

Guidelines for enhancing and creating nesting habitat for Blanding's turtles in the Northeastern United States in the context of regional conservation

Northeast Blanding's Turtle Working Group (<http://blandingsturtle.org>)¹

Summary.—In this document, we provide an overview of nesting habitat enhancement and creation for Blanding's turtles in the northeastern United States, based on literature and unpublished data from priority sites in the Northeast Region. Suitable nesting areas are essential components of a landscape-based approach to the regional conservation of Blanding's turtle. Because of the expense and monitoring requirements of nesting habitat programs, they should be primarily implemented at regional priority sites. Because of the lack of replicated experimental studies and overall uncertainty, existing nesting areas should be preserved and enhanced unless they are perceived by managers to be an ecological trap. Available case studies, including an analysis of 19 communal nesting areas in Massachusetts and New Hampshire, indicate that the ideal configuration of nesting habitat within a priority management site would encompass multiple nesting areas with stabilized and partially vegetated coarse sand or sand and gravel, located near clusters of suitable wetlands in the interior of a site and away from major roads and developments. Multiple nesting areas are ideal. Peripheral nesting in residential areas is not a preferred condition because females are exposed to greater risk of mortality. Shallow, temporary "staging wetlands" will provide necessary cover for nest-searching female turtles. Management activities should not present an added risk to turtles of any age class. Nesting area creation or management should be monitored using regionally standardized protocols.

Context.—The majority of freshwater turtle species in New England, New York, and Pennsylvania are of regional conservation concern and are likely to decline in number and overall extent as a result of habitat fragmentation and degradation (NEPARC 2010). For the successful conservation of representative populations northeastern freshwater turtles, it is often necessary or ideal to maintain or expand known nesting habitats where they occur in optimal locations, or create new potential nesting areas where nesting habitat is lacking or unreplicated. In the eastern United States, Blanding's turtle (*Emydoidea blandingii*) is restricted to small, isolated populations in eastern New England, New York, and Pennsylvania, where populations are often found where high-quality scrub-shrub, emergent, riverine, and vernal pool systems are closely juxtaposed with suitable nesting areas. Many authors have reviewed the nesting requirements of Blanding's turtle (Kiviat et al. 2000; Compton 2007; Dowling et al. 2010) or provided new data on nest area characteristics (Kiviat et al. 2000; Beaudry et al. 2010; Jones and Sievert 2012). Several authors have drafted recommended guidelines for the creation and management of nesting habitat (Kiviat et al. 2000;

Massachusetts NHESP 2010), or have undertaken experiments on Blanding's turtle, related species, or surrogates (Marchand and Litvaitis 2004; Dowling et al. 2010; Buhlmann and Osborn 2011; Massachusetts NHESP unpublished data). Survey protocols to detect nesting activity have also been developed (Ross 2009). Despite considerable attention in recent years, many questions about the usefulness and effectiveness of nesting habitat management remain. In this document, we present a summary of the current knowledge of nest site creation and management as it pertains to Blanding's turtle, and make recommendations for implementation.

Broad-scale Characteristics of Confirmed Nesting Areas in the Northeast.—Although nest-site

Table 1. Key aspects of Blanding's turtle nesting habitat in the Northeast

Parameter	Description
Total area	0.01 to 4.4 ha; median = 0.74 ha; some larger mosaics
Aspect	A range of primarily southerly aspects are ideal
Topography	Gently rolling, stable terrain with berms and mounds
Vegetation	Cespitose grasses and sedges with bryophytes and lichens
Soil	Well-drained, well-graded sand, gravel, or sandy loam
Other	Near known occupied wetlands, containing staging wetlands, away from roads; site-tailored monitoring plan

¹ Prepared by Mike Jones and Liz Willey, University of Massachusetts, Amherst, MA 01003. contact: mtjones@bio.umass.edu or lwilley@cns.umass.edu



Figure 1. Major communal nesting areas for Blanding's turtle in the Northeastern United States. Clockwise from top left: anthropogenically augmented Blanding's turtle nesting area in St. Lawrence County, NY; stabilized dune blowouts in St. Lawrence County, NY; oak-little bluestem savannah managed for karner blue butterfly in Saratoga County, NY; important nesting area with unsorted till stabilized by sweetfern, graminoids, juniper, and hazelnut where a powerline crosses an esker/kettlehole network in Middlesex County, MA; major sandy nesting area of 100+ female turtles stabilized by little bluestem, *Carex* spp., bryophytes, and lichen in Worcester County, MA.

