

**Toward an Eco-cultural
Water Tower and Landbridge
for Madison's Northside**

*A Proposal to Celebrate Our Heritage,
While Linking Neighborhoods and Eco-communities
Across Northport and Troy Drives*

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From:

Northsiders for an Eco-cultural Water Tower (NEWT)

Bill Bauer
Jon Becker
Don Dettor
Tim Nelson
Anne Pryor

With support from:

*Earth/Art® Resources (E-art-H)
Capitol Region Advocacy Network for Environmental Sustainability (CRANES)*

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Introduction

This proposal is meant to stimulate imaginations and start conversations about forthcoming changes in Lake View Hill County Park (LVCHP).

Northsiders for an Eco-Cultural Water Tower (NEWT) formed to brainstorm how these changes could become eco-cultural catalysts for the north Capital region, including Madison's northside.

NEWT focused mostly on the plans of the Madison Water Utility (MWU) to replace the water tower located on Lake View Hill on a utility easement within the county park. The new water tower is to be constructed at the same location and occupy about the same volume of space. It will however hold up to 1.6 million gallons, to meet present and future community needs. The new tower will cost around \$3 million. (Please see below for more detailed information.)

NEWT sees many opportunities that could be catalyzed by the new water tower, including:

- an artful tower, integrated with a landscape design that reduces stormwater runoff, improves aesthetics, and provides a better quality of life for the adjacent neighborhood;
- new outdoor amenities, such as tree-top education or viewing platforms and eco-ziplines;
- celebration with public art of the site's internationally significant eco-cultural heritage, e.g., effigy mounds and John Muir's visit;
- re-use of 1940s water tower, modified to reduce its height to treetop canopy level, as an additional viewing/education/activity center;
- a landbridge connecting Lake View Hill and Warner parks, for safe passage of humans and other critters (first envisioned by park planners during the 1970s); and,

Again, NEWT offers these ideas and images as a starting point for the wider conversations, discussions, and planning that an eco-cultural site of this significance merits.

For example, one of the illustrations of the new water tower shows, on its lower third, an image of legendary environmentalist John Muir as a young man in 1863, In *The Story of My Boyhood and Youth*, Muir recalled:

From the top of a hill on the north side of Lake Mendota I gained a last wistful, lingering view of the beautiful university grounds and buildings where I had spent so many hungry and happy and hopeful days. There with streaming eyes I bade my blessed Alma Mater farewell. But I was only leaving one university for another, the Wisconsin University for the University of the Wilderness.

Experts agree that Muir, always attracted to high places, went the highest elevation on Madison's Northside. Now known as Lake View Hill, it is clearly visible from a treed knoll that Muir frequented, near UW's North Hall, his dormitory.

As illustrated, the Muir image could be engraved with a plasma laser directly onto the tower, if its exterior were sheathed with Cor-Ten steel. This metal rusts briefly to a rich hue, and then stabilizes which could reduce exterior maintenance costs, perhaps allowing some of the saved utility funds to be used for the proposed eco-cultural features. Alternatively, a Muir image could be engraved on a Cor-Ten "art-screen" attached to the tower's base, or installed near it, similar to the surround used to screen MGE's roof top water tower (see photo below). Or, Muir's historic visit could instead be commemorated with a stand-alone sculpture, reserving the tower structure for artful images inspired by the North American Indian Effigy Mound culture. These are just some of the options possible, with just one of the NEWT proposal's ideas.



The several illustrations in the next section were commissioned by NEWT to help visualize some of the concepts in this proposal. The illustrations and aerial view were created by Parker Jones, a UW Landscape Architecture student, in consultation with NEWT participants. Funding for the Parker illustrations was generously provided by the *Capital Region Advocacy Network for Environmental Sustainability* (CRANES), a Wisconsin non-profit (fiscal agent: *River Alliance of Wisconsin*). Coordination of the NEWT process and report, including illustrations and research, was provided by *Earth/Art® Resources*, a Wisconsin non-profit (fiscal agent: *1000 Friends of Wisconsin*).

Illustrations

A.

Current water tower (55,000 gallon capacity)



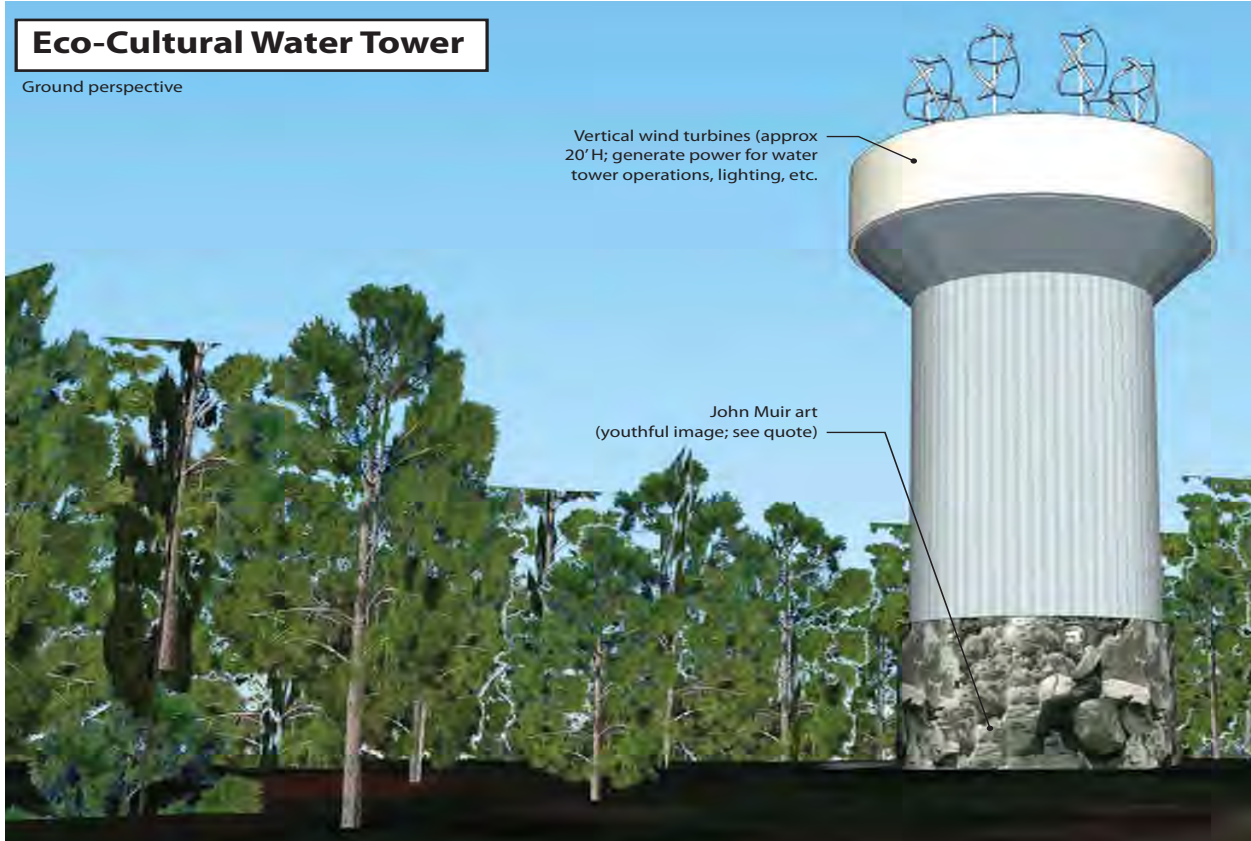
B.

