

**Review of the  
Bingham Wind Project  
Visual Impact Assessment**

**Part 2: Independent Analysis**

**James F. Palmer**

Scenic Quality Consultants  
Burlington, Vermont

Prepared for  
Department of Environmental Protection  
Augusta, Maine

August 23, 2013



## Table of Contents

<b>1. Introduction</b> .....	1
<b>1.1 Project Description</b> .....	1
<b>1.2 Area of Potential Effects</b> .....	2
<b>1.3 Scenic Resources of State or National Significance</b> .....	3
<b>2. Fieldwork</b> .....	7
<b>3. Methods</b> .....	8
<b>3.1 GIS Database</b> .....	8
<b>3.2 Visibility Analysis</b> .....	9
<b>3.3 Visualizations</b> .....	9
<b>3.4 Recreation Opportunity Spectrum</b> .....	10
<b>3.5 User Intercept Surveys</b> .....	11
<b>4. Evaluation of Scenic Impacts</b> .....	15
<b>4.1 Evaluation Criteria</b> .....	15
<b>4.2 Rating the importance of the Evaluation Criterion for each Scenic Resource</b> .....	16
<b>4.3 Criterion A: Significance of resource</b> .....	17
<b>4.4 Criterion B: Character of surrounding area</b> .....	22
<b>4.5 Criterion C: Typical viewer expectation</b> .....	28
<b>4.6 Criterion D: Development’s purpose and context</b> .....	32
<b>4.7 Criterion E.1: Extent, nature and duration of uses</b> .....	33
<b>4.8 Criterion E.2: Effect on continued use and enjoyment</b> .....	41
<b>4.9 Criterion F: Scope and scale of project views</b> .....	46
<b>4.10 Summary of Impacts</b> .....	52
<b>5. Associated Facilities</b> .....	56
<b>6. Conclusions and Summary</b> .....	57
<b>6.2 6.1 Conclusions</b> .....	57
<b>6.2 Summary of Impacts</b> .....	57
<b>7. References</b> .....	59
<b>Appendix 1. Review Maps</b> .....	63
<b>Appendix 2. ArcScene Visualizations</b> .....	69



## 1. Introduction

On May 10, 2013, Maine's Department of Environmental Protection (DEP) accepted as complete Blue Sky West LLC and Blue Sky West II LLC's permit application for the Bingham Wind Project. This project has a nameplate capacity of 191 megawatts (MW) generated by 62 Vestas V112-3.0 (or the slightly smaller Siemens SWT-3.0-113) wind turbines. The turbines are located in Bingham, Bingham Plantation, Kingsbury Plantation, and Mayfield Township, in Somerset and Piscataquis Counties, Maine and are within the area designated for expedited grid-scale wind development. The visual impact assessment (VIA) was prepared by LandWorks (2013a).

The current document presents an independent analysis of the potential scenic impacts that may be caused by the Bingham Wind Project.

### 1.1 Project Description

The Bingham Wind Project turbines are located on ridges and hills in the vicinity of Route 16, including Johnson Mountain and unnamed hills north and northeast of Johnson Mountain, and an unnamed ridge north of Route 16 in Somerset and Piscataquis Counties, Maine. The project is within the area designated for expedited grid-scale wind development. The generation facilities include:

- **Turbines.** The project includes 62 3.0 MW turbines produce a nameplate capacity of 191 megawatts (MW), though the project application identifies 63 potential turbine sites for approval. For the purposes of analysis, it is assumed that Vestas V112-3.0 wind turbines will be used, though a slightly smaller turbine is also being considered. The height to the hub center is 94 meters (approximately 308 feet), plus 56 meters (approximately 184 feet) for the rotor blades, resulting in a total height of 156 meters (492 feet) to the tip of an upright blade. The turbines will be painted white.
- **Warning lights.** Red warning lights will be installed according to Federal Aviation Administration (FAA) guidelines to warn pilots of the location of project elements higher than 200-feet. Typically lights are placed on the ends of a turbine string, and on alternating turbines between them. As well as on meteorological towers. Blue Sky West LLC and Blue Sky West II LLC indicate that they will install radar-assisted warning lights when they are approved for use by FAA. However, FAA has not yet approved such guidelines, and it is not certain that FAA will approve radar-assisted lighting for the Bingham Wind Project.
- **Collector line.** A 34.5 kV collector line will run between turbines. A substantial portion will be buried along project roads. However, approximately 9.75 miles will be above ground, and 3.7 miles of this will run parallel to Route 16. The

Associated facilities include:

- **Roads.** The primary access to the project is from Route 16. One new and four existing roads will be upgraded and widened to 24 feet, with portions widened to 38 feet to accommodate the crane during construction. An additional 17 miles of crane path will be built between turbines. Following construction, approximately a third of the crane path width will be allowed to revegetate naturally.

- **Turbine pads.** It appears that 3.5 acres typically will be cleared around each turbine to facilitate construction. Following construction, the area will be allowed to revegetate naturally.
- **Building.** A single-story Operations and Maintenance building will be constructed just south of Route 16 in Mayfield Township. A buffer of trees will screen views of the building from the road. It will be 5,880 square feet (70-by-84 feet) and painted a neutral color and have a dark roof to minimize color contrast.
- **Meteorological towers.** There will be five permanent 105-meter (344-foot) guyed lattice meteorological (met) towers. Met towers will require FAA safety lighting and will be painted a distinctive color pattern (i.e., broad white and orange stripes). It is anticipated that the permanent met towers will become part of the system of radar-activated warning lights, when approved by FAA.

There will be up to five temporary meteorological towers, up to 105 meters (344-foot) in height. These towers will be located on turbine pads and will be removed before the turbines are assembled.

- **Generator lead line and substations.** The project collector lines will terminate at a substation that is located close to project turbines. A 17-mile 115 kV generator lead line connects this substation to an existing Central Maine Power Company substation in Parkman, Maine, near the village of Guilford. The generator lead line extends beyond the normal area of potential effects—8 miles from the generating facilities.

## 1.2 Area of Potential Effects

The WEA requires that “an applicant for an expedited wind energy development shall provide the primary siting authority with a visual impact assessment” (VIA)<sup>1</sup> Impacts are limited to scenic resources of state or national significance (SRSNS).<sup>2</sup> “There is a rebuttable presumption that a visual impact assessment is not required for those portions of the development's generating facilities that are located more than 3 miles, measured horizontally, from a SRSNS.”<sup>3</sup> However, in practice every VIA has evaluated all SRSNS within 8 miles, beyond which the effects of portions of the development’s generating facilities are insignificant.<sup>4</sup> The WEA directs that “the primary siting authority shall consider insignificant the effects of portions of the development's generating facilities located more than 8 miles, measured horizontally, from a SRSNS.”<sup>5</sup> As a result, for every VIA conducted under the WEA the study area boundary or area of potential effects (APE) has been set to 8 miles from the generating facilities.

However, there are important subtleties to the WEA’s establishment of the 8-mile limit to potentially significant scenic effects. First, only generating facilities within 8 miles of a viewer can be considered and toward the edge of the APE boundary it is possible that some project turbines are potentially visible but beyond the 8 mile threshold. Second, the APE is based on the distance from generating facilities; it makes no mention of associated facilities. It is assumed that associated facilities within the 8-mile APE are evaluated using the WEA criteria. When

---

<sup>1</sup> 35-A MRSA, § 3452, §§ 4

<sup>2</sup> 35-A MRSA, § 3451, §§ 9

<sup>3</sup> 35-A MRSA, § 3452, §§ 4

<sup>4</sup> 35-A MRSA, § 3452, §§ 3

<sup>5</sup> 35-A MRSA, § 3452, §§ 3

associated facilities fall beyond the 8-mile APE it may be appropriate for the primary siting authority to require that they be evaluated using the traditional Site Law and NRPA procedures.<sup>6</sup>

### **1.3 Scenic Resources of State or National Significance**

The WEA presents a clear delineation of areas to be evaluated for scenic impacts.<sup>7</sup>

"Scenic resource of state or national significance" means an area or place owned by the public or to which the public has a legal right of access that is:

- A. A national natural landmark, federally designated wilderness area or other comparable outstanding natural and cultural feature, such as the Orono Bog or Meddybemps Heath;
- B. A property listed on the National Register of Historic Places pursuant to the National Historic Preservation Act of 1966, as amended, including, but not limited to, the Rockland Breakwater Light and Fort Knox;
- C. A national or state park;
- D. A great pond that is:
  - (1) One of the 66 great ponds located in the State's organized area identified as having outstanding or significant scenic quality in the "Maine's Finest Lakes" study published by the Executive Department, State Planning Office in October 1989; or
  - (2) One of the 280 great ponds in the State's unorganized or deorganized areas designated as outstanding or significant from a scenic perspective in the "Maine Wildlands Lakes Assessment" published by the Maine Land Use Regulation Commission in June 1987;
- E. A segment of a scenic river or stream identified as having unique or outstanding scenic attributes listed in Appendix G of the "Maine Rivers Study" published by the Department of Conservation in 1982;
- F. A scenic viewpoint located on state public reserved land or on a trail that is used exclusively for pedestrian use, such as the Appalachian Trail, that the Department of Conservation designates by rule adopted in accordance with section 3457;
- G. A scenic turnout constructed by the Department of Transportation pursuant to Title 23, section 954 on a public road that has been designated by the Commissioner of Transportation pursuant to Title 23, section 4206, subsection 1, paragraph G as a scenic highway; or
- H. Scenic viewpoints located in the coastal area, as defined by Title 38, section 1802, subsection 1, that are ranked as having state or national significance in terms of scenic quality in:
  - (1) One of the scenic inventories prepared for and published by the Executive Department, State Planning Office: "Method for Coastal Scenic Landscape Assessment

---

<sup>6</sup> 35-A MRSA, § 3452, §§ 2 states: "The primary siting authority shall evaluate the effect of associated facilities of a wind energy development in terms of potential effects on scenic character and existing uses related to scenic character in accordance with Title 12, section 685-B, subsection 4, paragraph C or Title 38, section 484, subsection 3, in the manner provided for development other than wind energy development, if the primary siting authority determines that application of the standard in subsection 1 to the development may result in unreasonable adverse effects due to the scope, scale, location or other characteristics of the associated facilities."

<sup>7</sup> 35-A MRSA, § 3451, sub-§9

with Field Results for Kittery to Scarborough and Cape Elizabeth to South Thomaston," Dominie, et al., October 1987; "Scenic Inventory Mainland Sites of Penobscot Bay," Dewan and Associates, et al., August 1990; or "Scenic Inventory: Islesboro, Vinalhaven, North Haven and Associated Offshore Islands," Dewan and Associates, June 1992; or

(2) A scenic inventory developed by or prepared for the Executive Department, State Planning Office in accordance with section 3457.

Based on these definitions, Table 1 lists the potential SRSNS within 8 miles of the generating facilities, the distance to the nearest wind turbine, and whether “the public has a legal right of access.”<sup>8</sup> No SRSNS is within 3 miles of a turbine.

There are two of the historic sites listed on the National Register of Historic Places to which the public does not have access—Caratunk Falls Archaeological District and Concord Haven. They will not be considered in the remainder of this analysis.

The Appalachian National Scenic Trail is identified as a SRSNS both as “C. A national or state park” and as “F. ... a trail that is used exclusively for pedestrian use, such as the Appalachian Trail, that the Department of Conservation designates by rule adopted in accordance with section 3457.” For the remainder of this analysis, it will be considered under its designation as a unit of the National Park Service.

The stretch of the Kennebec River within 8 miles of the generating facilities is listed as a SRSNS. The *Maine Rivers Study* (Maine DOC 1982, p. 136-137) clearly includes Wyman Lake as an integral part of this designation. However, it is noted that the *Maine Wildlands Lake Assessment* (Giffen et al. 1987) also evaluated Wyman Lake but did not rate its scenic resource as being significant.

Determining a reasonable location for the Arnold Trail to Quebec is a bit awkward. The National Register of Historic Places (NRHP) nomination form identifies the property locations as a large four-sided polygon that clearly includes areas unrelated to the Arnold Trail (Holmstrom 1969). For the purposes of this VIA, it is assumed that Arnold generally followed the Kennebec River-bed; the NRHP nomination form makes reference to the public highway, so highway US 201, which is also the Old Canada Road Scenic Byway, is also considered part of the Arnold Trail to Quebec.

---

<sup>8</sup> 35-A MRSA, § 3451, sub-§9



**Table 1. Scenic Resources of State and National Significance within 8 Miles of the Generating Facilities**

<b>Scenic Resources of State or National Significance</b>	<b>Distance to Nearest Turbine (miles)</b>	<b>Public Right of Access</b>
<b>Historic Sites</b>		
Arnold Trail to Quebec	3.8	Yes
Bingham Free Meeting House	4.4	Yes
Caratunk Falls Archaeological District	7.5	No
Concord Haven	6.8	No
<b>National or State Park</b>		
Appalachian National Scenic Trail	6.5	Yes
<b>Great Ponds</b>		
Bald Mountain Pond	5.7	Yes
Jackson Pond	5.7	Yes
Punchbowl Pond	3.6	Yes
<b>Segment of a Scenic River</b>		
Kennebec River: Augusta to the Forks (including Wyman Lake)	3.8	Yes
Piscataquis River: Howland to West Branch	5.8	Yes
East Branch Piscataquis River	7.5	Yes
West Branch Piscataquis River	6.6	Yes
<b>Public Reserved Lands or Pedestrian Trail</b>		
Appalachian National Scenic Trail	6.5	Yes
<b>Scenic Turnout on a Scenic Highway</b>		
Old Canada Road Scenic Byway (Route 201) Turnout	6.1	Yes

Table 2 lists the SRSNS within 3 miles of the generating lead line, all of which are beyond 8 miles from the generating facilities.

**Table 2. Scenic Resources of State and National Significance within 3 Miles of the Generating Lead Line**

<b>Scenic Resources of State or National Significance</b>	<b>Distance to Nearest Turbine (miles)</b>
<b>Historic Sites</b>	
H. Hudson Law Office	0.6
Straw House	0.8
Guilford Memorial Library	0.8
Robert Carleton House	1.7
Sangerville Town Hall	1.6
<b>Segment of a Scenic River</b>	
Piscataquis River – Howland to West Branch	0.4

Table 3 indicates the area or length of each of the eleven SRSNS within 8 miles of a wind turbine.

**Table 3. The Area or Length of the SRSNS within 8 miles of a Wind Turbine**

Scenic Resources of State or National Significance	Effected Area (within 8-miles of turbines)	
	Area (acres)	Length (miles)
<b>Historic Sites</b>		
Arnold Trail to Quebec	1,408 <sup>†</sup>	12.2
Bingham Free Meeting House	1	
<b>National or State Park/Designated Pedestrian Trail</b>		
Appalachian National Scenic Trail	1,733 <sup>#</sup>	14.3
<b>Great Ponds</b>		
Bald Mountain Pond	1,142	
Jackson Pond	31	
Punchbowl Pond	41	
<b>Segment of a Scenic River</b>		
Kennebec River: Wyman Lake	1,125	2.6
Kennebec River -Augusta to the Forks (excluding Wyman Lake)	229 <sup>§</sup>	9.6
Piscataquis River – Howland to West Branch	105 <sup>§</sup>	8.8
East Branch Piscataquis River	8 <sup>§</sup>	0.7
West Branch Piscataquis River	81 <sup>§</sup>	6.8
<b>Scenic Turnout on a Scenic Highway</b>		
Old Canada Road Scenic Byway (Route 201) Turnout	1 <sup>*</sup>	

Note: Values are from the GIS database and only include the area within 8 miles of the wind turbines; they may differ slightly from other sources.

<sup>†</sup> The area of the Arnold Trail to Quebec listed in the NRHP nomination form is 2,841,564 acres, based on the "geographic data latitude and longitude coordinates defining a rectangle locating the property" (Holmstram 1969). This is clearly too extensive. Therefore area listed here is the sum of Wyman Lake, the Kennebec River, and the Old Canada Road Scenic Byway (assumed to be 10 meters wide, it is approximately 54.1 acres).

<sup>\*</sup> The area is assumed to be 1 acre.

<sup>§</sup> Assumes the Kennebec River is 60 meters wide and the Piscataquis River is 30 meters wide.

<sup>#</sup> Assumes standard corridor width of 1,000 feet.

## 2. Fieldwork

The primary purpose of the fieldwork was to verify the extent of project visibility from the SRSNS, to inspect the photosimulation locations, and to observe the landscape character and scenic quality of the APE. Fieldwork was conducted on Monday, Tuesday and Wednesday, July 22 to 24, 2013. In addition to James Palmer (Scenic Quality Consultants), on Monday and Tuesday the party included Daniel Courtemanch and Dawn Hallowell (DEP), Josh Bagnato and David Fowler (First Wind), Juliet Browne (Verrill Dana), and Patrick Olstad (LandWorks).

On Monday's we investigated the full length of the generator lead line and the O&M building site—there is no visibility of the project. We also visited several of the turbine sites, which seemed to have been recently harvested. We attempted to reach Punchbowl Pond, but the bridge was out and we did not have sufficient time to hike there and back.

On Tuesday it rained most of the day. We went to the southern Wyman Lake boat launch and an informal campsite on the Kennebec River, which were both simulation viewpoints. We also approached two sites listed on the national Register of Historic Places that were posted as private: Concord Haven and Caratunk Falls Archaeological District. The Bingham Free Meeting House is public, but there will be no visibility. There are two turn-outs with historical interpretive signs on the Old Canada Road Scenic Byway that will not have visibility of the project. We then went to the Bald Mountain Pond and used a 6-person canoe to reach the northern shore where we disembarked to investigate visibility from the Appalachian Trail (AT). From the shore we walked on an informal trail to the Moxie Bald lean-to, and then followed a short blue-blazed trail to the AT. Mature forest blocks all visibility of the project from the AT and lean-to. We then went by canoe to the area on Bald Mountain Pond where the simulation photograph was taken.

On Wednesday, I went to check visibility from several SRSNS within 3 miles of the generator lead line. The Straw House (now named the Trebor Mansion) and the H. Hudson Law Office (now apparently W. G. Blake's Agency Real Estate) are private without any suggestion that the public has the right of access. The Robert Carleton House could not be confidently located, but as a single family dwelling the public would not likely have access. The public has a right of access to the Guilford Memorial Library, Sangerville Town Hall, and Piscataquis River, but will not have visibility of the generator lead line from these SRSNS.

### 3. Methods

In addition to conducting fieldwork and reviewing the VIA (LandWorks 2013a), original analyses made extensive use of ArcGIS (ESRI 2012) software to conduct spatial modeling. The GIS was used to evaluate several different models of the project's potential visibility. The ArcScene extension was used to create perspective visualizations using data from the GIS database. The GIS database was also used to estimate the probable Recreation Opportunity Spectrum (ROS) land class. ROS is a widely used by recreation managers to understand and plan for the appropriate relationships among the physical, social and managerial settings of areas used for outdoor recreation. An independent evaluation of the Bingham intercept survey data was also conducted.

#### 3.1 GIS Database

A Geographic Information System (GIS) is a software program that is used to create, manage and analyze spatial data. The following elevation, land cover and road data form the core of what was used for the analysis.

Terrain elevation was obtained from the National Elevation Dataset (NED), available from The National Map viewer. The NED data present elevations for 1/3 arc-second cells, which are about 10 meters on a side. USGS states that "NED is a seamless dataset with the best available raster elevation data of the conterminous United States"<sup>9</sup> However, experience has shown that in some more remote areas of Maine the individual data files do not match "seamlessly." This is the case for the data used to evaluate the Bingham Wind Project. Edges were blended to provide a more seamless condition, and resampled using a bilinear algorithm to match the MELCD's 5-meter resolution.

The Maine Office of GIS makes available the following statewide data:<sup>10</sup>

- Land cover (MELCD) for 2004. The data are derived from 1999-2001 satellite imagery that was used to create the National Land Cover Dataset (NLCD 2001). These data were refined and updated using higher resolution seasonal imagery from 2004. The data represent land areas that are 5 meters on a side. Of particular interest are the three classes of forest cover in areas that have not been harvested since 1995. These areas are assumed for analysis purposes to have a canopy that provides full visual screening to 40 feet. These data are now over a decade old, and some of these areas may have been harvested, while some areas classified as recently harvested may have recovered sufficiently to be reclassified as forest. Limited corrects may be made based on documented field observation.
- Publicly maintained roads (MEPUBRDS) are mapped by Maine Department of Transportation. These data were published in July 2013. While some locally maintained roads are not paved, all are assumed to be passable by 2-wheel drive vehicles.
- Emergency 9-1-1 project has further mapped roads (E911RDS) to facilitate public safety needs. These data were published in March 2013. The data set was developed from USGS 1:24,000 digital roads data and includes additional data provided by participating

---

<sup>9</sup> <http://ned.usgs.gov/>

<sup>10</sup> <http://www.maine.gov/megis/catalog/>

municipalities and the Maine Forest Service. Both public and private roads are included, some of which will certainly require 4-wheel drive for dependable access.

