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October 28, 2010

Mr. Rob Messenger
Mr. Justin Perry
Strategic Plan for State Forest Management
New York State Department of Environmental Conservation
625 Broadway
Albany, NY 12233-4255

Re: Comments on Draft Strategic Plan for State Forest Management

Dear Mr. Messenger and Mr. Perry:

On behalf of Earthjustice and the undersigned organizations, please accept these comments on the Draft Strategic Plan for State Forest Management ("DSPSFM"). These comments are directed specifically to the proposal to permit shale gas development in State Forests. New York State has long demonstrated a strong commitment to reviving and preserving its forest resources. As private lands face increasing pressures from urbanization, undeveloped State Forest lands provide ecosystem services vital to the continued prosperity of New York State and its citizens. Healthy forests renew air and water resources, protect against floods, provide valuable wildlife habitat and carbon sequestration, and act as a sustainable source of forest products.

The New York State Department of Environmental Conservation ("NYSDEC") should not permit development of unconventional gas reserves on State Forest land, unless and until the potential for adverse environmental impacts is thoroughly studied and such studies conclude that the entire development process can be safely conducted without harm to the forest ecosystem.

These comments begin with an assessment of New York State's obligations in regard to State Forest lands. The comments next address the importance of the forest complex in providing key ecosystem services and set forth the numerous risks posed to the State Forests by shale gas development, especially high-volume hydraulic fracturing. Finally, in the event that NYSDEC nevertheless proceeds with drilling, hydraulic fracturing, and gas production in State Forests, a set of Best Management Practices ("BMPs") to minimize adverse impacts is advanced.

I. The DSPSFM Fails to Satisfy NYSDEC's Obligation to Ensure the Environmental Protection of State Forests.

The development of the State Forest system has its roots in the early 20th Century campaign to combat a growing crisis of deforestation through the re-conversion of abandoned farmland to a forested state. Forests constituted less than one quarter of state land by the 1880s.[1] Prior to the 1900s, forest land had been routinely cleared for agricultural purposes. Because the soils on much of the cleared land were marginal for agricultural use, nutrients were quickly depleted and the land soon proved unproductive.[2] As more nutrient-rich land was discovered with westward expansion, many of New York State's farmers abandoned their attempts at farming the unproductive soil.[3] This decline in agriculture continued through the Great Depression, when many of the remaining farmers found they could no longer make a profit from the marginal land.[4] While early efforts focused on replanting the Forest Preserve, the State Reforestation Act of 1929 and the Hewitt Amendment of 1931 expanded reforestation efforts to other portions of the state, authorizing the acquisition of land outside of the Forest Preserve for the express purpose of fostering reforestation, watershed protection, timber production, and

[1] N.Y. State Dep't of Envtl. Conservation, DSPSFM 15 (2010) [hereinafter DSPSFM].
[2] *Id.*
[3] *Id.*; N.Y. State Dep't of Envtl. Conservation, *History of State Forest Program*, http://www.dec.ny.gov/lands/4982.html (last visited Oct. 20, 2010) [hereinafter *History of State Forest Program*].
[4] DSPSFM, *supra* note 1, at 15; *History of State Forest Program*, *supra* note 3.

recreational opportunities.[5] From these beginnings, New York State has worked diligently to produce the vibrant and vital State Forest system of today. In NYSDEC's own words,

> New York's State Forest lands serve as large blocks of open space on the landscape outside of New York's Adirondack and Catskill Forest Preserve that won't be subdivided, developed or converted to grey infrastructure. As the landscape changes over time, these green blocks and patches across the landscape will act as essential ecosystems supporting people, plants and animals, providing needed habitats and ecosystem services such as carbon sequestration, clean water and a sustainable supply of forest products. State Forests, due to their perpetual term of ownership, dedicated purposes and large contiguous acreage, are uniquely able to contribute habitat types and other components of biodiversity which are not normally found or sustained on privately held forest lands.[6]

That the forests of New York State have recovered from the historic low of the late 19th Century is due in no small part to the safeguarding and careful management of the State Forest system. In contemplating the advent of drilling in low-permeability formations underlying State Forest lands, NYSDEC must take care not to undo the great efforts and hard-earned gains of the last several decades.

The DSPSFM proposes to permit shale gas development within State Forests and asserts that the ability to enter into leases for gas removal from State Forests is a power granted by Article 9 of the Environmental Conservation Law equal to the power to acquire lands for reforestation, timber, and watershed protection.[7] However, state law does not permit the leasing of state land for gas production absent a demonstration that the development is consistent with environmental protection. As a general matter, the first section of New York's Environmental Conservation Law establishes that it is the policy of New York State "to conserve, improve and protect its natural resources and environment and to prevent, abate and control water, land and air pollution, in order to enhance the health, safety and welfare of the people of the state and their

[5] DSPSFM, *supra* note 1, at 15; *History of State Forest Program*, *supra* note 3.
[6] DSPSFM, *supra* note 1, at 42.
[7] *Id.* at 236, 313.

overall economic and social well being."[8] Section 9-0507 of the N.Y. Envtl. Conserv. Law states that NYSDEC:

> may, in any lands acquired by the state in accordance with section 9-0501, enter into leases for the purpose of aiding in discovering and removing any oil or gas upon such lands or storage of gas or oil thereon, under such terms as may be prescribed by the department, and upon such conditions that the exercise of such leasehold rights shall not interfere with the operation of such reforestation areas for the purposes for which they were acquired and as defined in Section 3 of article XIV of the Constitution.[9]

Section 9-0501 details the State's power to acquire reforestation areas:

> In order to provide for the acquisition of lands outside of the Adirondack park and the Catskill park . . . which are adapted for reforestation and the establishment and maintenance thereon of forests for watershed protection, the production of timber and other forest products, and for recreation and kindred purposes, [NYSDEC] may acquire . . . reforestation areas . . . which shall be forever devoted to the planting, growth and harvesting of [trees].[10]

N.Y. Const. art. XIV, § 3, cl. 1 permits the legislature to "appropriate moneys for the acquisition by the state of land, outside of the Adirondack and Catskill parks as now fixed by law, for the practice of forest or wildlife conservation." Thus, NYSDEC may lease State Forest Reforestation Areas for gas exploration and production only if it demonstrates that such activity

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[8] N.Y. Envtl. Conserv. Law § 1-0101(1) (McKinney 2010).

