Sustainability Baselines and Resources 2010

ENVIRONMENT – Natural Systems sustainability category
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Overall Natural Systems Vision:
Madison will endeavor to create a state of balance between the natural and built environments wherein human, plant and animal communities live in harmony. City residents breathe clean air, drink clean water, and swim and boat in clean water and enjoy those waters from the shore. Any human alteration of natural systems is balanced with restoration and enhancement of other natural system elements.

Opportunities:

- Tie to an increased focus on public health/healthy city initiatives. Healthy natural systems are more likely to withstand climate change impacts

Threats:

- climate change, financial limitations, political will
- long patterns of public and private entities acting unsustainably, and prioritizing short-term financial gains over restoration and enhancement of natural systems
- high percentage of impervious surfaces in the watersheds, preventing infiltration and increasing runoff carrying pollutants to lakes and streams
- area resident tendency to prioritize convenience over sustainable actions (e.g. reducing VMT)

Goal 1 – Improve Air Quality

Background
Madison's air quality meets or exceeds the NAAQ standards for all criteria air pollutants. However, ozone levels are just below the NAAQ standard; therefore, it is important that Madison devise ways of reducing emissions of ozone forming pollutants. According to the Madison Department of Public Health, there have been increases in asthma and other respiratory diseases in recent years due to outdoor and indoor air pollution.

Air quality was assessed by the review of measured levels of ozone, fine particulate matter ($PM_{2.5}$), and reported Air Quality Index (AQI) values during 2007 and 2008 and compared with values recorded during the past decade. In recent years, the EPA has adopted more stringent standards for both the levels of $PM_{2.5}$ and ozone. In 2006, the federal air quality standard was lowered from 65 parts per million (ppm) to 35 ppm. Although Dane County met this new regulatory requirement following the submission of air $PM_{2.5}$ data collected in 2008, poor grades were issued to the county from the American Lung Association's State of the Air report for the 2007 and 2008 reporting periods. In 2008, the federal standards for ozone level concentrations were lowered from 0.084 ppm to 0.075 ppm averaged over an eight-hour period. Despite the relative consistency in the reported ozone levels during 2007 and 2008, poor grades (F) for this variable were also issued by the American Lung Association.

Vehicular Traffic

The air quality in Dane County is heavily dependent upon emissions from vehicular traffic. Recent estimates from the Wisconsin Department of Natural Resources (WI DNR) have shown that cars and trucks are the largest contributors of nitrogen oxides (NO_Xs) and the second largest contributor of volatile organic chemicals (VOCs), both of which combine to form ozone during warm sunny days. These emissions are also significant sources of hazardous air pollutants such as benzene, formaldehyde, and others (light and heavy-duty vehicles account for 70% of benzene).

The impact of vehicular traffic on air quality is directly affected by the type of and number of vehicles driven. Dane County's population grew 46.9 percent from 1970 to 2000 and is expected to grow another 36 percent by 2030. Just under half (46 percent) of this growth is expected to occur in the City of Madison and central urban area communities. This will also translate into increased traffic volumes. Overall (highway and arterial) the average weekday *traffic volume* has increased approximately 10% since 2000. The amount of increase is consistent with the rate of population growth in Dane County; an estimated 11%. However, since 2004 traffic volume has declined slightly. This decrease also affected the average *daily vehicle miles traveled* (VMT) resulting in the relative consistency since 2004 after annual increases from 2000. The average daily vehicle miles traveled (VMT) in Dane County has increased by approximately 4% since 2000. In 2007 the average VMT per person in Dane County was 28.44, while in 2008 the average was 26.92. Both trends are likely a result of increasing fuel prices during these time periods and the economic decline noted during recent years.

For the City of Madison in 1990, the amount of work-trip commuting into the City from adjacent counties was approximately 9,800 per day, with approximately 1,500 work trips per day going from the City into adjacent counties. For the City of Madison by 2000, the amount of work-trip commuting into the City from adjacent counties increased 63 percent to 16,000 per day, with approximately 2,600 work trips per day going from the City into adjacent counties. Mode choice for work-trip commuting throughout the county also changed from 1990 to 2000, particularly in the drive-alone category. In that 10-year period, the percentage share of drive-alone work trips increased from 60 percent to 65 percent, while the percentage share of all other modes of work trip commuting fell, except for the bicycle and work-at-home categories. If population growth in outlying communities continues to outpace employment growth in these same areas, and if employment growth in Madison and the central urban area continues to grow faster than its labor force, commuting into the City will likely continue to increase.