### **3.2 Visibility Analysis**

Visibility analysis evaluates the line of sight from an observer to a target. The basic data for the analysis are terrain elevation (NED), turbine location and height, and observer height. A GIS is used to perform the actual calculation, which identifies every 5-meter square cell within 8 miles of a turbine that has visibility of that turbine. The resultant map records the number of turbines within 8 miles that are visible from each cell. The screening effect of forest cover can be taken into account by assigning a nominal forest canopy height of 12 meters (40 feet) and adding that to the elevation of areas with forest cover (MELCD classes 9, 10 and 11). The areas that will be cleared for the project are taken out of the forest cover, which keeps the turbines grounded to the terrain elevation. The resultant analysis shows visibility for areas that are forest canopy, but people standing under the canopy will not have visibility. Therefore, areas with visibility that are under forest cover are deleted from the final map.

The four viewshed maps prepared to investigate the potential visibility associated with the Bingham Wind Project are included in Appendix 1. The first two maps investigate the greatest possible area from which a part of any turbine could possibly be visible. In this case it is an upraised blade tip 492 feet (156 meters) above the ground. Two different constraints on visibility are considered: (1) just bare terrain and (2) terrain with forest cover. The resulting viewshed maps are:

Map 1: Terrain Viewshed for Blade Tip

Map 3: Forested Viewshed for Blade Tip

While there may be a line-of-sight to just an upraised blade tip, it may not be noticeable and would never be visually dominant. Therefore another analysis investigates the area from which a significant portion of a turbine could possibly be visible. In this case it is visibility of the turbine hub, located 308 feet (94 meters) above the ground. The same two constraints on visibility resulted in the following viewshed maps:

Map 2: Terrain Viewshed for Turbine Hub

Map 4: Forested Viewshed for Turbine Hub

Within two or three miles of a turbine, 20 or 30 feet of the blade may be noticeable, but at further distance the Casual Observer is unlikely to be aware of them. Therefore, the forested viewshed for turbine hubs, which also will include the full length of at least the upright moving blades, is a better representation of what users of SRSNS are likely to actually experience.

### **3.3 Visualizations**

ArcGIS software has an extension, ArcScene that uses the GIS data to construct geometrically accurate perspective visualizations. These visualizations were used in the first part of the review to evaluate the adequacy of the photosimulations. In this part of the review, they are used to understand the visual magnitude of the turbines. While the focus in the first part of the review was on the viewpoints used for the photosimulation, various viewpoints within the SRSNS were investigated in the second part of the review.

The terrain elevation is used as the three-dimensional base of the visualizations. Roads and water are draped over the terrain layer. The three forest cover classes (deciduous, evergreen and mixed) are assigned a base height 12 meters (40 feet) above the terrain elevation layer. Each forest class is shown in a different opaque shade of green. A second forest canopy is set at 18 meters (60 feet) using the same colors at 75 percent transparency. The potential screening from partial cut harvest areas was also investigated by assigning these areas various canopy heights. Wind turbines are represented by a three-dimensional symbol that is scaled to be 150 meters (492 feet) high. A 12-meter red sphere is placed above the appropriate turbine nacelles to represent the FAA warning lights. The observer's height is approximately 1.5 meters, and the field of view is set to 45 degrees.

The primary utility of the visualizations is to provide information about the visual magnitude (i.e., the size of a seen area or object relative to the visual field) of the wind turbines from specific viewpoints. In addition, ArcScene can be used to identify which turbines have the potential to be visible from specific viewpoints. However, visualizations are somewhat schematic. They use a floating sheet to represent a forest canopy, and the viewer must understand that turbines below the canopy will not be visible because the sides of the trees will screen them. ArcScene visualizations also are poor representations of the foreground, because the accuracy and resolution of the GIS data are inadequate for this purpose—they primarily suitable for evaluating the visual condition of the middle and background.

Visualizations that match the photosimulations from the Bingham VIA are included in Appendix 2.

### **3.4 Recreation Opportunity Spectrum**

The Recreation Opportunity Spectrum (ROS) is a widely used recreation inventory and management tool originally developed for use by the US Forest Service (USDA 1982). A complementary tool was then developed for water resources, called the Water Recreation Opportunity Spectrum (WROS) (Haas et al. 2004); WROS has since evolved to become the Water and Land Recreation Opportunity Spectrum (WALROS) (Haas et al. 2011). However, these handbooks were all prepared for use primarily on public lands in the Western United States—a very different landscape and social setting than we have here in New England. Thomas More and other (2003) proposed revisions to ROS for nonfederal lands in the Northeast that focused on the fact that we live in a landscape with more roads and smaller ownerships, though the focus is still on public lands it might also apply to large conservation holdings or easements. More et al. (2003, Table 1, pages 12-13) describes five ROS land classes that are potentially relevant to the study area.

- **Primitive.** Area appears to be an essentially unmodified natural environment of relatively large size. It may contain evidence of past human activities and historical-cultural sites, but these are subordinate to its natural state. Interaction between users is very low, and evidence of other users is minimal. The area is essentially free from evidence of management restrictions and controls. Motorized or mechanized use is not permitted.
- **Semi-Primitive Non-Motorized.** Area appears to be a predominantly natural or natural appearing environment of relatively medium-to-large size. Interaction between users is

low, but there is often evidence of other users. The area is managed so that minimum on-site controls and restrictions, if needed, are subtle. Non-mechanized uses predominate. Mechanized uses may be permitted. Motorized use is not permitted.

- Semi-Primitive Motorized. Area appears to be a predominantly medium-to-large size natural or natural appearing environment. Interaction between users is low, but there is often evidence of other users. The area is managed so that minimum on-site controls and restrictions, if needed, are subtle. Mechanized uses may be permitted.
- Semi-Developed Natural (aka Rural Natural). Area is a natural appearing environment. Evidences of the sights and sounds of people are moderate. Such evidences usually harmonize with the natural environment. Interaction between users may be low to moderate, but evidence of other users is prevalent. Resource modification and utilization practices are evident but harmonize with the natural environment. Construction standards and facility design accommodate conventional motorized and mechanized uses..
- Developed Natural (aka Rural Developed). Area is a substantially modified natural environment. Resource modification and utilization practices enhance specific recreation activities and maintain vegetative cover and soil. Sights and sounds of people are readily evident. Interaction between users often is moderate to high. Many facilities are designed for use by a large number of people. Density levels decline with increasing distance from developed sites. Facilities often are provided for special activities. Facilities for intensified motorized and mechanized uses and parking are available.

The ROS links a particular degree of naturalness and remoteness to a particular expected social experience. A complete ROS inventory gathers data about the site, social and managerial settings. However, a complete ROS inventory is not available, which is to be expected since these lands are not actively managed for recreation purposes the way a National Forest or State Park might be. However, some of the relevant site data are part of the GIS database and they can be used to identify remoteness, which can be used to tentatively identify ROS land class. An area's appropriate social setting can be inferred from the ROS land class, and checked for consistency through field observation. While less than ideal, this approach to partially inventorying ROS remoteness to evaluate the potential effects of landscape change on recreational experience has also been used by others (e.g., Harshaw and Sheppard 2013).

### **3.5 User Intercept Surveys**

It has become accepted practice for wind energy developers to conduct a user intercept survey in support of the VIA. The intercept survey is particularly relevant for evaluating:

- Criterion C: Typical Viewer Expectations,
- Criterion E.1: Extent, Nature and Duration of the Public Use, and
- Criterion E.2: Effect on Continued Use and Enjoyment.

In the field of recreation research, using best professional practices for conducting intercept surveys has been found to provide generally reliable results.

A typical user intercept survey will be conducted at or near a SRSNS photosimulation viewpoint. Users may be asked open-ended questions, such as:

- What prompted you to come out to [this SRSNS] today?
- Now I'd like to ask you about scenic value. Can you think of a destination in Maine that has a very high scenic value, or outstanding view? On a scale of 1-7 for scenic views, one you would rate as a 7 for highest scenic value.

or closed-ended questions, such as:

- Think about your activities [at this SRSNS]. What are your plans for today?
- What is your primary reason for coming here today?

The questions most directly related to the potential scenic impact employ color photographs printed on 11"-by-17" paper that represent the existing view without and the future view with the wind turbines, and perhaps associated facilities. These questions typically employ a scenic value rating scale. A typical series of questions may be:

- On a scale of 1-7, where 7 is the highest scenic value and 1 is the lowest, how would you rate the scenic value of this view? (first the existing view, and then the proposed view)
- Now I'd like you to think about how your enjoyment of visiting the lake would be affected if you were to see the proposed wind project during your visit today. On a scale of 1-7, where a 1 is a very negative effect, a 4 means that it would not change your enjoyment at all, and a 7 is a very positive effect on your enjoyment, how would your enjoyment be affected?
- Now I'd like you to think about your trip here today. Imagine the proposed wind project was built. On a scale of 1 to 7, where a 1 means you are very unlikely to return, a 4 means the change in view would have no effect on your return, and a 7 means you are very likely to return, how likely are you to return to [the SRSNS] given the presence of the wind turbines?

While the open-ended questions may provide useful descriptive information, two independent investigators may synthesize the results in very different ways. In contrast, closed-ended questions offer a structure to both respondents and investigators that often results in higher consistency in reporting the results. However these results are often reported as percentages, and there is still the difficulty of deciding when these results reach the level that separates reasonable from unreasonable. One advantage of rating scales is that they provide quantitative data, the reliability of which can often be evaluated. While it may be difficult to evaluate the importance or meaning of percentages or averages, there are statistical methods to assist in this evaluation of rating scales.

The current best practice in scientific analysis and reporting is to use effect size as a way to report the strength of the relationship between the means of two variables measured on the same scale (e.g., APA 2010, p. 33). The statistic used in this analysis is Hedges' *g*, which estimates the effect size based on the difference between means (Hedges 1985). Cohen (1988) suggested thresholds for interpreting the significance of a mean difference: a size effect of 0.2 is small, 0.5 is a medium effect, and 0.8 is a large effect. These thresholds have been found useful across a wide range of disciplines. Stamps (2000) has presented a powerful argument for using size effect to establish the importance of visual impacts. He reviewed "275 relevant studies, covering over



12,000 stimuli and more than 41,000 respondents” (Stamps 2000, page xi). Based on his findings, he has characterized effect sizes below 0.2 as being trivial or unnoticeable, at 0.2 there is a noticeable effect where the difference between better and worse is subtle and difficult to distinguish, while at 0.5 there is a significant effect where distinction becomes easy to determine, and at 0.8 there is a major effect where distinction is grossly perceptible. He also suggests adding an additional threshold at 1.1 to indicate when a visual impact would be very large “and likely to be controversial” (Stamps 2000, page 163-170).

Table 4 lists proposed effect size thresholds for evaluating Criterion E.2 indicators based on intercept surveys at SRSNS with potential visibility of a proposed wind energy project. This proposal is based on my reading of the literature and experience with the intercept studies conducted to date. However, it is presented for discussion purposes as we gain further experience with evaluating the impact of grid-scale wind development on scenic value and the use of SRSNS.

**Table 4. Proposed Effect Size Thresholds for Wind Energy Act Ratings**

Effect Size	Description	Rating
0.00 or higher	Positive	None
0.00 to -0.19	Not noticeable, Trivial	Low
-0.20 to -0.49	Small, Noticeable, Subtle	
-0.50 to -0.79	Medium, Significant	Medium
-0.80 to -1.09	Large, Major, Grossly perceptible	
-1.1 or lower	Very large, Controversial	High

**Bingham intercept surveys.** Kleinschmidt (2013a, 2013b) conducted intercept surveys to investigate the potential effect of the Bingham Wind Project on SRSNS users. The surveys were conducted at two SRSNS, Bald Mountain Pond and Wyman Lake. At both SRSNS the survey location was a boat launch that served as a primary access point to the water for boaters and others. At Wyman Lake the boat launch was also near the photosimulation viewpoint. Based on the information provided, it appears that commonly accepted professional practices were followed in conducting the interviews.

The survey was conducted for half a day at each site on September 1, 2, 8, 15, 21 and 25, 2012, which included the Labor Day Weekend. One adult from each group of individuals was randomly identified to be interviewed. In all, 45 people were observed and 16 interviews completed at Wyman Lake, and 31 people observed and 7 interviews completed at Bald Mountain Pond.

The survey was repeated at Wyman Lake on June 30, July 6 and July 13 and at Bald Mountain Pond on July 7 and 20 because of concerns about the sample size and having conducting the survey during a time of apparently low use. The interviewer spent an average of 5 hours at one site each day. At Wyman Lake a total of 199 people were observed and 34 surveys completed; at Bald Mountain Pond 42 people were observed and 7 interviews completed.

These characteristics are summarized in Table 5. Between the two survey periods, there are 50 completed surveys at Wyman Lake and 14 at Bald Mountain Pond.

**Table 5. Intercept Survey Response and People Observed**

Interviews	Wyman Lake			Bald Mountain Pond		
	2012	2013	Total	2012	2013	Total
Surveys completed	16	34	50	7	7	14
Refusals	1	12	13	0	0	0
Response rate	94%	74%	79%	100%	100%	100%
<b>People Observed</b>						
Observed	45	199	N/A	31	42	N/A
Mean/day	8	66	N/A	5	21	N/A
Mean group size	2	4	N/A	3	7	N/A

Notes: The 2012 interviews were conducted between September 1 and 25; the 2013 interviews were conducted between June 30 and July 20.

**Appalachian Trail.** Manning and his colleagues conducted in-depth interviews with 1,879 AT hikers in 2000. The study was divided into four geographic regions—one of which is New England—and “twenty-two relatively homogenous geographic segments based on physical features, park and wilderness boundaries, and volunteer hiking club jurisdictions” (Manning et al. 200a, p. 4). The portion of the AT passing within 8 miles of the Binging Wind Project is within the Western Maine segment, which begins at the New Hampshire boarder and extends to Monson. The raw data from this study are not available and most results are reported as percents.

## 4. Evaluation of Scenic Impacts

This section evaluates the scenic impact from the Bingham Wind Project based on my understanding of the Wind Energy Act's Evaluation Criteria. It is my objective to illustrate an approach to evaluating scenic impacts based on applying indicators and thresholds appropriate to each of the Evaluation Criteria.

The use of indicators is becoming common for all types of assessment, from learning outcomes and public health, to investment portfolios and environmental impacts. This approach can also be applied to landscape character and scenic impact assessment (Tveit et al. 2006; Ode et al. 2008). If one were to adopt their Framework, the Concept being evaluated is Scenic Impact, and the Dimensions are analogous to the Evaluation Criteria. Attributes and Indicators appropriate to the WEA Evaluation Criteria need to be identified (Tveit et al. 2006, p. 233). Finally, to be relevant to the WEA, Indicator Thresholds need to be identified that help determine when scenic impacts are Not Adverse, Adverse or Unreasonably Adverse.<sup>11</sup> The objective is to identify Indicators and Thresholds that are directly relevant to the statutory Evaluation Criteria and that can be applied reliably (i.e., independent objective measurement by competent experts produce similar results). This is a major shift from reliance on professional judgment, where the developer's expert supports a project and the opponent's expert condemns the project.

### 4.1 Evaluation Criteria

The WEA requires that the following Evaluation Criteria be considered in determining scenic impacts of an expedited wind energy development.<sup>12</sup>

- A. The significance of the potentially affected scenic resource of state or national significance;
- B. The existing character of the surrounding area;
- C. The expectations of the typical viewer;
- D. The expedited wind energy development's purpose and the context of the proposed activity;
- E. The extent, nature and duration of potentially affected public uses of the scenic resource of state or national significance and the potential effect of the generating facilities' presence on the public's continued use and enjoyment of the scenic resource of state or national significance; and
- F. The scope and scale of the potential effect of views of the generating facilities on the scenic resource of state or national significance, including but not limited to issues related to the number and extent of turbines visible from the scenic resource of state or national significance, the distance from the scenic resource of state or national significance and the effect of prominent features of the development on the landscape.

A finding by the primary siting authority that the development's generating facilities are a highly visible feature in the landscape is not a solely sufficient basis for determination that an expedited wind energy project has an unreasonable adverse effect on the scenic character and existing uses related to scenic character of a scenic resource of state or national significance.

---

<sup>11</sup> 35-A MRSA, § 3452, sub-§1

<sup>12</sup> 35-A MRSA, § 3452, sub-§3

In making its determination under subsection 1, the primary siting authority shall consider insignificant the effects of portions of the development's generating facilities located more than 8 miles, measured horizontally, from a scenic resource of state or national significance.

#### **4.2 Rating the importance of the Evaluation Criterion for each Scenic Resource.**

The importance of the contribution for each Evaluation Criteria toward reaching a determination of an Unreasonable Adverse scenic impact can be rated as follows:

- **None.** The Evaluation Criterion makes no important contribution toward a determination of Unreasonable Adverse scenic impact. In most cases a rating of None means that there is No Adverse Impact (e.g., there are no people present at possible viewpoints—Criterion E, or the project is not visible—Criterion F).
- **Low.** The importance of the Evaluation Criterion's contribution toward a determination of Unreasonable Adverse scenic impact is low. Low may mean that a project is visible but is not seen as Adverse. Alternately, the scenic impact may be Adverse, but it appears to be within the acceptable range for any type of development (e.g., several blade tips will be partially visible over a forest canopy at a distance of one or more miles—Criterion F, which may be less than the visibility of development located behind a shoreline vegetation management buffer<sup>13</sup>).
- **Medium.** The importance of the Evaluation Criterion's contribution toward a determination of Unreasonable Adverse scenic impact is medium, which is Adverse but typical of wind energy development, and within the range of impacts that the Wind Energy Act anticipates (e.g., a few wind turbine towers may be visible at a distance but there is no sense that they dominate the landscape or significantly compromise views of SRSNS<sup>14</sup>).
- **High.** The importance of the Evaluation Criterion's contribution toward a determination of Unreasonable Adverse scenic impact is high, or beyond what might be considered reasonable even for large highly visible structures in the landscape. A high rating makes the likelihood that the Overall Scenic Impact may be Unreasonably Adverse, but it will likely still depend on the Evaluation Criterion's relationship to the other ratings (e.g., a possible scenario suggesting an Unreasonable Adverse impact might be that the scenic resource is a national icon—Criterion A is High. Though there are only modest numbers of viewers—Criteria E.1 is Low—every user in the intercept survey indicated that their enjoyment will seriously decline—Criteria E.2 is High.).

A threshold or a similar decision rule needs to be identified for each level of importance. These thresholds may be quantitative, but they may also be ordinal or nominal categories.

In addition, a valid and reliable procedure for combining the Indicator ratings into an Overall Scenic Impact rating needs to be described. Current practice is to summarize these ratings in a

<sup>13</sup> <http://www.maine.gov/dep/land/slz/ip-szveg.html>

<sup>14</sup> 35-A MRSA, § 3452, sub-§2(C)

matrix where the SRSNS are listed by row and the Evaluation Criteria are listed by column. This helps the evaluator understand the overall picture, but it is not a procedure for combining the ratings into an Overall Scenic Impact rating. The best that has been done to date is a narrative rationale to support what appears to be a professional judgment. However, a *post hoc* procedure such as this provides no guidance to others about how to determine the Overall Scenic Impact rating under other circumstances. A systematic review of *post hoc* justifications would likely uncover conflicting rules and circular reasoning; a reliable procedure needs to be specified *a priori*.

#### **4.3 Criterion A: Significance of resource.**

The WEA identifies designations lists for SRSNS; all of these resources are “scenic” by definition. However, some of them are obviously more “scenic” than others and determining the level of scenic-ness is the objective of this Criterion A. Two indicators will be presented here: (1) significance ratings from designation reports, and (2) significance based on the Chapter 315 definition.

**4.3.1 Significance identified in the designation documents.** In many cases, when a SRSNS receives its designation there is supporting report that marshals the evidence concerning its significance. This indicator uses this documentation to determine if the relative importance of the SRSNS Low, Medium or High.

**Historic sites.** The National Register of Historic Places Inventory–Nomination Form for the Arnold Trail to Quebec is designated a historic district including both public and private lands. Section 12, where the State Historic Preservation Officer evaluates and certifies the significance of the property, indicates that it is of State rather than National significance (Holmstrom 1969).

The National Register of Historic Places Inventory–Nomination Form for the Bingham Free Meeting House indicates that the publicly owned. The section where the State Historic Preservation Officer is to evaluate and certify the significance of the property within the state is not completed (section 12), though similar properties indicate that the resource is of local significance. The nomination does not discuss the scenic value of the setting or landscape in the description (section 7) or significance (section 8) narratives. The rating for this Indicator is Low, based on the probability that this site is of local significance within the state and that scenic value of its surroundings does not mentioned.

**Table 6. Significance of Historic Sites listed on the National Register of Historic Places**

<b>Scenic Resources of State or National Significance</b>	<b>Rating</b>
<b>Historic Sites</b>	
Arnold Trail to Quebec	Medium
Bingham Free Meeting House	Low

**National or State Park.** There is only one unit of the National Park Service within 8 miles of the project—the Appalachian National Scenic Trail. The Appalachian Trail is the paragon of long distance recreation trails. It was the first trail designated by the National Scenic Trails Act and is a recreation resource of international importance. Its rating is High.