[9] *Id.* § 9-0507 (emphasis added). A separate approval for leasing state lands for oil and gas production is provided by N.Y. Envtl. Conserv. Law § 23-1101: "[NYSDEC] may make leases . . . for [the] exploration, development, and production of gas in state-owned lands, except state park lands and the lands under the waters of Lake Ontario or along its shoreline."

[10] *Id.* § 9-0501. Out of 786,329 total acres of State Forest, 743,136 acres, or nearly 94.5 percent, are designated as Reforestation Areas. DSPSFM, *supra* note 1, at 8. The remainder of State Forest land is even less suited to natural gas development. The final 5.5% of State Forest land comprises Unique Areas (22,112 acres), Multiple Use Areas (16,071 acres), and several small miscellaneous land categories (5,010 acres). *Id.* Multiple Use land is land acquired "primarily for outdoor recreation, including public camping, fishing, hunting, boating, winter sports, and, wherever possible, to also serve multiple purposes involving the conservation and development of natural resources, including the preservation of scenic areas, watershed protection, forestry and reforestation." *Id.* at 12 (citing N.Y. Parks Rec. & Hist. Preserv. Law § 36B-15.01(1)(b)). Unique Areas include "lands of special natural beauty, wilderness character, geological, ecological or historical significance for the state nature and historical preserve, and similar lands within a forest preserve county outside the Adirondack and Catskill Parks. *Id.* at 13 (citing N.Y. Envtl. Conserv. Law § 51-0703(4)). Gas drilling activities would greatly hinder public use of land for outdoor recreation and would mar the natural beauty of forests and are thus inappropriate to both of these land areas.

will not interfere with watershed protection, timber production, recreation, forest conservation or wildlife conservation.

NYSDEC has failed to make this showing in the DSPSFM. According to the DSPSFM, "Development on public lands, with heightened protections and oversight, has proven to be a compatible use of State Forests."[11] The DSPSFM further asserts, "This plan assesses impacts and establishes mitigation measures and further analysis of oil and gas developments as it applies specifically to State Forests. Compliance with the guidelines of this section will avoid and minimize potential impacts resulting from mineral resource activities."[12] Shale gas development is unlike development of conventional gas reserves, and the high-volume hydraulic fracturing required to stimulate production of shale gas presents a larger array of threats and greater magnitude of risk compared with conventional drilling technologies. The fact that New York State has previously permitted, whether wisely or not, a total of 208 oil and gas wells on State Forest land is not proof of future compatibility and certainly does not demonstrate the consistency of hydraulic fracturing with NYSDEC's environmental protection obligations. Potential impacts from hydraulic fracturing on State Forest land must be assessed directly.

The DSPSFM's claim to assess the impacts of such future gas development cannot be supported. As is discussed in greater detail below, the DSPSFM inadequately addresses watershed protection, forest conservation, and wildlife conservation in the context of permitting gas drilling. The Division of Lands and Forests must properly analyze the potential impacts of gas development, especially hydraulic fracturing, upon the State Forest environment before a determination can be made that such activities on State Forest lands will not interfere with the

[11] DSPSFM, *supra* note 1, at 242.
[12] *Id.*

above-stated purposes. This analysis must include the evaluation of impacts relating to forest fragmentation, air pollution, watershed preservation, and water resources generally.

II. The Division of Lands and Forests May Not Rely on the SGEIS Regarding Hydraulic Fracturing in the Marcellus Shale for General Assurances of Safety and Environmental Acceptability.

In completing its Strategic Plan for State Forest Management, the Division of Lands and Forests may not avoid its obligation to address the environmental implications of hydraulic fracturing by relying on the 2009 Draft Supplemental Generic Environmental Impact Statement on the Oil, Gas, and Solution Mining Regulatory Program ("DSGEIS") that is not yet final and itself fails to adequately address the potential impacts of hydraulic fracturing in the Marcellus Shale. The DSPSFM devotes one scant paragraph to the impacts of hydraulic fracturing generally, noting only that concerns have been raised relating to the high volume of water and chemical additives used in hydraulic fracturing as well as the treatment of any hydraulic fracturing solution drawn back out of the well following drilling.[13] The DSPSFM later explains that NYSDEC's Division of Mineral Resources has previously addressed the leasing of lands for oil and gas development in the 2009 DSGEIS and the July 1992 Final GEIS on the Oil, Gas and Solution Mining Regulatory Program.[14]

However, the DSGEIS nowhere addresses potential impacts from hydraulic fracturing unique to drilling within State Forests. The DSGEIS did not discuss the potential for forest fragmentation, which results from the construction of roads, pipelines, and other infrastructure associated with gas drilling.[15] Nor did it discuss the potential for impacts to ecosystem services as a result of that fragmentation. Forest conversion and fragmentation can be detrimental to area

[13] *Id.* at 231.
[14] *Id.* at 242.
[15] *See id.* at 55-56, 158.

water quality[16] and also hinder the free movement and dispersal of wildlife throughout the landscape.[17] The Division of Lands and Forest must do more than state that the potential for fragmentation is a concern. Because forest fragmentation is not discussed in the DSGEIS, the DSPSFM must include a rigorous analysis of all potential fragmentation-related impacts from gas drilling before permitting expanded drilling in the State Forests.

Furthermore, the DSGEIS fails to address adequately all of the potential effects of hydraulic fracturing, including increased air and water pollution. It fails to consider sufficiently the potential negative effects stemming from the large amount of wastewater produced or the increase in stormwater runoff resulting from drilling infrastructure, roads, and truck traffic. Cumulative impacts, whether relating to the effects on wildlife or stemming from frequent water withdrawals, were also effectively ignored. Given that increased air and water pollution may seriously impair forest health and productivity, the Division of Lands and Forests cannot rely on the SGEIS unless and until these concerns are adequately addressed.

