*Photo: A flock of Canada Goose become on-lookers as they swim along the Menomonee River near the Harley Davison Musuem


Photo: A team of neighborhood volunteers shovel, haul and spread soil for community planting beds on the Valley's southside

*Photo: Looking upstream from the Valley Passage bridge, these riparian habitats along the Menomonee River host a diverse list of tree and animal species


*Photo: Afternoon shade covers the Menomonee River upstream near Miller Park

*Source (All): Greg Latsch Photography

SECTION TWO

9 INDICATORS

THE VALLEY ENVIRONMENT

THE MENOMONEE VALLEY ENVIRONMENT

The following section presents analyses of data and trends related to four issues of Environment - ***Water Quality, Air Quality, Land Cover & Habitat, and Flora & Fauna***. These issues have been confirmed by work groups and other stakeholders as important measurements to gauge changes in the Valley environment during its redevelopment.

ENVIRONMENT SECTION CONTENTS

The content below details the information under the ***Environment Section. To the left***, each indicator analyzed for this section under its represective issue. ***To the right,*** key findings are highlighted for each specific issue. ***At the bottom,*** a timeline graphic depicts relevant Valley environment events that have occurred since the previous MVBI State of the Valley Report in 2005. Lastly, data sources and additional information on environment indicators can be found at the end of this section.

WATER QUALITY INDICATORS:

Index of Biotic Integrity - Aquatic IBI (Page 27)
Physical Water Quality Parameters (Page 28)

10-25
IBI score range 2003-2011

WATERSHED LAND USE AMONG OTHER REASONS FOR POOR IBI SCORES

Neither the Menomonee River or Burnham Canal testing stations had an IBI score above 25 - a "poor" rating. Low counts for native, sucker, riverine and intolerant species (and low fish weights) contributed to the poor scores.

AIR QUALITY INDICATORS:

Fine Particulate Matter - PM 2.5 (Page 29)
Air Toxics (Page 30)
8-Hour Ozone (Page 31)

3,9,14
days with peak daily values

VALLEY AIR QUALITY CONTINUES TO MEET 8 HOUR O-ZONE STANDARD

For 2006-2011, the number of daily peak 8-hour ozone concentration days exceeding the federal government standard for the Valley site was 3, the WI-DNR site was 9 & the Bayside site was 14. Without the new standards set in 2008, these counts would be less for all sites.

LAND COVER & HABITAT INDICATORS:

Surface & Tree Canopy Coverage (Page 32)

120.84
acres under tree canopy in Valley

VALLEY REDEVELOPMENT MAKES EFFICIENT USE OF LAND & TREES

According to recent tree canopy data from the City of Milwaukee, 8.7% (120.8 acres) of land within the Valley (tract 132) is considered to be under a tree canopy. For the City, that number is larger at 21.9% (13,583.6 acres).

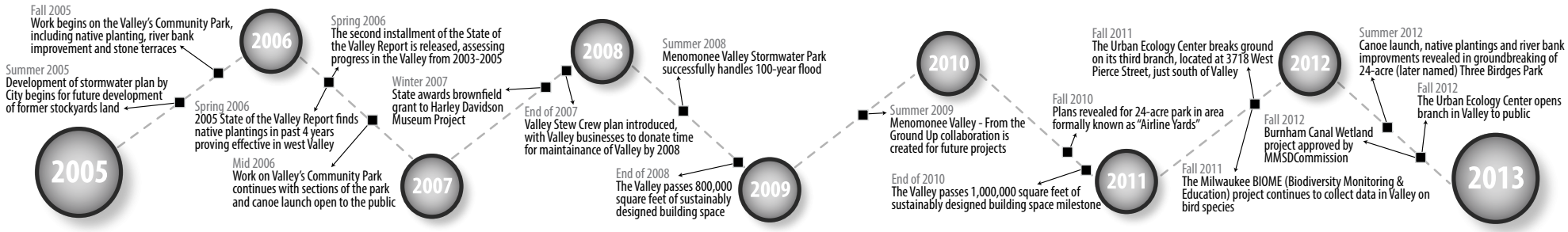
FLORA & FAUNA INDICATORS:

Bird Populations (Page 33)
Woody Plant Species (Page 34)
Small Animal Species (Page 35)

38.6%
percent of non-native species

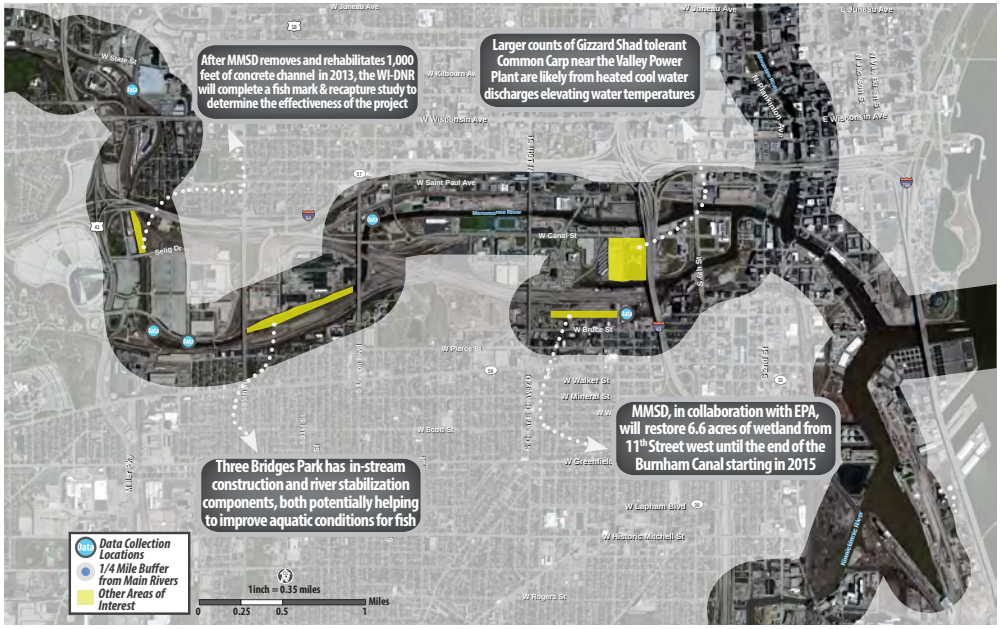
NORTH BLUFF & RIPARIAN ZONES OF VALLEY STILL CONTAIN HIGH COUNTS OF NON-NATIVE TREE SPECIES

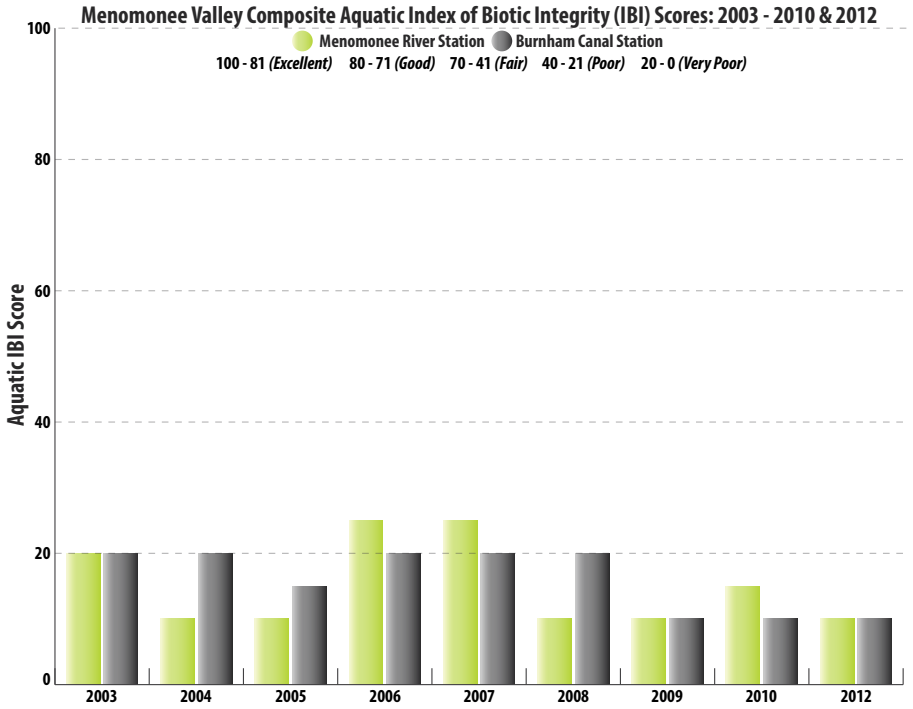
These sections had 9,917 tree stems surveyed, of which 3,902 were invasive. European Buckthorn and Tree-of-Heaven were most common species.