**Great ponds.** The WEA designates great ponds as SRSNS if they were identified as having significant or outstanding scenic quality in *Maine's Finest Lakes* (Parkin et al. 1989) or *Maine Wildlands Lakes Assessment* (Giffen et al. 1987). The basis for the scenic quality ratings in these two reports is the fieldwork reported in the *Scenic Lakes Evaluation for the Organized Towns in Maine* (Parkin and Lortie 1989) and the *Scenic Lakes Evaluation for the Unorganized Towns in Maine* (Jones 1986). The process used in these reports is clearly stated. A procedure is used to evaluate and assign points to 6 lake attributes associated with scenic quality: relief, physical features, shoreline configuration, vegetation diversity, special features, and inharmonious development. A total of 100 is possible; it appears that lakes with 50 or more points are identified as Outstanding and lakes with 20 to 45 points are Significant.<sup>15</sup> There are approximately 2,378 lakes 10 acres or larger in the state; 6.1% are an Outstanding and 8.7% are a Significant scenic resource.

Based on these results, I suggest the following thresholds for significance based on the scenic lakes studies: a rating of 20 to 35 is Low, 40 to 55 is Medium and 60 or higher is High.

The total assessment points and significance rating for each of the great ponds that are SRSNS within 8 miles of the turbines are listed in Table 7.

**Table 7. Great Ponds' Significance from the *Maine Wildlands Lakes Assessment***

Great Ponds	Total Points	Rating
Bald Mountain Pond	80	High
Jackson Pond	60	High
Punchbowl Pond	70	High

**River segments.** The *Maine Rivers Study* (Maine DOC 1982) considered 31,806 miles of permanently flowing rivers and streams. Of these rivers, 1,560 miles or 4.9 percent were rated as Significant and 208 miles or 0.7 percent were rated as Unique.

Based on the results of the *Maine Rivers Study* I recommend river segments identified as scenically Unique be rated High, those identified as scenically Significant and placed on Lists "A" or "B" be rated Medium, and those identified as scenically Significant and placed on Lists "C" or "D" be rated Low. The scenic river ratings are listed in Table 8.

<sup>15</sup> While the *Scenic Lakes Evaluation for the Organized Towns in Maine* (Parkin and Lortie 1989) applied a more restrictive thresholds (60 for Outstanding and 40 for Significant), it appears that the thresholds from *Scenic Lakes Evaluation for the Unorganized Towns in Maine* (Jones 1986) is used in both *Maine's Finest Lakes* (Parkin et al. 1989) or *Maine Wildlands Lakes Assessment* (Giffen et al. 1987).

**Table 8. River Segments' Significance from the *Maine Rivers Study***

Segment of a Scenic River	Significance	List	Rating
Kennebec River: Augusta to the Forks (including Wyman Lake)	Unique	"A"	High
Piscataquis River – Howland to West Branch	Significant	"B"	Medium
East Branch Piscataquis River	Significant	"B"	Medium
West Branch Piscataquis River	Significant	"B"	Medium

**Scenic turnout on a scenic highway.** Maine has one All American Road—Acadia All American Road, and three National Scenic Byways—Old Canada Road Scenic Byway, Rangeley Lakes Scenic Byway, and Schoodic Scenic Byway. There are only 31 All-American Roads and 120 National Scenic Byways in the country. There are also eight Maine Scenic Byways—Blackwoods Byway, Grafton Notch Scenic Byway, Grindstone Scenic Byway, Million Dollar View Scenic Byway, Pequawket Trail Scenic Byway, Seboomook Scenic Byway, State Route 11 Scenic Byway, and State Route 27 Scenic Byway.<sup>16</sup>

Based on my understanding of these designations, I recommend that an All American Road receive a rating of High, a National Scenic Road a rating of Medium, and a State Scenic Byway a rating of Low.

The Old Canada Road Scenic Byway is a designated National Scenic Byway on June 15, 2000.<sup>17</sup> As a National Scenic Byway, its turnout is rated Medium.

**4.3.2 Significance based on the visitor catchment area.** A common way to distinguish the significance of a recreation resource is whether it attracts a large number of its visitors from the local, regional, state, national or international population. Maine DEP currently uses this type of Indicator to determine the significance of scenic resources.<sup>18</sup>

A scenic resource visited by large numbers who come from across the country or state is generally considered to have national or statewide significance. A scenic resource visited primarily by people of local origin is generally of local significance. Unvisited places either have no designated significance or are “no trespass” places.

It might be helpful to place the non-Maine resident use in perspective. The Maine SCORP reports that Maine State Parks receive 42% of their use from non-residents (Maine DOC BPL 2009, page III-5). Based on these results, I suggest the following thresholds for significance based on the visitor catchment area: if more than 33% of visitation is from outside of Maine the SRSNS significance is High, if more than 33% is from the local region than the significance is Low, otherwise it is Medium.

<sup>16</sup> <http://byways.org/explore/states/ME>

<sup>17</sup> <http://byways.org/explore/byways/11510/designation.html>

<sup>18</sup> Natural Resources Protection Act (NRPA) rule Chapter 315 §10. This rule also appears to have been the basis for the WEA definition of SRSNS.

**Historic sites.** We do not have visitation data for the Bingham Free Meeting House, but based on a site visit it is expected that visitation is low and local, so the rating would be Low.

There is also no information about the number of people using Wyman Lake or the Old Canada Road Scenic Byway who are even aware of the Arnold Trail to Quebec. However, the intercept survey found that over half of the Wyman Lake respondents lived locally, which suggests that the users of the Arnold Trail to Quebec likely live locally too. Therefore the rating is Low.

**National or State Park.** The permanent residence of users of the Appalachian Trail is unknown. However, Manning and his colleagues asked 115 hikers on the Western Maine segment whether they were day hikers (33.7%) overnight hikers (18.2%) or long distance hikers (45.5%) (Manning et al. 2000b, p. 357). The largest number are long distance hikers, though many are also day hikers, who may be local. It is assumed that at least a third of the users come from outside Maine; the Appalachian Trail's rating is High

**Great Ponds.** The Bingham Wind Project is located in Piscataquis and Somerset Counties, and very close to Penobscot County. Users from these counties could be considered regionally local user, while others from Maine would be considered state users. At the national level, I would separate users from the New England or Northeastern from the rest of the country.

Intercept surveys were conducted on the two largest water surfaces within 8 miles—Wyman Lake<sup>19</sup> and Bald Mountain Pond. One of the questions on the survey was the ZIP code of the respondent's primary residence; Table 9 summarizes the results. Overall 51% resided in Penobscot or Somerset Counties, 34% from the rest of Maine, 10% from New England, and 5% from the rest of the country.

**Table 9. Residence of People Interviewed in the Bingham Intercept Surveys**

Residence	Bald Mtn. Pond		Wyman Lake	
	Number	Percent	Number	Percent
Penobscot	1	7.1	1	2.1
Piscataquis	0	0.0	0	0.0
Somerset	5	35.7	25	51.1
Maine—other areas	8	57.1	13	27.7
New England	0	0.0	6	12.8
Other USA	0	0.0	3	6.4

Since what appear to be the most visited lakes are not drawing a third of their visitors from outside the state, and a third or more come from the local region, then it is assumed that the value of this Indicator is Low for all of the great pond SRSNS.

**River segments.** The only data for the SRSNS river segments is from the Wyman Lake intercept survey. The results in Table 9 from the intercept survey indicate that users of Wyman Lake

<sup>19</sup> Wyman Lake is a SRSNS because it is part of the Kennebec River SRSNS. It is discussed here to simplify the presentation of the data.



(which is part of the Kennebec River SRSNS) are primarily from nearby towns, therefore its rating is Low. It seems reasonable that the visitor catchment area would be similar to the great ponds, or even more local. The rating for all four river segments is Low.

**Scenic turnout on a scenic highway.** The Old Canada Road Scenic Byway (US Highway 201) has a turnout that is located in Embden, approximately half a mile south of the Bingham Town line. The closes traffic count site is in Bingham on US 201 near Mahoney Hill Road. The annual average daily traffic for 2012 (AADT12) is 3,510 and there is no information how many of these vehicles stop at the scenic turnout (Maine DOT 2013). There is no suggestion for setting Thresholds for this Indicator. However, it would seem that the use is relatively modest and therefore the rating is Low.

**4.3.3 Combining Criterion A ratings.** Criterion A has two Indicators. In the absence of evidence that one indicator is more important than the other, I propose to obtain a final rating using an equally weighted combinatorial matrix shown in Figure 1. The ratings for Criterion A are presented in Table 10.

		Indicator 2		
		Low	Medium	High
Indicator 1	Low	Low	Low-Med	Medium
	Medium	Low-Med	Medium	Med-High
	High	Medium	Med-High	High

**Figure 1.** This generic equally weighted matrix is for combining the ratings of two Indicators.

**Table 10. Criterion A Indicator and Final Ratings**

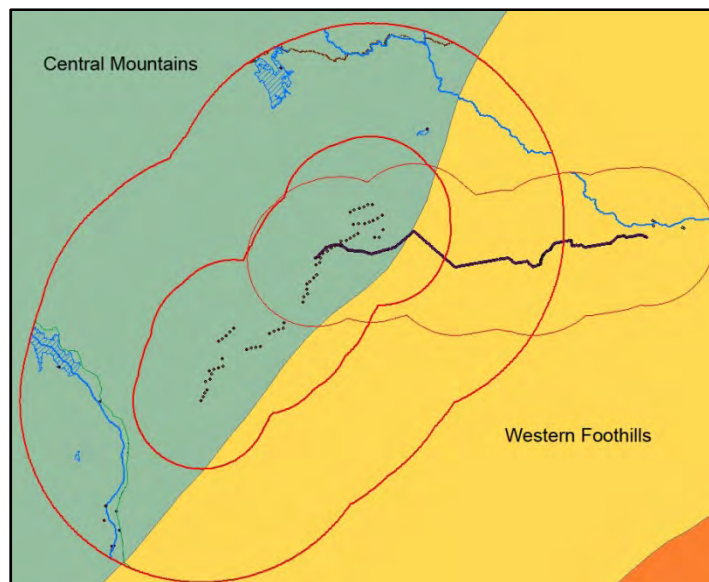
<b>Scenic Resources of State or National Significance</b>	<b>Designation Documents</b>	<b>Visitation Catchment</b>	<b>Criterion A Rating</b>
<b>Historic Sites</b>			
Arnold Trail to Quebec	Medium	Low	Low-Med
Bingham Free Meeting House	Low	Low	Low
<b>National or State Park/Designated Pedestrian Trail</b>			
Appalachian National Scenic Trail	High	High	High
<b>Great Ponds</b>			
Bald Mountain Pond	High	Low	Medium
Jackson Pond	High	Low	Medium
Punchbowl Pond	High	Low	Medium
<b>Segment of a Scenic River</b>			
Kennebec River -Augusta to the Forks (including Wyman Dam)	High	Low	Medium
Piscataquis River – Howland to West Branch	Medium	Low	Low-Med
East Branch Piscataquis River	Medium	Low	Low-Med
West Branch Piscataquis River	Medium	Low	Low-Med
<b>Scenic Turnout on a Scenic Highway</b>			
Old Canada Road Scenic Byway (Route 201) Turnout	Medium	Low	Low-Med

#### **4.4 Criterion B: Character of surrounding area.**

In general, the purpose in describing landscape character in a VIA is to provide a contextual baseline and determine the attributes that contribute to the area’s intrinsic scenic attractiveness (see for instance USDA 1995). A character analysis may also include a description of “sense of place” or more accurately the “sense that people have of a place.” In the absence of clear scenic management objectives, a landscape character assessment can help establish what changes might be reasonable and acceptable.

My understanding of how Criterion B contributes the WEA scenic impact assessment is to establish the state and regional landscape context within which to evaluate the other criteria. In order to do this the study area for a landscape character analysis should be substantially larger than 8 miles from the proposed generation facilities.

**4.4.1 Ecological units.** *Landscape Assessment* (USDA 1995) begins identifying landscape character by describing the area’s ecological units. In Maine, the standard reference is McMahon’s (1990) *Biophysical Regions of Maine: Patterns in the Landscape and Vegetation*, which places the Bingham Wind Project and surrounding area as straddling the Central Mountains and the Western Foothills bioregions, as located in Figure 2. The following summary is taken from Maine’s Comprehensive Wildlife Conservation Strategy (DIFW 2005).



**Figure 2.** Biophysical regions in the Bingham Wind Project study area (Maine DIFW 2005). The red lines indicate the area 3 and 8 miles from the turbines and 3 miles from the generator lead line.

### **Central Mountains Region**

**Physiography:** The Central Mountains Region includes the Katahdin group and surrounding foothills. It also includes the highlands surrounding Moosehead Lake. The region contains the greatest relief in the state with elevations ranging from 600' to 5268'. Topographic highs include Baxter Peak (5268'), White Cap (3644'), Baker Mountain (3520'), Traveler (3541'), North Turner (3323'), South Turner (3122'), and Big Spencer (3230').

Bedrock is dominated by the Katahdin Pluton, which is composed of granite and granodiorite. A series of smaller plutons composed of gabbro and other ultramafic rocks underlies the Whitecap Mountain area. Bedrock of the surrounding hills is composed primarily of weakly metamorphosed pelites and sandstones. Melange and metavolcanic outcrops occur northeast of Moosehead Lake.

**Climate:** The climate of the Central Mountains resembles that of the Western Mountain Region except that summers are slightly milder, winters are slightly colder, and the frost-free season (approximately 100 days) averages 10 days longer. Mean maximum July temperature is 77° F and mean minimum January temperature is 1° F. As in the Western Mountains, annual precipitation is variable because of an orographic effect. Average annual precipitation is 38", while average annual snowfall is 120", the highest in the state.

**Surficial Geology and Soils:** The most extensive bedrock outcrops in the state occur in this region. The remaining landscape is covered with thin drift and till with scattered eskers and glaciofluvial deposits. Some of the deepest deposits occur in the ribbed moraine southeast of the Katahdin mountains, where coarse-textured Hermon soils predominate. As in the Western Mountains, the higher peaks are covered with cryic Saddleback and Enchanted soils,

although these are not extensive. Where bedrock is near the surface, fine-textured, somewhat excessively drained Monson loams have developed. At lower elevations, in till derived from metasedimentary rocks, well-drained Elliottsville loams occur. Wetter and deeper Telos and Monarda soils are typical of valleys and flatter areas.

**Vegetation and Flora:** The Katahdin area is known for its alpine vegetation. Disjunct woody species that occur here and nowhere else in Maine include *Arctostaphylos alpina*, *Betula glandulosa*, *Betula minor*, *Cassiope hypnoides*, *Loiseleuria procumbens*, *Phyllodoce caerulea*, *Rhododendron lapponicum*, *Salix arctophila*, *Salix argyrocarpa*, and *Salix herbacea*. Woody species richness is high (132 species) on Mount Katahdin relative to the surrounding area.

As in the Western Mountains, the region is dominated by spruce-fir forests in poorly-drained valleys and on ridges, and northern hardwoods at middle elevations. Extensive stands of subalpine forest occur between the krummholtz zone and the 2500' contour.

The Bingham Wind Project turbines are all sited near the southern tip of this biophysical region. The higher elevations are approximately 1,500 feet, substantially below the mountains that are the defining characteristic of this region. The visually interesting rock outcrops and high-elevation vegetation communities are not found within the study area. Spruce-fir and northern hardwoods are the dominant forest cover.

### **Western Foothills Region**

**Physiography:** The Western Foothills parallel the Western and Central Highlands in a 10 to 20 mile wide band. Elevations in the region average between 600' and 1000'. The terrain is hilly. The entire region is underlain by metasedimentary rocks except for several small plutons of granite or granodiorite in the southwest. Next to the Aroostook Lowlands, some of the largest calcareous formations occur here. The southwest portion is characterized by moderately to strongly metamorphosed pelites, limestones, and dolostones.

**Climate:** The climate is intermediate between that of the Western Mountains and the Central Interior. Mean maximum July temperature is 79° F and mean minimum January temperature is 5° F. Average annual precipitation is 43", while average annual snowfall is 100". The frost-free season ranges from 110 to 140 days.

**Surficial Geology and Soils:** The northern portion of the region is dominated by the largest ribbed moraine in the state. The landscape consists of numerous hummocks and short parallel ridges. These are most conspicuous in the Millinocket and Pemadumcook Lakes area. Thin drift, occasional bedrock, and till composed of mica schist and phyllite with some granite and gneiss provide the parent material in southern sections. Valley soils north of the moraine are generally deep, somewhat poorly drained Telos and poorly drained Monarda loams, with shallower, better drained Monson and Elliottsville soils on upper slopes. Soils on the moraine tend to be deep, moderately well drained, coarse loamy Dixfield and stony excessively drained Hermon soils, while lower slopes are typically deep, poorly drained Brayton and Daigle soils. Soils in central and southern portions are generally better drained silts and fine sandy loams. Ice-contact glaciofluvial deposits and stream alluvium are scattered throughout the region.

**Vegetation and Flora:** The western boundary of the region roughly follows the 1000' contour, which marks a transition from temperate forest species to boreal species. In addition to the species that reach western limits between the Saint John Uplands and Aroostook Hills, a number of other woody plants are rare or do not occur west of the 1000' contour in this region. These include *Amelanchier canadensis*, *Carya ovata*, *Cephalanthus occidentalis*, *Comptonia peregrina*, *Cornus ammomum*, *Crataegus macrocantha*, *Fraxinus pennsylvanica*, *Prunus serotina*, *Rubus hispidus*, *Rubus occidentalis*, *Rubus pensylvanicus*, and *Viburnum acerifolium*. Woody species richness increases markedly from west to east.

The Bingham Wind Project turbines are located just to the west of this biophysical region. However, the project ridges appear more similar to those found in this region than the high peaks to the north (Mount Katahdin) or the west (Bigelow Mountains). The spruce-fir and northern hardwoods forest that dominate the project area are common through Maine.

#### **4.4.2 The image of the surrounding area as represented to potential visitors.**

The project is sited primarily in the Piscataquis County (Highlands region) and Somerset County (Kennebec and Moose River Valley region).

One way to investigate the landscape character of an area would be to evaluate the text and images used to represent it to potential visitors. The official government tourism website offers a relatively objective source of data, in that their task is to represent the best tourism opportunities within the state and its regions. The Maine Office of Tourism is clearly a booster for Maine tourism, but it has no bias toward particular attractions.

A proper characterization would inventory all the images and text on the sampled websites, and then conduct a qualitative content analysis of these data. In this case there are three relevant websites that I have identified: the Maine Office of Tourism website and the official websites for the Kennebec and Moose River Valley Region, and Highlands Region. I have perused these sites for reference to SRSNS within 8 miles of the proposed Bingham Wind project; however I have not attempted to conduct a thorough analysis.

**Kennebec and Moose River Valley.** The Maine Office of Tourism focuses on cultural resources at the southern end of the region (i.e., near Augustus and Waterville) and natural resources and outdoor recreation at the northern end (i.e., near Jackman and The Forks).<sup>20</sup> However, the Bingham wind Project is located in the center of the region, and the SRSNS at this location apparently are not sufficiently noteworthy to be highlighted.

There is a short description of the Old Canada Road National Scenic Byway, but it does not mention resources in the study area”

Route 201 follows the old river trading paths of the Abenaki tribe, leading visitors back in time through towns where turn-of-the-century homes line the main thoroughfare. This byway passes through The Forks, where the Dead and Kennebec Rivers meet. This area is well-known for rafting expeditions down these swift-

---

<sup>20</sup> <http://www.visitmaine.com/region/kennebec/>

flowing rivers. The route ends at the US international border crossing at Sandy Bay.<sup>21</sup>

There are 281 miles of the Appalachian Trail in Maine; the central third extends from Monson through the Bigelow Preserve, which includes the project area. It is described this way:

The central section of the AT in Maine crosses between Monson and the Bigelow Preserve, 36,000 acres of public land encompassing the entire Bigelow Range, with its extensive trail system navigating seven peaks. You can follow the AT along the spectacular above-treeline Bigelow Preserve Trail, or choose many less demanding loops.<sup>22</sup>

Features of the project area, such as Bald Mountain Pond, are not mentioned.

Notably, there is no mention of other SRSNS within 8 miles of the proposed project, such as the Arnold Trail to Quebec, Bald Mountain Pond, Wyman Lake, the local stretches of the Kennebec or Piscataquis Rivers.

**Maine Highlands.** The Maine Office of Tourism has this to say about the Maine Highlands Region.<sup>23</sup> “Here you can hike Maine’s highest mountain or canoe Maine’s largest lake. You can experience whitewater rafting one day, and enjoy a riverside concert the next. You can explore pristine wilderness or tour Stephen King’s favorite haunts.” The focus is on the Moosehead Lake and Baxter State Park. The official website of The Maine Highlands does not seem to reference the lakes within 8 miles of the proposed project.

This is admittedly a minimal investigation; normally an objective qualitative analysis for consideration in making a major decision would need to be more comprehensive. However, it does illustrate that with the Kennebec and Moose River Valley Region and the Maine Highlands Region the potentially effected SRSNS are not being highlighted for their scenic value or as primary tourist destinations.