III. Shale Gas Development in State Forests Threatens the Health of the Forest Ecosystem.

Healthy forests provide a number of essential ecosystem services that have substantial ecological, economic, and social benefits, including wildlife habitat and diversity, clean water, clean air, carbon storage, flood protection, recreational opportunities, and scenic beauty.[18] These benefits extend far beyond the boundaries of any individual forested area.[19] Forest fragmentation, the process by which contiguous forests are fragmented into smaller, more

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[16] Robert A. Smail & David J. Lewis, Forest Service, U.S. Dep't of Agric., Forest Land Conversion, Ecosystem Services, and Economic Issues for Policy: A Review 12 (2009), *available at* http://www.fs.fed.us/openspace/fote/pnw-gtr797.pdf.
[17] DSPSFM, *supra* note 1, at 322.
[18] Forest Service, U.S. Dep't of Agric., Draft National Report on Sustainable Forests – 2010 § 5-6 (2008), *available at* http://www.fs.fed.us/research/sustain/; N.Y. State Dep't of Envtl. Conservation, *Forests and the Environment*, http://www.dec.ny.gov/lands/41769.html (last visited Oct. 23, 2010).
[19] *See generally* Smail & Lewis, *supra* note 16.

isolated sections, interferes with forest health and productivity.[20] Forest fragmentation can result in increased air and water pollution, decreased native biodiversity, the introduction of invasive species, changes in microclimate, increased flooding, and the loss or degradation of habitat.[21] The impacts of hydraulic fracturing and its related infrastructure threaten the ecosystem services that State Forests provide due to the risks of forest fragmentation and watershed contamination. Because the Division of Lands and Forests is responsible for managing the surface impacts of natural gas drilling, hydraulic fracturing, and production on State Forests,[22] it must thoroughly assess these risks before making a decision regarding such development in State Forests.

A. Healthy Forests Provide a Number of Essential Ecosystem Services That Must Be Protected.

1. Wildlife

In considering whether to permit shale gas development on State Forest lands, the Division of Lands and Forests must take into account potential negative impacts to wildlife dependent on State Forests for habitat. Forests are essential to the protection of wildlife and the promotion of biodiversity. The fragmentation of forests increases species isolation, inbreeding, and extinction.[23] Other negative effects include the loss of forage and breeding grounds and a greater incidence of roadside mortality.[24] Additionally, through the creation of greater edge habitat, fragmentation may allow invasive species to gain a foothold into a new area where they may ultimately overwhelm and out-compete native species.[25] Furthermore, as is discussed in greater detail below, drilling on State Forest land may cause the degradation of water quality,

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[20] State of N.J. Highlands Water Prot. and Planning Council, Ecosystem Management Technical Report 39-40 (2008).
[21] *Id.*
[22] DSPSFM, *supra* note 1, at 225.
[23] Richard T. T. Forman, Land Mosaics: The Ecology of Landscapes and Regions 414-15 (1995).
[24] *See* Smail & Lewis, *supra* note 16, at 16.
[25] *Id.* at 15.
[25] DSPSFM, *supra* note 1, at 31.

which might further impact wildlife. Permitting shale gas development on State Forest lands without a thorough assessment of the potential impacts to wildlife could prevent the Division of Lands and Forests from meeting its first goal for State Forest management – the goal of providing "healthy and biologically diverse ecosystems."[26]

2. Water

In considering whether to permit shale gas development on State Forest lands, the Division of Lands and Forests must also take into account potential negative impacts to the State's water resources. Forests play an essential role in purifying water for drinking and irrigation.[27] When intact forests are fragmented, "ground water recharge decreases, surface runoff and soil erosion increases, and storm flow volume peaks result in increase to downstream flooding."[28] Permitting hydraulic fracturing in State Forests may therefore erode the ability of the forests around New York to perform their essential function of filtering water and regulating its flow, thus preventing the Division of Lands of Forests from achieving its stated goal of protecting essential watersheds.[29] Because watershed preservation was one of the initial rationales behind establishing State Forest reforestation areas (comprising nearly 95 percent of all State Forest land), allowing hydraulic fracturing inside State Forest boundaries without further assurances of watershed protection would be in direct conflict with one of the State Forests' very reasons for being.

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[26] *Id.*
[27] Smail & Lewis, *supra* note 16, at 11.
[28] State of N.J. Highlands Water Prot. and Planning Council, *supra* note 20, at 39.
[29] DSPSFM, *supra* note 1, at 150 ("Consider new acquisitions of state forest lands in areas of the state that have not traditionally been served by State Forests but are underserved by open space and recreational benefits or are in need of watershed protection.").

3. Air Quality

The Division of Lands and Forests must also consider potential impacts to air quality stemming from the conversion of land for drilling infrastructure. Globally, forest ecosystems serve as a net sink for tropospheric ozone, CO_2 and ammonia.[30] Pollutants are removed from the atmosphere via leaf stomata at the same time plants take in air for photosynthesis and respiration.[31] "Ozone is destroyed by reacting with plant tissues."[32] Beyond absorbing gaseous pollutants, plants also aid in the removal of particulate matter, which adheres to plant surfaces.[33] A loss of overall forested area will inhibit the potential for State Forests to improve air quality. As with water, it should be noted that there is a limit to forestland's restorative properties. Plants may filter out atmospheric pollutants, but beyond a certain point they, like other life forms, face negative impacts from doing so. The Final SPSFM must therefore examine not only how forest clearance for gas development affects air quality but also how adverse air quality impacts from gas development, which increases ground-level ozone and other pollutants, affect the capacity of State Forests to provide ecosystem services.