ENVIRONMENT EVENT TIMELINE 2005-2013

SECTION 2 HIGHLIGHTS





WATER QUALITY
AQUATIC IBI

view with layar

2003 2005 2013

MEASUREMENT

Data on fish assemblages for the Menomonee River and Burnham Canal was collected during the late summers from 2003-2012 by the Wisconsin DNR. Data, such as species numbers, length, weight and abnormalities, were interpreted through the Index of Biotic Integrity (IBI). The IBI score, through 10 different metrics, measures characteristics of the fish community that may be impacted by natural or human factors. The combination of these metrics yields a score reflective of the study area's environmental quality - 0 (being poorest) and 100 (being best).

IMPORTANCE

The current environmental quality at the mouth of the Menomonee River reflects local and watershed factors including land use, stormwater quality, and river conditions. Declining environmental quality can dramatically influence the composition of species normally found in healthy aquatic habitats, thus disrupting the ecological uses and processes occurring in these environments. As a result, the health of people, wildlife, and water supply are adversely impacted.

ANALYSIS

Over the course of 9 annual sample dates (2003-2012), both site fish communities were indicative of degraded environmental quality. Annual IBI scores ranged from 10 points (Very Poor) to 25 points (Poor) for both sites. Interestingly, 2004 and 2008 IBI samples from upstream on the Menomonee River, except Little Menomonee Creek, ranged from "Very Poor, Poor or Fair". All together, 26 species of fish were collected from both sites from 2003-2012. Of the 26 species, six are non-native exotics (Grass carp, Common carp and Goldfish), and three are non-native introduced species (Chinook salmon, Coho salmon and Rainbow trout). Because of watershed-wide influences and historic practices of dredging and filling wetlands in the Valley, it should be noted that the IBI scores alone may not be suffice.

Among the 10 metrics, both sites had low numbers of fish with diseases or eroded fins, lesions or tumors. This was the only metric both sites scored above "Poor" in. In total, 26 fish species were collected at both sites, including six being non-native exotics and three non-native introduced species. Field observations note the majority of specimens being collected upstream of 11th Street and upstream of 25th Street. Both areas are far removed from the direct influence of heated cooling water discharged by the local power plant.

In the past decade, over 1 mile of free-flowing stream and environmental corridor, between 27th street and Interstate 94, has been rehabilitated. Future efforts by the Milwaukee Metropolitan Sewerage District (MMSD) include the removal and rehabilitation of a 1,000 feet of concrete channel from the Menomonee River (2013), and restoration of a 6.6 acre wetland at the terminus reach of the Burnham Canal (2015).

*Source (Map & Graph): Wisconsin Department of Natural Resources (WI-DNR) & Will Wawrzyn, WI-DNR
Special thanks to Will Wawrzyn, WI-DNR for his contributions to this indicator

MEASUREMENT

Water quality in the Menomonee River was measured by the US Geological Survey (USGS) with monitoring equipment placed in the water upstream in the Village of Menomonee Falls and near the 16th Street Viaduct. These monitoring stations record river discharge, water temperature, turbidity, dissolved oxygen, specific conductance, and chloride automatically every hour. A comparison of these data allow us to evaluate the impact of development on the Menomonee River as it flows from its agricultural headwaters, through residential and urban communities into Lake Michigan.

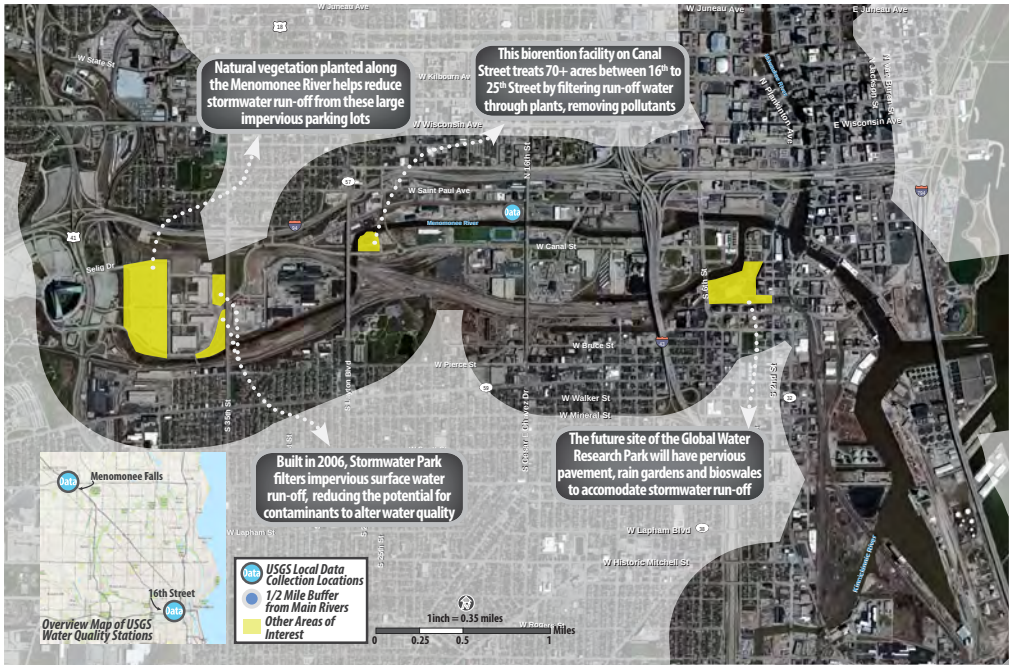
IMPORTANCE

The water quality parameters are valuable in characterizing the health of the river and aquatic wildlife and of potential threats to human health. If the impact of human actions were small, then the differences in these parameters would remain relatively constant over time and reflect the natural changes in rivers as they flow from upstream to downstream. However, activities in the built environment can disrupt this continuum and contribute to wide fluctuations in measurements that can have harmful effects on aquatic organisms. Rapid changes in these parameters are usually caused by runoff and poorly treated stormwater flowing into the river from impervious surfaces throughout the Menomonee River Watershed.