**4.4.3 Remoteness.** Remoteness is a landscape characteristic that LUPC has actively promoted and sought to protect. “The Commission has identified four principle values that, taken together, define the distinctive character of the jurisdiction,” including:

Natural character, which includes the uniqueness of a vast forested area that is largely undeveloped and remote from population centers. Remoteness and the relative absence of development in large parts of the jurisdiction are perhaps the most distinctive of the jurisdiction's principal values, due mainly to their increasing rarity in the Northeastern United States. These values may be difficult to quantify but they are integral to the jurisdiction's identity and to its overall character” (LURC 2012, page 2).

In particular, remote lakes are prized:

---

<sup>21</sup> [http://www.visitmaine.com/organization/1070/old\\_canada\\_road\\_national\\_scenic\\_byway/](http://www.visitmaine.com/organization/1070/old_canada_road_national_scenic_byway/)

<sup>22</sup> [http://www.visitmaine.com/attractions/state\\_national\\_parks/appalachian\\_trail/](http://www.visitmaine.com/attractions/state_national_parks/appalachian_trail/)

<sup>23</sup>

The jurisdiction contains a diverse array of lakes, but the most highly treasured are its remote ponds—inaccessible, undeveloped lakes that offer a remote recreational experience which is not easily found in the Northeast (LURC 2012, page 38).

“Remote pond” is a land planning designation with a particular meaning. The “remote ponds” are identified by a Lake Management Class 6 designation. They are “inaccessible, undeveloped lakes with coldwater game fisheries. The Commission intends to continue to prohibit development within 1/2 mile of these ponds to protect the primitive recreational experience and cold water lake fisheries in remote settings” (LURC 2012, page C-10). In addition, the related Lake Management Class 1 protects the “highest value, least accessible, undeveloped lakes [that are not designated as remote] ... by prohibiting development within 1/4 mile of their shores and restricting permanent vehicular access to these lakes” (LURC 2012, page C-9).

Remoteness is also a key concept in the Recreation Opportunity Spectrum (ROS), which is discussed in under section 3.4 Recreation Opportunity Spectrum in the Methods chapter of this report. Remoteness is a central criterion for identifying the ROS, WROS and WALROS land classes. I have considered LUPC’s remoteness standard in the context of these management systems and identified the following thresholds for determining the following land classes:

- **Primitive (P)** areas are further than 2 miles from any road.
- **Semi-Primitive Non-Motorized (SPNM)** areas are between 0.5 and 2 miles from any road.
- **Semi-Primitive Motorized (SPM)** areas are within 0.5 mile of all private roads, which are assumed to be less well maintained and often not passable by a two-wheel drive vehicle.
- **Semi-Developed Natural (SDN)** (aka Rural Natural) areas are within 0.5 mile of public roads, which are assumed to be passable for a two-wheel drive vehicle.
- **Developed Natural (DN)** (aka Rural Developed) areas are also within 0.5 mile of public roads.

The result of applying these thresholds is shown on Map 5 Predicted Remoteness in Appendix 1.<sup>24</sup> An inspection of the DeLorme (2009) *Maine Atlas and Gazetteer* suggests that the patches of ROS Primitive class do have unimproved roads—probably old logging roads—threaded through them. These Primitive areas might more properly be classified Semi-Primitive Non-Motorized.

The analysis could not distinguish Semi- Developed Natural from Developed Natural areas by their distance from public roads. The villages of Bingham and Solon would be more properly classified as Developed Natural areas, since they are more densely settled areas. Table 11 identifies the ROS Class associated with the land surround each SRSNS based only on the Remoteness criterion.

---

<sup>24</sup> Maine Office of GIS provided Maine DOT public roads data (MEDOTPUBRDS) and the Enhanced 911 database that includes private roads (E911RDS). The Maine Office of GIS does not recommend using the very out of date TRANS.shp data (Bistrais 2013). However, there are likely to be very rough tracks and old logging roads that are not included in the E911RDS data.

**Table 11. ROS Class based on Remoteness Criteria**

Scenic Resources of State or National Significance	ROS Remoteness Class <sup>†</sup>
<b>Historic Sites</b>	
Arnold Trail to Quebec	SDN
Bingham Free Meeting House	DN
<b>National or State Park/Designated Pedestrian Trail</b>	
Appalachian National Scenic Trail	SPNM
<b>Great Ponds</b>	
Bald Mountain Pond	SPNM
Jackson Pond	SDN
Punchbowl Pond	SPNM
<b>Segment of a Scenic River</b>	
Kennebec River: Augusta to the Forks (including Wyman Lake)	SDN
Piscataquis River – Howland to West Branch	SDN
East Branch Piscataquis River	SDN
West Branch Piscataquis River	SPM
<b>Scenic Turnout on a Scenic Highway</b>	
Old Canada Road Scenic Byway (Route 201) Turnout	SDN

Notes: DN = Developed Natural. SDN = Semi-Developed Natural. SPM = Semi-Primitive Motorized. SPNM = Semi-Primitive Non-Motorized. <sup>†</sup> If a secondary ROS class is present, it is listed in parentheses.

**4.4.4 Summary of Criterion B Character of surrounding area.** This response to considering Criterion B is an attempt to describe the condition of the area surrounding the Bingham Wind Project as it exists now. This area appears to be similar to much of the less developed parts of Maine. It is typically scenic within the context of Maine, but not spectacular. As such, a Medium rating will be assigned to all of the SRSNS. However, the primary importance of Criterion B in this analysis is to establish the context for making judgments about several of the other criteria.

#### **4.5 Criterion C: Typical viewer expectation.**

A typical viewer's expectations concerning their use of a SRSNS may be influenced by the characteristics of the SRSNS and the role that scenery plays in their anticipated activities.

**4.5.1 Overall quality of experience expected today.** The 2013 Bingham intercept surveys included a question that asked "When you think about coming to this site to (Bald Mountain Pond or Wyman Lake), what is it you look forward to?" They were asked to rate 6 different expectations "on a scale of 1 to 7 where 1 is very unimportant, 4 is neither important nor unimportant, and 7 is very important." The expectations were"

- Getting Outdoors
- Scenery: Enjoying the Surroundings
- Companionship/spending time with friends/family



- Challenge
- Rejuvenation: relief from the tensions of everyday life
- Novelty: trying something different

There are 21 from Wyman Lake, which seems adequate, but only 7 from Bald Mountain Pond, which is too few to be confident in the results. People’s expectations for “getting outdoors” and the “scenery” were of primary importance; “companionship” and “rejuvenation” also play a major role in their expectations. “Challenge” and “novelty” played no real role in their expectations. The results for each lake are presented in Table 12.

Based on these results for two quite different water bodies, their ratings for expectations are High.

**Table 12. Bingham survey results for expected quality of experience.**

Expectations	Bald Mountain Pond				Wyman Lake			
	Mean	Std. Dev.	Count	Effect Size <sup>†</sup>	Mean	Std. Dev.	Count	Effect Size <sup>†</sup>
Getting Outdoors	6.86	0.378	7	7.56	6.95	0.218	21	13.53
Scenery	6.57	0.787	7	3.27	6.95	0.218	21	13.53
Companionship	7.00	0.000	7	*	6.19	1.834	21	1.19
Challenge	3.71	1.380	7	-0.21	3.81	2.294	21	-0.08
Rejuvenation	6.57	1.134	7	2.27	6.35	1.496	20	1.57
Novelty	4.67	1.366	6	0.49	4.00	1.924	21	0.00

Note: <sup>†</sup> Effect Size is Hedges g. \* All ratings were “7” so there is no variation and an effect size cannot be calculated.

**Appalachian Trail survey.** In 2000, Robert Manning and his colleagues conducted a survey of hikers along the length of the Appalachian Trail. The Bingham Wind Project is in Western Maine section, from Monson west to the border with New Hampshire. Hikers were asked “People have many potential reasons for hiking. We would like to know what motivated you to hike on the Appalachian Trail on the trip when you were contacted for this study. Please indicate (1) how important each of the experiences listed below was to you as a reason to hike, and (2) the extent to which you attained each of these experiences on your hike.” They evaluated 22 possible reasons using “a 5-point scale where 1=Not at all important through 5=Extremely important, and 1=Not at all attained through 5=Highly attained” (Manning et al. 2000b, p. 395). The motivations in Table 13 selected to be similar to the expectations question in the Bingham intercept surveys. Out of the 22 motivations, “to enjoy the view along the trail” ranked first in Importance and second in being Attained. This supports a rating of High.

**Table 13. What Motivated You to Hike the Western Maine Section of the Appalachian Trail?**

Motivations	Mean <sup>†</sup>	
	Importance	Attained
To get exercise	4.3	4.6
To enjoy the view along the trail	4.5	4.5
To do something with my family	2.8	3.2
To test my endurance	3.2	3.7
To help reduce built-up tension	3.4	3.9

Notes: <sup>†</sup> Responses used a 5-point scale where 1 is not at all important or attained and 5 is extremely important or highly attained.

**4.5.2 ROS experience characterization.** If one accepts that the ROS classes identified using remoteness criteria are reasonable, then it is possible to describe the attributes that a SRSNS user could reasonably expect to experience. Following are excerpts from More et al. (2003) that characterize the potential experience (Table 2, pages 14-15) and evidence of humans (Table 5, pages 20-21) for each ROS class.

- **Primitive (P).** Extremely high probability of experiencing isolation from human development, use, and impact. ...Setting appears to be an essentially unmodified natural environment. Evidence of recent human activities would be unnoticed by an observer wandering through the area. ...Structures are extremely rare.
- **Semi-Primitive Non-Motorized (SPNM).** Moderately high probability of experiencing isolation from human development, use, and impact. ...Natural appearing setting may have subtle modifications that could be noticed but not draw the attention of an observer wandering through the area. ...Structures are rare and isolated.
- **Semi-Primitive Motorized (SPM).** Moderate probability of experiencing isolation from human development, use, and impact. ...Natural appearing setting may have moderately dominant alterations but would not draw the attention of motorized observers on trails and primitive roads within the area. ... Structures are rare and isolated.
- **Semi-Developed Natural (SDN) (aka Rural Natural).** About equal probability of encountering other user groups and isolation from sights and sounds of people. ...Natural appearing setting may have obvious modifications, ranging from easily noticed to strongly dominant. However these alterations remain unnoticed or visually subordinate from visually scenic and heavily traveled routes and use areas. ...Structures generally are scattered, remaining visually subordinate or unnoticed by observers on visually scenic or heavily traveled routes. Structures may include power lines, microwave installations, etc.
- **Developed Natural (DN) (aka Rural Developed).** Encounters with other individuals and groups are common. ... The physical setting is not as important as the activity opportunity. ...Natural appearing setting has been culturally modified so that the modifications are dominant. ... May include pastoral, agricultural, intensively managed wildland resource landscapes, or utility corridors. ...Structures are readily apparent and may range from scattered to small clusters that could dominate the landscape. Structures

may include power lines, microwave installations, local ski areas, minor resorts, and recreation sites.

When in the Semi-Primitive and Semi-Developed areas, it is reasonable to expect a high degree of interaction with the natural environment. Users of Semi-Primitive areas can expect isolation from the sights and sounds of people; users of Semi-Developed areas are just as likely as not to encounter other users. However, these characterizations appear to be primarily from the perspective of a person experiencing the visual foreground (up to ½ mile in USDA 1995), not necessarily an area seen miles away.

Interpreting the experience of the ROS classes through the lens of the WEA, I suggest that when considering Criterion C, Primitive and Semi-Primitive Non-Motorized areas have a rating of High, Semi-Primitive Motorized and Semi-Developed Natural have a rating of Moderate, and Developed Natural and more urbanized areas have a rating of Low importance in determining the overall scenic impact.

**4.5.3 Summary of Criterion C expectations of the typical viewer.** The ratings for the two Criterion C indicators as well as the final rating are shown in Table 14.

**Table 14. Criterion C Expectations of the Typical Viewer Indicator and Final Ratings**

Scenic Resources of State or National Significance	Survey	ROS Class	Criterion C Rating
<b>Historic Sites</b>			
Arnold Trail to Quebec	--	Medium	Medium
Bingham Free Meeting House	--	Low	Low
<b>National or State Park/Designated Pedestrian Trail</b>			
Appalachian National Scenic Trail	High	High	High
<b>Great Ponds</b>			
Bald Mountain Pond	High	High	High
Jackson Pond	--	Medium	Medium
Punchbowl Pond	--	High	High
<b>Segment of a Scenic River</b>	--		
Kennebec River: Augusta to the Forks (including Wyman Lake)	High	Medium	Med-High
Piscataquis River – Howland to West Branch	--	Medium	Medium
East Branch Piscataquis River	--	Medium	Medium
West Branch Piscataquis River	--	Medium	Medium
<b>Scenic Turnout on a Scenic Highway</b>			
Old Canada Road Scenic Byway (Route 201) Turnout	--	Medium	Medium

#### **4.6 Criterion D: Development's purpose and context.**

One would not expect that a VIA would consider issues such as the changes that global warming will cause to the visible landscape unless a major shift to renewable energy sources is made immediately. Nor would it consider how productive and efficient wind energy projects are. These are outside the purview of a VIA. However, there are visual considerations that might be considered part of the development's purpose and context. For instance, will the project require extensive new associated facilities, such as access roads and power lines? Or the project may be proposed near other wind projects, thus concentrating the cumulative impacts to a few locations rather than spreading them evenly throughout the state.

**4.6.1 Limiting new associated facilities.** Limiting the need for new associated facilities will reduce the potential for scenic impacts. The Bingham Wind Project requires a 17 mile 115kV generator lead line. This is a significant project in itself, though it will not be visible from any SRSNS. There will be 17 miles of new crane paths, though effective use is made of existing roads for other purposes. The rating is Medium.

**4.6.2 Clustering projects.** There is some discussion about whether it is more desirable to distribute wind energy development throughout the state, or to cluster it in fewer areas. The thinking is that the greatest scenic impact occurs with the initial project, and that the incremental impact from additional projects is less than that initial impact.<sup>25</sup> Following this logic, the overall impact to the state's scenic resources will be lower if projects are clustered than if they are distributed evenly throughout the state. In a sense, identification of the expedited permit area is a movement in the direction of clustering. However, this approach does not offer guidance on determining when the cumulative scenic impact reaches an Unreasonably Adverse level, since the WEA criteria are only applied to each project's incremental impact.

The Cumulative Visual Impact Study Group (2012) considered approaches to manage or mitigate the cumulative impacts. An important starting point for their discussions was a paper prepared by LURC staff entitled *Cumulative Visual Impacts—Concepts & Issues* (CVISG 2012, appendix 2). In part it stated:

The LURC commissioners felt the best way to address CVI at the large landscape level is by clustering the development in “appropriate” locations and steering development away from “inappropriate” places. While site design, turbine design, color or other visual mitigation tools play a role in minimizing CVI, clustering is seen as the primary mechanism by which the cumulative effects of wind energy development on scenic resources across a large landscape (such as the existing expedited area) may be mitigated.

There appeared to be wide support for clustering from other stakeholders as well.

The Bingham Wind Project is not near any existing projects, though at 62 wind turbines it is the biggest project yet proposed for Maine, and is comparable to the “clustering” at the Stetson or Kibby Wind Projects. The rating is Low, meaning that the project has clustered many turbines together rather than spread them throughout the region.

---

<sup>25</sup> Palmer (1999) demonstrated this phenomenon in a study of the scenic impacts associated with clearcutting.

**4.6.3 Summary of Criterion D: Development’s purpose and context.** Two possible ways that a development’s purpose and context might be relevant to conducting a VIA are proposed—limiting new associated facilities, and clustering. When applied to Bingham Wind, Criterion D indicates that the project will make a Low-Medium contribution to the overall scenic impact.

**4.7 Criterion E.1: Extent, nature and duration of uses.**

Consider the number of users, how they use of the resource, and their typical length of stay. User observations or surveys provide the most direct indicators, but trail logs or traffic counters are also be useful. Potential accessibility may be an indicator in the absence of empirical data.

**4.7.1 Extent of use.** The only data concerning extent of use at the SRSNS was collected as part of the intercept surveys at Bald Mountain Pond and Wyman Lake. However, there are some other use statistics from other sources that can be brought to bear on this indicator.

**Historic sites.** During the 2013 intercept survey at Wyman Lake, respondents were asked whether they were aware of the Arnold Trail to Quebec. Sixty-two percent indicated that they were aware of the Arnold Trail, and of those 46 percent indicated that the presence of the Arnold Trail made an important positive contribution to their time at Wyman Lake. In other words, 29 percent of the users on Wyman Lake thought the Arnold Trail made an important contribution to their time at Wyman Lake. In the summer of 2013, the interviewers observed an average of 66 people per day. This suggests that 19 people a day gained some enjoyment from knowing that they were near the route of Arnold’s march to Quebec. In addition, an unknown percentage of the 3,510 vehicles traveling the Old Canada Road Scenic Byway/US 201 have their trip enhanced by this knowledge. These numbers are comparable to the numbers of daily users for Wyman Lake; therefore the Arnold Trail is given the same Low rating.

There is no direct information about how the Bingham Free Meeting House is used. “The Meeting House is now owned by the Town of Bingham and is used on Memorial Day, the Fourth of July, and on other occasions by arrangement.”<sup>26</sup> The use appears to be Low.

**National or State Park.** As part of the Highland Wind Project hearings, the Maine Appalachian Trail Club submitted caretaker and ridge runner tallies for several locations along the Appalachian Trail in Maine. The use of the Appalachian Trail through the Bigelow Preserve was estimated to be 1,700 to 2,100 hikers per year. (Palmer 2011, p. 36). It is expected that the use of the Appalachian Trail in the Bigelow Preserve is higher than in the project area. The rating for use is Low.

**Great Ponds.** The only great pond with user data is Bald Mountain Pond, where a daily average of 21 people were observed in the summer of 2013 and 5 people during the fall of 2012. Wyman Lake is evaluated as a River Segment.

Apparent ROS class may be used to determine the appropriate intensity of use (Hass et al. 2004, 2011; USDA 1982). These documents set the reasonable carrying capacity range for semi-primitive (SPNM and SPM) lakes to be between 110 and 480 acres per boat; on a semi-developed lake it is 50 to 110 boats per acre.

---

<sup>26</sup> <http://www.mainememory.net/artifact/18819>

The range for boat carrying capacity and the observed mean and maximum BAOT are reported in Table 15. The number of boats at one time (BAOT) was not observed during the intercept surveys. Instead the total number of people observed during the interview period was recorded. However, one might estimate BAOT by dividing the number of people by average group size, as reported in Table 15. If one accepts these assumptions as reasonable, then Bald Mountain Pond's usage is toward the high end for the Semi-Primitive Non-Motorized ROS class (i.e., fewer boats), while the maximum observed is in the middle of the range. It is assumed that the other lakes have a similar modest level of use for their ROS class. Each lake will be given a rating of Low for extent of use.

**Table 15. Boat Carrying Capacity and Observed Use**

Great Ponds	Area (acres) <sup>†</sup>	ROS Class	Carrying Capacity (# of BAOT)		Observed BAOT *	
			Low	High	Mean	Maximum
Bald Mountain Pond	1,142	SPNM	10.4	2.4	3.0	4.0
Jackson Pond	31.3	SDN	0.6	0.3	--	--
Punchbowl Pond	41.2	SPNM	0.4	0.1	--	--
Wyman Lake <sup>†</sup>	1,820*	SDN	36.4	16.5	16.5	25.8

Note: \* BAOT is estimated from the number of people observed and dividing it by the reported average group size. † Wyman Lake is evaluated as a section of the Kennebec River.

**River segments.** The only river segment with user data is Wyman Lake (TRC 2009). This survey was conducted as part of a requirement that the Florida Light and Power, the owner of the Wyman Dam, monitor recreation use of Wyman Lake as a condition of the dam's license. They estimated that:

From April 1, 2008 through March 31, 2009, the Wyman Project was utilized during an estimated 76,735 daytime recreational days. A limited amount (4,344 recreation days) of nighttime use, as identified by camping activity, was recorded at the Project. Recreational usage peaked in the summer, with approximately 62 percent of all recreation days (47,213 days) occurring during the summer season. Spring recreational usage was estimated to be 14,667 days (19 percent of total use) in 2008. Usage at the Wyman Project was somewhat lower in the fall, with only 9,835 days (13 percent of total use). An estimated 5,020 recreation days were spent at the Project during the winter recreation season (TRC 2009, p. 9).

These estimates are compared in Table 16 with the number of people Kleinschmidt (2013a, 2013b) observed while conducting the intercept surveys in the fall of 2012 and summer of 2013. The DeLorme (2009) *Atlas* indicates are three boat launches on Wyman Lake, and the intercept surveys were conducted at the most southern of these, out of view of the other two. In any case, the use observed by Kleinschmidt in that portion of Wyman Lake within 8 miles of the project is substantially below that estimated by TRC for the whole lake.

**Table 16. Users per Day at Wyman Lake by Season**

Season	Users per Day	
	TRC estimate	Kleinschmidt observed
Spring	161	--
Summer	519	66*
Fall	108	8 <sup>†</sup>
Winter	55	--

Notes: \* 2013 intercept survey. † 2012 intercept survey.