4. Carbon

Forests play an important role in offsetting greenhouse gas emissions through the sequestration of carbon, the process through which trees and other plants take in carbon from the atmosphere during photosynthesis and store it in biomass.[34] As the DSPSFM notes, "Carbon sequestered by US forest growth and harvested wood products currently offsets 12-19% of US

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[30] Millennium Ecosystem Assessment, Ecosystems and Human Well-Being: Current State and Trends 357 (Rashid Hassan et al. eds., 2005), *available at* http://www.maweb.org/en/Condition.aspx.
[31] *See* Beth Anne Currie & Brad Bass, *Estimates of Air Pollution Mitigation With Green Plants and Green Roofs Using the UFORE Model*, 11 Urb. Ecosystems 409, 410 (2008); Walter Larcher, Physiological Plant Ecology 91 (Elisabeth Huber-Sannwald trans., 4th ed. 2003) (explaining photosynthetic and respiratory gas exchange).
[32] Millennium Ecosystem Assessment, *supra* note 30, at 375.
[33] Currie & Bass, *supra* note 31, at 411.
[34] *See* Smail & Lewis, *supra* note 16, at 17.

fossil fuel emissions."[35] The clearing of forested land can interfere with the carbon cycle in two primary ways. First, "recently disturbed . . . forests usually lose carbon from both soil and remnant vegetation, whereas mature undisturbed forests maintain an overall neutral carbon balance."[36] Second, the clearing of trees and other plants can cause a net loss in biomass, thereby decreasing a forest's ability to take in and store carbon.[37] Because the DSPSFM states that NYSDEC's ecosystem management strategy will emphasize the enhancement of carbon sequestration,[38] shale gas development should not be permitted on State Forest land without a thorough assessment of how such development will impact carbon sequestration in State Forests.

B. The Development of Shale Gas Will Have a Large and Lasting Footprint on State Forests.

The DSPSFM states, "Facilities may be developed in unfragmented areas if they have a small footprint of impact (ex. campsites) or a relatively short duration of impact (ex. gas wells)."[39] The impacts of clear-cutting for roads and pipelines will last for at least the lifetime of each well pad, potentially for decades, and then for as long as it takes to reforest what likely will be contaminated land. One need only look at aerial views of the Allegheny National Forest to see that the oil and gas development footprint is neither small nor short-lived.[40]

The development of shale gas will, in fact, have a large footprint of impact and a lasting duration of impact. The initial activities associated with drilling a gas well include clearing and grading land and constructing access roads, well pads, and pipelines.[41] A 2009 report prepared in partnership with the New York City Department of Environmental Protection estimated that a

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[35] DSPSFM, *supra* note 1, at 307 (citations omitted).
[36] Millennium Ecosystem Assessment, *supra* note 30, at 606.
[37] *See* Smail & Lewis, *supra* note 16, at 18.
[38] DSPSFM, *supra* note 1, at 39.
[39] *Id.* at 167.
[40] Allegheny Defense Project, *Photo Documentation of Logging and Oil and Gas Drilling on the Allegheny National Forest*, http://www.alleghenydefense.org/forest_watch/slideshows.shtml (last visited October 24, 2010).
[41] Hazen and Sawyer, N.Y.C. Dep't of Envtl. Prot., Final Impact Assessment Report: Impact Assessment of Natural Gas Production in the New York City Water Supply Watershed 5 (2009).

typical well pad for natural gas drilling through hydraulic fracturing in New York State would cover approximately five acres, and an additional two acres per well pad would be required for roads, pipelines, and other features.[42] The well pad site may be active for months or years. The process of clearing and grading the land, constructing and installing equipment, delivering water, drilling and stimulating the wells, and disposing of waste may last from four to ten months and requires a constant level of industrial activity.[43] If the well pad contains multiple wells, the entire well pad may be active for several years.[44] While drilling sites may be partially restored[45] when drilling and stimulation are completed, an area of approximately one to three acres is left open for the life of the well (approximately twenty to forty years) for access, water storage, and gas production equipment.[46] Furthermore, a well may be re-fractured multiple times over the course of its life to increase productivity.[47] Finally, rights-of-way for pipelines carrying gas from the wellhead to transmission lines must remain clear for safety reasons throughout the period of production.

C. The Visible and Durable Gas Development Footprint Carries Adverse Impact on Forests.

The clearing of five-acre patches of unfragmented forestland for natural gas development would pose significant risks to the integrity and health of New York's State Forests. Approximately half of all fragmentation in the United States takes the form of small perforations of less than seventeen acres in otherwise intact forests.[48] The impacts of perforation are as

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[42] *Id.*
[43] *Id.* at ES-2, 6.
[44] *Id.* at 6.
[45] The DSPSFM is unclear in its discussion of reclamation activities. This matter is addressed below in Section V.
[46] Hazen and Sawyer, *supra* note 41, at 32.
[47] *Id.* at ES-2, 6.
[48] *Fragmentation of U.S. Forests,* Compass (Fall 2005), at 4; Kurt H. Riiters & John W. Coulston, *Environmental Assessment: Hot Spots of Perforated Forest in the Eastern United States*, 35 Envtl. Mgmt. 483, 484 (2005).

serious as the impacts of larger fragmentation,[49] which, as noted above, has been shown to have "effects on almost all ecological patterns and processes."[50] Additionally, perforations introduce edge habitat into intact forests due to increased exposure to sun, light, and wind.[51] This exposure can alter microclimates, thereby affecting habitat and regional biodiversity.[52] The DSPSFM fails to consider the risks associated with perforations to State Forests. Furthermore, if any shale gas development is permitted in the future, the Division of Lands and Forests must assess the extent to which unfragmented State Forest areas should be reserved from such development.

The development of a spider web of roads and pipelines in State Forests to access well sites also poses significant risks to the integrity and health of New York's State Forests. The forest impacts of roads and pipelines extend hundreds of yards from the actual boundary of the cut.[53] Roads and pipelines may disturb drainage patterns, increase sediment loads to streams, restrict the movement of native species, and increase the territory of nonnative species.[54] Furthermore, regions that have more than sixty percent of land within five hundred feet of a road may be at particularly high risk for long-term ecological impacts.[55] The Divisions of Lands and Forests must analyze this threat and, if shale gas development is permitted in the future, address the extent to which access roads may be constructed in unfragmented areas of State Forests.