selection at a broad scale has not been systematically surveyed (but see Beaudry et al. 2010), Blanding's turtles females are known to nest both in **concentrated aggregations** (Figure 1) and in **dispersed, remote sites** where only one turtle may nest at a site in a given year (Beaudry et al. 2010; B.W. Compton et al., unpublished data; Jones and Sievert 2012). Concentrated nesting areas likely suffer higher depredation rates (Marchand and Litvaitis 2004), but are probably preferable to the dispersed model when dispersed nesting areas are peripheral to the core of the site, which may result in higher probability of road mortality of adult females. Further, Blanding's turtles are known to nest in a very wide variety of anthropogenic and natural nesting sites. **Anthropogenic habitats** commonly used for nesting include borrow pits, dredge piles, vineyards, residential yards and gardens, areas recently cleared for development, selection cuts or clear cuts, playing fields, abandoned gravel pits, road shoulders and causeways, ATV trails, powerlines, military training areas, wasteland areas, and berms or clearings constructed for Blanding's turtle (Dowling et al. 2010; Beaudry et al. 2010; Grgurovic, pers. comm.; NE Blanding's Turtle Working Group, unpublished data; Jones and Sievert 2012). In the northeastern United States, **natural nesting areas appear to be relatively rare**, and consist mostly of rocky outcrops in Maine (Beaudry et al. 2010) and possibly disturbed dune areas in the St. Lawrence Valley. In Nova Scotia, Blanding's turtles are known to nest on cobble lakeshores (Standing et al. 1999), and they may sometimes nest on beaches in New England and New



Figure 2. Native plant species found commonly on stabilized soils in significant (communal) Blanding's turtle nesting areas in New England and New York. Clockwise from top left: little bluestem (*Schizachyrium scoparium*), white pine (*Pinus strobus*), sweetfern (*Comptonia peregrina*), staghorn sumac (*Rhus typhina*), cinquefoils (*Potentilla* spp.) and strawberries (*Fragaria* spp.), and blackberries and raspberries (*Rubus* spp.). White pine, sweetfern, *Rubus*, and sumac form clumped thickets that provide shelter for nest-searching females but can overtake exposed areas and limit solar exposure.

York. Of 19 confirmed communal nesting areas (≥ 2 Blanding's turtle nests per year) in Massachusetts and New Hampshire, many are situated in abandoned gravel pits and residential landscapes (Grgurovic 2006; Jones and Sievert 2012). The contiguous open area of these features ranged from 0.01 to 4.4 ha and the median size was 0.74 ha.

Fine-scale Characteristics of Confirmed Nesting Areas in the Northeast.—Although some nest-site creation guidelines call for broad, level areas (MA NHESP 2010), most known communal nesting areas have pronounced topography in the form of gravel pit walls, mounds, berms, and ditches in addition to broad, level areas (Figure 1). The largest known nesting area in New England (MA-WO-OX), as well as most other communal nesting areas, has a gently rolling topography (Figure 1). The substrate is usually a mix of well-drained, friable, gravel and well-graded sand (Table 1; Compton 2007; NE Blanding's Turtle Working Group, unpublished data) but individual nests may be located in sandy or gravelly loam or loam (Kiviat et al. 2000; Dowling et al. 2010) or in a variety of organic materials (Grgurovic 2006). Common plants in these areas include bryophytes and lichens (which stabilize loose soils and retain moisture), little bluestem (*Schizachyrium scoparium*) and other grasses, Pennsylvania sedge (*Carex pennsylvanica*) and other xeric-adapted sedges, trailing roses including cinquefoil (*Potentilla* spp.), strawberry (*Fragaria* spp.), and blackberries (*Rubus* spp.) and low shrubs such as sweetfern (*Comptonia peregrina*), with pioneering stands of



Figure 3. Blanding's turtles frequently rely on "staging" wetlands during nesting migrations. Situating shallow ponds within and adjacent to known or created nesting areas may improve overall site quality.

Figure 4. Timelapse cameras can be used to assess the effectiveness and relative use of nesting features.



Figure 5. Blanding's turtle nesting at the ecotone between stabilized open sand and gravel and vegetated gravel (Merrimack Co., NH).

gray birch (*Betula populifolia*), aspen (*Populus tremuloides*), white pine (*Pinus strobus*), and sumacs (*Rhus* spp.) (Figure 2). Many key nesting areas have temporary, open, vegetated pools used heavily as staging areas by female turtles (Grgurovic 2006; Figure 3).