Using the analysis assumptions described for Great Ponds above, the average number of approximated BAOT for Wyman Lake is 16.5, and the maximum is 25.8. This usage is toward the high end for the Semi-Developed Natural ROS class (i.e., fewer boats), while the maximum observed is in the middle of the range. Wyman Lake will be given a rating of Low for extent of use.

While the actual use of the other river segments is unknown, it is expected that it is lower than Wyman Lake, so their ratings are also Low.

**Scenic turnout on a scenic highway.** The Old Canada Road Scenic Byway (US Highway 201) has a turnout that is located in Embden, approximately half a mile south of the Bingham Town line. Just to the north of the Bingham Town line is the Arnold's Way Rest area.

The closest Maine DOT traffic count site is in Bingham on US 201 near Mahoney Hill Road. The annual average daily traffic for 2012 (AADT12) is 3510 (Maine DOT 2013). The annual average daily traffic for 2012 (AADT12) is 3510 and there is no information how many of these vehicles stop at the scenic turnout (Maine DOT 2013). There is no suggestion for setting Thresholds for this Indicator. However, in nearby Skowhegan, a rural section of US Highway 2 has an AADT11 of 9,960. It seems reasonable to expect that the actual number of users of the turnout is rather small, which suggests a rating of Low.

**4.7.2 Nature.** The nature of use concerns the activities in which people engage at the SRSNS, and perhaps the role scenic quality might play in those activities.

**Historic sites.** Approximately 12 miles of the Arnold Trail to Quebec pass within 8 miles of the Bingham Wind Project. A review of the Arnold Expedition Historical Society web site indicates that there are no regularly organized events involving this section of the Arnold Trail.<sup>27</sup> It appears that most uses of the Arnold Trail in this area are as a secondary activity for people who are recreating on Wyman Lake or traveling on the Old Canada Road Scenic Byway/US 201. While there are "users," perhaps hundreds on some days, the nature of this activity and its relationship to scenery is unclear. It is clear from the nomination documents that "along the trail from Bingham to the Canadian border, ... gives the appearance of a vast, hostile wilderness, as it did in 1775" (Holmstrom 1969). In this case a rating of Medium may be appropriate.

There is no direct information about how the Bingham Free Meeting House is used, but it appears to be for indoor activities. A Low rating seems appropriate.

<sup>27</sup> <http://arnoldsmarch.com/>

**National or State Park.** As part of the Appalachian Trail survey, Manning and his colleagues (2000) asked hikers on Western Maine section “Please look at the following list of activities and tell us which activities you and your group did during this trip on the Appalachian Trail.” Table 17 summarizes the results. Viewing Scenery was identified as the most common activity, followed by other activities that are thought to be associated with a High sensitivity to scenery.

**Table 17. Participation in Activities along the Western Maine Section of the Appalachian Trail**

<b>Activity</b>	<b>Percent Participated</b>
Viewing Scenery	80.0
Backpacking	63.5
Day Hiking/Walking	55.7
Camping	55.7
Photography	51.3
Picnicking	29.6
Nature Study	18.3
Fishing	5.2
Jogging/Trail Running	0.9
Horseback Riding	0.0
Hunting	0.0

**Great Ponds.** The Bingham intercept surveys asked users to identify which of 18 activities they participated in that day at the SRSNS, and then which was their primary activity. The results are summarized in Table 18. At Bald Mountain Pond, fishing was the primary activity for half of the respondents, and people are thought to be less sensitive to scenery when fishing (Palmer 1999). Less than a third of the respondents mentioned enjoying the scenery as an activity in which they engaged. Based on the primary recreation activity and the relatively low participation in viewing scenery, the rating is Low.

There is no information about the pattern of use at Jackson Pond or Punchbowl Pond, though without a boat launch or road access it is very unlikely that motor boats or larger canoes are put in the water. However, based on the results at Bald Mountain Pond, a Low rating is also assigned to these SRSNS.



**Table 18. Percent User Participation in Activities and Their Primary Activity**

Activity	Bald Mountain Pond		Wyman Lake	
	Engaged	Primary	Engaged	Primary
Beach going/using the beach	7.1	7.1	8.0	2.0
Camping	50.0	21.4	4.0	0.0
Canoeing	28.6	0.0	4.0	0.0
Driving at ATV	7.1	0.0	2.0	0.0
Enjoying the scenery/scenic viewing	28.6	7.1	20.0	8.2
Fishing	64.3	50.0	42.0	20.4
Kayaking	35.7	14.3	16.0	10.2
Motor boating	28.6	0.0	34.0	16.3
Nature study	0.0	0.0	8.0	2.0
Observing wildlife or nature	28.6	0.0	22.0	6.1
Personal watercraft	0.0	0.0	4.0	0.0
Picnicking	0.0	0.0	30.0	2.0
Relaxing	35.7	0.0	26.0	8.2
Stargazing/enjoying the night sky	14.3	0.0	0.0	0.0
Staying at a camp	14.3	0.0	2.0	0.0
Staying at a lodge	0.0	0.0	0.0	0.0
Sunbathing	14.3	0.0	12.0	0.0
Swimming	28.6	0.0	44.0	22.4

Notes: Bald Mountain Pond n = 14. Wyman Lake n = 50 for engaged; 49 for primary.

**River segments.** The Bingham intercept surveys asked users to identify which of 18 activities they participated in that day at the SRSNS, and then which was their primary activity. The results are summarized in Table 18. At Wyman Lake, swimming was the primary activity for 22 percent of the respondents, followed closely by fishing (20%), motor boating (16%) and kayaking (16%). Swimming, fishing and motor boating are not activities generally associated with viewing scenic. Only a fifth of the respondents mentioned enjoying the scenery as an activity in which they engaged. Based on the primary recreation activities and the relatively low participation in viewing scenery, the rating is Low.

It is expected that fishing is the dominant activity on the other SRSNS river segments, though canoeing and kayaking may also be important. However, based on the relatively high participation in fishing and low participation in viewing scenery found by the intercept survey, the Piscataquis River segments will also be given a Low rating.

**Scenic turnout on a scenic highway.** The Old Canada Road Scenic Byway turnouts are oriented toward historic interpretation, not scenic appreciation. There is no information about the importance of scenery to users of these turnouts, though it is assumed to be Low.

**4.7.3 Duration.** Duration can refer to the length of time that a SRSNS user is engaged in recreation activities. It is reasonable to expect that a viewer who spends more time in an area with high potential visibility will be more impacted than someone who spends a very short time at a SRSNS (e.g., stopping at a scenic highway turnout). The influence that length of visit might have on scenic impact might be Low for a mean of less than half an hour, and High for greater than 4 hours.

Duration could also refer to the number of visits per year that a user makes to an SRSNS. In this case, the influence that number of visits might have on scenic impact might be Low for a mean of less than 2 per year, and High for greater than 7 per year.

The equally weighted combinatorial matrix shown in Figure 1 can be used to obtain a single rating for Duration.

**4.7.3.1 Length of visit.** There is no research to support setting of thresholds for length of visit as an indicator of potential exposure to a wind energy project. For this review, tentative thresholds are set at up to 5 hours (half a day) is Low, 4 to 48 (2 days) hours is Medium, and more than 48 hours (2 days) is High. It must be recognized that length of visit is a measure of how long visitors are in the area, not how long they are exposed to views of the wind turbines or other project elements.

**Historic sites.** If the Bingham Free Meeting House is used primarily for holiday related memorial services, it would be used for less than 5 hours at a time, so the rating is Low.

The primary means to access the Arnold Trail to Quebec is either by water, particularly on Wyman Lake, or by the Old Canada Road Scenic Byway/US 201. There is approximately 14 miles of US 201 within 8 miles of the generating facilities. Traveling at normal speeds people would spend only a short time in the area, even if they stop at an interpretive turnout. The rating is Low.

**National or State Park.** There are about 13 miles of the Appalachian National Scenic Trail within 8 miles of the generating facilities and two lean-tos. It is anticipated that users will spend an average of more than 5 hours but less than two days in this area, so the rating is Medium.

**Great Ponds.** The Bingham survey asked respondents “approximately how long do you expect to visit this site?” (Kleinschmidt 2013). The responses are in hours, ranging from 1 to 336 (i.e., 14 days). These results indicate that respondents at Bald Mountain Pond are recreating for an average of 56 hours, or 34 hours if the individual staying two weeks is excluded. The results of the survey indicate that the rating should be High, though the sample size is too small to evaluate whether the two week stay is representative or an anomaly. If it were an anomaly, then the rating would be Medium.

There is no information about the pattern of use or length of stay at Jackson Pond or Punchbowl Pond. However, since there is no boat launch or camp site it is assumed that most use is by people who come to fish for the morning or afternoon. Their rating would be Low.

**River segments.** At Wyman Lake the average length of a visit was 4.7 hours; the rating is Low. The number of visits to the other SRSNS river segments is unknown, since the pattern of use is unknown. However, it is anticipated that all of the SRSNS river segments have a similar length of stay to Wyman Lake; their ratings are also Low.

**Scenic turnout on a scenic highway.** The scenic turnouts have interpretive signs that may hold a visitor for half an hour, but longer stops are unlikely. The rating is Low.

**4.7.3.2 Number of visits.** There is no research to support setting of thresholds for number of visit as an indicator of potential exposure to a wind energy project. For this review, tentative thresholds are set at less than 3 days is Low, 2 to 14 days is Medium, and 15 or more days is High.

**Historic sites.** If the Bingham Free Meeting House is used primarily for holiday related memorial services, it would be expected that someone would use it less than 3 days per year, so the rating is Low.

The primary means to access the Arnold Trail to Quebec is either by water, particularly on Wyman Lake, or by the Old Canada Road Scenic Byway/US 201. Users of Wyman Lake who are aware of the Arnold Trail to Quebec visited Wyman Lake 19 times during the past year. It is anticipated that on average travelers on US 201 would stop at the turnout interpretive signs or reflect on the significance of Arnold's Expedition no more than once or twice a year. Therefore the rating for number of visits to the Arnold Trail to Quebec is Low.

**National or State Park.** Long distance hikers would visit the sections of the Appalachian Trail within 8 miles of the Bingham Wind Project at most once in a year. There is no reason to expect that day hikers would use this section more than a couple of time a year at most, since it does not have the breathtaking views that are available from the Bigelow Preserve or Mount Katahdin. The rating is Low.

**Great Ponds.** The Bingham survey asked respondents "is this your first visit to this site?" and those who were repeat visitors were asked "during the past year, how many times have you visited/hiked...?" (Kleinschmidt 2013). These responses are combined to show the number of visits in the past year. These results indicate that respondents visited Bald Mountain Pond an average of 1.8 times in the past year; resulting in a Low rating.

There is no information about the pattern of use or length of stay at Jackson Pond or Punchbowl Pond. However, based on the Bald Mountain Pond response, their rating is Low.

**River segments.** At Wyman Lake the average number of visits was 8.9 times in the past year; the rating is Medium.

The number of visits to the other SRSNS river segments is unknown, since the pattern of use is unknown. However, it is anticipated that the use is less than 3 time per year, so the rating is Low.

**Scenic turnout on a scenic highway.** It is anticipated that on average travelers on US 201 would stop at the turnout no more than once or twice a year. The rating is Low.

**4.7.3.3 Synthesis for duration.** The equally weighted combinatorial matrix shown in Figure 1 can be used to obtain a single rating for Duration.

**Table 19. Determining Rating for Duration**

<b>Scenic Resources of State or National Significance</b>	<b>Length of Stay</b>	<b>Number of Visits</b>	<b>Duration Rating</b>
<b>Historic Sites</b>			
Arnold Trail to Quebec	Low	Low	Low
Bingham Free Meeting House	Low	Low	Low
<b>National or State Park/Designated Pedestrian Trail</b>			
Appalachian National Scenic Trail	Medium	Low	Med-Low
<b>Great Ponds</b>			
Bald Mountain Pond	Medium	Low	Med-Low
Jackson Pond	Low	Low	Low
Punchbowl Pond	Low	Low	Low
<b>Segment of a Scenic River</b>			
Kennebec River: Augusta to the Forks (including Wyman Lake)	Low	Medium	Med-Low
Piscataquis River – Howland to West Branch	Low	Low	Low
East Branch Piscataquis River	Low	Low	Low
West Branch Piscataquis River	Low	Low	Low
<b>Scenic Turnout on a Scenic Highway</b>			
Old Canada Road Scenic Byway (Route 201) Turnout	Low	Low	Low

**4.7.5 Summary of Criterion E.1 extent, nature, duration of use.** The ratings for the Criterion E.1 indicators as well as the final rating are shown in Table 20.

**Table 20. Criterion E.1 Indicators and Final Ratings**

<b>Scenic Resources of State or National Significance</b>	<b>Extent</b>	<b>Nature</b>	<b>Duration</b>	<b>Criterion E.1 Rating</b>
<b>Historic Sites</b>				
Arnold Trail to Quebec	Low	Medium	Low	Med-Low
Bingham Free Meeting House	Low	Low	Low	Low
<b>National or State Park/Designated Pedestrian Trail</b>				
Appalachian National Scenic Trail	Low	High	Med-Low	Medium
<b>Great Ponds</b>				
Bald Mountain Pond	Low	Low	Med-Low	Low
Jackson Pond	Low	Low	Low	Low
Punchbowl Pond	Low	Low	Low	Low
<b>Segment of a Scenic River</b>				
Kennebec River: Augusta to the Forks (including Wyman Lake)	Low	Low	Med-Low	Low
Piscataquis River – Howland to West Branch	Low	Low	Low	Low
East Branch Piscataquis River	Low	Low	Low	Low
West Branch Piscataquis River	Low	Low	Low	Low
<b>Scenic Turnout on a Scenic Highway</b>				
Old Canada Road Scenic Byway (Route 201) Turnout	Low	Low	Low	Low

#### **4.8 Criterion E.2: Effect on continued use and enjoyment.**

Criterion E.2 is “the potential effect of the generating facilities' presence on the public's continued use and enjoyment of the scenic resource of state or national significance.” There are two identified indicators, the effect of the scenic change on enjoyment and continued use. Intercept surveys are the most direct way to obtain data for these indicators. The survey can request respondents to consider the range in scenic quality throughout the state, and then using that range as a reference, respondents can rate the scenic quality of a viewpoint in a SRSNS. Next they can rate a photographic simulation of how the view will change if the wind project is constructed. Scenic change is the difference between the view with and without the project.

Similar questions can be asked about likelihood of returning and enjoyment of a SRSNS as represented by the before and after construction photographic simulations of a wind energy project. The difference between the simulated with and without visual conditions is the “effect” or change that the change has on enjoyment and continued use.

The results have typically been presented as the percent responding to each rating, or often just the percent that responded with a positive or neutral rating. However, there are problems with

this survey approach. First a decision maker has no information about the reliability of the results. Second these percentages are difficult to interpret. These two problems can be addressed by calculating the reliability coefficient for the ratings used to calculate the “effect,” and to employ effect size to report the result. Effect size has become the preferred way to report findings about change in the scientific literature (e.g., APA 2010).

**4.8.1 Reliability.** The first thing to consider is whether the respondents’ scenic ratings are reliable—that is if another survey is conducted in a similar manner, how confident should we be that the results would be the same. Reliability can range between 0 and 1. Nunnally (1978) states that reliability coefficients of 0.70 or 0.80 are normally acceptable for research purposes, but that reliability should be 0.90 or higher in situations where the measurements are the basis of important decisions.

Table 21 reports the reliability for individual respondents, as well as for the group of respondents using intraclass correlation coefficients (Palmer and Hoffman 2001). The individual reliabilities are quite low—they average 0.25 for Bald Mountain Pond and .34 for Wyman Lake. However, reliability can be improved by averaging the responses for a group of respondents; normally the more respondents, the higher the reliability. The group reliability for the intercept surveys is quite high (0.91)—they average 0.82 for Bald Mountain Pond and .96 for Wyman Lake. In general, the ratings with and without the proposed project from each viewpoint are very reliable for the intercept surveys, though it may be necessary to survey more than 35 respondents to reach reliabilities of 0.90 or higher.

**Table 21. Reliability for scenic change and continued use ratings.**

SRSNS	Scenic Change			Continued use		
	Count	Individual Reliability	Group Reliability	Count	Individual Reliability	Group Reliability
Bald Mountain Pond	14	0.213	0.791	14	0.295	0.854
Wyman Lake	49	0.277	0.949	50	0.393	0.970

**4.8.2 Effect size.** The current best practice in scientific analysis and reporting is to use effect size as a way to report the strength of the relationship between the means of two variables measured on the same scale (e.g., APA 2010, p. 33). The statistic used in this analysis is Hedges’ (1985) *g*, which estimates the effect size based on the difference between means. Effect size is also comparable across all viewpoints because it is not affected by the rating scale.

Cohen (1988) suggested thresholds for interpreting the significance of a mean difference: a size effect of 0.2 is small, 0.5 is a medium effect, and 0.8 is a large effect. These thresholds have been found useful across a wide range of disciplines. Stamps (2000) has presented a powerful argument for using size effect to establish the importance of visual impacts. He reviewed “275 relevant studies, covering over 12,000 stimuli and more than 41,000 respondents” (Stamps 2000, page xi). Based on his findings, he has characterized effect sizes below 0.2 as being trivial or unnoticeable, at 0.2 there is a noticeable effect where the difference between better and worse is subtle and difficult to distinguish, while at 0.5 there is a significant effect where distinction becomes easy to determine, and at 0.8 there is a major effect where distinction is grossly

perceptible. He also suggests adding an additional threshold at 1.1 to indicate when a visual impact would be very large “and likely to be controversial” (Stamps 2000, page 163-170).

Table 22 lists proposed effect size thresholds for evaluating Criterion E.2 indicators based on intercept surveys at SRSNS with potential visibility of a proposed wind energy project. This proposal is based on my reading of the literature and experience with the intercept studies conducted to date. However, it is presented for discussion purposes as we gain further experience with evaluating the impact of grid-scale wind development on scenic value and the use of SRSNS.

**Table 22. Proposed Effect Size Thresholds for Wing Energy Act Ratings**

Effect Size	Description	Rating
0.00 or higher	Positive	None
0.00 to -0.19	Not noticeable, Trivial	Low
-0.20 to -0.49	Small, Noticeable, Subtle	
-0.50 to -0.79	Medium, Significant	Medium
-0.80 to -1.09	Large, Major, Grossly perceptible	
-1.1 or lower	Very large, Controversial	High

**4.8.3 Scenic change.** The Bingham intercept surveys asked respondents to “think of an outdoor place in Maine that you would rate as having very high scenic quality or outstanding views and which—on a scale of 1 to 7—you would rate as a 7 for the highest scenic quality” (Kleinschmidt 2013). A similar questions asked about “a very low scenic quality” view. These questions helped establish the extremes for rating the scenic value of the existing condition of the lake they are using and how the same view will appear if the Bingham Wind Project is constructed. Respondents only evaluated a viewpoint from the lake they were using. The effect size for scenic change and the statistical parameters used to calculate it for each lake is given in Table 23. The results translate into Medium ratings for perceived scenic change.

**Table 23. Effect size for scenic change.**

	Bald Mountain Pond	Wyman Lake
<b>Existing View</b>		
Mean	6.071	5.776
Std. Dev.	0.730	1.006
Count	14	49
<b>Proposed View</b>		
Mean	4.786	4.417
Std. Dev.	2.045	1.922
Count	14	48
<b>Pooled Std. Dev.</b>	2.303	1.529
<b>Effect Size (Hedges g)</b>	-0.837	-0.889

**4.8.4 Effect on enjoyment.** The Bingham intercept surveys asked respondents “Now I’d like you to think about how your enjoyment of visiting the lake would be affected if you were to see the proposed wind project during your visit today. On a scale of 1-7, where a 1 is a very negative effect, a 4 means that it would not change your enjoyment at all, and a 7 is a very positive effect on your enjoyment, how would the visibility of the wind project effect your enjoyment?” (Kleinschmidt 2013). This question is phrased in such a way that the existing enjoyment, without the wind project, is assigned a value of 4, and the rating is for the effect of the change on their enjoyment. The effect size calculated from these data is the standard score and the same effect size thresholds are applied. The results translate into a Low ratings for Wyman Lake, but Medium on Bald Mountain Pond.

**Table 24. Effect size for effect on enjoyment.**

	<b>Bald Mountain Pond</b>	<b>Wyman Lake</b>
<b>Pre-rating</b>		
Mean (implicit)	4.000	4.000
<b>Post-rating</b>		
Mean	3.286	3.673
Std. Dev.	1.139	1.586
Count	14	49
<b>Effect Size (Std. score)</b>	-0.627	-0.206

**4.8.5 Effect on continued use.** The Bingham intercept surveys asked respondents several questions about their activities on the lake, and then “On a scale of 1 to 7, where 1 is very unlikely, 7 is very likely, and 4 is neither unlikely nor likely, how likely is it that you will visit Wyman Lake/Bald Mountain Pond/Bald Mountain in the future?” (Kleinschmidt 2013). After showing the respondents the photograph of the existing view and the simulated condition and asking for scenic value ratings, respondents are asked “Now I’d like you to think about your trip here today. Imagine the proposed wind project was built. On a scale of 1 to 7, where a 1 means you are very unlikely to return, a 4 means the change in view would have no effect on your return, and a 7 means you are very likely to return, how would the presence of the wind turbines effect your likelihood to return to Wyman Lake/Bald Mountain Pond/Bald Mountain?” (Kleinschmidt 2013). These questions are posed similar to the scenic value questions, they ask about continued use before and after construction of the Bingham Wind Project, and the effect size is calculated in the same manner as it is for scenic change. The effect size for continued use and the statistical parameters used to calculate it for each of the three lakes is given in Table 25. The results translate into High ratings.