New Water Tower, as proposed by Madison Water Utility (1,300,000 gallon capacity)



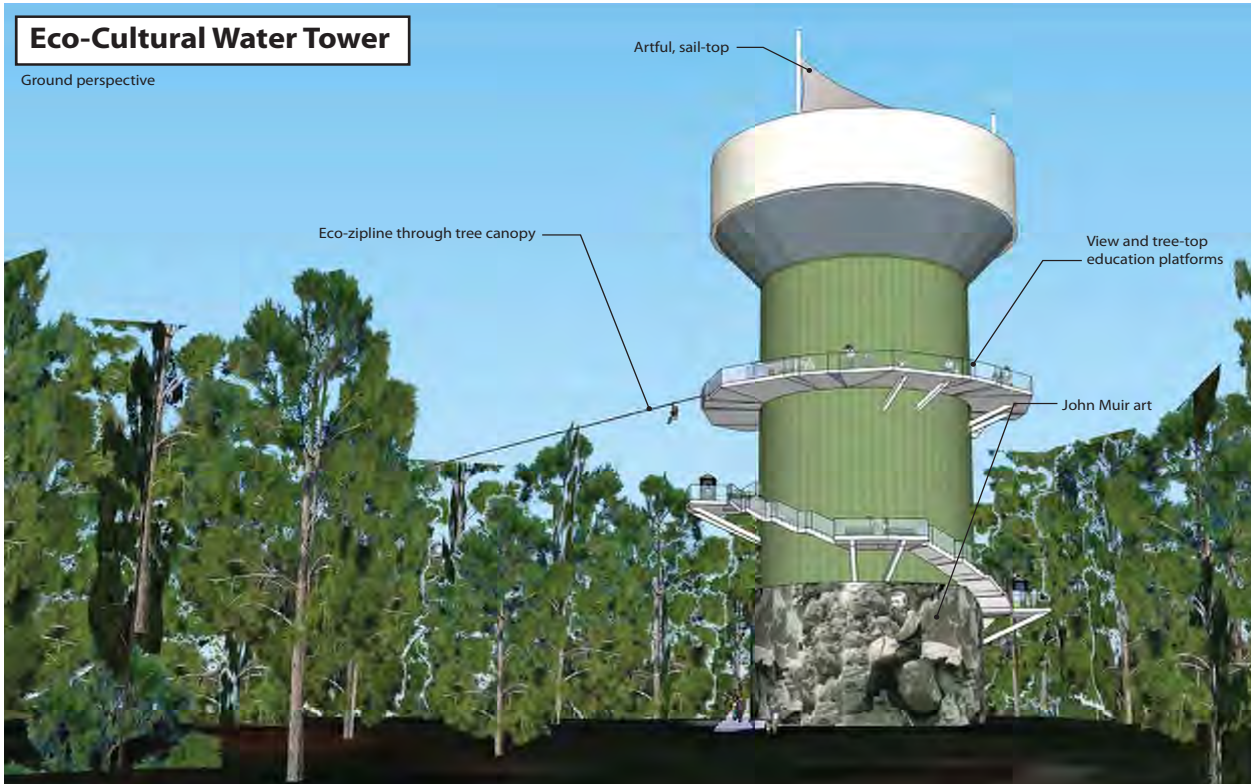
Illustrations (continued)

C.



C.

D.



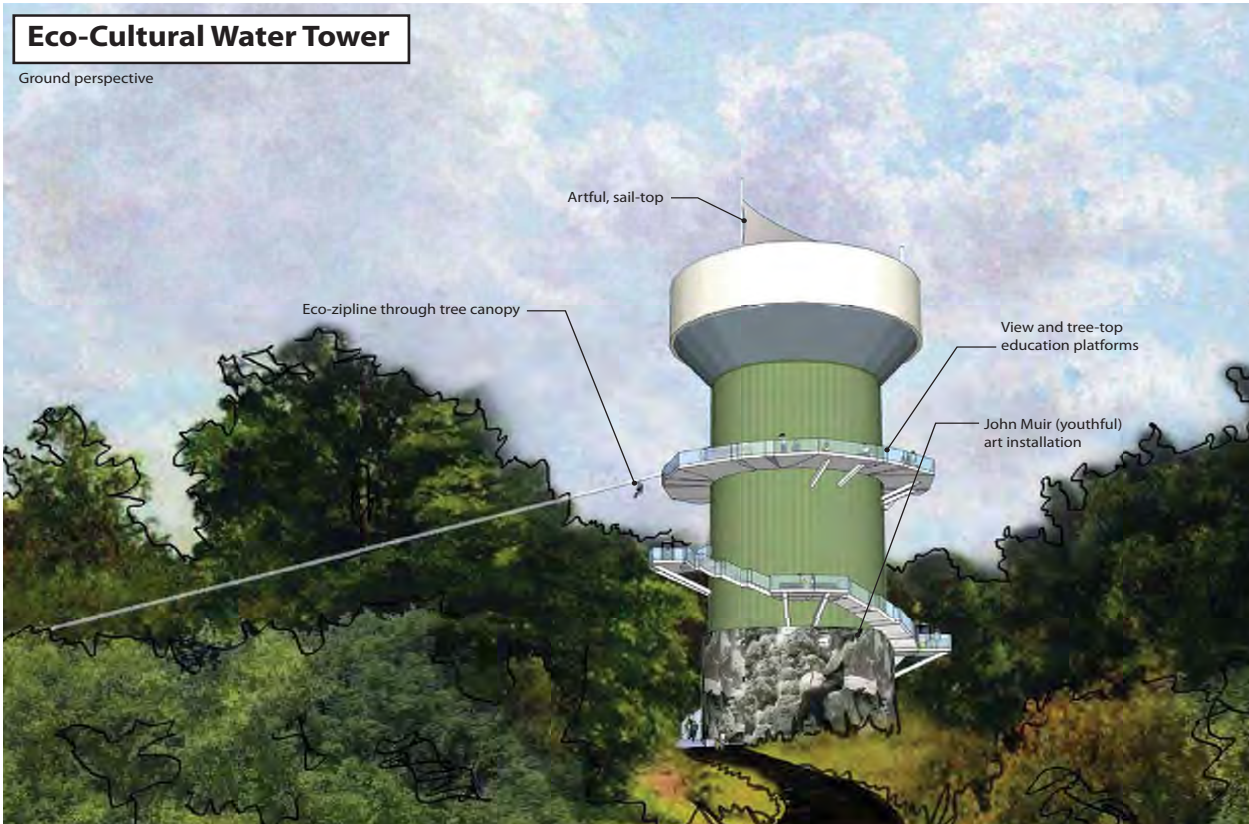
D.