ANALYSIS

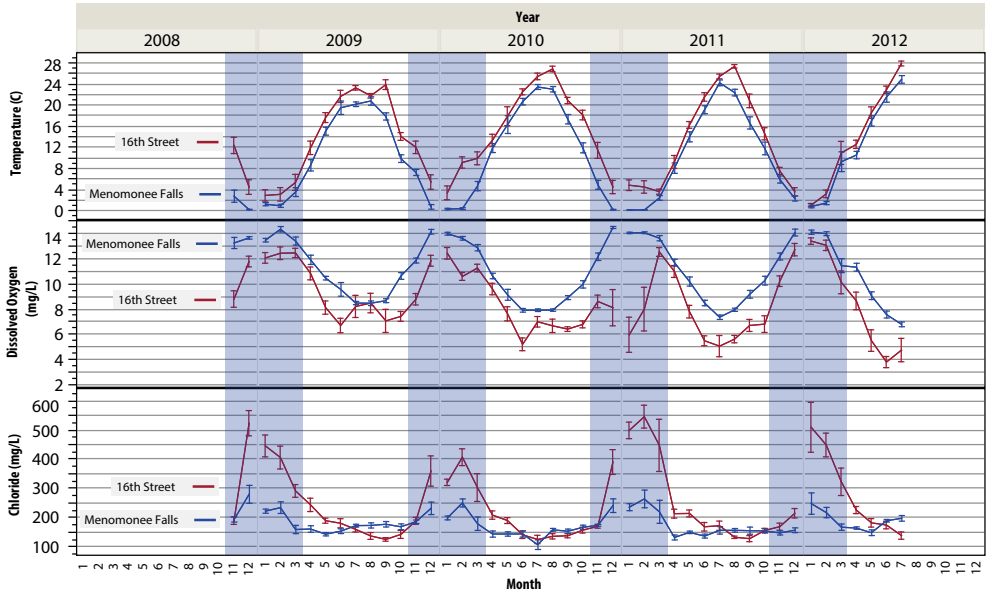
Temperature changes across seasons with the 16th Street site being typically warmer than upstream in Menomonee Falls. However, the average summer temperatures at 16th Street have steadily increased from 2009-2012 and are now approaching levels dangerous for fish survival. This trend of increased summer temperature is occurring in parallel with decreasing levels of dissolved oxygen. Average summer oxygen levels have steadily decreased since 2008, and in June 2012 were below the level considered safe for aquatic life. The drop in dissolved oxygen levels is due to the combined effects of temperatures, water depth and speed of the water. Dissolved oxygen levels lower overall at night because photosynthesizing organisms produce oxygen during the day, but not at night.

During winter months, the chloride levels of the 16th Street station are markedly higher than those of the reference site in Menomonee Falls. The stations drop back to similar levels during the summer months. This trend in chloride is a strong indicator that winter salt applications to roadways is affecting the Menomonee River. Chloride by itself is not toxic unless in much higher concentrations. However, changes in water chemistry caused by high chloride levels can potentially increase the toxicity of other more dangerous chemicals in the sediments of the river.



Water Quality Indicators for the Menomonee River

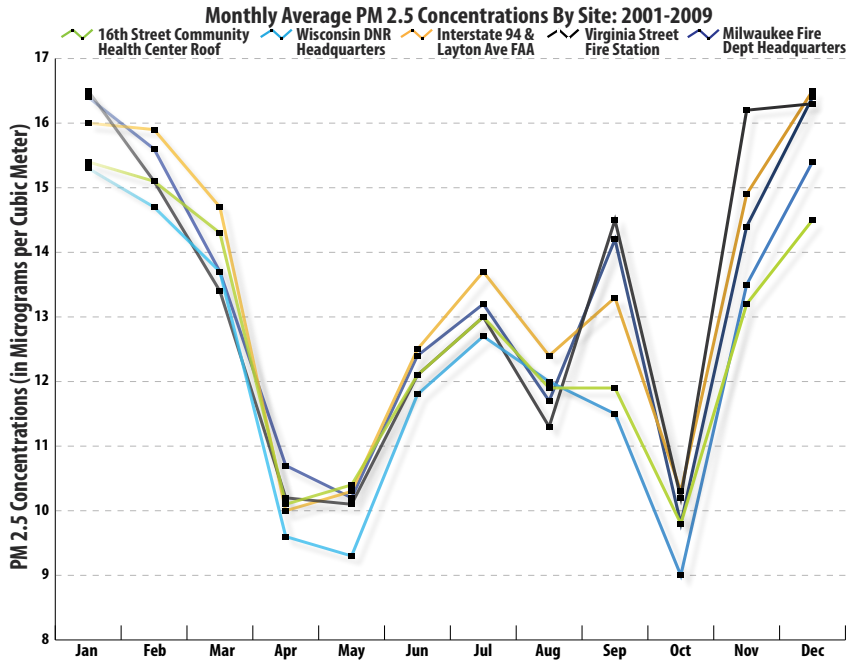
Data show monthy means + 95% Confidence Interval

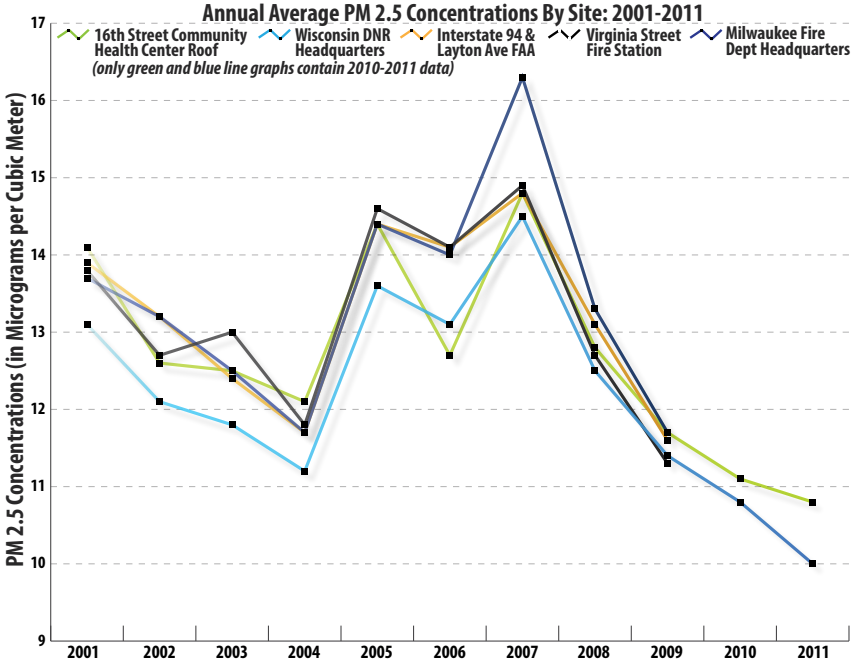


*Source (Map & Graph): United States Geological Survey (USGS) & Tim Ehlinger, UW-Milwaukee Department of Biological Sciences
Special thanks to Tim Ehlinger, UW-Milwaukee for his contributions to this indicator

WATER QUALITY

PHYSICAL WATER QUALITY





MEASUREMENT

Observational data regarding the concentration of airborne fine particulate matter (particles measuring less than 2.4 microns in diameter) were collected by the Wisconsin Department of Natural Resources (WI-DNR). Data were evaluated from 2001 to 2009 at five monitoring stations - Milwaukee Fire Department HQ, Virginia Street Fire Department, WI-DNR Milwaukee Office, 16th Street Community Health Center rooftop (SSCHC), and Milwaukee I-94 & FAA site. Separate measurements from 2010-2011 were made for only two monitoring stations (SSCHC and WI-DNR Milw HQ). All monitoring values are shown in $\mu g/m^3$ (micrograms per cubic meter).

IMPORTANCE

Monitoring $PM_{2.5}$ concentrations is vital for public health because these particles can cause serious health threats and respiratory problems if exposed at both long and short-term durations. The current US Environmental Protection Agency (EPA) standards for 24-hour fine particulate matter concentrations were set in 2006 - at or below 35 $\mu g/m^3$. The current annual $PM_{2.5}$ concentration standards have been in existentence since 1997 - averages at or below 15 $\mu g/m^3$. In June 2012, the US EPA proposed lowering the annual $PM_{2.5}$ standard, proclaiming current standards are inadequate to protect public health.

ANALYSIS

In 2009, average annual readings for the five monitoring stations decreased 16% since 2001, and 19% since 2005. The highest annual averages for the nine year span was at the Milwaukee 1-94 & FAA site - 13.24 $\mu g/m^3$. Conversely, the lowest overall readings were found at the SSCHC (13.07 $\mu g/m^3$) and WI-DNR Milwaukee HQ (12.60 $\mu g/m^3$) sites respectively. The Milwaukee I-94 & FAA site had the highest annual average reading (16.36 $\mu g/m^3$), occurring in 2007. And the SSCHC site experienced the highest daily average reading (82.8 $\mu g/m^3$), occurring in 2001. Both are well above the annual and daily federal regulatory standards.

Combined, the five sites experienced their highest annual average readings in 2005 (14.29 $\mu g/m^3$) and 2007 (15.05 $\mu g/m^3$). However, levels declined since 2007 with 2009 representing the lowest annual average (11.54 $\mu g/m^3$). The largest annual percent change occurred between 2004 and 2005 with a 22% increase.