IV. The DSPSFM Fails to Adequately Address Air and Water Pollution Impacts to State Forests.

Beyond threatening the health of State Forests through increased fragmentation and inhibiting the ability of State Forests to provide crucial ecosystem services, shale gas

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[49] Forman, *supra* note 23, at 415.
[50] *Id.*
[51] Riiters & Coulston, *supra* note 48, at 484; State of N.J. Highlands Water Prot. and Planning Council, *supra* note 20, at 39.
[52] State of N.J. Highlands Water Prot. and Planning Council, *supra* note 20, at 39.
[53] Zoe Hoyle, *Sometimes a Great Notion: Visualizing Forest Fragmentation,* Compass (Fall 2005), at 1, 5.
[54] *Id.*
[55] *How Far to the Nearest Road?*, Compass (Fall 2005), at 5.

development within State Forests may in fact directly degrade the State Forest environment through the introduction of pollutants into State Forest air, ground, and water. Shale gas development activities, from construction through production, result in the emission of numerous air pollutants. Excess water withdrawal may deplete State Forest aquifers. Further, the use of toxic fracturing fluids in vast quantities provides numerous opportunities for State Forest ground and water contamination, through improper on-site storage or escape during the hydraulic fracturing process. Lastly, construction activities and the placement of infrastructure within State Forest boundaries will elevate stormwater runoff levels, which may also impair water quality.

A. The DSPSFM Does Not Address Air Pollution Impacts to State Forests.

Gas drilling and related construction activities will result in increased air pollution.[56] Routine drilling activities result in emissions of nitrous oxides, particulate matter, carbon monoxide, sulfur dioxide, and varied volatile organic compounds.[57] Furthermore, allowing hydraulic fracturing would likely lead to a significant increase in the level of traffic in State Forests, as each hydraulic fracturing well will require approximately 800 to 1,200 trips by truck to transport equipment, chemicals, water, and waste.[58] Additional truck trips will be needed for pipeline construction. Diesel trucks emit high quantities of particulate matter and contribute to the formation of ozone.[59]

While improving air quality by filtering out low-level pollution is in fact an ecosystem service provided by forested land, heightened pollution levels result in harm to plant life. "Toxic

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[56] *See* N.Y. State Dep't of Envtl. Conservation, DSGEIS, 6-48 – 6-128 (2009) [hereinafter DSGEIS].
[57] *See id.* at 6-48 – 6-57.
[58] *Id.*
[59] Envtl. Protection Agency, EPA420-F-02-048, Diesel Exhaust in the United States 3 (2002), *available at* http://www.epa.gov/otaq/retrofit/documents/f02048.pdf.

pollutants from the environment are detrimental to all processes related to CO_2 exchange."[60] "Air pollution induces changes in tree physiology, phenology, and biochemical cycling. Among air pollutants affecting forest health, sulfur, nitrogen, heavy metals, and ozone are the most pervasive[.]"[61] In most plant species, particulate matter pollution causes injury to plants and inhibits growth.[62] Ground level ozone is formed when atmospheric NO_x reacts with volatile organic compounds in daylight.[63] Ozone directly affects sensitive vegetation and "has been associated with reduced yields in crops and forestry, as well as with changes in species composition and biodiversity in natural and semi-natural ecosystems."[64] Ozone has been found to damage trees at levels as low as one hundred parts per billion.[65] Ozone damage makes trees "more susceptible to insects and disease, and less adaptable to environmental changes such as soil compaction or overwatering."[66] NYSDEC cannot proceed with gas development in the State Forests without thoroughly examining potential air pollution impacts to tree health and growth, the very resource that State Forests were established to foster. Such analysis should also consider potential impacts to New York State residents utilizing State Forests for recreation.

B. The DSPSFM Does Not Address Water Pollution Impacts to State Forests.

The DSPSFM emphasizes the importance of maintaining the quality of the water in State Forests but fails to rigorously address the potential adverse impacts of gas development on these resources. The DSPSFM notes that the "protection of soil and water quality is one of the highest

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[60] Larcher, *supra* note 31, at 111.
[61] Millennium Ecosystem Assessment, *supra* note 30, at 611.
[62] A. Farmer, *Effects of Particulates, in* Air Pollution and Plant Life 197 (J.N.B. Bell & M. Treshow eds., 2d ed. 2002).
[63] Ian Colbeck, *Air Pollution: History of Actions and Effectiveness of Change, in* The SAGE Handbook of Environment and Society 375 (Jules Pretty et al. eds., 2007).
[64] *Id.*
[65] Jeff Gillman, How Trees Die 214 (2009).
[66] *Id.*

management priorities and is the foundation of sustainable management."[67] The document also cites a number of BMPs that will help to ensure the continued health of the water resources in State Forests, such as "minimiz[ing] the use of equipment in streams," "locat[ing] improvements away from streams, wetlands, and unstable slopes," and requiring protection buffers around ponds, lakes and streams.[68] It is not enough, however, for the DSPSFM to simply acknowledge the importance of clean water and the practices available to protect it. The DSPSFM must address the specific harms that could result from shale gas development, including impacts to freshwater, dangers posed by wastewater and stormwater, and the removal and possible contamination of water from underground aquifers. As explored in more detail below, failure to adequately assess these issues or to identify mechanisms to mitigate their potential harm may severely degrade water quality within State Forests and defeat the objective of maintaining a healthy and vibrant forest ecosystem.