Illustrations (continued)

E.



F.



Illustrations (continued)

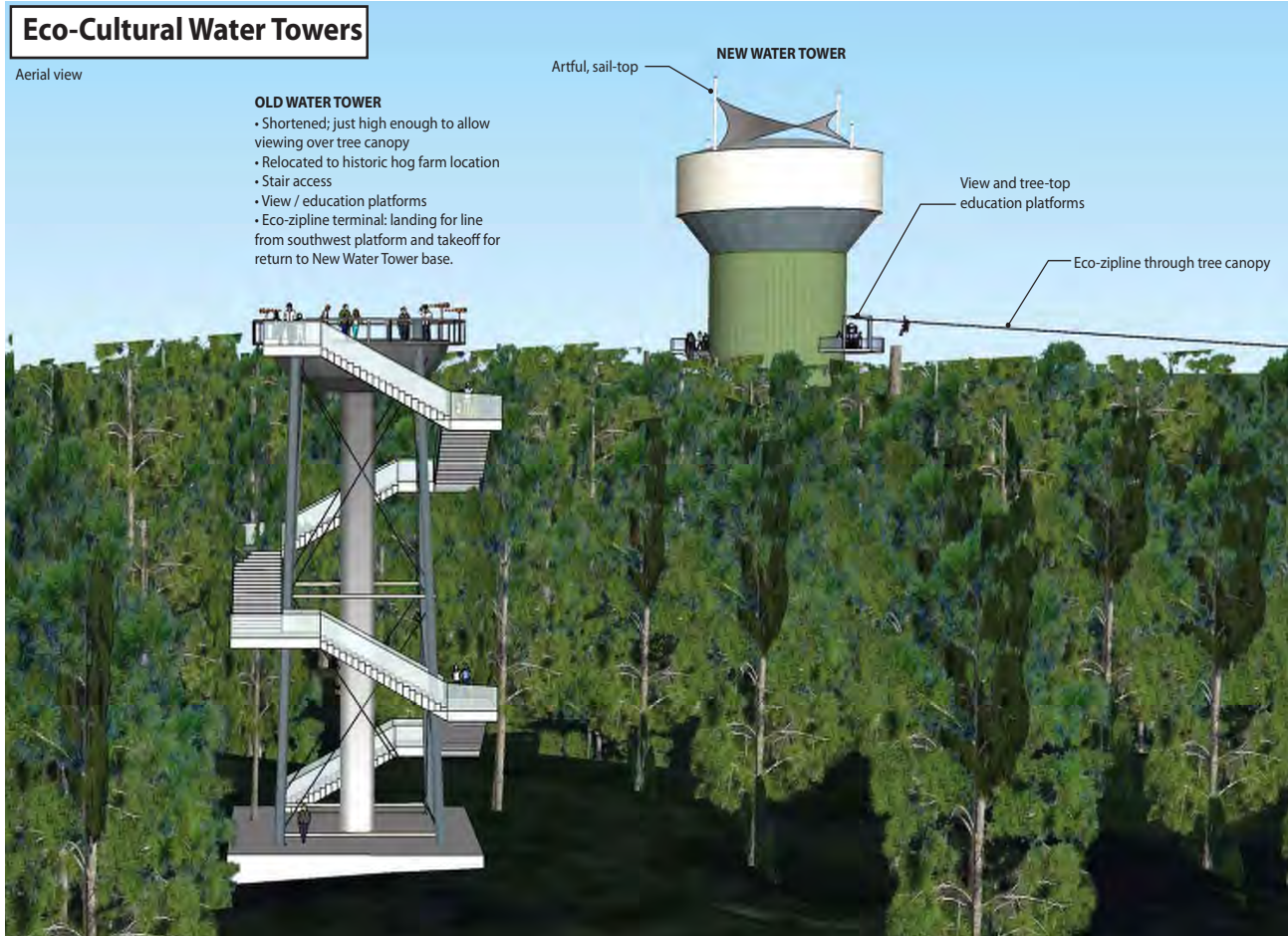
G.

Eco-Cultural Water Towers

Aerial view

OLD WATER TOWER

- Shortened; just high enough to allow viewing over tree canopy
- Relocated to historic hog farm location
- Stair access
- View / education platforms
- Eco-zipline terminal: landing for line from southwest platform and takeoff for return to New Water Tower base.



H.

Eco-Urban Landbridge Link

Street perspective



Troy Drive, facing west

NOTE: When resources permit, NEWT hopes to provide additional illustrations showing Northport Drive perspectives.

Illustrations (continued)

I.



Ideas

1. *Eco-cultural heritage (site features at the intersection of nature and culture)*

- a. Earth Day Heritage
 - Mound Builder Indians
 - Woodland, Ho-Chunk Indians (sugarbush grove, foot trail across Yahara River)
 - John Muir (public art work commemorating last day in Wisconsin?)
 - La Follette
 - Nelson
- b. Euro-settlement: farms, chapel/cemetery, quarry, wagon trail; Sanatorium
- c. Geological: Ice Age glaciations; cave system (hibernacula; tour/access)

2. *Outdoor recreation*

- a. tree-top forest education platform or observation deck (re-use former water tower?)
- b. suspended canopy walkway
- d. eco-ziplines (would require
- e. community gathering space and eco-cultural features orientation site (near fountain per master plan?; near site of soon to be demolished Nurses Dorm? near new or old water towers?)
- a. funicular between Warner Park Community & Recreation Center and Dane County Human Services Department parking lots
- f. trail-oriented vendor kiosks featuring local food

3. *Landscape design enhancements*

- a. enhance viewshed within, to, and from LVHCP (e.g., keep top of water tower below tree tops? underground utility powerlines within or near parks?)
- b. construct eco-landbridge across Northport to Warner Park
- c. reduce stormwater runoff and enhance infiltration, benchmarked to natural (pre-Original Survey or 1820s) hydrological conditions
- d. reduce surface pollutants, such as salt, pesticides, etc., and their conveyance to Warner Park lagoons or to Lake Mendota, whether surface or underground (e.g., cave system, stormwater pipes, etc.)
- e. improve aesthetics and safety of parking lots and outbuildings (old well house, former San's garage/storage buildings); consider extending landbridge across current LVHCP driveway and parking SE, between existing water tower and the site of the soon to be demolished Nurse's Dorm
- f. improve the viewshed, enhance energy resiliency, and reduce maintenance costs, by underground electric utilities along the east border of LCVHP (along the Nurse Dorm site and the Esch Addition to the south, and along the woods to the north, as well as along Northport and Troy drives
- g. improve aesthetics of cellular outbuildings and transmission equipment (consider separate artful tower for mounting of latter)

4. *On-site water/energy conservation and renewable power generation*

- a. wind turbine/s (mounted on water tower)
- b. underground cisterns or other water storage/pumping equipment
- c. geothermal (caves, etc.)
- d. solar thermal/photovoltaic (roof/pole-mounted panels, or building/roofing-integrated)

Image-inations

WATER TOWER Artful forms



Camouflaged



Re-used



Viewing Platforms Or Turrets



Image-inations (continued)

COMMUNITY GATHERING SPACE



Renaissance Italian water tower sheathed with pedestrian stairs to viewing platform; town plaza makeover with green infrastructure.