Monthly averages for all sites were highest during winter (November to February) and mid-summer (June to July) months. While spring months (April to May) yielded lower levels, October had the lowest readings of any month. Hourly readings, conducted from 2010-2011 at the WI-DNR Milwaukee HQ station, peaked during late-evening (8PM to 12AM) and early morning (6AM to 8AM) hours.

AIR QUALITY

FINE PARTICULATE MATTER

*Source (Graph & Chart): Wisconsin Department of Natural Resources (WI-DNR), Grant Hetherington, WI-DNR &Mark Allen, WI-DNR
Special thanks to Grant Hetherington, WI-DNR for his contributions to this indicator

MEASUREMENT

Samples were collected by the WI-DNR for the atmospheric concentrations of four toxic air pollutants known as cancer risk drivers or contributors: 1, 3-Butadiene, Acetaldehyde, Benzene, and Formaldehyde. All samples were collected from 2001 to 2011 at the 16th Street Community Health Center (SSCHC) rooftop monitoring station. Through various studies and measurements, these air toxics were associated with the highest health risk. Of note - no data was available for 2006.

IMPORTANCE

The US Environmental Protection Agency (EPA) categorizes toxic air pollutants as compounds known, or suspected, to cause cancer or serious health affects in humans, while potentially causing adverse impacts on the environment. Acute and chronic exposure to air toxics is known to cause respiratory problems, such as lung and nasopharyngeal cancer, and irritation to the nose, eyes and throat. The Valley's central location and proximity to high traffic volumes increase its potential exposure to air toxics. Thus, residents in neighborhoods near the Valley can experience increased health risks.

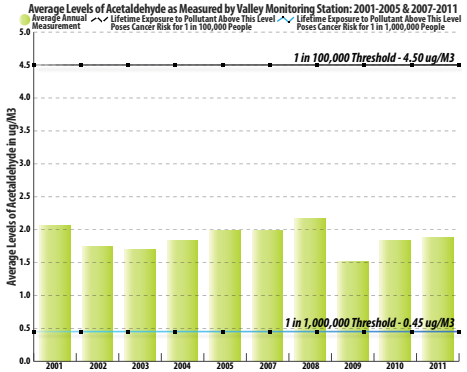
ANALYSIS

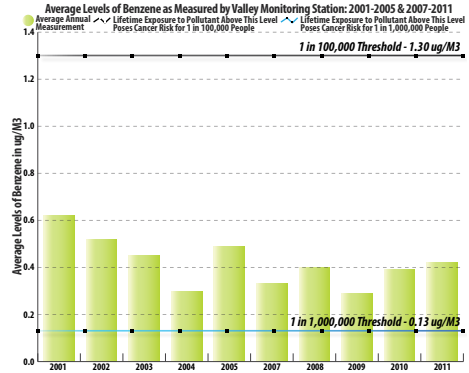
As of 2011, Formaldehyde was the only air toxic with levels above its respective cancer risk factor threshold (0.77 µg/m^3) for 1 in 100,000 people exposed to the toxic over their lifetime. This toxic is commonly used for healthcare (e.g., shampoo, deodorant, toothpaste, etc.) and home building products (e.g., pressed wood products, fiber board, plywood, etc.). Historically, Formaldehyde levels were above this threshold for every year since 2001, peaking in 2008 (3.91 µg/m^3) and increasing since its lowest levels in 2009. The remaining toxics had levels well below the 1 in 100,000 people cancer risk factor threshold for all years since 2001.

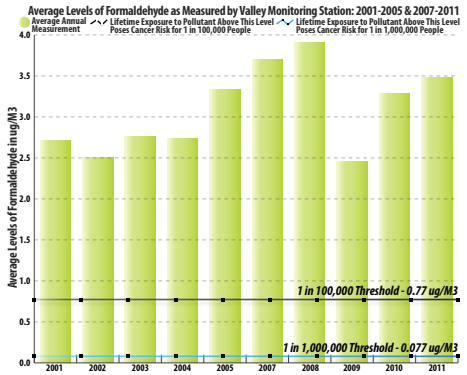
For 2011, three of the four toxics (Acetaldehyde, Benzene & Formaldehyde) all had levels above their respective cancer risk factor thresholds for 1 in 1,000,000 people exposed to the toxic over their lifetime. Since 2001, Acetaldehyde levels remained constant at 2.07 µg/m^3, with 2009 having the lowest reading (1.57 µg/m^3). Exposure to Acetaldehyde (i.e., household combustibles) is commonly experienced from ambient air with inadequate ventilation indoors increasing potential health risks. Lastly, average values for Benzene have remained below peak levels in 2001 (0.62 µg/m^3), but had steady fluctuations since then. Sources of Benzene include emissions from factories, automobile exhaust and waste water.

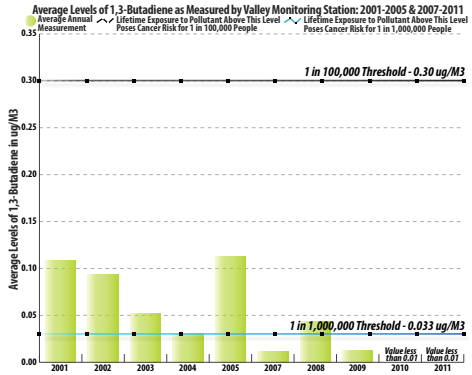
The 1, 3-Butadiene toxic was above its respective threshold (0.033 µg/m^3) for years 2001-2005 & 2008, but has since showed decreasing levels each year. Common sources for this toxic include motor vehicle exhaust, manufacturing plants and processing facilities.

*Source (Graph & Chart): Wisconsin Department of Natural Resources (WI-DNR), Grant Hetherington, WI-DNR, Mark Allen, WI-DNR & Jeff Myers, WI-DNR
Special thanks to Grant Hetherington & Jeff Myers, WI-DNR for their contributions to this indicator









0 Total readings for 1, 3-Butadiene registering greater than 0 in 2010 & 2011. And since 2009, only 3 of the potential 36 months had values greater than zero (all in 2009).

2.29 The average reading for Acetaldehyde (for years 2001-2005 & 2007-2011) during the month of June. This was the highest average reading out of all months.

2003 No years or months following 2003 had peak readings of Benzene. All peak readings were observed in either 2001, 2002 or 2003.

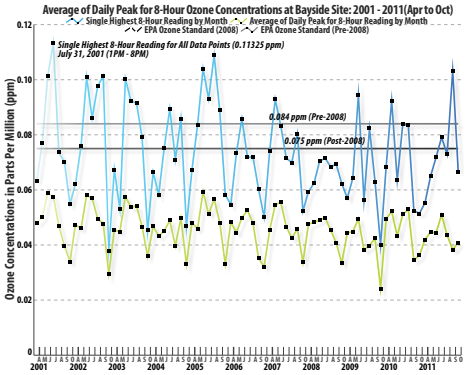
6.70 This reading occurred on June, 2011 and was the highest reading observed for Formaldehyde for all years. In fact, the year 2011 also had peak readings in March and April.