1. The DSPSFM Does Not Address the Cumulative Impacts of Multiple Water Withdrawals.

The hydraulic fracturing process requires between 2.4 and 7.8 million gallons of water per well.[69] The high volume of water necessary to support hydraulic fracturing could be trucked in to State Forests, but nearby water supplies may present a more likely and economic choice. Excessive groundwater withdrawal can have a number of adverse impacts on ecosystems that could threaten the health of State Forests through, among other consequences, reducing stream flow and depleting groundwater, decreasing aquifer storage capacity, and degrading water quality.[70] The DSPSMF fails to adequately consider this issue. In order to ensure that State Forests do not suffer from these effects, NYSDEC must study the cumulative impacts of the

[67] DSPSFM, *supra* note 1, at 112.
[68] *Id.* at 109–110.
[69] DSGEIS, *supra* note 56, at 5-92.
[70] *Id.* at 6-7.

substantial water withdrawals necessary to support hydraulic fracturing, both from groundwater and from surface water. This study should include information about the water sources and locations of withdrawal. In order for the Final SPSFM to meet its stated purpose of "recommend[ing] actions that promote biodiversity at the landscape level, as well as healthy, productive, sustainable forest ecosystems," the State must undertake such a study before allowing natural gas exploitation.[71]

2. The DSPSFM Fails to Sufficiently Assess the Impact of Wastewater from Natural Gas Exploitation on State Forests.

The water required for hydraulic fracturing is combined with chemicals and granular material to produce the fracturing fluid capable of creating underground fissures to heighten natural gas flow and increase total gas removed. The great volume and toxicity of the fracturing fluid creates numerous risks for State Forests, both before it has been injected into natural gas wells and after a portion has resurfaced, when it requires safe handling for proper disposal.[72] Given the vast amounts of fracturing fluid that operators use in hydraulic fracturing for shale gas, a detailed plan to limit the potential impacts of the resulting waste product is necessary. Beyond merely degrading the State Forests' ability to purify water, any leak of these fluids into the natural environment will even more directly impact water quality within the State Forests. This degradation in water quality will impact State Forest plant and animal life as well as the ability of New York State residents to use State Forest lakes and rivers for recreation. The sections below raise questions that must be answered before NYSDEC can be certain that wastewater from hydraulic fracturing will not threaten the health of State Forests, whether through failure to mitigate the impact of fluids and effluent, inadequate storage, or insufficient treatment and

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[71] DSPSFM, *supra* note 1, at 39.

[72] N.Y. State Dep't of Envtl. Conservation, *Marcellus Shale*, http://www.dec.ny.gov/energy/46288.html (last visited Oct. 20, 2010) ("Fluid removed from the well is required by law to be handled, transported and disposed of properly.").

disposal capacity. As with other issues already discussed in these comments, the DSPSFM includes no discussion of these concerns and instead announces its intent to rely on the DSGEIS, which is inadequate to the forest inquiry.

i. Fluid and Effluent Impact Mitigation

The DSPSFM fails to define the steps operators must take to ensure that the use and storage of hydraulic fracturing fluid and gas wastewater will not impair the health of State Forests. Although proponents of hydraulic fracturing claim that most fracturing fluids are comprised of common chemical additives, some of these chemicals are also highly toxic.[73] The fluid and resulting wastewater thus pose significant threats to State Forests that must be assessed. On-site storage of fracturing fluids and their components has the potential for significant adverse impacts. Yet, neither the DSPSFM nor the DSGEIS address these potential impacts to State Forests.[74] There is no consideration of the potential environmental impacts from a spill of the fracturing fluid or wastewaters. The State must evaluate these issues so that operators can take the steps necessary to mitigate the impact to State Forests.

Furthermore, the DSGEIS allows operators to store flowback in on-site steel tanks[75] and in off-site centralized impoundments.[76] In our view, open impoundments are never appropriate for wastewater storage and, in any event, the State has not yet developed criteria for the location of centralized impoundments. If they are to be permitted at all, it is imperative that NYSDEC prohibit their placement within State Forests. Locating impoundments within State Forests is not necessary for shale gas development and would unnecessarily contribute to forest fragmentation

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[73] Among the dangers posed by some of the chemical compounds in their undiluted forms are: eye damage, skin disorders, respiratory irritation, abdominal pain, and tissue damage. Other compounds, such as the one used as an acid corrosion inhibitor, is a known carcinogen. U.S. Envtl. Protection Agency, Evaluation of Impacts to Underground Sources of Drinking Water by Hydraulic Fracturing of Coalbed Methane Reservoirs 4-9 – 4-10 (2004).

[74] DSGEIS, *supra* note 56, at 5-75.

[75] *Id.* at 7-48.

[76] *Id.* at 7-51.

and the inhibition of vital ecosystem services. Should NYSDEC nevertheless permit the conversion of State Forest land for the purpose of constructing open impoundments, a number of issues must be addressed. First, the DSGEIS states that the storage impoundments will be "temporary,"[77] yet fails to give any guidance as to what qualifies as a temporary impoundment. These "temporary" impoundments may be used throughout the multi-year development period.[78] Secondly, the DSGEIS notes that the temporary nature of the impoundments means that alternate materials may be used and that design engineers have "latitude" in certain decisions as long as they meet basic requirements.[79] To the extent any standards are provided, they are weakly drafted, which may lead to less secure conditions.[80] Finally, the DSGEIS allows for storage of flowback fluid in pits with liners designed to contain solid waste.[81] However, the storage of solid versus liquid waste presents different concerns and requires different precautionary measures.[82] In order to ensure the health of State Forests, NYSDEC must address these issues prior to proceeding with shale gas development.

ii. Wastewater Treatment

After the operators have successfully stored the flowback, they must eventually treat it or reuse it in subsequent fracturing operations. The treatment process will leave the operators with a large quantity of waste requiring proper disposal. The capacity of existing facilities to adequately process the sheer volume of waste is unclear and is not satisfactorily addressed by the

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[77] *Id.* at 7-53.
[78] *Id.* at 6-56.
[79] *Id.* at 7-53.
[80] *See id.* at 7-55 ("Consideration *should* be given to use of electrical leak location services prior to putting the surface impoundment into service." (emphasis added)); *see also id.* at 7-54 ("However, the relative short-term nature of the surface impoundments compared to landfills and the anticipated quality of the flowback waters supports use of subdivision 360-2.14(a) to allow, at the design engineers discretion, the substitution of a geosynthetic clay liner (GCL) in lieu of the 2-foot thick compacted clay barrier in the composite.").
[81] *Id.* at 7-53.
[82] Tom Myers, Review and Analysis of DRAFT Supplemental Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program Well Permit Issuance for Horizontal Drilling and High-Volume Hydraulic Fracturing to Develop the Marcellus Shale and Other Low-Permeability Gas Reservoirs 16–20 (2009).