Singapore "Gardens By The Bay" Eco-Cultural Complex

Image-inations (continued)

ZIPLINES, SWINGLINES, AERIAL WALKWAYS & PLATFORMS



Image-inations (continued)

WOODLANDS/TREETOP EDUCATION



Black Forest, Germany

Image-inations (continued)

COR-TEN



Local example: MGE Water Tank Screen

Image-inations (continued)

LANDBRIDGES (local examples)



Proposed connection of Olin-Turville Park with Alliant Energy Center, across John Nolan Drive.



Proposed connection in conjunction with Union Corners re-development, across East Washington Avenue. (CRANESinc.org)

Image-inations (continued)

LANDBRIDGES (North America)



Florida (national trail system, across federal interstate highway)

<http://www.tampabay.com/news/humaninterest/gampa-i-75-overpass-near-ocala-is-cross-florida-greenway-land-bridge/1171947>
 EXCERPTS: Cross Florida Greenway Land Bridge, which crosses Interstate 75 just south of Ocala, between Exits 67 and 68. It's part of the Marjorie Harris Carr Cross Florida Greenway, which occupies much of the space that used to be the Cross Florida Barge Canal. The recreational greenway is 110 miles long, winding between a spot just south of Palatka, in Putnam County, near the East Coast and Inglis on the Gulf Coast. The bridge over I-75 connects the eastern and western portions of the greenway with a landscaped trail for hikers, horse riders, bike riders and wildlife. In 1998, the Cross Florida Greenway was officially renamed the Marjorie Harris Carr Cross Florida Greenway. The \$3.1 million land bridge was completed in 2000 by the Florida Department of Transportation, and was paid for with federal gas tax revenue earmarked for nonmotorized transportation. The bridge is 52 feet wide and 200 feet long, with an additional 400 feet of ramps on both sides. Its planters sport such native Florida plants ...



New Jersey (2), Montana, Washington (left to right)



USA (various)



Canada

Image-inations (continued)

LANDBRIDGES (abroad)



Europe



The Netherlands: Most wildlife overpasses or landbridges are less than 70-80 m (230-262 ft) long. The one shown above, near Hilversum, is 800 m (2625 ft) long and spans two roads and a railroad. (Credit: Goois Natuurreservaat, The Netherlands/Photo: W. Metz).

UNDERPASSES



Landbridge and, at bottom, underpass (for critters that need underground passage)



Photo. "Stepping stone" ponds on wildlife overpass used to assist amphibian movement (Credit: Tony Cleveger).



Figure 49. Photo. Small- to medium-sized mammal underpass (Credit: Tony Cleveger).



Figure 55. Photo. Construction and placement of amphibian tunnel in Waterton National Park, Alberta (Credit: Parks Canada).



Figure 50. Photo. Continuous wildlife underpass on divided highway (Credit: Tony Cleveger).

Image-inations (continued)

AERIAL TRAMS & FUNICULARS



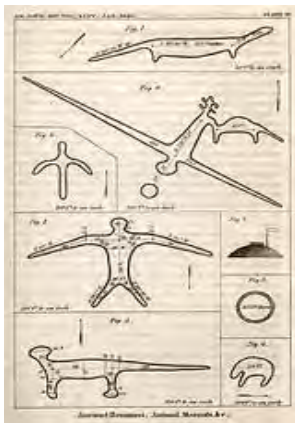
Image-inations (continued)

John Muir

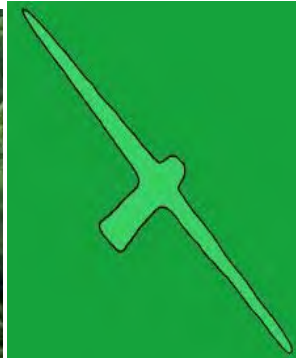
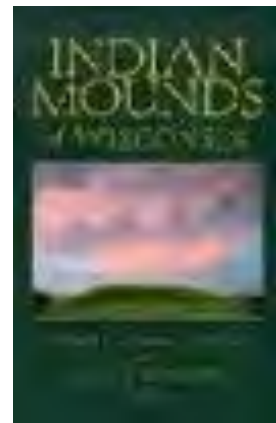


MOUND BUILDER CULTURE

Effigy Mound Distribution



A rabbit or deer effigy mound near Lake Mendota in Madison, c. 1914. Photo: Wisconsin Historical Society.



Information

In preparing this proposal, NEWT considered gathered and discussed information about how some communities have used new or retired water towers to create other benefits, such as artful structures, viewing platforms, outdoors activities, gathering spaces, and generation of renewable energy.

NEWT also considered how the water tower might relate to other changes and ideas for the general area. Those included relevant portions of the LVHCP master plan, as well as City of Madison plans for a landbridge connecting Lake View Hill and Warner parks dating back to the 1970s. There was also discussion of the wireless facilities that are currently mounted on the 1940s water tower.

NEWT then met with some residents and proprietors who live near the study area, as well as others. Information was shared, along with illustrations that were commissioned by NEWT to visualize various ideas. Feedback from the presentations provided new information, ideas, and perspectives. While there were concerns, the overall response was very positive, centering on the potential for community re-connections and public safety, protection of wild critters, and the enhancement of commercial activity and neighborhood quality of life.

Water Tower

As mentioned in the introduction, MWU plans to replace the water tower located on Lake View Hill. In creating the NEWT proposal, participants assumed that the new water tower would be built as tentatively described to NEWT during a meeting and subsequent exchanges in 2012-13 (see COMMUNICATIONS, below).

Because this site is in a utility easement within the county park, there will need to be a Land Use Agreement between the City of Madison and Dane County.

The current iconic 1940s water tower rises 130 feet and holds 55,000 gallons. It is part of a complex of buildings and landscape features associated with the former tuberculosis Sanitorium. This historically designated campus is now being used mostly for the offices of the Dane County Human Services Department. The tower has reached the end of its safe use for the heavy load requirements of water storage, but MWU thinks it likely is structurally sound enough to be re-purposed for other uses, such as a viewing tower.