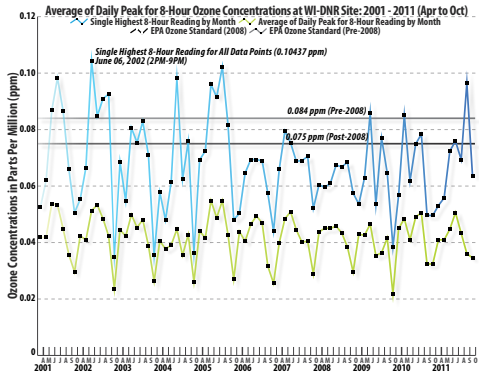
AIR QUALITY

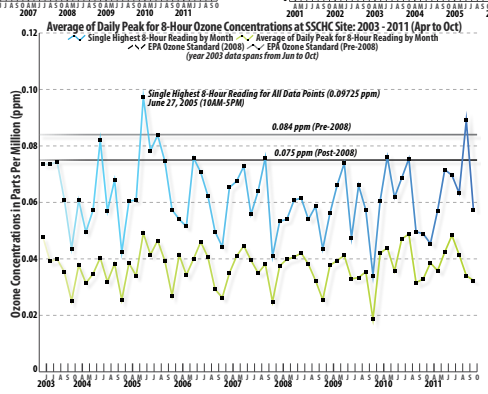
AIR TOXICS

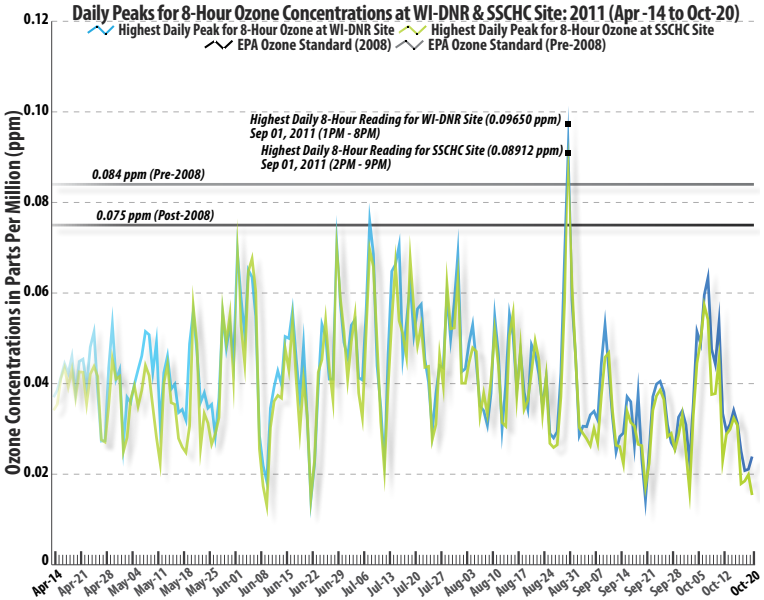
view with layar

2003 2005 2013









AIR QUALITY
8-HOUR OZONE

view with layar

2003 2005 2013

MEASUREMENT

Monitoring of ground-level atmospheric ozone concentrations, measured in parts per million (ppm), were done every 8 hours from 2001-2011 by the WI-DNR. Ozone data for this indicator is from three locations - the 16th Street Community Health Center (SSCHC), WI-DNR office and the Village of Bayside. The WI-DNR office is the only station that completes monthly readings year round, with the other two sites generally reporting data from March to October. Of note - the "daily peak 8-hour ozone concentration" values indicate the highest 8-hour reading of the day.

IMPORTANCE

Ground-level ozone can produce a various health problems for those exposed, including (but not limited to) - chest pain, coughing and throat irritation. Exposure can also exacerbate asthma, bronchitis, emphysema and heart disease. The creation of ozone particles occur when the combination of sunlight and high temperatures chemically react with compounds from motor vehicle exhaust, industrial emissions, gasoline vapors and other chemical solvents. Ozone concentrations are both local and regional problems as reactions between the ozone and compounds can travel hundreds of miles from its original source. The EPA standard as of 2008 for 8-Hour Ozone concentration levels is 0.075 ppm, updated from the previous standard (0.084 ppm).

ANALYSIS

For 2011, the Valley site for 8-hour ozone monitoring had average daily peaks for some months slightly higher than in previous years, in particular July (0.0483 ppm) and September (0.0341 ppm). While June and July commonly have higher ozone readings than other months, average daily peaks for each respective month in 2011 were lower at the Valley than the other two sites - the WI-DNR office and Village of Bayside. From 2003-2011, 8-hour ozone daily peak average values for the year were highest in 2005 (0.0394 ppm) and 2010 (0.0403 ppm) at the Valley site. Conversely, daily peak values fell annually from 2006-2009, but rose again in 2010.

A daily peak value on June 27, 2005 (0.0973 ppm) was the highest recorded value for this site during all years. Comparatively, the Bayside site exceeded this value nine times and the WI-DNR office four times from 2001-2011. The highest daily peak value observed between all three sites was 0.1132 ppm at Bayside on July 31, 2001. In fact, this site experienced daily peak values above 0.100 ppm eight times since 2001, as the Valley site had zero and the WI-DNR office two.

As expected, the Valley site had the fewest daily peak values exceed the pre-2008 (0.084 ppm) and post-2008 (0.075 ppm) standard for ozone. Overall, this site observed daily peaks above these thresholds four times since 2003, considerably lower than the other sites - Bayside (37 times) and WI-DNR office (28 times).

*Source (Graph & Chart): Wisconsin Department of Natural Resources (WI-DNR), Grant Hetherington, WI-DNR & Mark Allen, WI-DNR
Special thanks to Grant Hetherington, WI-DNR for his contributions to this indicator

MEASUREMENT

The percentage of impervious (e.g., buildings, sidewalks, streets, etc.), soil, shrub or tree, and grass surfaces was found for the Valley Environmental study area (tract 132). Land cover type calculations were made by comparing 4x4 meter resolution satellite imagery for 2000 and 2007, and overlaying the analysis on an aerial photograph. Changes to land cover types after 2007 are quite evident (e.g., Menomonee Valley Industrial Center, Harley-Davidson Museum, etc.), however, no high resolution satellite imagery was readily accessible.

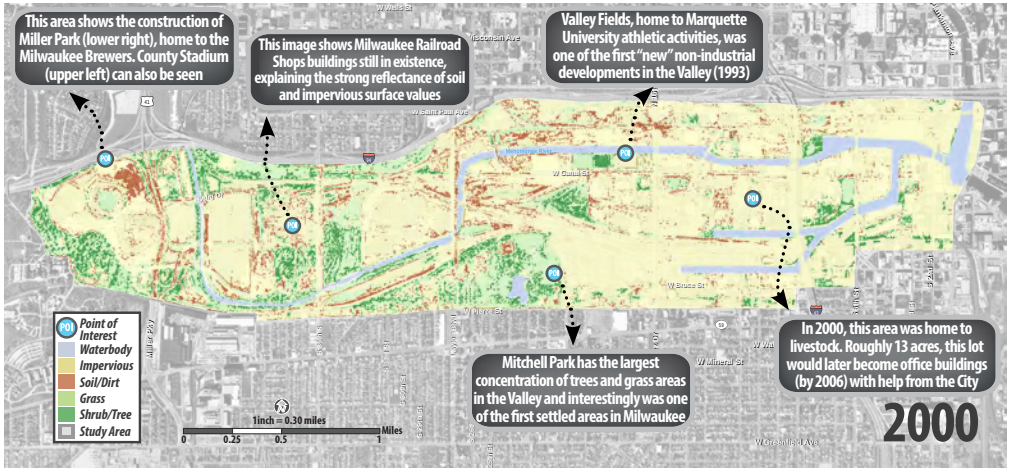
IMPORTANCE

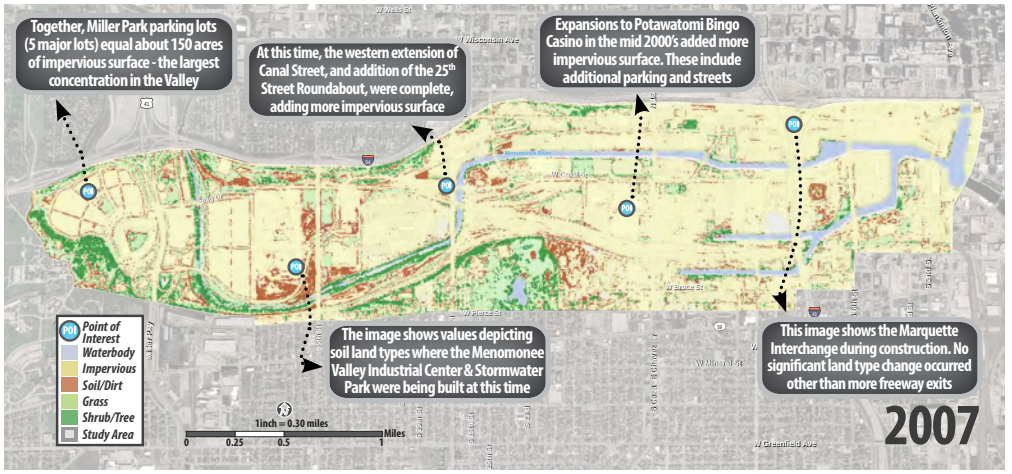
The amount of porous ground (pervious) and vegetation cover (e.g., lawns, gardens, trees, etc.) existing in the Valley has a profound impact on the quality and quantity of stormwater released into important nearby waterbodies - the Menomonee River and Lake Michigan. Vegetation cover helps absorb stormwater from impervious surfaces by filtering the run-off before it flows into nearby waterbodies. These vegetation cover features also attract an abundance of aquatic and terrestrial wildlife (seeking food and shelter), provide recreational opportunities and have been proven to increase property values.