Key Considerations in Artificial Nest-Site Creation, Expansion, and Management for Blanding's Turtles.—Managers should use extreme caution when augmenting or restoring known nesting habitat for Blanding's turtles and should apply the precautionary principle to disturb strips of habitat on a rotational basis. Open or cleared areas of rolling topography, with berms and mounds, up to approximately 0.7 ha are within the observed range of variation in northeastern Blanding's turtle nesting areas, but much smaller sites (≥ 0.01 ha) are evidently used. Nesting areas should be created or expanded in close proximity to confirmed



Figure 6. Important nesting area for Blanding's turtle in the Northeastern United States is shown at center. Residence wetlands east and west of the nesting feature. Staging wetlands are under the white pines immediately left of center along an ATV path. The ATV path is not ideally situated because it isolates the nesting area from the deep overwintering wetland to the west.

nesting areas when possible, and several hundred meters away from roads and residences, in the interior portion of a site. Replication of potential nesting features within a site is ideal. Nesting areas should be situated in well-drained, sand and gravel soils or in substrates with confirmed Blanding's turtle nests (if known). Berms or mounds with many slopes and aspects probably improve site quality, but southerly aspects are necessary. The site should be allowed to stabilize with bryophytes, lichens, and native xeric-adapted plants such as sweetfern and little bluestem. Multi-scale ecotones should be encouraged, such as those between open gravel and vegetated gravel, and herb and shrub-dominated areas (Figure 5; Figure 6). Semipermanent or temporary, shallow, vegetated pools or ponds are useful as **staging wetlands**; these may be created by digging into the water table (Figure 3). Manually carrying adult female Blanding's turtles to the managed nesting areas (after being trapped or radio-located) may improve the chances of success (Buhlmann and Osborn 2011). An extreme scenario—placing sand and gravel berms *within* large wetland complexes rather than adjacent to them, is likely difficult to permit but may create an optimal nesting context where feasible, such as under powerlines, if mortality of turtles in the wetland can be prevented. Similar actions (placing sand and gravel on ice to create nesting areas) have been undertaken for breeding birds in the Midwest, and similar opportunities for island nesting sites may exist along powerline rights of way. Managers should be ready to respond to invasive plant colonization.

Monitoring Use of Nesting Areas by Blanding's Turtles.—The continued site quality and relative success of experimental nest site creation should be assessed at intervals following the manipulation. Monitoring to ensure that there are no drainage or erosion problems, invasive species, or rapid succession should be conducted at monthly intervals in the first year and five-year intervals thereafter. Relative use may be assessed using either repeated visual surveys or fixed-location time lapse cameras, and results pooled and analyzed across the northeast region in the context of the Northeast Blanding's Turtle Working Group. Monitoring efforts should be designed to quantify a two-tiered response: presence/absence of nesting females and long-term trends in use. Both may be determined through standardized sampling techniques, including visual foot surveys and remote-sensing timelapse (not motion-sensing) cameras.