Ridesharing

Since 1980, work-trip commuting by rideshare has gradually declined in the City of Madison. Daily ridesharing levels for work purposes declined from 15,200 to 11,480 between 980-2000. In 2003, it is estimated that the ridesharing program resulted in a reduction of 11.0 million vehicle miles of travel (VMT) and 221 tons of smog-producing hydrocarbon emissions.

Mass Transit

The major transit operator in the metro area is Metro Transit, which is owned by the City of Madison and operates within the oversight of the Mayor, Common Council, and the City's Transit and Parking Commission. Metro also contracts with other communities and public institutions (including UW-Madison and the Madison Metropolitan School District) to provide

service. Most transit service is provided by Metro on regular fixed-routes using large buses. Other transit services include Metro paratransit service, other demand-responsive services, special event shuttles, state vanpools, and ridesharing services. Metro has seen a growth of 1.5 million trips over the past five years. Metro's total annual ridership (combined transit and paratransit) in 2006 was 12.0 million, a 20 year high. The number of users increased by 5.3% in 2007 and another 6.0% in 2008.

WisDOT performs a Transit System Management Performance Audit every five years. In 2004, the state's audit for Metro Transit found it carries almost four times as many passengers per capita as the average for population peer transit systems, and carries over twice as many passengers per capita as the peer average for 11 much larger communities with comparable levels of transit service. Ridership per revenue hour (also known as trips or passengers per hour) is the most common transit industry indicator to measure productivity. It is the ratio of annual fixed route ridership and annual hours of service. The average for Metro's service level peers is 23.6 trips per hour during 2004. Survey data from 2005 shows that 32% of Madison residents ride Metro Transit or have a family member who does in a typical month. Among countywide residents, the figure is 22%.

Madison Fleet

Air Service

Annually, there are nearly 130,000 aircraft landings and takeoffs at the DCRA (61 percent general aviation, 34 percent commercial, and 5 percent military). In 2003, the airport had nearly 1.6 million passengers, a 5 percent increase over the record-setting passenger levels in 2002. This places the DCRA in the top 10 percent of all airports nationally in terms of percentage increase in passenger usage. The relationship of landings and takeoffs to air emissions would be useful information to obtain.

Industry

Industrial emissions are also an important factor impacting Dane County air quality. However, in the last decade the emission of air toxics from these sources has decreased dramatically; an approximate 57% since the year 2000. Industry is another significant contributor of air pollutants.

CO_2 is derived from industrial and vehicular emissions. In contrast to auto-induced emissions, the estimated CO_2 *point source* emissions for Dane County have been reduced during the past decade. Changes in energy use behavior, usage of energy-efficient products, and the purchase and/or generation of renewable-source electricity at the individual and/or community level continue to aid in the reduction of greenhouse gas emissions.

Point sources (industries and other distinct sources of emissions) are the primary source of SO_2, and important sources of VOCs, NO_X, and PM 2.5. Measurements of carbon monoxide (CO), nitrogen dioxide (NO_2), and sulfur dioxide (SO_2) indicate that the level of these air pollutants is much lower than NAAQS and do not currently pose a health risk.

Hazardous air pollutants (HAPs), also called air toxics, are chemicals in the air that are either known or suspected to cause a variety of adverse health conditions including cancer, reproductive effects, respiratory effects, and birth defects. Dane County does not routinely

measure these chemicals in outdoor air but does monitor the release of these chemicals as emissions from industrial sources. Examples of air toxics include benzene, formaldehyde, acetaldehyde, mercury, and 1,3-butadiene.

Vision:
Madison and surrounding communities exceed EPA standards, and obtain American Lung Association highest grade possible for their ranking based on ozone and fine particulates for metro area of its size and land use mix.

Subgoals

- Maintain Attainment Status for ozone and fine particle pollution ($PM_{2.5}$) per federal EPA clean air standards
- Reduce toxic air emissions (of Ozone and $PM_{2.5}$ or other pollutants) to 25% of 1993 levels

Baseline:
The Air Quality Index (AQI) is an index of daily air quality by the evaluation of the 5 major pollutants regulated by the Clean Air Act (ground-level ozone, particulate matter, carbon monoxide, sulfur dioxide, and nitrogen dioxide). Air quality has been generally consistent over the past 8 years; the vast majority of recorded days demonstrating "Good" AQI scores.