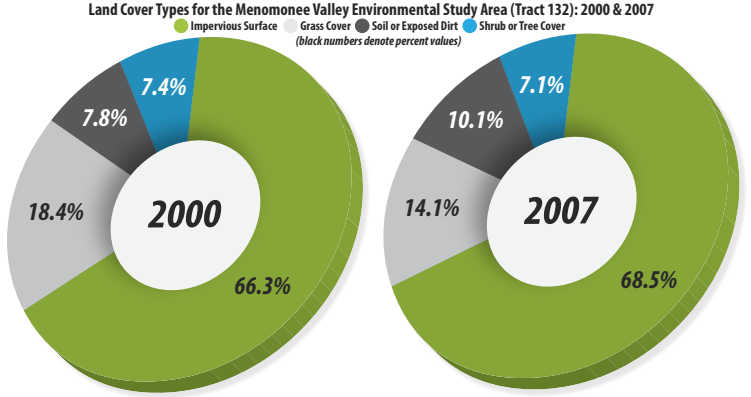
ANALYSIS

Due to numerous construction projects since 2000, increases in exposed soil and impervious land cover surfaces are shown for 2007. The former 140-acre Milwaukee Railroad Shops property (western portion of 2000 image) was remediated into the Menomonee Valley Industrial Center (MVIC) during this time period, with its first building being erected in 2006. While the 2000 image suggests a healthy concentration of grass and shrubs near this site, much of it was overgrown, non-native and agressive tree species reflecting the derelict condition the property was in after the property had been abandoned. Just west of this site, the Miller Park area contains the largest concentration of impervious surface in the Valley - nearly 200 acres of parking lots and over four miles of roads and sidewalks.

An increase in tree and shrubbery land cover can be seen in the 2007 image, specifically within the riparian zones upstream on the Menomonee River, and the dense tree canopies southwest of Miller Park. A component of the Valley's Sustainable Design Guidelines list, large numbers of native plant and tree species can be seen upstream on the Menomonee River. However, downstream on the northside of the Menomonee River, much of the land cover type remains impervious with little vegetation. This includes a 25-acre vacant site near 16th Street & Mount Vernon Avenue and a 14-acre recycling facility near Emmber Lane & Mount Vernon Avenue. Stormwater management at these locations is critical to ensure good water quality practices are carried through in the future.





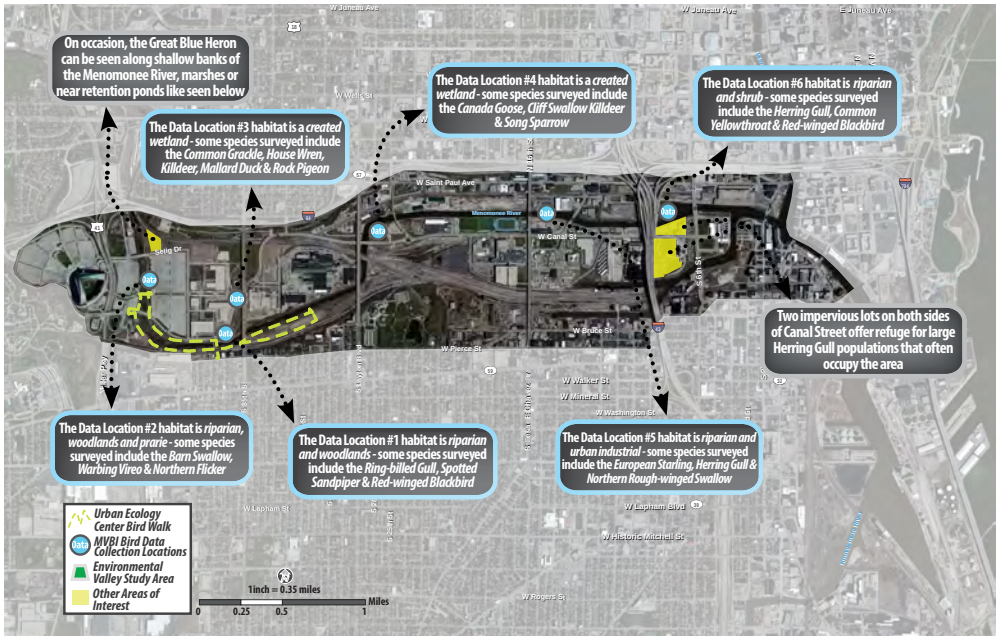


*Source (Map & Chart): American Geographical Society Library (AGSL) & Chengbin Deng, UW-Milwaukee Geography Department

Special thanks to Chengbin Deng, UW-Milwaukee Geography Department for his contributions

LAND COVER & HABITAT

SURFACE & TREE CANOPY



MEASUREMENT

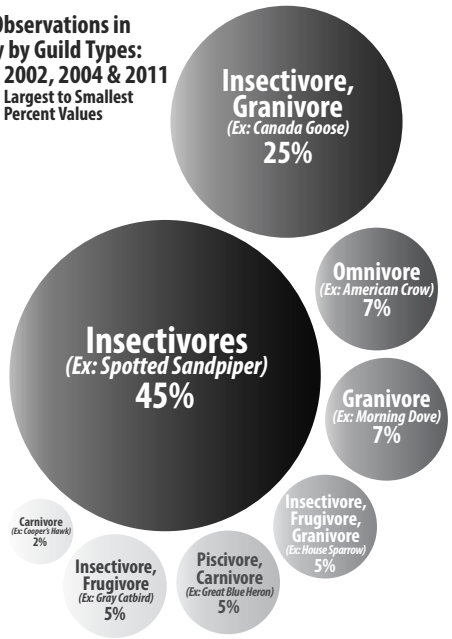
Migratory and breeding bird species presence data were collected along the Menomonee River in the Valley for 2001, 2002, 2004, and 2011. In survey years prior to 2005, monitoring was completed exclusively during peak breeding periods (May or early June) by ornithologist Bill Mueller and the Milwaukee Audubon Society. From 2006-2012, additional bird count surveys within the Valley were conducted from point count transects during breeding and migratory periods by the Milwaukee Biodiversity, Monitoring and Education (BIOME) Project.

IMPORTANCE

Bird species presence and abundance are indicators of the environmental quality of a particular area. Migrating birds rely on stopover sites, areas of native habitat, to refuel and rest after long periods of migration. These sites are essential to birds so they can reach their breeding grounds in a healthy condition. Stopover sites in an urban setting are of critical importance. Historically, the industrial uses of the Valley diminished available bird habitats. The restoration efforts and continuing preservation of the Valley stopover and breeding habitat is vital to maintain breeding and migratory bird populations.