**Table 25. Effect size for effect on continued use.**

	<b>Bald Mountain Pond</b>	<b>Wyman Lake</b>
<b>Pre-rating</b>		
Mean	6.500	6.560
Std. Dev.	1.092	1.181
Count	14	50
<b>Post-rating</b>		
Mean	4.818	4.837
Std. Dev.	1.834	1.724
Count	11	49
<b>Pooled Std. Dev.</b>	1.462	1.475
<b>Effect Size (Hedges g)</b>	-1.151	-1.168

**4.7.5 Summary of Criterion E.2 Effect on enjoyment and continued use.** The ratings for the Criterion E.2 indicators as well as the final rating are shown in Table 26. There is no information about how users of the other SRSNS may be affected by views of the Bingham Wind Project. However, it seems appropriate to apply the Bald Mountain Pond ratings to the other SPNM ROS class SRSNS (Punchbowl Pond) and the Wyman Lake ratings to the other SDN ROS class SRSNS (Arnold Trail to Quebec, Kennebec River, and the Old Canada Road Scenic Byway turnout). There will be no visibility from the other SRSNS (see Criterion F below), so there can be no perceived effect.

**Table 26. Criterion E.2 Indicators and Final Ratings**

<b>Scenic Resources of State or National Significance</b>	<b>Scenic change</b>	<b>Effect on Enjoyment</b>	<b>Continued Use</b>	<b>Criterion E.2 Rating</b>
<b>Historic Sites</b>				
Arnold Trail to Quebec	Medium	Low	High	Medium
Bingham Free Meeting House	None	None	None	None
<b>National or State Park/Designated Pedestrian Trail</b>				
Appalachian National Scenic Trail	None	None	None	None
<b>Great Ponds</b>				
Bald Mountain Pond	Medium	Medium	High	Med-High
Jackson Pond	None	None	None	None
Punchbowl Pond	Medium	Medium	High	Med-High
<b>Segment of a Scenic River</b>				
Kennebec River: Augusta to the Forks (including Wyman Lake)	Medium	Low	High	Medium
Piscataquis River – Howland to West Branch	None	None	None	None
East Branch Piscataquis River	None	None	None	None
West Branch Piscataquis River	None	None	None	None
<b>Scenic Turnout on a Scenic Highway</b>				
Old Canada Road Scenic Byway (Route 201) Turnout	None	None	None	None

#### **4.9 Criterion F: Scope and scale of project views.**

The WEA states that:

A finding by the primary siting authority that the development's generating facilities are a highly visible feature in the landscape is not a solely sufficient basis for determination that an expedited wind energy project has an unreasonable adverse effect on the scenic character and existing uses related to scenic character of a scenic resource of state or national significance.<sup>28</sup>

However, visibility is clearly to be considered as part of Criterion F:

The scope and scale of the potential effect of views of the generating facilities on the scenic resource of state or national significance, including but not limited to issues related to the number and extent of turbines visible from the scenic resource of state or national

<sup>28</sup> 35-A MRSA, § 3452 sub-§ 3

significance, the distance from the scenic resource of state or national significance and the effect of prominent features of the development on the landscape.<sup>29</sup>

**Visibility analysis.** In general blade tips alone are not sufficiently prominent from a distance greater than a couple of miles to be recognizable. At the distances between the SRSNS and the Bingham Wind Project, visibility of the turbine hub and full blades is a better indicator. The visibility analysis used in this evaluation considers the screening effect of forest cover, assigning it a height of 40 feet. It is recognized that the trees in this area could be as high as 65 feet or more. However, based on the land cover data<sup>30</sup> available, it is safer<sup>31</sup> to use the lower value. The results of the visibility analysis are summarized in Table 27, which shows the percent of a SRSNS' area that has potential visibility of a certain number of turbine hubs. An example may help clarify how to read this table. Look at the row for the Wyman Lake. In the column for 16 turbine hubs, the value is 0—it is doubtful that a viewer would see 16 hubs from anywhere on Wyman Lake. Moving to the right on the Wyman Lake row, one finds that 12 turbine hubs may be visible from 7 percent of the area. Continue along the row in the same manner reading the percent of the lake's area that will have visibility of the specified number of turbine hubs. At the right side of the table it shows that 39 percent of Wyman Lake has potential visibility of at least one turbine hub, and 61 percent of the lake does not have visibility of any turbine hubs (though there may be blade tips that are visible).

There are re are 261,010 acres (408 sq. miles) within 8 miles of the proposed wind turbines, of which 49,756 acres (78 sq. miles) or 19 percent has potential visibility of at least one turbine hub over the forest canopy.

SRSNS account for approximately 4,550 acres or 1.7 percent of the area within 8 miles of the proposed wind turbines. There is potential visibility of at least one turbine hub from 595 acres or approximately 13 percent of the SRSNS area. An average of 0.7 turbine hubs are visible from a viewpoint somewhere within the SRSNS.

Criterion F identifies several indicators: the number of turbines visible, the extent of visibility from a SRSNS, the distance to turbines and the visual relationship between turbines and prominent landscape features.

#### **4.9.1 Number of turbine hubs visible within the 10<sup>th</sup>-percentile of the SRSNS's area.**

The first indicator sets thresholds based on the number of hubs that are visible from somewhere on the lake. Occasionally there is an anomalous small patch of very high visibility that cannot be properly explained. I therefore suggest that this indicator consider the number of turbines visible at the 10<sup>th</sup>-percentile of the SRSNS's area of maximum turbine visibility.

---

<sup>29</sup> 35-A MRSA, § 3452 sub-§ 3(F)

<sup>30</sup> These are the same data used by the applicant. Accurate canopy data are available for purchase from third parties. For instance, InterMap sells digital terrain and canopy surface data that in my experience are accurate to approximately 3 meters and account for the height of all land cover (<http://www.intermap.com/en-us/databases/nextmap.aspx>).

<sup>31</sup> By "safer" I mean that visibility may be over stated, but it is unlikely to be understated.



Based on my experience reviewing most of the VIAs and intercept surveys conducted for wind projects proposed in Maine, I propose the following thresholds shown in Table 28; the results of applying these thresholds are presented in Table 29.

**Table 28 Rating thresholds for number of turbine hubs visible within the 10<sup>th</sup>-percentile of the SRSNS's area.**

Number of turbine hubs	Indicator Rating
0	None
1-15	Low
16-30	Medium
Over 31	High

**Table 29. Number of Turbine Hubs Visible within the 10<sup>th</sup>-Percentile of the SRSNS's Area and the Indicator Ratings for SRSNS Lakes.**

Scenic Resources of State or National Significance	# Hubs Visible	Rating
<b>Historic Sites</b>		
Arnold Trail to Quebec	2.5	Low
Bingham Free Meeting House	0	None
<b>National or State Park/Designated Pedestrian Trail</b>		
Appalachian National Scenic Trail	0	None
<b>Great Ponds</b>		
Bald Mountain Pond	< 1	Low
Jackson Pond	0	None
Punchbowl Pond	8	Low
<b>Segment of a Scenic River</b>		
Wyman Lake	11	Low
Kennebec River: (excluding Wyman Lake)	1.5	Low
Piscataquis River – Howland to West Branch	0	None
East Branch Piscataquis River	0	None
West Branch Piscataquis River	0	None
<b>Scenic Turnout on a Scenic Highway</b>		
Old Canada Road Scenic Byway (Route 201) Turnout	0	None

**4.9.2 Percent of SRSNS with visibility of turbine hubs.** Another indicator for Criterion F is the percent of a SRSNS with potential visibility of at least one turbine hub. The analysis is based on the same data described above. The suggested thresholds for this indicator are given in **Error! Reference source not found.**; the results of applying these thresholds are presented in Table 31.

**Table 30. Rating thresholds for percent of SRSNS with visibility of turbine hubs.**

Number of turbine hubs	Indicator Rating
0	None
1-33	Low
34-66	Medium
Over 67	High

**Table 31. Percent of SRSNS with Visibility of Turbine Hubs and the Indicator Ratings for SRSNS Lakes.**

Scenic Resources of State or National Significance	% w/ Visibility	Rating
<b>Historic Sites</b>		
Arnold Trail to Quebec	21	Low
Bingham Free Meeting House	0	None
<b>National or State Park/Designated Pedestrian Trail</b>		
Appalachian National Scenic Trail	0	None
<b>Great Ponds</b>		
Bald Mountain Pond	8	Low
Jackson Pond	0	None
Punchbowl Pond	83	High
<b>Segment of a Scenic River</b>		
Wyman Lake	39	Medium
Kennebec River: (excluding Wyman Lake)	13	Low
Piscataquis River – Howland to West Branch	0	None
East Branch Piscataquis River	0	None
West Branch Piscataquis River	0	None
<b>Scenic Turnout on a Scenic Highway</b>		
Old Canada Road Scenic Byway (Route 201) Turnout	0	None

**4.9.3 Distance to nearest visible turbine hub.** The WEA has established that beyond 8 miles, the visual effect of wind projects is insignificant, or Low. Similarly, the WEA requires that a VIA be prepared for projects where SRSNS are within 3 miles of the turbines; setting this as the threshold for the High rating. When the closest visible turbine hub is between 3 and 8 miles the SRSNS is rated Medium for this indicator.

**Table 32. Distance to Nearest Visible Turbine Hub and the Indicator Ratings for SRSNS Lakes.**

Scenic Resources of State or National Significance	Distance (miles)	Rating
<b>Historic Sites</b>		
Arnold Trail to Quebec	3.9	Medium
Bingham Free Meeting House	0	None
<b>National or State Park/Designated Pedestrian Trail</b>		
Appalachian National Scenic Trail	0	None
<b>Great Ponds</b>		
Bald Mountain Pond	6.8	Medium
Jackson Pond	0	None
Punchbowl Pond	4.2	Medium
<b>Segment of a Scenic River</b>		
Wyman Lake	3.9	Medium
Kennebec River: (excluding Wyman Lake)	5.6	Medium
Piscataquis River – Howland to West Branch	0	None
East Branch Piscataquis River	0	None
West Branch Piscataquis River	0	None
<b>Scenic Turnout on a Scenic Highway</b>		
Old Canada Road Scenic Byway (Route 201) Turnout	0	None

Note: These values are from the VIA (LandWorks 2013a, Table 1, page 20).

**4.9.4 Visual relationship between the project and prominent landscape features.** Criterion B described the visible landscape character of the area surrounding the project. The project is sited on a broad ridge that is approximately 1,500 in elevation. It is the transition between the Western Foothills Region, where hills are 600 to 1,000 feet high, and the Central Mountains Region, that includes Mount Katahdin and a number of peaks above 3,000 feet. The project ridge is not a prominent regional landform and a small portion of Wyman Lake is the only SRSNS from which it is visible. The effect related to this indicator is Low for all SRSNS with visibility of turbine hubs.

**4.9.5 Summary of Criterion F: Scope and scale of project views.** The ratings for the four Criterion F indicators are summarized in Table 33. Again, the general principle of giving each indicator equal weight is followed.

**Table 33. Criterion F Indicators and Final Ratings**

<b>Scenic Resources of State or National Significance</b>	<b># Hubs Visible</b>	<b>% Lake Visibility</b>	<b>Nearest Turbine</b>	<b>Prominent Features</b>	<b>Criterion F Rating</b>
<b>Historic Sites</b>					
Arnold Trail to Quebec	Low	Low	Medium	Low	Low
Bingham Free Meeting House	None	None	None	Low	None
<b>National or State Park/Designated Pedestrian Trail</b>					
Appalachian National Scenic Trail	None	None	None	Low	None
<b>Great Ponds</b>					
Bald Mountain Pond	Low	Low	Medium	Low	Low
Jackson Pond	None	None	None	Low	None
Punchbowl Pond	Low	High	Medium	Low	Medium
<b>Segment of a Scenic River</b>					
Wyman Lake	Low	Medium	Medium	Low	Med-Low
Kennebec River: (excluding Wyman Lake)	Low	Low	Medium	Low	Low
Piscataquis River – Howland to West Branch	None	None	None	Low	None
East Branch Piscataquis River	None	None	None	Low	None
West Branch Piscataquis River	None	None	None	Low	None
<b>Scenic Turnout on a Scenic Highway</b>					
Old Canada Road Scenic Byway (Route 201) Turnout	None	None	None	Low	None

#### 4.10 Summary of Impacts

**4.10.1 Approach for determining Overall Scenic Impact.** There are two levels in determining Overall Scenic Impact; the first is for the individual SRSNSs, the second is the Total Scenic Impact to the area within 8 miles of the generation facilities.

**Overall Scenic Impact to individual SRSNS.** The following rules are used in this analysis.

1. If Criterion F indicates that there is no visibility of blade tips within 3 miles and a turbine hub within 8 miles of a generation facility, then the Overall Scenic Impact for the SRSNS is None.
2. There are three core criteria for determining the Overall Scenic Impact to individual SRSNS: E.1 Extent, Nature and Duration, E.2 Effect to Enjoyment and Continued Use, and F Scope and Scale. I propose to use the combinatorial matrix in Table 34.



**Table 34. The equal weighted combination rules to obtain the rating for the core criteria.**

Criterion			Core Rating
E.1	E.2	F	
Low	Low	Low	Low
Low	Medium	Low	Low +
Low	High	Low	Medium –
Low	Low	Medium	Low +
Low	Medium	Medium	Medium –
Low	High	Medium	Medium
Low	Low	High	Medium –
Low	Medium	High	Medium
Low	High	High	Medium +
Medium	Low	Low	Low +
Medium	Medium	Low	Medium –
Medium	High	Low	Medium
Medium	Low	Medium	Medium –
Medium	Medium	Medium	Medium
Medium	High	Medium	Medium +
Medium	Low	High	Medium
Medium	Medium	High	Medium +
Medium	High	High	High –
High	Low	Low	Medium –
High	Medium	Low	Medium
High	High	Low	Medium +
High	Low	Medium	Medium
High	Medium	Medium	Medium +
High	High	Medium	High -
High	Low	High	Medium +
High	Medium	High	High –
High	High	High	High

I recognize that the WEA does not differentiate among the 6 or 7 evaluation criteria. However, it is my professional expert judgment that these three form the core for determine the scenic impact to individual SRSNS.

3. If the core rating for an individual SRSNS receives a core rating of High – or High, then the scenic impact is Unreasonably Adverse
4. If the core rating for an individual SRSNS receives a core rating of Medium + or Medium, then the four modifier Criteria are considered: A Significance, B Character of the Surrounding Area, C Expectation of a Typical Viewer and D Development’s Purpose are to be considered. If any two of these four modifier criteria are High – or High, or if

three are Medium + or higher, or if four are Medium or higher, then the scenic impact is Unreasonably Adverse.

**Total Scenic Impact.** Even if no single SRSNS reaches the threshold of an Unreasonable Adverse scenic impact, it may still be possible that extensive Medium ratings warrant determining that the scenic impact from a project is Unreasonably Adverse.

5. I propose that if SRSNSs with ratings of Medium or higher comprise 10 percent of the area within 3 miles or 8 miles then the scenic impact is Unreasonably Adverse.

**4.10.2 Overall Scenic Impact of the Bingham Wind Project.** Table 35 summarizes the above findings from applying the scenic change evaluation criteria to the 11 SRSNS identified within 8 miles of the proposed Bingham Wind Project's turbines.

**Overall Scenic Impact to individual SRSNS.** The rules for determining the Overall Scenic Impact to individual SRSNS described above are applied to the ratings summarized in Table 35. And the results are presented in the last column, which reports the rating from the three core criteria. No SRSNS reaches the level of a Medium Overall Scenic Impact. While the Bingham Wind Project is found to have some Adverse scenic impacts, it does not reach the level of Unreasonably Adverse.

**Total Scenic Impact.** Since there are no SRSNS with an Overall Scenic Impact of Medium or greater, the Total Scenic Impact is not Unreasonably Adverse.

**Table 35. Summary of Evaluation Criteria Ratings for the Bingham Wind Project**

Scenic Resources of State or National Significance	Scenic Impact Evaluation Criteria							Overall Scenic Impact
	A	B	C	D	E.1	E.2	F	
<b>Historic Sites</b>								
Arnold Trail to Quebec	Low-Med	Medium	Medium	Med-Low	Med-Low	Medium	Low	Low +
Bingham Free Meetinghouse	Low	Medium	Low	Med-Low	Low	None	None	None
<b>National or State Park/Designated Pedestrian Trail</b>								
Appalachian National Scenic Trail	High	Medium	High	Med-Low	Medium	None	None	None
<b>Great Ponds</b>								
Bald Mountain Pond	Medium	Medium	High	Med-Low	Low	Med-High	Low	Low +
Jackson Pond	Medium	Medium	Medium	Med-Low	Low	None	None	None
Punchbowl Pond	Medium	Medium	High	Med-Low	Low	Med-High	Medium	Medium –
<b>Segment of a Scenic River</b>								
Wyman Lake	Medium	Medium	Med-High	Med-Low	Low	Medium	Med-Low	Low +
Kennebec River: Augusta to the Forks (excluding Wyman Lake)	Medium	Medium	Med-High	Med-Low	Low	Medium	Low	Low +
Piscataquis River – Howland to West Branch	Low-Med	Medium	Medium	Med-Low	Low	None	None	None
East Branch Piscataquis River	Low-Med	Medium	Medium	Med-Low	Low	None	None	None
West Branch Piscataquis River	Low-Med	Medium	Medium	Med-Low	Low	None	None	None
<b>Scenic Turnout on a Scenic Highway</b>								
Old Canada Road Scenic Byway (Route 201) Turnout	Low-Med	Medium	Medium	Med-Low	Low	None	None	None

**Notes:** The Evaluation Criteria are: (A) Significance of resource, (B) Character of surrounding area, (C) Typical viewer expectation, (D) Development's purpose and context, (E.1) Extent, nature and duration of uses, (E.2) Effect on continued use and enjoyment, and (F) Scope and scale of project views.

## 5. Associated Facilities

The associated facilities include turbine pads, roads, crane paths, the O&M building, meteorological towers, the generator lead line and its substations. There is no visibility of the associated facilities from SRSNS within 8 miles of the generating facilities.

The WEA establishes an APE of 3 or 8 miles from the generating facilities. However, it is silent about how to evaluate associated facilities that are located beyond this distance. The Bingham Wind Project's generator lead line is an example of an associated facility that extends beyond 8 miles of a generating facility and that is close to SRSNS that are beyond the 8-mile APE.

One way to deal with this issue would be to invoke the "Exception" clause, and evaluate those associated facilities that extend beyond the APE using "the manner provided for development other than wind energy development,"<sup>32</sup> as described by the Site Law and NRPA procedures.

It may be possible to apply the same procedures used for the WEA, but extend them to associated facilities beyond the 8-mile APE. However, one unresolved concern is whether to identify additional SRSNS if they are within 3 miles of the associated facility. In the case of the Bingham Wind Project, there are several scenic resources within 3 miles of the generator lead line that would qualify as SRSNS if they were within 8 miles of the generating facilities. However, based on a viewshed analysis and field investigation, there is no visibility of any portion of the project from these SRSNS. As a result, there is No Adverse scenic impact attributable to the Bingham Wind Project associated facilities.

---

<sup>32</sup> 35-A MRSA, § 3452, §§ 2

## 6. Conclusions and Summary

### 6.1 Conclusions

While there will be adverse scenic impacts from the Bingham Wind Project's generating facilities, they do not reach the level of being Unreasonably Adverse at any of the individual Scenic Resources of State or National Significance. In addition, the combined impact to all of the SRSNS within 8 miles of the generating facilities does not reach the level of Unreasonably Adverse. The associated facilities are not visible from any SRSNS, and there is No Adverse scenic impact from them.

### 6.2 Summary of Impacts

This analysis has been conducted to demonstrate that it is possible to be more explicit about the indicators and thresholds used to implement the WEA criteria. Some of the analysis uses quantitative data, but qualitative data are also used. In order for readers to better follow the logic of my analysis, citations are given for references that have been used to inform the analysis. However, even with these attempts to create a more objective and reliable procedure to implement the WEA criteria, I have exercised a substantial amount of professional judgment.

**Procedure for determining Overall Scenic Impact.** There is no clear procedure for determining the Overall Scenic Impact based on the criteria rating summarized in Table 35.

Within a Criterion, I have been giving the various Indicators equal weight and essentially doing arithmetic approximations as though the ratings were interval data. This procedure is not unusual for landscape assessments and has been found to work well in practice (e.g., McHarg 1969, Jones 1986, Parkin & Lortie 1989), however it is sometimes criticized as mathematically inappropriate.