The new water tower is to be constructed at the same location and occupy about the same volume of space. It will however hold up to 1.6 million gallons, to meet present and future community needs. The new tower will cost around \$3 million.

The 1940s water tower rises above the 1,072 foot Mean Sea Level (MSL) restriction for the Dane County Regional Airport's Height Limit Zone Ordinance (HLZO). The new water tower will also rise into the HLZO, requiring permission under the authority of the Federal Aviation Agency (FAA).

As with all such major utility projects, the MWU plans to form a Citizen Advisory Panel (CAP) for the water tower project. This public participation process may result in changes to the proposed structure's "silo" design, including its height. It's even possible that the water tower volume proposed for this site could be reduced, perhaps with a portion relocated to a new water tower closer to the airport and north of Lake View Hill Elementary School, or atop of the Dane County's Department Human Services building in the LVHCP campus (the former Sanitorium).

The 1940s water tower functions as a navigation reference for Lake Mendota users, especially those with sailboats. The NEWT proposal gives a nod to this function, with the idea of adding an artful "sail-top" for the new water tower. Like vertical wind turbines or wireless transmission facilities (see below), adding an artful structure to the top of the water tower could cause the entire structure to rise further into the HLZO. [NOTE: The curves of the "sail-top" structure are carried over to the railing for the landbridge, which also would function to prevent critters from jumping off the bridge or humans from tossing things off the landbridge; please see ILLUSTRATIONS, above.]

As mentioned in the INTRODUCTION, some of the NEWT proposals for an eco-cultural approach to the new water tower could be funded by cost-savings from sheathing the exterior in low-maintenance metal. The other features proposed by NEWT could also merit funding from outside sources.

Lake View Hill County Park Master Plan

The first LVHCP master plan was completed several years ago. Among many goals, it calls for reducing stormwater runoff, building a community gathering space, and adding renewable energy sources.

Stormwater Runoff Mitigation

Reducing stormwater runoff from the roofs, parking lots, driveway, and sidewalks of the DCHSD complex was identified in the master plan as a major goal, along with reduction of winter salt applications to these impervious surfaces. Naturalizing the campus's large south lawn was already underway, and expansion of the effort was envisioned. Additional efforts were envisioned. The building of the new water tower or landbridge seems to be an opportune time to mitigate stormwater runoff, insofar as possible, in part by redesigning impervious surfaces and the landscape. A recent consultant's report done in conjunction with a City of Fitchburg and EPA stormwater management study indicates it is feasible to aim to recreate the "natural" hydrological conditions in the 1830s, prior to European settlement.

Community Gathering Space

The LVHCP master plan calls for a community gathering space to be built near the fountain in front of the former Sanitorium's main building, now being used as office space for the DCHSD.

The master plan calls for preservation of the former Sanitorium's Nurses Dorm. Recently, a consultant to the county issued a report on options for the Nurse's Dorm, including its possible deconstruction. The consultant's report, although based on less public input than the LVHCP master plan, also suggests considering the post-deconstruction site for a community gathering space.

The NEWT proposal invites consideration of the water tower area as a gathering space as well. There could be a pedestrian-bike and critter friendly connection across the eastern DCDHS campus's driveway and parking, south to the Nurses Dorm site, and over the landbridge to Warner Park. (Although there is no illustration of this NEWT idea above, please see the Community Gathering Space section of IMAGE-INATIONS, above, for examples from other places.)

The landscaping design of this connection, as suggested by the NEWT proposal, could also enhance the quality of life for nearby neighbors, reducing traffic and parking impacts, providing visual and sound screening, and so forth.

Renewable Energy

Both the water tower and the landbridge could produce renewable energy.

The NEWT proposal includes the possibility of installing vertical wind turbines on the new water tower (please see ILLUSTRATIONS above). These are similar to wind turbines on a water tower in Addison TX, which generate power for both water tower operations and for nearby street lighting (please see CITATIONS, below). During their research, NEWT participants were informed that a Madison-based planning firm is working on a similar installation that has been proposed for a water tower in Iowa.

A landbridge proposal for the Union Corners redevelopment shows smaller wind turbines mounted on the sides and median of the highway below, capturing energy generated by the wind from passing cars (please see ILLUSTRATIONS above; for more illustrations of the Union Corners landbridge proposal, please go to CRANESinc.org).

Landbridge Between Lake View Hill and Warner Parks

As early as the 1970s, City of Madison park planners envisioned a landbridge connecting Lakeview Hill and Warner parks. More recently, a landbridge at this location has been mentioned in the LVHCP master plan and Northport-Warner Park-Sherman Neighborhood Plan.

A landbridge reconnect neighborhoods while also providing significant public safety benefits, creating a safe passage for pedestrian and bicyclists. Residents who live on or north of Drewry Lane might use a landbridge to, for instance, safely reach the proposed public pool in Warner Park, without crossing a road.

If the proposed landbridge were to start at the water tower, it could arch southeastward over the existing LVHCP parking lot, driveway, and outbuildings, "landing" in the area north of the current site of the Nurse's Dorm, then "resurfacing" at the south end of the DCHSD campus to cross over Northport and Troy drives, with the southern landing in Warner Park. The landbridge could solve some stormwater runoff, parking/traffic, aesthetic, and other neighborhood quality-of-life problems.

Built wide enough, a landbridge can provide passage for other critters, while reconnecting ecosystems. There is much critter movement between the hills and meadows of Lakeview Hill Park and the lagoons and lakeshore of Warner Park. Currently, critters that attempt this passage must cross both Northport and Troy Drives. Some cost/benefit analyses show that reduction of car/critter accidents substantially offsets landbridge costs (one such study showed that the entire cost of a certain landbridge was offset by avoiding just nine such accidents per year).

A retired engineer who reviewed the NEWT proposal reported that a bridge that bears vehicular traffic costs about \$100/SF. He also offered that the City of Madison owns the right-of-way and air rights for the Northport and Troy drives (NEWT had thought these were owned by the State of Wisconsin). The engineer added that City or County public works staff likely could build the approaches or “landings” to the north in LVHCP and to the south in Warner Park.

Landbridges do not carry vehicles, nor do they require the costly vehicular approaches necessary for traffic-bearing bridges. The cost of a landbridge may drop as more of them are built, and new technologies are used (a Colorado university landscape design department is sponsoring an annual contest to inspire landbridge construction efficiency and innovation). So it is likely that the landbridge proposed by NEWT would cost less than a regular traffic-bearing bridge.

The landbridge proposed by NEWT would have a span over Northport and Troy of 600 feet. Ideally that span would be 100 ft wide, but the minimum width required for both wild critter (deer require at least 18') and human passage (12') is 33 feet, including side safety structures. So, the cost of this span likely would be less than \$6 million, but perhaps as little as \$2 million.