- Ozone: 2008 Ozone levels did not reach the 2008 NAAQS ozone exposure level (0.075 ppm averaged over eight hours) but 10 days were in ranges unhealthy for sensitive populations. Dane County earned a grade of "F" in 2009 from the American Lung Association State of the Air report for high ozone days.
- Fine Particulate Matter ($PM_{2.5}$): Dane County met new regulatory requirements (2 days reached levels that surpassed 35 $\mu g/m.^3$ in 2008) but continues to receive poor grades from the American Lung Association State of the Air report. Dane County received a grade of "F" in the 2009 version of this report (data from 2008).
- VOC, NO_X, and SO_2 Emissions: Decreases in VOC and NO_X emissions but increase in SO_2
- Hazardous air pollutants (HAPs): In the last decade the amount of industrial toxic air pollutant emissions (HAPs) has decreased dramatically and allowed Dane County to achieve the Healthy People 2010 objective of decreasing emissions to 25% of 1993 levels (447 tons annually).

Opportunities:

- Reduction in demand for peak-hour travel through commuter transit, demand management measures, and effective land use planning and plan implementation
- Create an incentive program for City employees rewarding them for using alternatives to the automobile for commuting. Promote use of the City Rideshare and Carpool programs and coordinate these efforts with the other major public sector employers in the City including the University, County, and State.

Threats:

- Travel trends continue to favor driving. The percentage share of City of Madison commuters driving in SOV to work increased from 61% to 66% from 1990 to 2000.

- While transit ridership increased in gross numbers, the percentage share dropped from 7.7% to 7.2%.
- Since 1980, work-trip commuting by rideshare has gradually declined in the City of Madison. Daily ridesharing levels for work purposes declined from 15,200 to 11,480 between 1980 and 2000.

Recommended actions to reduce the gap between the baseline and the vision:

- Increase densities and infill in order to reduce single occupancy vehicles and increase mass transit, in alternative forms (commuter rail, streetcars) as well as increased bus transit, bike and ped use
- Promote use of low-carbon fuels for industry
- Promote more telecommuting
- Reduce demand for peak-hour travel through commuter transit, demand management measures, and effective land use planning and plan implementation (including compact and infill development)
- Create an incentive program for City employees rewarding them for using alternatives to the automobile for commuting. Promote use of the City Rideshare and Carpool programs and coordinate these efforts with the other major public sector employers in the City including the University, County, and State.
- Enact a tree preservation ordinance to reduce air pollutants

Possible actions from "Top Five Ideas" (move any up to "recommended"? Delete some?)

- Promote urban living downtown for low to middle income workforce to reduce overall vehicular use, carbon production and fuel wasted commuting. Includes home ownership programs, low interest loans, down payment assistance programs, etc.
- Promote urban infill to increase density, increase housing options and get more people living, working and recreating downtown.
- Ban gas-driven lawn mowers
- City residency preference for all city employees
- The City of Madison should develop a goal of having the most comprehensive urban tree program in the country focusing on carbon emission reductions and sequestration. The city currently does a good job with an urban forestry program focused on more traditional goals, but we could be leaders in managing the entire urban forest cycle, including diverting urban wood wastes to energy production (such as the proposed biomass boilers at the UW's Charter Street Heating Plant), diverting leaves to dry anaerobic digesters or compost, and planting more trees for their urban heat island cooling and carbon sequestration benefit (as opposed to current policy of increasing the spacing of trees and the planting of fewer canopy trees).
- Reverse Sprawl Momentum. No sustainability effort is meaningful if Madison policies or practices either a) encourage sprawl to outlying municipalities, or b) discourage private (i.e. taxable) investment in compact land use within the City itself. Madison governance commits both errors. We are a pro-sprawl government. Compact land use is essential: it eliminates the need for duplication of infrastructure, it improves viability of shared transportation systems, it increases tax revenue necessary for other initiatives, it attracts employees to a location with layers of employment opportunity, and underwrites the viability of more/better services which improve quality of life. ***repeats***

Resource(s):
EPA National Ambient Air Quality Standards (NAAQS)
http://www.epa.gov/air/criteria.html

WI DNR Air Management Program's Air Quality Monitoring site
http://dnrmaps.wisconsin.gov/imf/imf.jsp?site=wisards