It is also clear that converting the Criterion ratings to numbers and simply averaging them is inadequate for synthesizing the ratings across criteria. For instance, Criterion F identifies those SRSNS that do not have any visibility of the project—clearly there is no scenic impact to them irrespective of the other criteria ratings. Criterion B is also of a different type—it largely describes the character of the project area to help establish a baseline for several indicators of other criteria. The Bingham Wind Project VIA also questioned how to use some of the criteria. For instance, concerning Criterion E.1, extent, nature and duration of use, it states (LandWorks 2013, p. 98):

Note that this criterion does not assess impact to scenic quality. A resource that receives low use (and subsequently a low rating for E1) but has high scenic quality, such as a remote pond, could still receive a high overall scenic impact rating based on contributions from other criteria. Likewise, a resource that has a high use (and subsequently a high rating for E1) but has low scenic quality due to shoreline development or other considerations could still receive a low overall scenic impact rating based on contributions from other criteria.

In another instance the applicability of including in a VIA the State Policy as an Indicator for Criterion D is questioned (LandWorks 2032, p. 58):

This criterion is not site-specific, but is a more general requirement that the agency consider state policy to encourage the siting of wind energy projects within the expedited permitting area when determining the reasonableness of the visual impacts.

One alternative approach to determine the Overall Scenic Impact to a SRSNS would be to assign it the highest of the Criterion ratings. However, this also seems inappropriate to me. For instance imagine that all the Criteria have Low ratings except Criterion C, expectations of the typical viewer, which has High rating. It would inaccurate to say the scenic impact is High simply because expectations are high when it is also known that Criteria E and F are low. This suggests that some criteria may be more important than others in determining Overall Scenic Impact.

While there may not be a consensus yet in how to combine the Criteria ratings, I believe that it is important to be as explicit as possible. If a project has visibility, then I have treated the other two core Criteria as having equal weight but as more important than the remaining criteria.

## 7. References

- Anderson, Lee, Jerry Mosier, and Geoffrey Chandler. 1979. Visual absorption capability. In *Our National Landscape*, edited by G.H. Elsner and R.C. Smardon. Gen. Tech. Rep. PSW-35. Berkeley, CA: Pacific Southwest Forest and Range Experiment Station. pp. 164-171.
- Bistras, Bob. 2013. RE: MEGIS Request ~ Question about road layers. Email to James Palmer dated June 18, 2013.
- Cranmer, Leon, and Arthur Spiess. 2001. American Battlefield Protection Program, Associated Historic Property Form: Arnold March to Quebec. Augusta, ME: Maine Historic Preservation Commission. 7 pages plus attachments.
- DeLorme. 2009. *The Maine Atlas and Gazetteer*. 31<sup>st</sup> edition. Yarmouth, ME: Delorme.
- ESRI. 2012. *ArcGIS 10.1*. Redlands, CA: ESRI.
- Expedited Permitting of Grid-Scale Wind Energy Development*. MRSA Title 35-A, Chapter 34-A. <http://www.mainelegislature.org/legis/statutes/35-A/title35-Ach34-A.pdf> (accessed February 23, 2010).
- Fulton, James T., 2009. The Saccades of the Oculomotor System in Vision: Processes in Biological Vision. <http://neuronresearch.net/vision/reading/saccades.htm#type> (Accessed June 3, 2013).
- Giffen, R. Alec, Drew O. Parkin, and Frederick W. Todd. 1987. *Maine Wildlands Lake Assessment*. Augusta, ME: Maine Department of Conservation, Land Use Regulation Commission. <http://www.maine.gov/doc/mfs/windpower/pubs/pdf/Maine%20Wildlands%20Lake%20Assessment.pdf> (Accessed February 11, 2011).
- Harshaw, H.W., S.R.J. Sheppard. 2013. Using the recreation opportunity spectrum to evaluate the temporal impacts of timber harvesting on outdoor recreation settings. *Journal of Outdoor Recreation and Tourism* 1-2: 40-50.
- Holmstrom, Donald. 1969. Rational Register of Historic Places Inventory—Nomination Form: Arnold Trail to Quebec. Augusta, ME: State Park and Recreation Commission.
- Jones, Judy J. 1986. *Scenic Lakes Evaluation for the Unorganized Towns in Maine*. Augusta, ME: Maine Department of Conservation and Maine State Planning Office.
- Kleinschmidt. 2013. *Bingham Wind Project User Surveys*. Pittsfield, ME: Kleinschmidt. 29 p. plus appendices.
- LandWorks. 2013a. *Visual Impact Assessment for the Proposed Bingham Wind Project*. Middlebury, VT: LandWorks. 116 p. plus appendices.

- LandWorks. 2013b. Re: 6/25/13 Memo from Jim Palmer. Memo to Josh Bagnato dated July 2, 2013. Middlebury, VT: LandWorks. 2 p.
- LandWorks. 2013c. *Visual Impact Assessment for the Proposed Bowers Wind Project*. Middlebury, VT: LandWorks. 129 p. plus appendices.
- LandWorks. 2006. *Lake George Planning, Permitting & Management of Growth & Development for Sensitive Shoreland & Upland Areas*. Lake George, NY: The Fund for Lake George.
- Maine, Department of Conservation. 1982. *Maine Rivers Study*. (Accessed July 19, 2013) <http://www.maine.gov/doc/mfs/windpower/pubs/pdf/Maine%20Rivers%20Study.pdf>
- Maine, Department of Conservation, Land Use Regulation Commission. 2010. Comprehensive Land Use Plan. [http://www.maine.gov/doc/lupc/reference/clup/2010\\_CLUP.pdf](http://www.maine.gov/doc/lupc/reference/clup/2010_CLUP.pdf) (Accessed February 28, 2013).
- Maine, Department of Inland Fisheries and Wildlife. 2005. Appendix 7: Biophysical Regions of Maine. Maine's Comprehensive Wildlife Conservation Strategy. [http://www.maine.gov/ifw/wildlife/groups\\_programs/comprehensive\\_strategy/pdfs/appendix\\_7.pdf](http://www.maine.gov/ifw/wildlife/groups_programs/comprehensive_strategy/pdfs/appendix_7.pdf) (Accessed February 28, 2013).
- Maine, Department of Transportation. 2013. 2012 Annual Traffic Count: Somerset County. [http://www.maine.gov/mdot/traffic/documents/pdf/trafficcounts/2012/CountReport\\_Somerset.pdf](http://www.maine.gov/mdot/traffic/documents/pdf/trafficcounts/2012/CountReport_Somerset.pdf) (Accessed August 13, 2013).
- Manning, Robert E., William Valliere, James J. Bacon, Alan Graefe, Gerard Kyle, and Rita Hennessy. 2000a. *Use and Users of the Appalachian Trail: A Source Book*. [http://www.nps.gov/appa/parkmgmt/upload/Main\\_Report-2.pdf](http://www.nps.gov/appa/parkmgmt/upload/Main_Report-2.pdf) (Accessed August 13, 2013).
- Manning, Robert E., William Valliere, James J. Bacon, Alan Graefe, Gerard Kyle, and Rita Hennessy. 2000b. *Use and Users of the Appalachian Trail: A Source Book—Appendices*. <http://www.nps.gov/appa/parkmgmt/upload/MainReport%20Appendices.pdf> (Accessed August 13, 2013).
- McMahon, Janet S. 1990. *Biophysical Regions of Maine: Patterns in the Landscape and Vegetation*. MS thesis. Orno, ME: University of Maine.
- More, Thomas A., Susan Bulmer, Linda Henzel, and Ann E. Mates. 2003. Extending the Recreation Opportunity Spectrum to nonfederal lands in the Northeast: an implementation guide. Gen. Tech. Rep. NE-309. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station. 25 p.
- Ode, Åsa, Mari Tveit and Gary Fry. 2008. Capturing visual character using indicators: Touching base with landscape aesthetic theory. *Landscape Research* 33(1): 89-117.



- O'Shea, Robert P. 1991. Thumb's rule tested: visual angle of thumb's width is about 2 deg. *Perception* 20(3): 415-418. <http://www.perceptionweb.com/abstract.cgi?id=p200415> (Accessed January 15, 2010).
- Palmer, James F. 2013a. *Review of the Bowers Wind Project Visual Impact Assessment, Part 1: Adequacy*. Burlington, VT: Scenic Quality Consultants. 67 p.
- Palmer, J.F. 2013b. *Review of the Bowers Wind Project Visual Impact Assessment, Part 2: Independent Analysis*. Burlington, VT: Scenic Quality Consultants. 54 p.
- Palmer, James F. 2013c. *Review of the Hancock Wind Project Visual Impact Assessment*. Burlington, VT: Scenic Quality Consultants. 71 p.
- Palmer, James F. 2013d. Data request for Bingham Wind Project VIA review. Burlington, VT: Scenic Quality Consultants. 4 p
- Palmer, James F. 2013e. *Review of the Bingham Wind Project Visual Impact Assessment, Part 1: Adequacy..* Burlington, VT: Scenic Quality Consultants. 67 p.
- Palmer, James F. 2011. *Review of the Highland Wind Project Visual Impact Assessment*. Burlington, VT: Scenic Quality Consultants. 72 p.
- Palmer, James F. 2000. Reliability of rating visible landscape qualities. *Landscape Journal* 19(1/2):166-178.
- Palmer, James F. 1999. Recreation participation and scenic value assessments of clearcuts. In *Proceedings of the 1998 Northeastern Recreation Research Symposium*, edited by H.G. Vogel song. Gen. Tech. Rep. NE-255. Radnor, PA: USDA, Forest Service, Northeastern Forest Research Station. pp. 199-203.
- Schiffman, Harvey Richard. 2000. *Sensation and Perception: An Integrated Approach*. Fifth edition. New York: John Wiley & Sons.
- Sullivan, Robert. 2013. Wind Turbine Visibility and Visual Impact Threshold Distances. (Accessed April 16, 2013) <http://visualimpact.anl.gov/windvid/>.
- TRC Engineering, June 12, 2009, Recreation Monitoring Report for the Wyman Project, FERC Project Number 2329, 20090616 FERC PDF.
- Tveit, Mari, Åsa Ode, and Gary Fry. 2006. Key concepts in a framework for analyzing visual landscape character. *Landscape Research* 31(3): 229-255.
- USDA, Forest Service. 2005. *White Mountain National Forest — Land and Resource Management Plan*.

<http://www.fs.usda.gov/detailfull/whitemountain/landmanagement/planning/?cid=STELPRD B5199941&width=full> (Accessed July 21, 2013).

USDA, Forest Service. 1995. [page revisions 2000] *Landscape Aesthetics: A Handbook for Scenery Management*. Agricultural Handbook Number 701.  
<http://www.esf.edu/es/via/> (accessed March 11, 2010).

USDA, Forest Service. 1982. *ROS User's Guide*.  
[http://www.fs.fed.us/cdt/carrying\\_capacity/rosguide\\_1982.pdf](http://www.fs.fed.us/cdt/carrying_capacity/rosguide_1982.pdf) (Accessed June 3, 2011).

USDI, Bureau of Land Management. 1986. *Visual Resource Inventory*. BLM Manual H-8410-1.  
[http://www.blm.gov/pgdata/etc/medialib/blm/wo/Information\\_Resources\\_Management/policy/blm\\_handbook.Par.31679.File.dat/H-8410.pdf](http://www.blm.gov/pgdata/etc/medialib/blm/wo/Information_Resources_Management/policy/blm_handbook.Par.31679.File.dat/H-8410.pdf) (Accessed August 1, 2013).

USGS. 2009a. *National Elevation Dataset (NED)*.  
[http://eros.usgs.gov/#/Find\\_Data/Products\\_and\\_Data\\_Available/NED](http://eros.usgs.gov/#/Find_Data/Products_and_Data_Available/NED) (accessed April 26, 2010).

USGS. 2009b. *Vertical Accuracy of the National Elevation Dataset*.  
[http://ned.usgs.gov/downloads/documents/NED\\_Accuracy.pdf](http://ned.usgs.gov/downloads/documents/NED_Accuracy.pdf) (accessed April 26, 2010).

Wolsink, Maarten. 2012. Undesired reinforcement of harmful 'self-evident truths' concerning the implementation of wind power. *Energy Policy* 48: 83–87.

Yamamoto, Naohide, and John W. Philbeck. 2012. Peripheral vision benefits spatial learning by guiding eye movements. *Memory and Cognition* 41:109–121.

Yeomans, W. C. 1979. A proposed biophysical approach to visual absorption capability (VAC). In *Our National Landscape*, edited by G.H. Elsner and R.C. Smardon. Gen. Tech. Rep. PSW-35. Berkeley, CA: Pacific Southwest Forest and Range Experiment Station. pp. 171–181.

# Appendix 1

## Review Maps

Map 1: Terrain Viewshed for Blade Tips

Map 2: Terrain Viewshed for Turbine Hubs

Map 3: Forested Viewshed for Blade Tips

Map 4: Forested Viewshed for Turbine Hubs

Visibility analysis determines whether a line-of-sight exists between two specified points. A geographic information system (GIS) is used to map the viewsheds from which the Bingham Wind Project's turbines are potentially visible. In principle this is an objective exercise in geometry highly suited to a computer application. In practice however, since the data are only approximations of the actual condition and may include errors and assumptions, the resulting viewshed maps are best considered a preliminary analysis of potential visibility under specified conditions. The maps are useful for providing a preliminary investigation of the overall potential visual impact. If potential visual impacts appear to exist for significant scenic resources, they need to be confirmed through field investigation and other visualization techniques.

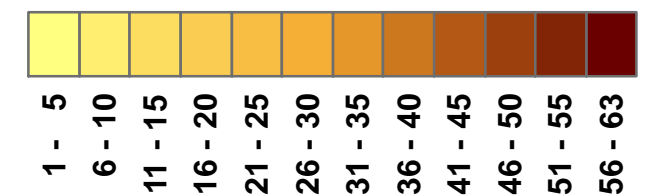
Map 5: Predicted Remoteness

# Map 1 Terrain Viewshed for Blade Tips Bingham Wind Project

GIS viewshed mapping is a preliminary means of visual analysis. While beneficial for preliminary orientation and investigation, because of data assumptions and omissions, viewshed maps are not a definitive indication of visibility. Potential visibility needs to be confirmed through field investigation and other visualization techniques.

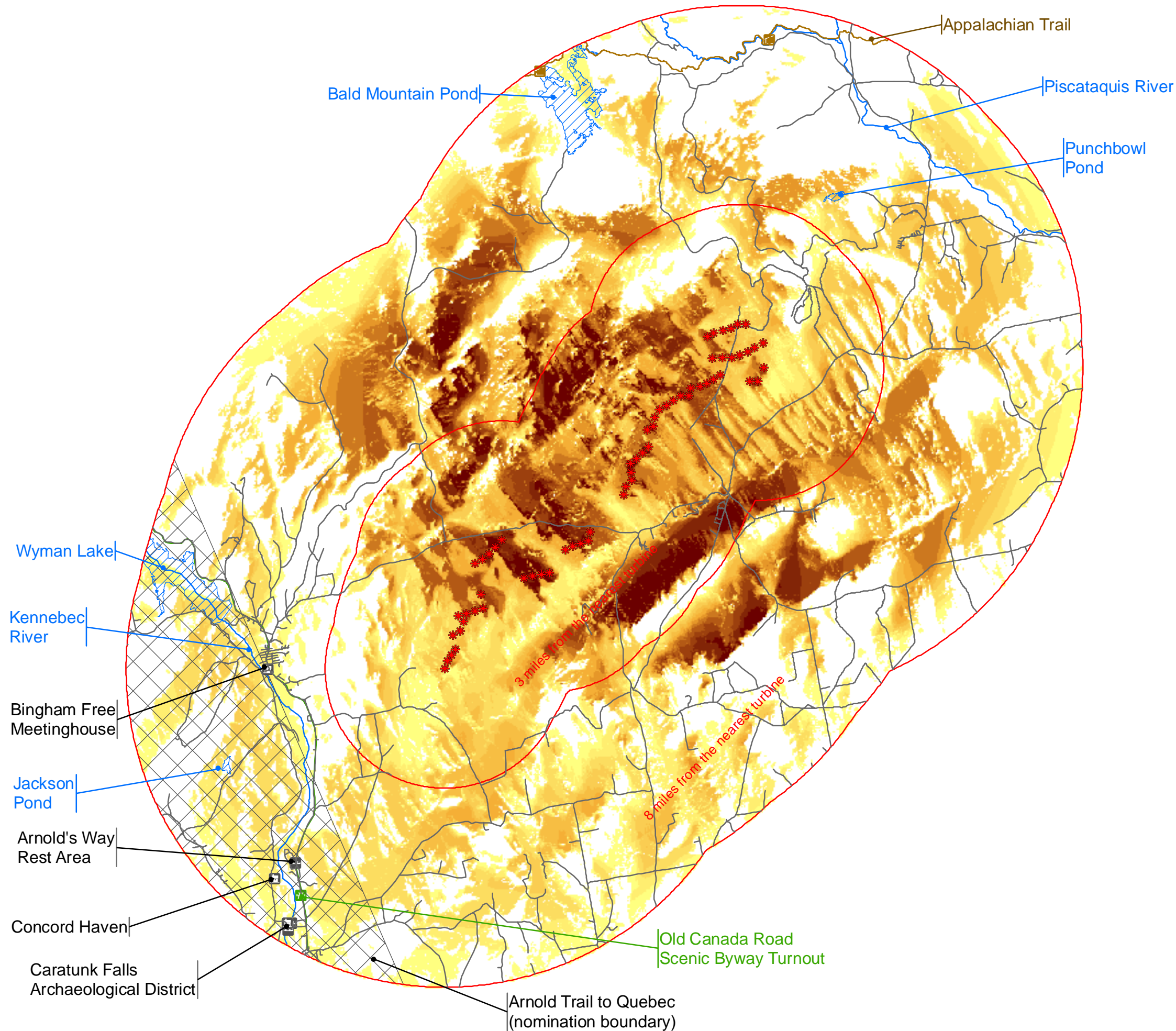
## Legend

### Turbines



### Scenic Resources of State or National Significance

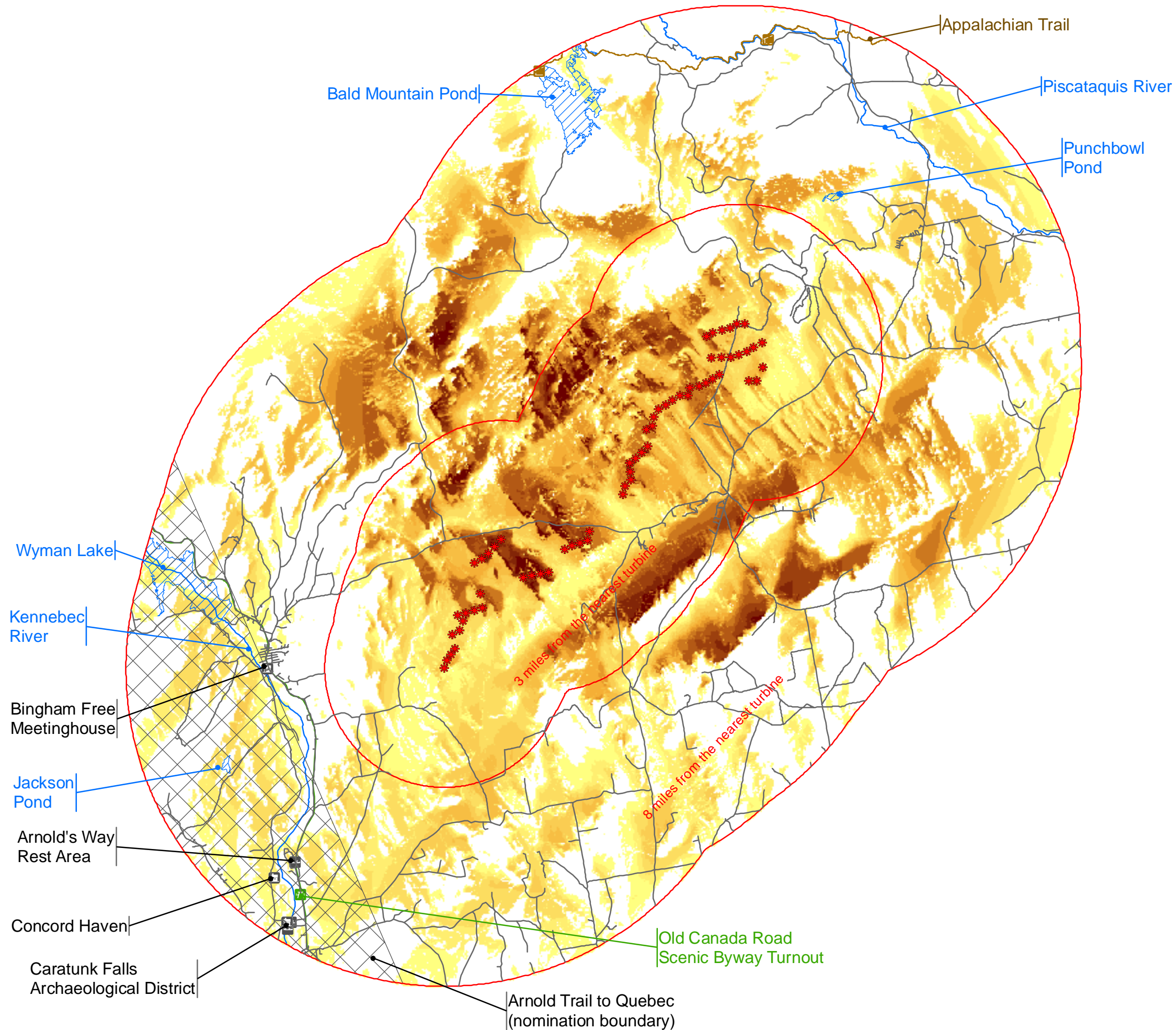
- Lakes and Rivers
- National Register of Historic Places
- National Park Units
- Scenic Road Turnout





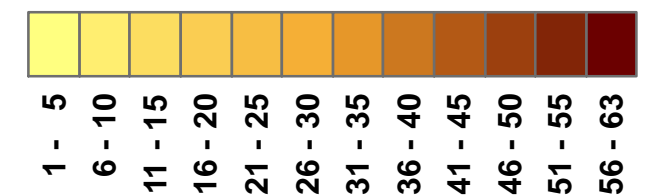
# Map 2 Terrain Viewshed for Turbine Hubs Bingham Wind Project

GIS viewshed mapping is a preliminary means of visual analysis. While beneficial for preliminary orientation and investigation, because of data assumptions and omissions, viewshed maps are not a definitive indication of visibility. Potential visibility needs to be confirmed through field investigation and other visualization techniques.



