forest and is stripped of the chemicals, which are taken up by the plants on the forest floor and by microbes in the soil, and by chemical reaction sites on clay and on the organic matter to which these compounds bind. In a healthy middle-aged forest in New England, like that of the Quabbin Watershed, rain enters with an average nitrogen load of about 8 pounds per acre each year. Stream water leaving these forests often contains less than 1/10th this concentration (22).

By its cutting practices, DWSP is removing large areas of the canopy, and causing severe damage to the forest floor and forest soil ecosystems. Both have the potential of threatening water quality.

In the STAC Report and in the “Response” document, it is proposed that there be water quality monitoring in areas where forest cutting has occurred, with sampling done before the harvesting and continuing through active logging, as well as over a five year period following completion of the logging. The sample sites are to be above and below the sites of forest management.

The DWSP has been logging in the Quabbin Watershed since the 1960s. Can it be that despite having had an active forest management program for more than 50 years, the DWSP, whose principal mandate is to supply clean drinking water to some 2.2 million people, has not been testing whether its timber harvesting has affected our water quality or not?

Conclusion

There are significant potential risks from DWSP’s planned logging operations for the Quabbin and other watersheds—increased greenhouse gas emissions, a decline in the populations of many deep forest species, massive damage to the forest floor and to forest soil ecosystems and their functioning, the spread of invasives, a greater risk of human Lyme disease, and a potential loss of the ability of the forest to filter pollutants from air and water. One major potential benefit that has been claimed by the STAC Report and the “Response” document—that cutting forest stands will lead to a more diverse forest, in age, structure, and type, a forest that will be more resilient to increasingly destructive natural disturbances, thereby ensuring the long-term stability and quality of our water supply, has not been tested. DWSP has no data to support this assumption. And one controlled experiment that has looked at this issue, by Foster and Orwig, has concluded just the opposite:

“All evidence suggests that harvesting exerts greater impacts on ecosystem processes than leaving disturbed or stressed forests intact. A conservative alternative hypothesis for the long-term management of watershed lands might be proposed: the elimination of harvesting and its associated impacts (e.g. soil compaction, road development and improvement) will yield forest and landscape conditions that maintain and improve water quality in the face of ongoing disturbances and stresses.” (20)

A group commissioned by the Ecological Society of America to study the importance of forest reserves in National Forests, led by Professor John D. Aber, a leading forest ecosystem biologist in the Department of Natural

Resources and the Environment, and Provost of the University of New Hampshire, came to the same conclusion:

“We are confident that:

- Despite natural disturbance and successional change, forest reserves are much more likely to sustain the full biological diversity of forests than lands managed primarily for timber production.
- No evidence supports the view that natural forests or reserves are more vulnerable to disturbances such as wildfire, windthrow, and pests than intensively managed forests. Indeed, there is evidence natural systems may be more resistant in many cases.” (23)

More than 44,000 acres out of a total of almost 188,000 acres of the Quabbin, Ware, and Wachusett watershed forests (and from Sudbury Forest) have already been harvested from 1980 to 2009, an amount that may be greater than any single natural disturbance, or combination of them. To harvest more (and it would seem, although the reports are vague about the numbers, that an equal amount, as much as 47,000 acres more, is being planned for harvesting over the next ten years), when there is a great deal of evidence that harvesting causes significant harm to forest ecosystems, and when there is no evidence whatsoever that it protects forests in the long run from natural disturbances, (and may, in fact, make them more vulnerable), should be unacceptable for the people of Massachusetts.

The only mandate of DWSP is to provide clean drinking water. There is no evidence that the harvesting plans as recommended by the STAC Report or by the “Response” document will accomplish this, and a vast literature to support just the opposite conclusion, that undisturbed watersheds, compared to those that have been harvested, are best able to provide the highest quality drinking water.

Until DWSP conclusively and convincingly demonstrates, which they have not in my view--through carefully controlled, long-term experiments within their watersheds, done by respected, impartial researchers from many diverse backgrounds, including several specialized in forest ecosystem services, including some who may even question DWSP’s logging policies--that restarting widespread logging in the Quabbin and in its other Massachusetts watersheds is absolutely essential to their short and long term health and to their providing abundant, clean drinking water for the citizens of Massachusetts; until DWSP conclusively and convincingly demonstrates,

which they have not in my view, that the benefits of their proposed forest management policies significantly outweigh the risks, the Moratorium on logging in the Quabbin and in other Massachusetts watersheds should be continued.

That, as Gifford Pinchot said in 1905, would indeed be for “the greatest good of the greatest number in the long run.”

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