Incidence of Clean Air Action days for Ozone and PM 2.5 in Dane County on an annual basis

Dane County Clean Air Coalition
http://www.healthyairdane.org/

Dane County Asthma Coalition
Contacts: Kathleen Kelly Shanovich, 608-262-8060, kks@medicine.wisc.edu, Sally Zirbel-Donish, 608-663-8424, szirbeldonis@madison.k12.wi.us

Madison and Dane County Public Health – 2008 Environmental Report Card and Executive Summary
http://www.publichealthmdc.com/publications/documents/2008RptCardExecSumm.pdf
http://www.publichealthmdc.com/publications/documents/2008RptCard.pdf

City of Madison Comprehensive Plan
http://www.cityofmadison.com/planning/comp/plan.html

Goal 2 – Improve Ground Water Quality

Background
Madison relies solely upon groundwater for its drinking water supply. Public water systems, including residential, industrial, and commercial, account for 73 percent of use in Dane County. The remaining 27 percent comprise irrigation stock watering, rural domestic, and self-supplied industry.

Dane County sits atop two aquifers that are separated by an aquitard (collectively called the Cambrian Eau Claire Formation). The aquitard, a mostly-impermeable shale layer, occurs at around 200 feet below the surface and is up to 60 feet thick in some areas. The upper aquifer is a source of water for many private wells, while the lower aquifer, called the Mount Simon Formation, is the main water source for all Dane County municipalities, and is up to 700 feet thick (Bradbury et al., 2007). Surface geology in Madison consists primarily of morainal deposits from the most recent glaciation. The surface materials include sand and gravel outwash material deposited by glacial meltwater. Subsurface geology is mostly Cambrian sandstones (i.e. Eau Claire and Mount Simon formations), which were deposited 400 to 600 million years ago. These sandstones extend over 300 feet deep and are the primary source of groundwater for the City water supply. The 23 Madison municipal wells range from 500 feet to 1,175 feet deep. The amount of available groundwater varies by season due to changes in precipitation.

Because groundwater moves slowly relative to surface water, contamination below ground can have an impact for many, many years. Depending on soil conditions, residue from a spill might

be detectable for hundreds or even thousands of years. The relatively slow movement of groundwater has significant implications for water quantity as well as quality.

In 1986, the federal government, through amendments to the federal Safe Drinking Water Act, required statewide wellhead protection programs. In turn, the WDNR requires a wellhead protection plan for any municipal well constructed after May 1992. The City of Madison has completed wellhead protection plans for 11 of its 23 wells thus far and has a wellhead protection ordinance in place. Water Utility staff is currently working on a wellhead protection plan for each municipal well in the city by 2010.

The Madison Water Utility now provides service to more than 62,000 locations in the City of Madison, Town of Madison, Shorewood Hills, Maple Bluff, Blooming Grove, and Town of Burke. Despite being adjacent to Lakes Mendota and Monona, the City developed its water supply system using deep wells.

Water Quality Measures

Manganese. In recent years, complaints of colored water, a result of elevated levels of Manganese (Mn) and Iron (Fe), have shaken public confidence in the safety of Madison's public water supply. While the colored water is not a public health problem, it is considered a water quality problem. The Water Utility has proposed to treat four wells that have had levels of Mn and Fe that exceed the EPA's Secondary Standards for water quality. In 2005, the Utility began a comprehensive sampling program and other projects designed to reduce iron and manganese levels and incidents of discolored water at customers' taps. Mandatory water quality standards at the state or federal level have not been established for manganese. However, non-enforceable secondary maximum contaminant levels (SMCLs) have been developed by the US EPA guidelines to assist public water systems manage drinking water quality. The SMCL for manganese is 50 ppb to protect against discolored water and the health advisory guideline is 300 ppb.

In 2006 the City began measuring Turbidity to benchmark water quality. This benchmark is the percent of water quality samples taken at customers' taps with turbidity levels above 1 ntu. Turbidity is a direct measure of the cloudiness or discoloration of water measured in nephelometric turbidity units (ntu). The Water Utility collects data as part of ongoing scientifically designed sampling programs that continually monitor, sample and report on water quality. The benchmark and sampling programs do not represent levels and targets in the water system as a whole, but rather in areas where iron and manganese levels are highest and areas where the Utility receives the most discolored water reports. A reduction in percentage of samples exceeding 1 ntu would indicate success in a number of efforts designed to reduce iron and manganese and discolored water events.