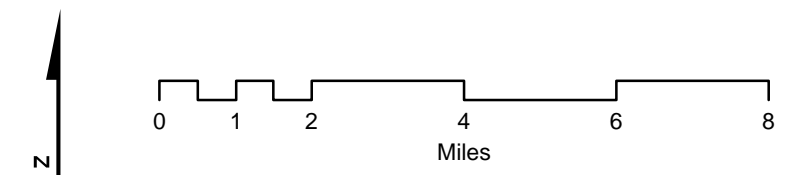
## Legend

### Turbines



### Scenic Resources of State or National Significance

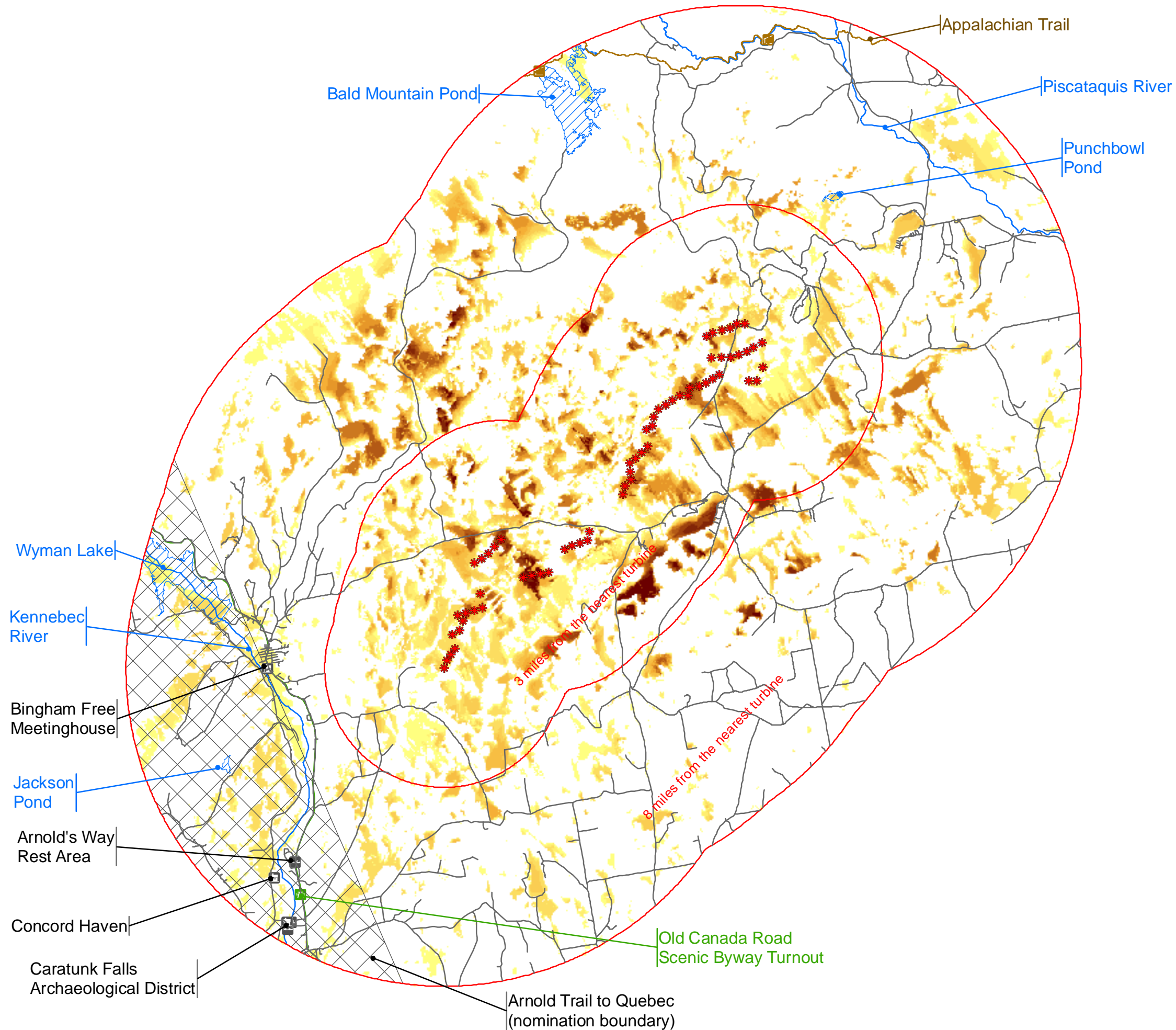
- Lakes and Rivers
- National Register of Historic Places
- National Park Units
- Scenic Road Turnout





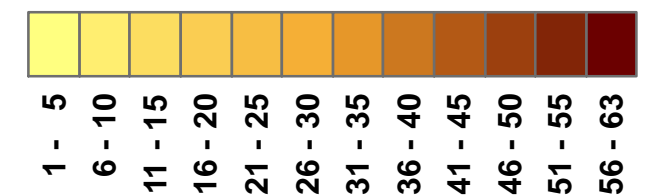
# Map 3 Forested Viewshed for Blade Tips Bingham Wind Project

GIS viewshed mapping is a preliminary means of visual analysis. While beneficial for preliminary orientation and investigation, because of data assumptions and omissions, viewshed maps are not a definitive indication of visibility. Potential visibility needs to be confirmed through field investigation and other visualization techniques.



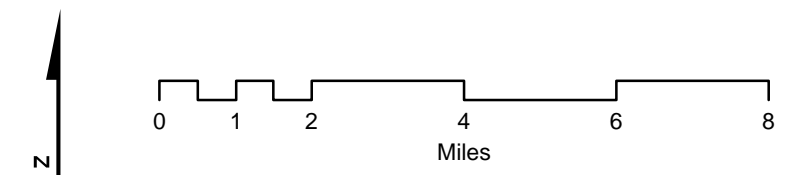
## Legend

### Turbines



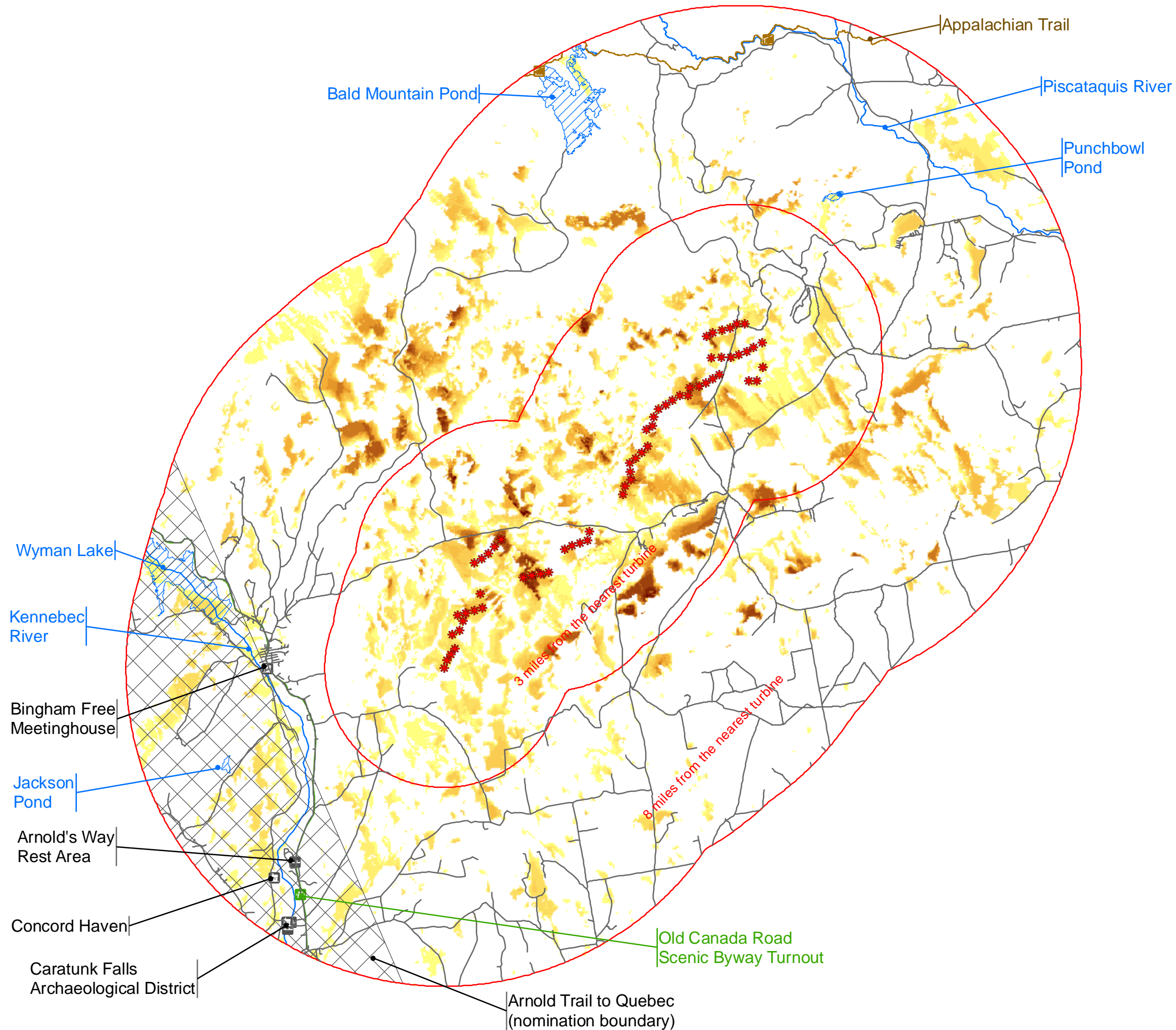
### Scenic Resources of State or National Significance

- Lakes and Rivers
- National Register of Historic Places
- National Park Units
- Scenic Road Turnout



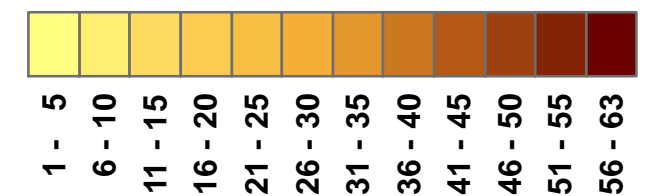
# Map 4 Forested Viewshed for Turbine Hubs Bingham Wind Project

GIS viewshed mapping is a preliminary means of visual analysis. While beneficial for preliminary orientation and investigation, because of data assumptions and omissions, viewshed maps are not a definitive indication of visibility. Potential visibility needs to be confirmed through field investigation and other visualization techniques.



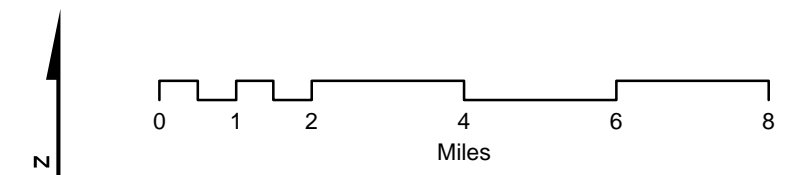
## Legend

### Turbines



### Scenic Resources of State or National Significance

- Lakes and Rivers
- National Register of Historic Places
- National Park Units
- Scenic Road Turnout





# Map 5 Predicted Remoteness for the Bingham Wind Project

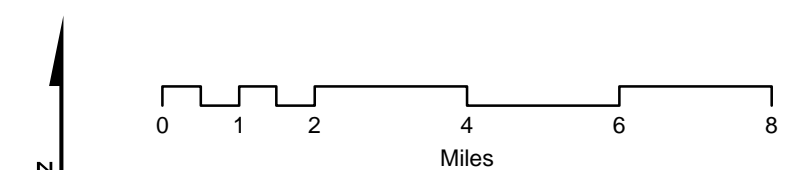
Remoteness is based on the distance from mapped roads. Semi-Developed Natural areas are within a 0.5 mile of publicly maintained roads. Semi-Primitive Motorized areas are within a 0.5 mile of roads mapped for e911. Semi-Primitive Non-Motorized are between 0.5 and 2.0 miles of e911 roads. Primitive areas are greater than 2.0 miles from e911 roads.

## Legend

- Semi-Developed Natural
- Semi-Primitive Motorized
- Semi-Primitive Non-Motorized
- Primitive

## Scenic Resources of State or National Significance

- Lakaes and Rivers
- National Register of Historic Places
- National Park Units
- Scenic Road Turnout





## Appendix 2

# ArcScene Visualizations

Visualization 1: Bald Mountain Pond

Visualization 2: Wyman Lake

Visualization 3: Kennebec River

Visualization 4: Punchbowl Pond

The purpose of these visualizations is to validate the relative accuracy of the *Visual Impact Assessment for the Proposed Bingham Wind Project* photographic simulations (LandWorks 2013a, Exhibits 15 and 16). They are created using the location and camera information from the photograph metadata and GIS database that were used to prepare the Bingham Wind Project VIA. Forest cover does not include forested wetlands or areas harvested since 1995. A 12-meter (40-foot) forest canopy is represented in opaque greens. For the Punchbowl Pond visualization, there is a second canopy in lighter translucent greens at 18 meters (60 feet). The representation of foreground vegetation may not be accurate. A red dot is placed above the nacelle of those turbines that have been identified as having FAA aviation warning lighting. The horizontal angle of view is 45 degrees, which is similar to the VIA photosimulations, and the visualization will be in proper perspective when viewed from a distance approximately 1.2 times its width.

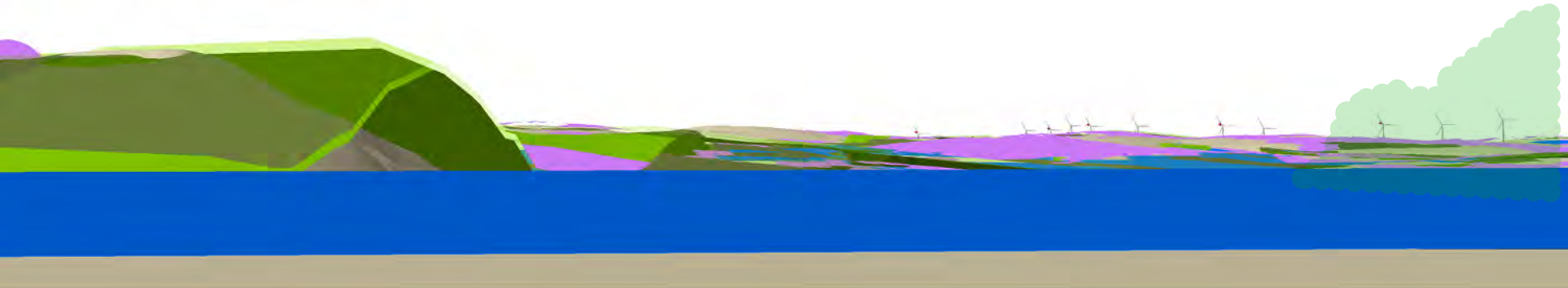
## ArcScene Visualization 1: Bald Mountain Pond

The purpose of this visualization is to validate the relative accuracy of Visual Simulation from Bald Mountain Pond (LandWorks 2013a, Exhibits 12 and 19). It is created using the location and camera information from the photograph metadata and GIS database that were used to prepare the *Visual Impact Assessment for the Proposed Bingham Wind Project*. Two forest canopy layers are shown in green, a darker opaque one at 40 feet and a lighter semi-transparent one at 60 feet high. Areas of light partial cutting since 1995 or forested wet lands are shown at 40 feet in purple. The representation of foreground vegetation may not be accurate. The turbines are 150 meters to the upraised blade tip. The FAA aviation warning lighting is represented as a red dot above the nacelle. The horizontal angle of view is 45 degrees, and the visualization will be in proper perspective when viewed from a distance 1.2 time its width.



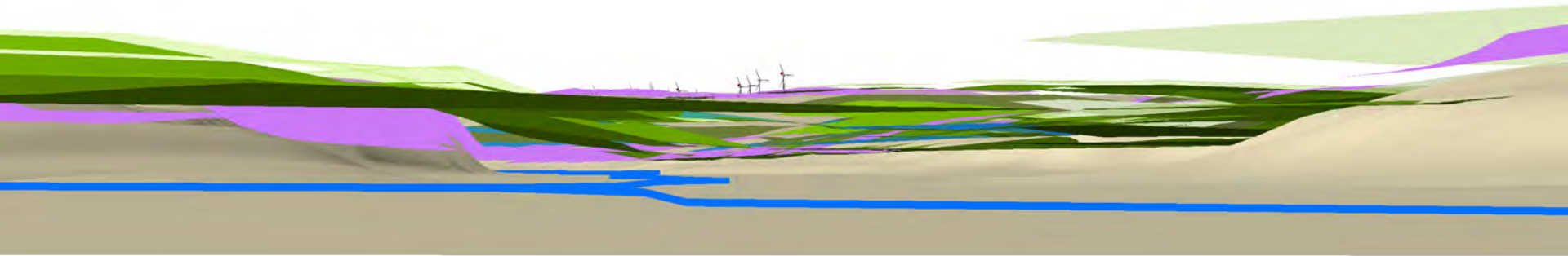
## ArcScene Visualization 2: Wyman Lake

The purpose of this visualization is to validate the relative accuracy of Visual Simulation from Wyman Lake (LandWorks 2013a, Exhibits 12 and 19). It is created using the location and camera information from the photograph metadata and GIS database that were used to prepare the *Visual Impact Assessment for the Proposed Bingham Wind Project*. Two forest canopy layers are shown in green, a darker opaque one at 40 feet and a lighter semi-transparent one at 60 feet high. Areas of light partial cutting since 1995 or forested wet lands are shown at 40 feet in purple. The translucent green polygon screening the three turbines on the right represents foreground vegetation visible in the original photograph. The turbines are 150 meters to the upraised blade tip. The FAA aviation warning lighting is represented as a red dot above the nacelle. The horizontal angle of view is 45 degrees, and the visualization will be in proper perspective when viewed from a distance 1.2 time its width.



### ArcScene Visualization 3: Kennebec River

The purpose of this visualization is to validate the relative accuracy of Visual Simulation from Kennebec River (LandWorks 2013a, Exhibits 12 and 19). It is created using the location and camera information from the photograph metadata and GIS database that were used to prepare the *Visual Impact Assessment for the Proposed Bingham Wind Project*. Two forest canopy layers are shown in green, a darker opaque one at 40 feet and a lighter semi-transparent one at 60 feet high. Areas of light partial cutting since 1995 or forested wet lands are shown at 40 feet in purple. The representation of foreground vegetation may not be accurate. The turbines are 150 meters to the upraised blade tip. The FAA aviation warning lighting is represented as a red dot above the nacelle. The horizontal angle of view is 45 degrees, and the visualization will be in proper perspective when viewed from a distance 1.2 time its width.





#### **ArcScene Visualization 4: Punchbowl Pond**

The purpose of this visualization is to validate the relative accuracy of Visual Simulation from Punchbowl Pond (LandWorks 2013a, Exhibits 12 and 19). It is created using the location and camera information from the photograph metadata and GIS database that were used to prepare the *Visual Impact Assessment for the Proposed Bingham Wind Project*. Two forest canopy layers are shown in green, a darker opaque one at 40 feet and a lighter semi-transparent one at 60 feet high. Areas of light partial cutting since 1995, including the shoreline trees on the opposite shore are shown at 60 feet in purple. The representation of foreground vegetation may not be accurate. The turbines are 150 meters to the upraised blade tip. The FAA aviation warning lighting is represented as a red dot above the nacelle. The horizontal angle of view is 45 degrees, and the visualization will be in proper perspective when viewed from a distance 1.2 time its width.