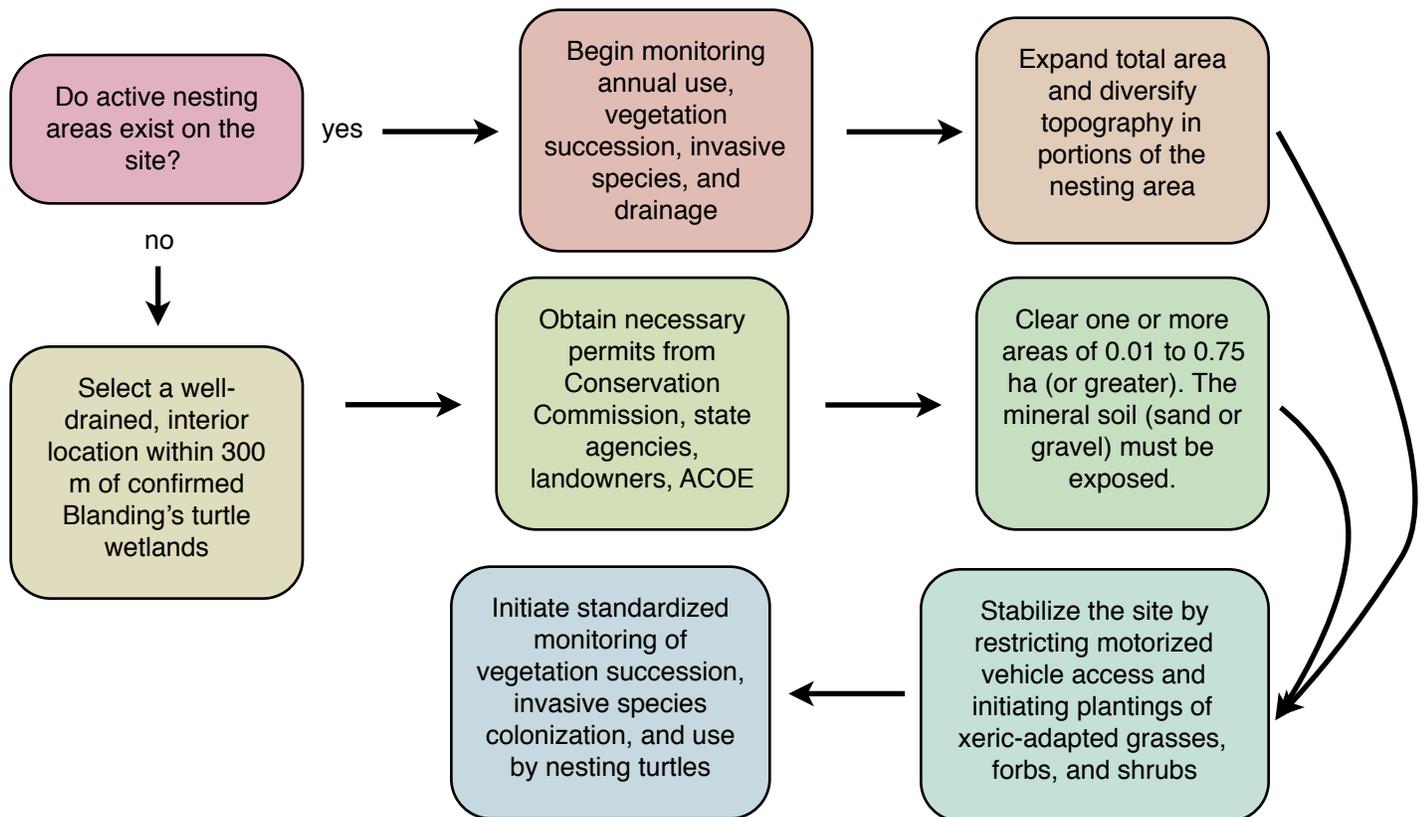
Visual surveys.—Visual surveys of nesting areas may be conducted on foot by one or more observers. Surveys should take place in the evening after 18:00 hr between May 25 and July 1, and earlier or later based on reports of nesting Blanding's turtles. The total survey area should be clearly defined, and the entire area searched if possible. The start/stop times and air temperature and weather conditions [% cloud cover, relative humidity, wind speed, precipitation] should be noted if possible (Ross 2009). Because the purpose is to track relative abundance of nest-searching females in the nest site feature and not to conclusively demonstrate presence/absence, a

combination of fixed cameras with three evening surveys may be conducted. Nest-searching Blanding's turtles and nests should be GPS-referenced. Some authors have recommended night-vision goggles (Ross 2009).

Camera surveys.—Time lapse cameras (e.g., TimelapseCam or PlantCam, Wingscapes, Alabaster, AL; PlotWatcher or Plotwatcher Pro, Day 6 Outdoors, Columbus, GA) may be used to evaluate the success of nesting areas. One or more cameras may be installed (with landowner permission) on trees facing north into the nesting feature (Fig. 6). The frame capture rate may be set to 1 or 5 minutes depending on access to the camera and card life (older models do not accept SD cards ≥ 4 gb). The cameras may be programmed to turn on at 17:00 and turn off at 21:00 (which is usually too dark for these cameras to register images). At the end of the season, the SD cards are downloaded and the results tabulated.

Monitoring Vegetation in Managed Nesting Areas.—Nesting areas should be systematically surveyed every five years to ensure that pioneer tree species like gray birch, white pine, quaking aspen (*Populus tremuloides*) and other species are not shading large portions of the site. Early signs of colonization by invasive plant species such as spotted knapweed (*Centaurea stoebe*), Japanese knotweed (*Polygonum cuspidatum*), multiflora rose (*Rosa multiflora*), autumn and russian olive (*Eleagnus umbellata* and *E. angustifolia*), glossy buckthorn (*Rhamnus frangula*), and tree of heaven (*Ailanthus altissima*) should be addressed immediately following established guidelines (NYIS 2013).

Nest Site Creation and Management Flowchart



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