In Dane County, the preventative strategy employed following the high manganese findings in 2005 and 2006 has resulted in significant improvements. These improvements are demonstrated in recorded water quality samples in Dane County municipal wells.

- In 2006, approximately 92% of samples were within the SMCL standard of 50 ppb.
- In 2007, approximately 94.5% met the SMLC; only 2 samples exceeded 50 ppb and only 1 exceeded the health advisory level of 300 ppb.

- In 2008, approximately 96.2% met the SMCL; only 2 samples exceeded 50 ppb with none greater than 300 ppb.

Chloride. Similar to manganese, chloride does not have enforceable federal or state drinking water quality standards. However, a secondary standard of 250 ppm and has been established by the US EPA for chloride and the State of Wisconsin has established a Preventative Action Limit (PAL) of 125 ppm. Chloride levels in Dane County have been increasing in some wells over the past 30 years. Similar trends have been observed in chloride levels in Dane County surface waters over the past three decades.

Nitrate. Nitrate contamination is a significant problem in private wells in Dane County. Over the last decade over 3,000 private well samples have been tested for nitrate levels to ensure water quality and safety. The results reported from available data show that approximately 19% of the samples exceeded the water quality standards for nitrate; an estimated 53% had nitrate levels between 2 and 10 ppm. All other samples were below 2 ppm.

High nitrate concentrations are less prevalent in municipal well tests. During the last decade over 2000 samples have been tested for nitrate; approximately 4% of these samples were found to exceed the nitrate standard of 10 ppm. The remaining samples were within acceptable levels. Approximately 38% had concentrations between 2 and 10 ppm while all others were below 2 ppm. Nitrate levels were higher in 2008 than previous years; approximately 11% of wells tested had rates higher than 10 ppm.

Turbidity. The benchmark is the percent of water quality samples taken at customers' taps with turbidity levels above 1 ntu. Turbidity is a direct measure of the cloudiness or discoloration of water measured in nephelometric turbidity units (ntu). Prior to 2006, the Utility did not have a program to test tap water for turbidity. Consequently, there is no benchmark data prior to 2006.

Iron. The benchmark is the percent of water quality samples taken at customers' taps with iron (Fe) levels above 300 parts per billion (ppb).

Lead. Lead in Madison's drinking water comes from the corrosion of plumbing systems, primarily lead service lines (or laterals) running from water mains in the street to customers'' water meters.

Copper. Like lead, copper in Madison's drinking water comes from the corrosion of plumbing systems, including water service lines and internal plumbing.

Coliform Bacteria. The presence of coliform bacteria in drinking water is considered to be an indicator that the water may have been contaminated with microbiological organisms. Regulatory requirements mandate that less than 5% of monthly samples test positive for coliform bacteria.

Volatile Organic Compounds. VOCs are derived from petroleum products or from solvents or cleaners. State and federal regulations establish maximum amounts of specific VOCs allowable in drinking water.

Vision:
Our drinking water is clean, clear and pleasing to taste, and meets and exceeds standards; existing activities and new developments are not degrading our groundwater (our source of drinking water).

Subgoals:

- Madison Water Utility continues to meet or exceed all federal and state drinking water standards, including secondary standards for iron, manganese, and other contaminants
- Address contamination of shallow groundwater – that is not reflected in drinking water standards or drinking water quality because drinking water is drawn from deeper aquifers).
- Reduce turbidity below 1 ntu at customers' taps. There is no established standard for turbidity in a groundwater system, but providing water at 1 ntu minimizes aesthetic problems such as discolored water and staining of laundry.

Opportunities:

- Retrofits; parking lot renovation to improve local recharge rates. Sediment traps to capture pollutants.

Threats:

- Maintaining sustainable infiltration rates in an urban area. Infiltration is controlled by a number of factors, one of which is ground cover. Roofs and pavement allow almost no infiltration. Though we receive about 31 inches of rainfall each year, only 18-30% infiltrates into the ground.
- Industrial and other potential groundwater contaminants are abundant in urban areas.
- Increasing population creates a growing demand for groundwater. In addition to direct pumping of groundwater humans have also impacted aquifers by decreasing the surface area available for recharge. Severe drawdown in a deep aquifer may pull water out of shallow aquifers, which in turn can affect springs and surface water bodies.