DSGEIS.[83] Even if facilities can treat the volume necessary, it is unclear whether they will be able to treat every chemical in the flowback, such as iron and barium, or the high concentrations of Total Dissolved Solids that will be present in the effluent.[84] Though this is a concern related to shale gas development, generally, the lack of adequate treatment facilities could lead to impacts on State Forest water quality, especially if waste is stored longer on-site as a result. The Division of Lands and Forests must not disregard such wastewater related impacts.

3. The DSPSFM Does Not Sufficiently Address All of the Potential Impacts Created By Stormwater if Natural Gas Development Is Permitted in State Forests.

Allowing natural gas development in State Forests will likely lead to a significant elevation in the volume of stormwater runoff as well as faster rates of discharge and longer periods of peak discharge flow.[85] The construction of roads, pipelines, and other drilling infrastructure will both increase surface runoff and contribute "large amounts of sediment and silt to runoff waters,"[86] thereby degrading downstream water quality and damaging "fisheries and [the] habitat of plants and animals that depend on clean water for survival."[87] The development of State Forests to allow natural gas extraction will necessarily increase the amount of impervious surfaces such as roads, impoundments, drilling pads, and construction areas for pipeline rights-of-way. Further, the high volume of trucks used to transport fresh water, flowback, chemicals, and equipment to and from gas wells will contribute additional sediment,

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[83] Not only is there a concern about insufficient treatment facilities, but applications for proposed facilities reveal the potential for adverse impacts to surface waters. Reserved Environmental Services, L.L.C., NPDES Application 4 (Aug. 25, 2009).
[84] DSGEIS, *supra* note 56, at 7-58 – 7-59.
[85] *See* Smail & Lewis, *supra* note 16, at 12 ("The construction of roads, parking lots, and large buildings can speed the runoff of rainfall to local waterways, thereby intensifying the effects of storm events.").
[86] U.S. Envtl. Protection Agency, *Erosion, Sediment and Runoff Control for Roads and Highways* (Dec. 1995), http://www.epa.gov/nps/education/runoff.html (last updated Jan. 13, 2010).
[87] N.Y. State Dep't of Envtl. Conservation, *Stormwater*, http://www.dec.ny.gov/chemical/8468.html (last visited Oct. 20, 2010).

metals, oils, and greases to the gas well access roads within State Forests.[88] These materials will be scoured in runoff and redeposited into State Forest lakes, streams, and rivers. Other adverse effects of increased runoff on State Forest water quality include higher amounts of riverbank erosion and elevated levels of turbidity.[89] Turbidity is an especially significant issue, as it can, among other effects, harm fish species and necessitate the filtration of drinking water.[90]

Although the DSPSFM states an interest in maintaining water quality and protecting fish in State Forests, it neither sufficiently addresses these effects nor provides any plan for their mitigation.[91] Indeed, as the DSGEIS acknowledges, the pre-existing permitting procedures are inadequate to prevent the harmful effects of higher volumes of runoff, and although it discusses the revision of the procedures, it is unclear if the resulting process will be sufficient to protect State Forest waters.[92] In order to obtain a comprehensive understanding of the potential impact of increased runoff, the State must conduct a cumulative analysis of the effects of multiple discharges from potential wellpads and related new developments.[93] The Division of Lands and Forests must take care to ensure continued State Forest water quality, as watershed protection was an explicit motivating factor for the acquisition of State Forest land.[94]

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[88] U.S. Envtl. Protection Agency, *supra* note 86.

[89] Bruce A. Bell, CEA Engineers, P.C., Comments on the Draft Supplemental Generic Environmental Impact Statement on the Oil, Gas, and Solution Mining Regulatory Program, Well Permit Issuance for Horizontal Drilling and High-Volume Hydraulic Fracturing to Develop the Marcellus Shale and Other Low-Permeability Gas Reservoirs 8--11 (2009),

[90] *See* Jeffrey C. Barrett, *Turbidity-Induced Changes in Reactive Distance of Rainbow Trout*, 121 Transactions of the Am. Fisheries Soc'y 437 (1992); Daniel E. Shoup & David H. Wahl, *The Effects of Turbidity on Prey Selection by Piscivorous Largemouth Bass*, 138 Transactions of the Am. Fisheries Soc'y 1018 (2009).

[91] DSPSFM, *supra* note 1, at 116 ("It is important to note that DEC has the responsibility to protect all fish and wildlife."); *id.* at 107 ("DEC's actions to protect soils and terrestrial vegetation directly and indirectly protect water quality by: maintaining the filtering capacity of soil; reducing soil erosion to protect stream habitat from sedimentation; stabilizing water chemistry; controlling water temperatures; buffering high water events to reduce damage from flooding; and storing water between rain events.").

[92] *See* DSGEIS, *supra* note 60, at 7-24 ("The MSGP will be revised as necessary to incorporate a required SWPPP for industrial activities to address potential sources of pollution which may reasonably be expected to affect the quality of stormwater discharges associated with industrial activity from Marcellus Shale and other low permeability gas reservoir hydraulic fracturing operations.").

[93] Bell, *supra* note 89, at 10-11.

[94] N.Y. Envtl. Conserv. Law § 9-0501.

V. Gas Development Should Not Be Permitted in State Forests Until NYSDEC Ensures That a Thorough Planning Process and Best Management Practices Will Be Employed to Prevent Environmental Degradation.