The NEWT landbridge portrayed in the illustrations shows an 18' traffic clearance, to meet transportation requirements, and a slope \leq 5 degrees, to meet ADA accessibility requirements.

Because of its community, trail, environmental, and aesthetic benefits, some or all of this funding likely would come from sources outside the county.

Wireless Facilities

There are wireless transmission facilities co-located on the MWU's present water tower. Those include the county's 911 emergency service, as well as several private facilities that generate co-location lease revenues for Dane County and the City of Madison.

Federal policy encourages co-location of cellular facilities on public utility structures where possible. Dane County and its municipalities have come to favor this policy as well, because it uses less land and reduces intrusions on the viewshed.

Co-location also can provide income for the public. The privately-owned cellular facilities on the 1940s Lake View Hill water tower generate site-leasing fee revenue for Dane County (the general fund and a fund dedicated to Lake View Hill County Park) and the City of Madison.

During the construction of the new tower, all the wireless facilities likely will need to be relocated to a temporary tower, with costs covered by the private companies. If this temporary tower must be erected outside the utility easement, MWU will need to get the county's permission.

Wireless transmission facilities can generate strong Electro-Magnetic Radiation (EMR), which has negative impacts on people and wildlife in the vicinity or along the path of transmissions (please see CITATIONS, below). This issue also should be considered during planning of the new water tower:

- Should the wireless transmission facilities be relocated to a different site altogether, further from residences? to a different site within LVHCP that is further removed from residences or county offices?
- Are the EMRs from the LVHCP cellular facilities compatible with amenities mentioned in the NEWT proposal (e.g., an educational/viewing platform)? with the wildlife that is to be protected by the LVHCP's conservation zoning designation, passed in 2007 by the City of Madison?
- Could any temporary tower be designed for the long-term, to—despite any future changes in wireless technology—relate to the artful features of the new water tower or landbridge?

NEWT's proposal call for adding functions to both the new water tower and to the 1940s water tower (modified for re-use), that may not be compatible with EMR from the wireless transmission facilities.

Wireless Facilities (continued)

Decisions about both the temporary and “permanent” locations of the wireless facilities will need to be informed by the possibility over-the-horizon transmission may in the future be replaced by modular, distributed technology. Companies like Alcatel-Lucent are developing smaller cellular antennae—some as small as a Rubik’s cube—that may reduce or eliminate the need for unsightly large cellular arrays mounted on towers (please see article/photographic in COMMUNICATIONS, below).

Other Issues

The NEWT proposal calls for consideration of the proposed new water tower as a potential eco-cultural feature that, if considered together with other activities and needs in the vicinity, could provide the occasion to re-establish ecological and community connections. Building on the area’s heritage, it could also catalyze additional sustainable features, as well as economic diversification, toward greater regional vitality and resiliency.

All this would have to be done in way that considers the preferences and concerns of nearby neighborhoods. From the public participation process that led to the LVCHP master plan, as well as other community history, it is already known that there are traffic, parking, and stormwater runoff are some of the neighborhood concerns. NEWT participants believe that these can be at least partially be mitigated by this proposal, while designing a connection from the water tower area across the parking lot and driveway to the Nurse Dorm.

Public safety is also a concern, especially after hours. Some of the ideas proposed by NEWT include new activities on or near the new water tower that would have to be designed for compatibility with the nearby residences.

During NEWT’s meetings some concern was expressed that the proposed new structures or activities could also expose the county and city municipalities to additional liability. Considering the existence of other similar offerings across the State of Wisconsin, it seems likely that the existing insurance policies would either already cover the proposed additions, or could be amended to do so.

Based on both prior input from public participation processes on the Northside of Madison, and outreach during development of this proposal, NEWT participants also uniformly recognized the importance of retaining existing Northside businesses, such as Jungs and Culvers. Any new efforts should aim to enhance the chances for their success, given the relatively small portions of this area that are zoned for commercial activity.

While an eco-cultural water tower and its landscape design could by itself achieve some of these goals, the chances for success are greater if connection of this site to Warner Park is considered, along with the overall viewshed from atop Lake View Hill.

That invites consideration of connecting the energy and resources associated with the new water tower outward. For instance, the proposed landbridge could foster additional commercial activity by providing connections to the Northport/Troy area from neighborhoods to the north and from nearby trails. It could also add to the area’s existing natural and built resources that already attract folks from outside the immediate area.

However, during meetings with nearby business proprietors, there was frank discussion about how a landbridge could negatively impact visibility and parking. Some of the existing businesses in this vicinity depend on visibility from the road, which already in some locations is impeded by the current “lay of the land.”

Fortunately, the site mapping done for NEWT indicates that a landbridge can be built across Northport and Troy drives without dislocating any existing businesses or residential buildings. It could be enhance parking between these two drives by providing overhead protection.

NEWT participants are optimistic that, with thoughtful planning or design, construction of an eco-cultural water tower and landbridge can enhance nearby neighborhoods and businesses. As proposed by NEWT, these eco-cultural ventures can also provide an opportunity to address long-standing concerns, such as public safety and commercial visibility.

Communications

Notes from an exploratory meeting on 26 JUNE 2012 @ Madison Water Utility Building; PRESENT: A Larson; K Wolf; A Weier; J Becker, *Northsiders for an EcoCultural Water Tower* (NEWT). Drafted by J Becker; revised and supplemented during subsequent communications between A Larson and J Becker, through FEB 2013.

The 1940s water tower transferred from Dane County to Madison Water Utility (MWU) holds 55,000-gallons. Built to provide water for a State of Wisconsin tuberculosis sanatorium, the preservation/reproduction of the tower is discussed in the Lake View Hill County Park master plan. The sanatorium's buildings and some portions of its former campus are on the National Register of Historic Places.

The existing water tower is sited on the highest elevation on the city's Northside. Because of John Muir's attraction to heights, there is good reason to believe that he was on or near this site when he looked across Lake Mendota to the UW campus, on his last day as a UW-Madison student.

The existing water tower is also somewhat of a visual landmark for the City's northside and the tower's silhouette serves as a logo for the Lake View Hill Neighborhood Association.

However, the current tower's capacity does not meet current Utility standards for fire and emergency capacity for Pressure Zone 5, which lies within about a three-block circumference. This inadequacy is due to current fire and emergency water supply standards that require provision of 3,000 gallons per minute for 2 hours for a commercial/industrial/institutional zoned area for fire fighting and a minimum of 12 hours of supply during a power outage or pump malfunction. (MWU is confident that there is no reason for county employees and clients, or residents within the Zone 5 area, to be worried about the current lack of capacity, pending replacement of the current water tower, which has been postponed from FY 2013 and is now slated for FY 2014.)