Recommended actions to reduce the gap between the baseline and the vision:

- Find and properly abandon all old drinking water wells in Madison
- Reduce contaminant use and infiltration (e.g. salt, fertilizers, spills of hazardous waste and industry solvents and other materials)
- spill prevention – policy and enforcement
- Complete and implement source water protection plans

Resources:
Dane County Groundwater Protection Plan
http://danedocs.countyofdane.com/webdocs/PDF/capd/GWPP-Final_Plan_web.pdf

Madison Metropolitan Sewer District 50-year Plan
http://www.madsewer.org/50YearMasterPlan.htm

City-County Public Health drinking water testing program and results

Dane County Comprehensive Plan
http://www.daneplan.org

http://www.epa.gov/safewater/contaminants/index.html

http://www.cityofmadison.com/water/Documents/WaterQuality09.final.pdf

Madison Water Utility's Water Quality and Treatment Policies for Iron and Manganese
http://legistar.cityofmadison.com/detailreport/?key=16884

Madison Water Utility's Policy on Testing for Pharmaceuticals and Endocrine Disrupting Compounds – http://legistar.cityofmadison.com/detailreport/?key=16906

Chloride Levels in Select Madison Wells
http://www.publichealthmdc.com/publications/documents/2006RptCard.pdf

Dane County Lakes and Watershed Commission salt reduction recommendations
City of Madison Commission on the Environment/City Council salt reduction recommendations

City of Madison Comprehensive Plan
http://www.cityofmadison.com/planning/comp/plan.html

Environmental Report Card
http ://www.publichealthmdc.com/publications/envReportCard.cfm

Goal 3 – Improve Surface Water Quality

Background

Two subwatersheds primarily cover the City of Madison: the Six Mile and Pheasant Branch Creeks within the Lake Mendota watershed; and the Yahara River and Lake Monona subwatershed. The Dane County Land and Water Resources Department has completed two priority watershed projects that affect Madison. The Lake Mendota priority watershed covers approximately 230 square miles in the Lower Rock River Basin and is comprised of the Yahara-Mendota and Six Mile-Pheasant Branch Creek watersheds. Pheasant Branch Creek, Dorn Creek, Six Mile Creek, Token Creek and the Yahara River are the five major Lake Mendota tributaries. Each suffers from non-point pollution.

Over 60 percent of the urban pollution problems in the Yahara River and Lake Monona Watershed originate from sources such as construction site erosion and stormwater runoff from streets and parking lots. These sources contribute sediment, bacteria, nutrients and metals to water bodies.

City Engineering, in conjunction with the Commission on the Environment, created a Clean Lakes report April 2006, which provides guidelines for working towards improving lake water quality over the next 15 years. Lake quality can be measured in several ways, depending on the

lake user's viewpoints. Total Phosphorus was chosen as the parameter for lake quality benchmark, as it can be controlled through erosion control practices and changes in agricultural and stormwater management practices. The benchmark chosen is the average Trophic State Index of Total Phosphorus for July and August each year. The Trophic State Index (TSI) is a number between 1 and 100, which indicates where a water body falls on a scale of biological activity. Trophic means the level of nutrients and biological activity in a water body. Phosphorus can directly affect other water quality parameters (clarity, algae, and weeds).

Public perception of lake water quality is usually dependent on visible parameters, including trash, algae, and weeds. If there is trash from storm sewers and weeds or algae blown to the shore, the perception will likely be that the lakes are in poor condition. So while obtaining low phosphorus levels is key to controlling weed and algae growth, keeping the shoreline clean is nearly as important for public perception of lake water quality.

The Yahara CLEAN MOU requires the city, Dane County, Wisconsin Department of Natural Resources, and Wisconsin Department of Agriculture, Trade and Consumer Protection to address nutrient and sediment runoff problems in the Yahara watershed. Practices to reduce nutrient and sediment runoff must be applied to both urban and rural lands within the watershed.

Water Quality Measures

Phosphorus. Total Phosphorus (TP) was chosen as a significant benchmark for the Lake Mendota Priority Watershed project. The Lake Mendota Priority Watershed Plan outlines goals for reducing Total Phosphorus loading into Lake Mendota, which in turn should reduce the frequency of algal blooms. These blooms may occur at phosphorus levels above 30 ppm and are common at levels higher than 50 ppm; levels that are typical in Dane County lakes. Phosphorus levels in the larger lakes forming the isthmus, Lakes Mendota and Monona, have increased since 2004 while the smaller lakes have remained relatively consistent. Phosphorus levels were sampled from the center of the lake. Goals were established for each land use.