Under its duty of environmental protection of State Forest land, NYSDEC cannot permit drilling on such lands until a thorough study is conducted of the impacts of gas development. If NYSDEC concludes from this study that it is possible to safely drill on State Forest lands, it must develop a comprehensive tract assessment process and mandatory BMPs to address adverse impacts of drilling. NYSDEC must then condition drilling leases on the implementation of these BMPs.

A. The Tract Assessment Process Must Thoroughly Address Ecological Concerns.

The tract assessment process[95] must take into account the issues of both habitat fragmentation and disturbance described in Parts III and IV above, as well as the impacts on surrounding property, state-owned and private, that may be affected by horizontal drilling from a well pad. To maximize protection of public lands as well as private property, before issuing any leases, NYSDEC must create publicly available maps delineating mineral rights holders' subsurface property.

The protection of wildlife habitat and State Forest resources should be a paramount concern in the tract assessment process. Sensitive ecological areas such as old growth forests must be categorically off-limits to drilling, and the Final SPSFM's description of the tract assessment process and considerations should state this explicitly. Preserving unfragmented forest areas should also be a priority for NYSDEC in the tract assessment process. Well pad density should be restricted to 1,280-acre spacing limits to protect habitat integrity, and any infill spacing waivers should be dependent on a strict necessity review by NYSDEC. In the event that

[95] As described in the DSPSFM, *supra* note 1, at 232-33.

NYSDEC plans to lease subsurface rights to a drilling company that will extend its horizontal subsurface drilling operation into state-owned land without surface infrastructure, the DSPSFM states[96] that no tract assessment will be necessary for the surface of the parcel. This ignores the possibility of escaped gas or drilling fluids from the well contaminating or damaging the surface estate, the effects of forest clearance on parcels adjacent to State Forest land, and the adverse impacts of off-site development on the air quality within State Forests. A tract assessment must still be conducted for parcels with only subsurface leases.

B. NYSDEC Must Develop A Comprehensive Set of Mandatory BMPs for Gas Drilling on State Forest Lands.

The DSPSFM includes reference to several kinds of forest management BMPs, but does not address crucial BMP issues relating to mineral extraction in State Forest lands. Correctly designed, monitored, and maintained BMPs in the following categories are particularly important. NYSDEC should develop and implement applicable BMPs in these categories as a part of the drilling lease program. The subsections below contain examples of BMPs from the Bureau of Land Management[97] that NYSDEC should develop. Additionally, the Natural Resources Law Center has compiled a database of nearly 8,000 BMPs for oil and gas development that NYSDEC should consult in developing its own mitigation procedures and BMPs.[98]

1. NYSDEC Must Mandate Ecological Sensitivity in the Well Pad Development Process.

The following is a list of sample well pad and road development and construction BMPs. These BMPs are an example of the type that NYSDEC must develop and enforce as part of gas drilling lease contracts. Please refer to Section III above for wildlife issues to consider in developing NYSDEC's BMPs.

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[96] *Id.* at 33.
[97] Bureau of Land Management, *Wildlife Management: Best Management Practices for Fluid Minerals* (Apr. 2009), http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/best_management_practices/technical_information.html.
[98] Natural Resources Law Center, Univ. of Colo. Law Sch., Intermountain Oil and Gas BMP Project (Oct. 21, 2010), http://www.oilandgasbmps.org/.

- Pad designs should not be rectangular, but rather designed to fit the available landscape and minimize tree removal.
- Co-location and directional drilling from a single well pad should be used wherever possible to minimize development of forest lands.
- Closely monitored gathering lines and off-site centralized production facilities and wastewater storage facilities should be considered to reduce the daily need for trucks.
- To the greatest extent possible, power lines, flow lines, and pipelines should follow roads to minimize habitat fragmentation.
- Road construction should be designed to lower impacts, including two-track roads and oak mats in low-volume areas.
- Road use should also be minimized through the use of carpool shuttles for site workers, low speed limits, and restricted public access.
- Ongoing habitat monitoring should be employed to ensure minimal impacts.
- Road and line rights of way should be shared with utilities wherever possible.
- Wildlife exclosures should be required if NYSDEC permits open tanks and pits.

2. Reclamation Must Be Mandatory and Thorough.

Thorough reclamation of all drilling sites must be required and enforced. The reclamation goals detailed in the DSPSFM are vaguely described and do not meet BMP standards. Both interim and final reclamation as well as adequate penalties for noncompliance should be conditions of the drilling lease program. A reclamation guarantee system should be included in the leasing program to ensure that reclamation of sites actually occurs regardless of site ownership. The goal of a thorough reclamation program should be to return the site to its condition before development, if not better. The following is a list of example BMPs to ensure proper reclamation.

- Practice minimal well pad excavation; topsoil should be removed only where absolutely necessary (for pits, rig leveling, and pipelines) while mowing and vegetation clearing will be adequate for other areas.
- Interim reclamation should begin immediately after initial construction is complete and should include contouring, reintroduction of topsoil, and revegetation of well pad areas impacted during construction.
- Interim reclamation should also be used on roads, including topsoil spreading and seeding in ditches to prevent erosion.
- Final reclamation should include contouring, revegetation and reforestation, habitat restoration, and monitoring to ensure successful natural resource recovery.

Conclusion

Thank you for the opportunity to submit these comments on the DSPSFM. As is discussed above, State Forest lands provide vital ecosystem services necessary to ensure the continued prosperity of New York State and its citizens. Shale gas development threatens forest ecosystems and should not be permitted on State Forest land unless and until the potential for adverse environmental impacts is thoroughly studied and such studies conclude that hydraulic fracturing can be safely conducted without harm to the forest ecosystem. The DSGEIS does not satisfy this requirement. If gas development using high-volume hydraulic fracturing is permitted on State Forest lands, the Final Strategic Plan for State Forest Management must adopt a set of BMPs to minimize impacts from the full development process.

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