Bird Observations in Valley by Guild Types: 2001, 2002, 2004 & 2011

Largest to Smallest Percent Values



Observed Birds in Valley on Rare, Watch or In Great Need Lists	Urban Ecology Center Survey (after 2010)	BIOME Survey (2006 - 2012)	MVBI Specific Surveys (2001, 2002, 2004, 2011)
Birds Observed in Valley found on WI-DNR Rare Species List			
Black-Crowned Night-Heron	Yes	Yes	
Common Goldeneye	Yes		
Connecticut Warbler		Yes	
Louisiana Waterthrush		Yes	
Ruby-Crowned Kinglet	Yes	Yes	
Swainson's Thrush		Yes	
Birds Observed in Valley found on WI-DNR Watch Species List			
American Black Duck		Yes	
Black-Billed Cuckoo		Yes	
Brown Thrasher	Yes		
Field Sparrow	Yes	Yes	
Great Blue Heron	Yes	Yes	Yes
Least Flycatcher	Yes		Yes
Rusty Blackbird		Yes	
Wilson's Warbler	Yes		
Wood Thrush		Yes	
Birds Observed in Valley found on Species of Greatest Conservation Need List			
American Black Duck		Yes	
Black-Billed Cuckoo		Yes	
Brown Thrasher	Yes		
Connecticut Warbler		Yes	
Field Sparrow	Yes	Yes	
Least Flycatcher	Yes		Yes
Louisiana Waterthrush		Yes	
Rusty Blackbird		Yes	
Wood Thrush		Yes	

ANALYSIS

The Milwaukee BIOME project observed more than 80 bird species at various times during spring (April-June) and fall (August-November) migration periods from 2006-2011. The majority of species found belong to the insectivore guild. Some species of greatest conservation need found during migration periods in the Valley include - American Black Duck, Black-billed Cuckoo, Connecticut Warbler, Field Sparrow, Louisiana Waterthrush, Rusty Blackbird, and the Wood Thrush.

Previous bird surveys conducted for the MVBI were during breeding seasons (June-July). The shallower, western portion of the Menomonee River attracts Mallards, Canada Geese, Killdeer, and the occasional Great Blue Heron. Near the 6th Street Viaduct (downstream), Herring Gulls are present in rather large numbers.

The original 2001 report identified a non-exhaustive list of 15 bird species that could be found in future surveys. They include the Baltimore Oriole, Cliff Swallow, Cooper's Hawk and Ruby-throated Hummingbird. All species on that list have since been observed by either the BIOME project or surveys conducted by the Urban Ecology Center. Future efforts to preserve and expand the Valley's environment, including plantings within the newly open Three Bridges Park, are essential to attracting new bird species. Overall, bird populations within the Valley have remained relatively consistent throughout its redevelopment, with local intiatives and the Urban Ecology Center to provide continuous monitoring in the future.

*Source (Map, Chart & Graph): Fieldwork by William Mueller, Ornithologist at Western Great Lakes Bird & Bat Observatory & Project Coordinator at Milwaukee Biodiversity Monitoring & Education Project (BIOME)

Special thanks to William Mueller, BIOME & Anne Reis, Urban Ecology Center for their contributions to this indicator

FLORA & FAUNA
BIRD POPULATIONS

view with layar

2003 2005 2013

MEASUREMENT

Native and non-native tree species (stems) were surveyed from 232 sample plots throughout the Valley in 2011, including the 208 sample plots previously evaluated in 2004. Due to recent developments in the Valley, 24 additional plots were added near the Harley Davidson Museum, Urban Ecology Center, Valley Passage Bridge, and Stormwater Park. Each sample plot measured roughly 30 feet in diameter. Of note - areas with woody plant cover were targeted for sample plots.

IMPORTANCE

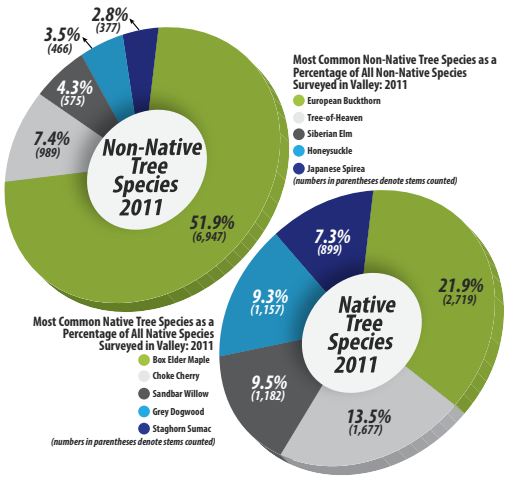
Once a vast wetland, the landscape and tree species of the Valley have changed over its history. Thus, the amount and type of vegetation found is important to monitor for its affect on stormwater management, flood control, and environment quality. Healthy native vegetation attracts diverse wildlife, improves stormwater quality, controls pest and pollution, and mitigates the urban heat island affect. Conversely, non-native vegetation can displace native fauna and upset the ecological system. Non-native & aggressive species, such as European Buckthorn and Honeysuckle, reproduce quickly and overtake other plant types.

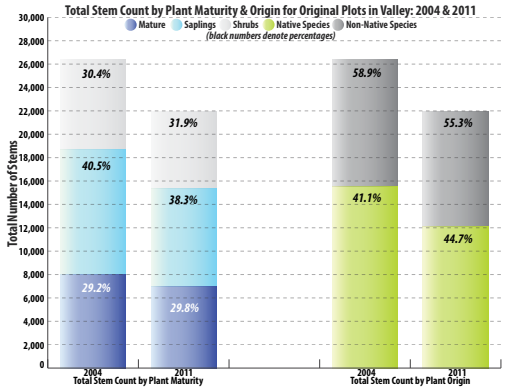
ANALYSIS

In 2004, the survey's 208 plots contained 26,082 stems of woody trees and shrubs. These plots contained 83 identified species. Of the stems counted, 59.8% were native with 40.2% non-native. In 2011, some 21,897 stems were counted in the original 208 sample plots, a loss of -4,483 stems resulting from the Potawatomi Casino parking expansion, Canal Street extension and Marquette Interchange project. An additional 24 sample plots were included in 2011 due to recent developments within the Valley. When including these plots, the 2011 survey stem count increases to 25,767, with 3,680 (14.2%) of those in the new plots.

A total of 130 tree species were found in the 232 sample plots, which represents an increase of 47 species since 2004. However, some species were unknown in 2004 and have since been classified. For tree origin in 2004, about 41% were non-native and 59% native. Comparing those same plots in 2011, non-native species accounted for 45% of all species found while 55% were native. Including the 24 additional plots for 2011, ratios for non-native and native stems had little change.

Much of the Valley's diversity in tree species is found in the riparian habitats upstream on the Menomonee River and areas with native plantings - the Hank Aaron State Trail, Stormwater Park and lots around Miller Park. While efforts to increase native plantings have proven effective, non-native species, specifically European Buckthorn, still maintain a strong presence along the northern Valley bluffs and parts of the Menomonee River. For 2011, about 27% of tree stem species found were European Buckthorn.