The City of Madison is close to meeting the urban runoff goal for phosphorus. Tracking lake water quality through summer (July/August) average Total Phosphorus over several years will be an indicator as to whether or not these reduction goals will affect lake quality over time. The Clean Lakes report outlines ways the City of Madison can meet the urban runoff goals. The report is to be updated each year.

Madison has used as a water quality benchmark the average Trophic State Index of Total Phosphorus for July and August. The Trophic State Index (TSI) is a number between 1 and 100, which indicates where a water body falls on a scale of biological activity. The target for Lakes Mendota and Monona is to maintain a TP TSI of 70 or below. Lake Wingra should maintain a TP TSI level of 63 or below.

Many different outside factors can affect the TSI. For example, in years with higher than average rain, the levels of phosphorus may dramatically increase due to more runoff. In contrast, in drought years the Index may be very low. For this reason, it is important that this Index not be used as the only indicator of water quality. It is important to continue to monitor lakes with this method but to keep in mind that they can be affected by a variety of parameters.

The peaks in Mendota and Monona in 2005 may be explained by heavy late winter rainstorms. Water is unable to adequately infiltrate when the ground is frozen. In addition, there was a manure spill in the Mendota watershed which may have contributed a higher than average concentration of nutrients early in the year.

A goal is to keep the July and August TSI to 70 or below, as greater than 70 indicates a hyper-eutrophic status. It is not realistic to aim for a TSI below 50, as the area lakes are naturally eutrophic. Therefore, the target for Mendota and Monona should be to maintain a TP TSI of 70 or below. Lake Wingra is not influenced by agricultural practices, and so should maintain a lower TSI level -- 63 was chosen as a realistic goal.

The Lake Mendota Watershed is largely agricultural and the lake itself is used intensively for recreational purposes. Most of the lake's water quality problems are linked to current and past rural and urban runoff carrying sediment, nutrients and toxins. About 50 percent of the original wetlands in the watershed have been drained or filled.

The Yahara River and Lake Monona Priority Watershed Project covers approximately 100 square miles in the Lower Rock River Basin. Murphy's (Wingra) Creek, Nine Springs Creek, Starkweather Creek, Swan Creek and the Yahara River are the six major tributaries to the watershed. Starkweather, Murphy (Wingra) and Nine Springs Creek have poor habitat for fish and aquatic insects, low dissolved oxygen, low base flow, bank erosion and undesirable metals in streambed and lakebed sediments. Lakes Monona, Waubesa and Wingra suffer from nuisance algae and weed growth due to high phosphorous levels from stormwater runoff.

Chloride. Similar trends have been observed in chloride levels. Chloride levels have been consistently increasing over the past three decades in Dane County surface waters. Although average chloride levels in each of the sampled lakes do not yet pose an immediate risk these levels may impact the ecology of Dane County lakes. This is especially the case for Lake Wingra, which has consistently displayed higher chloride levels than any of the other Yahara chain of lakes.

Trash. Since 2008, the City of Madison Engineering Division has contracted with a local company to remove trash along the shoreline of Monona Bay monthly and after major storm events. The city continues to work with Dane County to fund a barge crew that collect bags of trash from private piers in order to support group cleanup efforts. In addition, storm sewer treatment devices that capture trash and sediment (mostly sand) are being installed more frequently in conjunction with street reconstruction projects and as independent projects along Monona Bay.

Vision:
Consistent with the Yahara Lakes Legacy Partnership, our vision is that surface waters are beloved assets to our communities. We are proud of its chain of beautiful, clean and healthy lakes. There is widespread recognition of the lakes' contributions to our region's economy and quality of life. The lakes provide benefits that outweigh the investment required to keep them clean and healthy. Creative partnerships among urban and rural dwellers, farmers, and other

business people, and the private and public sectors generate lasting results as we tackle shared challenges across the watershed.