MWU will propose that the replacement water tower's capacity takes into consideration:

- current Madison Water Utility fire and emergency reserve capacity
- conservation efforts underway to reduce commercial and per capita residential use
- DOA's 20-yr population projections for the NE portion of the city up to I-39/94
- System hydraulic requirements
- Electric power conservation efforts

Madison Water Utility has also identified the need for a 1.0 million gallon reservoir in the north end of Pressure Zone 6E for fire protection, emergency reserve and to balance the system hydraulically. To make efficient use of space, the Utility is proposing to construct both tanks as a single structure.

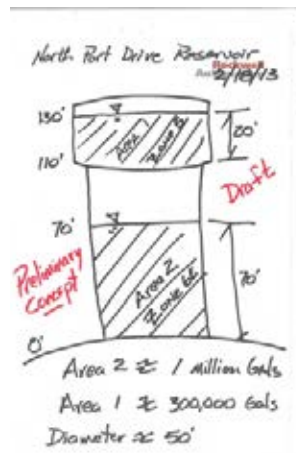
Given the above considerations, MWU will propose two chambers within the water tower. The first chamber, for Pressure Zone 5, will require a minimum capacity of 300,000 to 360,000 gallons. To reduce the volume, the City would have to rezone the area and implement a requirement for installation of fire sprinklers in large buildings. Another option that may reduce the volume required would be to locate a water storage reservoir for fire suppression on the roof of any large building in the area and include a fire sprinkler requirement in the building code. However, alterations to the profile of the former sanatorium's largest building, including its rooftop, could be problematic given its historical designation.

The second chamber, for the much larger Pressure Zone 6E (most of northeast Madison), will require 1,000,000 gallons. The elevation of the current water tower's site allows the benefits of using gravity, which reduces reliance on pumps and improves reliability in power outages. Additionally, the Lake View Hill site is well positioned to provide service across the northeast portion of the city, whereas a site such as the Mendota Mental Health Institution (where there is a water tower that serves the campus) is only able to service areas to the east, because of its location relative to Lake Mendota, the Yahara River, and the city limits. Also, the city has an easement from the county for the Lake View Hill site, so there would be no land acquisition costs.

For these reasons, the MWU has not yet investigated other potential sites on the northeast side of the city. However, if a different site with adequate elevation became available at no cost, and its location allowed service of Zone 6E (west of the airport), e.g., on the hill north of Lake View Hill ES, that location could also be considered by MWU.

Communications (*continued*)

Pending a structural engineering study of the site and its load-bearing capacity, MWU will propose that the two chambers are housed in a silo-style water tower structure:



MWU has not yet considered other external structure design options. For functional reasons related to pumping and elevation, the tower requires a height of 130 feet, which is the same height as the existing water tower. The WDNR no longer allows use of fully underground facilities (cisterns or storage tanks) for municipal water storage. A new tank would have to have a minimum of 2 feet exposed above ground level, to meet WDNR regulations.

MWU has not yet considered use of silo materials that might reduce maintenance costs, such as Cor-Ten steel (used by ATC for transmission towers along HWY 113 north of the Yahara River and by MGE for a structure screening a water storage tank at its Madison campus.). Used outdoors, Cor-Ten steel corrodes to a dark brown color and then stabilizes, eliminating the need for expensive exterior painting and its future upkeep with re-painting. Cor-ten can however be painted, which would be necessary for the interior of the water tower where potable water will be stored, to meet state codes.

MWU anticipates that the new water tower will need to accommodate existing wireless transmission equipment used by both private wireless companies and the City's emergency communications, plus any additions that may be approved (AT&T has requested permission to increase to 9 from 6 its modules, while staying within the current "footprint" on the tower). MWU favors co-location of wireless equipment, partly because of FCC recommendations to do so, but also to avoid viewshed clutter from the multiple towers that could result if the wireless companies were not allowed to co-locate on the water tower.

MWU has not yet considered the possibility of the wireless equipment being relocated to another tower or structure, nor has it considered use of stealth approaches such as location within the nearby church steeples or disguised as artificial dead trees within in the park's woods. MWU has also not yet considered the possibility that the wireless companies might be willing to build a new dedicated tower on or near the water tower site, perhaps reducing the viewshed and soundscape impacts of two related brick outbuildings, while also creating an eco-cultural experience. For example, in Dubai there is an artfully designed 3-tower facility with one used to illuminate itself, a tower for wireless devices, and a water tower.

MWU also has not yet considered the cost/benefits of separating wireless equipment from the new water tower. Such separation could perhaps reduce overhead, by lowering the cost and environmental impacts of maintaining the water tower functions. It is noted that the City has long-term contracts with the three cell carriers; any change to the current configuration would have to take into consideration those existing agreements. MWU is agnostic about separation of the wireless equipment from the water tower, but all such costs would have to be covered by the cell carriers, including any separate tower.

Separation of the wireless equipment from water tower would also expand eco-cultural possibilities. Absent this equipment, public artwork (e.g., celebrating John Muir's visit) likely could more easily be designed into or onto the silo, or its surrounds. Separation would also provide the opportunity to provide a treetop observation deck, educational platform or walkway (e.g., as in the Black Forest), or even a zip line experience, without concern for exposure to Electro-Magnetic Radiation.

Communications (continued)

If eco-cultural functions were to be sited on the water tower, the county would have to provide liability coverage for these, as part of a wider formal agreement with MWU.

MWU also is aware that each private wireless company currently pays licensing fees to co-locate on the water tower, annually amounting to tens of thousands of dollars. Of that, 25% goes to the county's general fund, 25% is dedicated to County Parks for Lake View Hill Park (e.g., environmental restoration, master planning, etc.) and the City keeps 50%. Technological changes, such as distributed wireless transmission, may someday eliminate this funding source, but until then there will be interest in maintaining this revenue stream.

MWU worked with the city arts commission and its former art staffer to commission and install public art outside the entryway to its current building; that collaboration came after the building had been designed. Additionally, some MWU staff have experience with public art past employment in other cities or states.

However, at present MWU takes the position that it cannot include extra funds for public art in its proposed water tower's construction budget, which is projected to be almost \$3 million.

MWU has not yet considered no- or low-cost integration of public art into the design of the water tower, e.g. the exterior of the proposed silo, nor has MWU considered the possibility that water tower-related public art could actually provide a cost/benefit for MWU or the city.

It should be noted that the City of Madison has had a policy of keeping text or images off its water towers.

WIRELESS TECHNOLOGY

With Swedens, president of Alcatel-Lucent's wireless division, holds a "lightRadio cube," a small cell phone antenna that can be deployed on lamp posts, buildings and other places that can't accommodate a full-sized antenna. The cube integrates much of the workings of a conventional cell phone base station, which is shown behind Swedens.

Advances could cut need for unsightly cell towers

Industry is looking at much tinier, more versatile antennas.

By PETER SVENSSON
Associated Press

As cell phones have spread, so have large cell towers — those unsightly stalks of steel topped by transmitters and other electronics that sprouted across the country over the last decade.