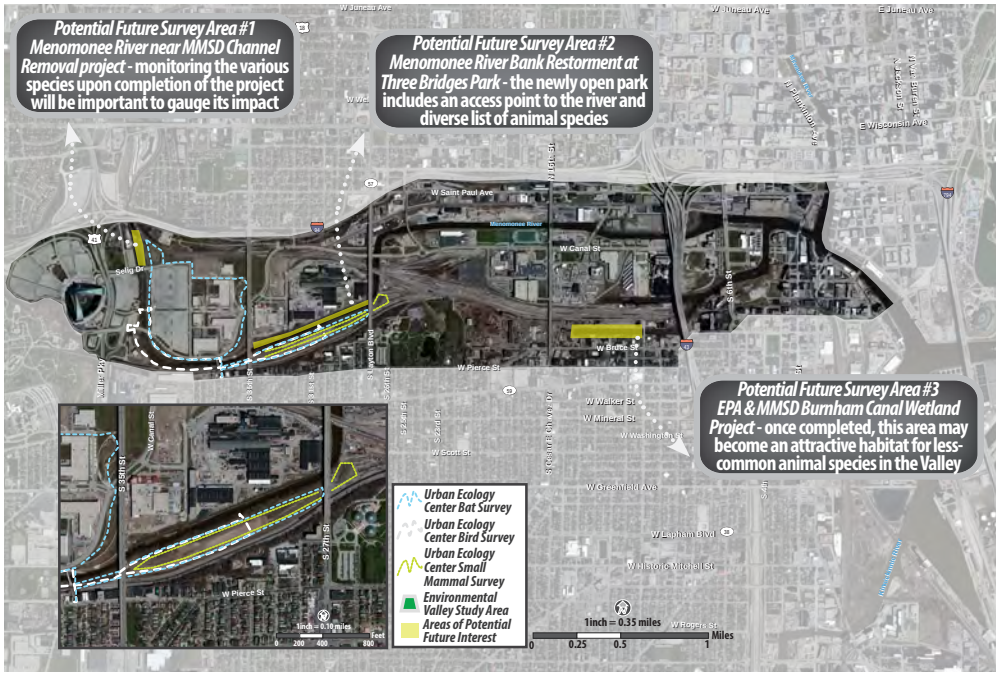




FLORA & FAUNA

WOODY PLANT SPECIES

*Source (Map & Chart): Tree survey fieldwork by Will Sharkey, UW-Sheboygan
Special thanks to Will Sharkey, UW-Sheboygan for his contributions to this indicator



MEASUREMENT

The Urban Ecology Center's Menomonee Valley facility, located on West Pierce Street, conducts activities related to the benchmarking and monitoring of various animal species in and around the Valley. Presently, the Center manages Bird Walks and Banding, Acoustic Bat Monitoring, Small Mammal Live Trapping, and Snake Cover board surveys to help establish a biotic index. The Center has plans to extend these activities to include invertebrate, frog and turtle monitoring.

IMPORTANCE

The Urban Ecology Center's Citizen Science Program serves as a meaningful bridge between academic research and the community-at-large, enabling collaboration, and creating a more engaged, knowledgeable and ecologically literate citizenry. The Center collects data to gather baseline information for numerous taxa at all branches. These activties aim to answer questions related to "what species are present in our parks", "how does this change over time", "how do animal communities relate to plant communities", and "to what extent can wildlife monitoring affect our land stewardship practices". These benchmarks are vital for accurately reporting how the Valley's redevelopment affects the local biotic community.

ANALYSIS

The Urban Ecology Center opened a Menomonee Valley facility in Fall of 2012 and functions both as a classroom teaching neighborhood youth about the environment and a community center offering workshops for local residents. Several activities to collect benchmark data on birds, bats, small mammals and snakes have begun in the Valley. However, the Urban Ecology Center has yet to create a biotic index based on the monitoring projects conducted thus far at the Valley location. To date, the Urban Ecology Center's most successful projects include the bird walks, bird banding and bat monitoring surveys. These monitoring sessions provide a learing opportunity for residents and others interested in learning more about the local ecology. Usually these are led by an Urban Ecology Center specialist and occasionally involve the use of specialized equipment.

Since January 2012, volunteers and staff have conducted over 70 bird walks, 10 bat surveys, 3 small mammal surveys, 2 snake cover board surveys and 4 bird banding sessions. All Urban Ecology Centers, including the Valley location, have dedicated in-house space to care for species collected in the field.

The result of this work is the Urban Ecology Center conducting sophisticated analyses and eventually producing reports for the public to view. Additional information is provided in the 2012 Research and Citizen Science Annual Review by the Urban Ecology Center.

4 The total count of high and low frequency bat species found in the Valley. They include the Eastern Redbat (high), Hoary, Big Brown or Silver-haired, and Big Brown Bats (low).

53 The number of volunteers who pledged their time for seven animal species surveys between the three branches - Riverside Park, Washington Park and Menomonee Valley.

2,000 The total hours logged by 53 volunteers for all three Urban Ecology Center branches for 2011. As the Urban Ecology Center in the Valley becomes more familiar with local residents, these numbers should rise.

28,000 The estimated total amount of feet covered between bat, bird and small mammal surveys. The Urban Ecology Center has plans to include soil monitoring, invertebrate monitoring, and frog and turtle monitoring.

FLORA & FAUNA
SMALL ANIMAL SPECIES

view with layar

Source (Map & Chart): Urban Ecology Center & Anne Reis, Urban Ecology Center
Special thanks to Anne Reis, Urban Ecology Center for her contributions to this indicator

WATER QUALITY DATA
PAGES 27 - 28

University of Wisconsin-Milwaukee - Department of Biological Sciences
Website: www4.uwm.edu/letsci/biologicalsciences | **Phone:** 414.229.4214

University of Wisconsin-Milwaukee - Great Lakes Water Institute (GLWI) Research
Website: www4.uwm.edu/freshwater/research | **Phone:** 414.382.1700

Milwaukee Metropolitan Sewerage District (MMSD) - Water Quality Research
Website: www.mmsd.com/Report.aspx | **Phone (general):** 414.272.5100

Wisconsin Department of Natural Resources (DNR) - Surface Water Information
Website: www.dnr.wi.gov/topic/surfacewater

Wisconsin Department of Natural Resources (DNR) - WebView Mapping Viewer
Website: www.dnrmaps.wi.gov/imf/imf.jsp?site=SurfaceWaterViewer

The Water Council
Website: www.thewatercouncil.com | **Phone:** 414.988.8751

Environmental Protection Agency (EPA) - Water Quality Data Portal
Website: www.waterqualitydata.us

US Geological Survey (USGS) - Water Quality Data Portal
Website: www.water.usgs.gov/owq/data.html

AIR QUALITY DATA
PAGES 29 - 31

Wisconsin Department of Natural Resources (DNR) - Air Quality Information
Website: www.dnr.wi.gov/topic/AirQuality

Wisconsin Department of Natural Resources (DNR) - Current Air Quality Data
Website: www.airquality.wi.gov/StateMapping.aspx

Environmental Protection Agency (EPA) - Air Quality Data Portal
Website: www.epa.gov/airdata

Wisconsin Department of Natural Resources (DNR) - Small Business Clean Air Assistance Program (SBCAAP)
Website: www.dnr.wi.gov/topic/CompAssist/sb | **Phone (toll free):** 855.889.3021

Wisconsin Partners for Clean Air (WPCA)
Website: www.cleanairwisconsin.org | **Phone:** 414.263.8653

LAND COVER DATA
PAGE 32

University of Wisconsin Milwaukee - Geography Department
Website: www4.uwm.edu/letsci/geography

Milwaukee Metropolitan Sewerage District (MMSD) - Green Solutions Research
Website: www.mmsd.com/Sustainability.aspx#

University of Wisconsin-Madison - WisconsinView Data Portal
Website: www.relief.ersc.wisc.edu/wisconsinview/form.php

Environmental Protection Agency (EPA) - Sustainable Strategies
Website: www.epa.gov/oaintrnt/index.htm

US Fish & Wildlife Service - Wetland Mapping Viewer
Website: www.fws.gov/wetlands/Wetlands-Mapper.html

US Geological Survey (USGS) - Aerial & Satellite Imagery Portal
Website: www.usgs.gov/pubprod/aerial.html

FLORA & FAUNA DATA
PAGES 33 - 35

The Future of Birds Blog
Website: www.futureofbirds.blogspot.com

Menomonee Valley Partners - Native Tree Species List
Website: www.goo.gl/e22FtW

Milwaukee Audubon Society
Website: www.milwaukeeaudubon.org | **Phone:** 414.352.2437

Urban Ecology Center
Website: www.urbanecologycenter.org | **Phone (Valley Office):** 414.431.2940

Wisconsin Bird Conservation Initiative
Website: www.wisconsinbirds.org | **Phone:** 608.255.2473

Western Great Lakes Bird & Bat Observatory
Website: www.wglbbo.org

Wisconsin Department of Natural Resources (DNR) - Tree Identification
Website: www.dnr.wi.gov/education/educatorresources/TreeId.html

ENVIRONMENTAL INDICATORS

SOURCES & INFORMATION