Now the wireless industry is planning a future without them, or at least without many more of them. Instead, it's looking at much smaller antennas, some tiny enough to hold in a hand. These could be placed on lamp posts, utility poles and buildings — virtually anywhere with electrical and network connections.

If the technology overcomes some hurdles, it could upend the wireless industry and offer wireless service, with fewer dead spots and faster data speeds.

Some big names in the wireless world are set to demonstrate "small cell" technologies at the Mobile World Congress, the world's largest cell phone trade show, which starts Monday in Barcelona, Spain.

"We see more and more towers that become bigger and bigger with more and bigger antennas that come to obstruct our view and clutter our landscape and clutter our towers. Single cubes or clusters

of them could be placed in or out and be easily hidden in view. All they need is electrical power and an optical fiber connecting them to the phone company's network.

The cube, Swedens said, can make the top of a conventional cell tower "go away." Alcatel-Lucent will start trials of the cube with carriers in September. The company hopes to make it commercially available next year.

For cell phone companies, the benefits of dividing their networks into smaller "cells" are one served by something as one served by something as the cube antenna, go far beyond aesthetics. Smaller cells fit vastly higher capacity for voice and data traffic.

Instead of having all phones within a mile or two connect to the same cell tower, the tower could be divided between several smaller cells, so there's less competition for the cell tower's attention.

"If it is what they call lightRadio could be a highly disruptive force within the wireless industry," said Dan Hays, a consultant at consulting firm PRTM.

Rasmus Hellberg, director of technical marketing at wireless technology developer Qualcomm, said smaller cells

Swedens, president of the wireless division of Alcatel-Lucent, the French-U.S. maker of telecommunications equipment.

"What we have realized is that we, as one of the major mobile equipment vendors, are partially if not mostly to blame for this."

Alcatel-Lucent will be at the show to demonstrate its "lightRadio cube," a cellular antenna about the size and shape of a Rubik's cube, vastly smaller than the ironing-board-sized antennas that now decorate cell towers. The cube was developed at the famous Bell Labs in New Jersey, birthplace of many other inventions when it was AT&T's research center.

In Alcatel-Lucent's vision, these little cubes could soon begin replacing conventional cell towers. Single cubes or clusters

Photo: THE TOWER

Citations

LANDBRIDGES

http://www.cfhd.gov/programs/techdevelopment/wildlife/documents/01_Wildlife_Crossing_Structures_Handbook.pdf

ENERGY

<http://www.addisontexaswatertower.com/>

WIRELESS FACILITY RADIATION

U.S. Fish & Wildlife Service Concerns Over Potential Radiation Impacts of Cellular Communication Towers on Migratory Birds and Other Wildlife

Albert M. Manville, II, Ph.D., Senior Wildlife Biologist, Division of Migratory Bird Management, USFWS

May 10, 2007, "Congressional Staff Briefing on the Environmental and Human Health Effects of Radiofrequency (RF) Radiation," House Capitol 5, Washington, DC

http://www.hese-project.org/hese-uk/en/papers/manville_wildlife_towers.pdf

While focus of this briefing is pointed toward radiation impacts on human health – e.g., rising levels documented "cancer clusters" – USFWS growing concerned about potential impacts of tower radiation on resident and migrating birds and bats, listed species under our jurisdiction, and other potentially impacted living resources including bees.

Briefing Paper on the Need for Research into the Cumulative Impacts of Communication Towers on Migratory Birds and Other Wildlife in the United States Division of Migratory Bird Management (DMBM), U.S. Fish & Wildlife Service

<http://electromagnetichealth.org/pdf/CommTowerResearchNeedsPublicBriefing-2-409.pdf>

Calls for research of cell tower effects on critters from collisions or radiation.

Electromagnetic pollution from phone masts: Effects on wildlife.

[http://www.pathophysiologyjournal.com/article/S0928-4680\(09\)00003-0/abstract](http://www.pathophysiologyjournal.com/article/S0928-4680(09)00003-0/abstract)

Abstract: A review on the impact of radiofrequency radiation from wireless telecommunications on wildlife is presented. Electromagnetic radiation is a form of environmental pollution which may hurt wildlife. Phone masts located in their living areas are irradiating continuously some species that could suffer long-term effects, like reduction of their natural defenses, deterioration of their health, problems in reproduction and reduction of their useful territory through habitat deterioration. Electromagnetic radiation can exert an aversive behavioral response in rats, bats and birds such as sparrows. Therefore microwave and radiofrequency pollution constitutes a potential cause for the decline of animal populations and deterioration of health of plants living near phone masts. To measure these effects urgent specific studies are necessary.

<http://plukrijp.be/wp-content/uploads/Balmori2009-EMPollutionPhoneMasts-EffectsOnWildlife.pdf>

Conclusions: This literature review shows that pulsed telephony microwave radiation can produce effects especially on nervous, cardiovascular, immune and reproductive systems [111]:

- *Damage to the nervous system by altering electroencephalogram, changes in neural response or changes of the blood–brain barrier.*
- *Disruption of circadian rhythms (sleep–wake) by interfering with the pineal gland and hormonal imbalances.*
- *Changes in heart rate and blood pressure.*
- *Impairment of health and immunity towards pathogens, weakness, exhaustion, deterioration of plumage and growth problems.*
- *Problems in building the nest or impaired fertility, number of eggs, embryonic development, hatching percentage and survival of chickens.*
- *Genetic and developmental problems: problems of loco-motion, partial albinism and melanism or promotion of tumors.*

In the light of current knowledge there is enough evidence of serious effects from this technology to wildlife. For this reason precautionary measures should be developed, along- side environmental impact assessments prior to installation, and a ban on installation of phone masts in protected natural areas and in places where endangered species are present. Surveys should take place to objectively assess the severity of effects.

Mobile Phone Induced Honey-Bee Piping

<http://www.springerlink.com/content/bx23551862212177/fulltext.pdf?MUD=MP>

Exposure to cell phone radiations produces biochemical changes in worker honey bees

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3052591/?tool=pubmed>

Changes in honeybee behaviour and biology under the influence of cellphone radiation

http://cs-test.ias.ac.in/cs/Downloads/article_45415.pdf

Effects of weak electromagnetic irradiation on various types of behavior in the mealworm *Tenebrio molitor*.

<http://www.ncbi.nlm.nih.gov/pubmed/20680476?dopt=Abstract>

Effects of weak physical and chemical factors on morphogenetic processes in invertebrates

<http://www.ncbi.nlm.nih.gov/pubmed/20067193?dopt=Abstract>

Influence of weak electromagnetic field on different forms of behavior in grain beetle, *Tenebrio molitor*

<http://www.ncbi.nlm.nih.gov/pubmed/19795812?dopt=Abstract>

Neue Belege für einen Zusammenhang zwischen Mobilfunk und Pflanzensterben

[translation: New evidence of a relationship between cellular and plant death]

http://www.puls-schlag.org/download/Raum_und_Zeit_2680_147_021.pdf