Subgoals:

- Reduce phosphorus loading to lakes Mendota and Monona by 50% overall, and reduce total suspended solids by 40% compared to no controls by 2013.
- Implement beach clean-up plans so that all 6 beaches are removed from DNR impaired waters list.
- Assist with completion of Yahara Capital Lakes Environmental Assessment and Needs (CLEAN) Memorandum of Understanding -

  Develop a Vision; Model Existing Nutrient and Sediment Loadings; Assess Causes of Bacterial Outbreaks at Beaches; Develop Achievable Goals; Identify Needs to Meet Sediment Loading and Bacterial Reductions Goals; Advise and Communicate Progress to Madison Community Foundation on efforts to protect and improve Yahara lakes and identify future actions and costs; and finalize framework for long-term Yahara lakes "umbrella" group
- Reduce the likelihood of algal blooms on any given summer day from 50% to 20%.
- Preserve the lakes as a natural feature and protect the lake waters, shorelines and associated wetlands from development or activities that would increase lake pollution or adversely affect the lakes' spawning grounds, fish and other aquatic life.

Opportunities:

- Continued high level of attention and visibility for the Yahara Lakes

Threats:

-

Recommended actions to reduce the gap between the baseline and the vision:

- Implement Yahara CLEAN recommendations for nutrient, sediment and beach bacteria reduction at beaches and from urban and rural areas
- Expand the Yahara Lakes Legacy Partnership's work to address other issues such as invasive species and other pollutants
- Develop a community education program and incentives for residents, businesses and developers
- Create incentives for homeowners to install raingardens, turn asphalt driveways into permeable pavement
- Encourage homeowners to take advantage of existing programs like Plant Dane! through the Madison Area Municipal Storm Water Partnership.
- Sweep streets earlier in spring in order to capture sediment and attached pollutants before spring rainstorms carry them into surface waters. Establish a policy that streets must be swept as soon as daytime temperatures reach 40 degrees F or above in spring.
- Use high efficiency street sweepers
- Increase stormwater retention through streetscape improvements
- Continue to reduce salt use and work with surrounding communities to implement similar reductions

Possible actions from "Top Five Ideas" (move any up to "recommended"? Delete some?)

- Speedy approval process for building projects that meet certain standards for sustainable practices. Rewarding projects by reducing cost, time and uncertainty in the project approval process will be a valuable incentive. (TFI)
- We need to not penalize but reward positive actions of developers (For example if you provide a green roof on your project, we will give you park and recreation tax credits) (TFI)
- Create a series of demonstration projects that are visible and accessible to the public. Clustering the projects in small groupings will allow people to easily experience the benefits of sustainable practices. (TFI)
- City efforts lead by example but their influence is limited to the extent that their efforts are noticeable and their motivations understood. Conduct green building training to the public on topics such as integrated pest management, composting, sustainable agriculture, etc. through courses or seminars. In lieu of courses, provide material such as websites, local television programs, videos, printed material, etc. on green building topics. Educating the community on green building issues helps to filter local government commitment to public sector and ensures local industry is educated on techniques and benefits, and that they are acknowledged for their efforts. (TFI)
- Develop programs or practices that encourage and reward the "greening" of existing building stock. We have a lot invested in our current homes and buildings. Rather than rebuild, we should encourage adaptive reuse of existing properties. (TFI)
- Ban 2 cycle motors (TFI)
- Build all new and retrofit all old infrastructure (streets, sidewalks, parking lots, etc) to be green infrastructure – i.e. managing rainwater/storm water sustainability and with vegetation instead of pavement, all streets complete, etc (TFI) ***repeats***
- Reduce contaminated storm water runoff from streets, parking: (TFI) ***repeats***
- Switch from traditional parking lot flushing to modern recycled water cleaning method to keep contaminated water out of storm water sewers and the lakes. (Check new UW plans.) (TFI)

Resources:
Dane County Water Quality Plan
http://www.capitalarearpc.org/publications.htm

Yahara CLEAN and Yahara Lakes Legacy Partnership
www.yaharawatershed.org

Dane County Comprehensive Plan
http://www.daneplan.org

Dane County Lakes and Watershed Commission salt reduction recommendations
City of Madison Commission on the Environment/City Council salt reduction recommendations

Nonpoint Source Control Plan for the Lake Mendota Priority Watershed Project
http://www.countyofdane.com/lwrd/landconservation/papers/Lmw.pdf

Lake Monona Priority Watershed Project Plan

Prepared by the former Dane County Regional Planning Commission

Road salt use report
http://legistar.cityofmadison.com/attachments/6492.pdf

Madison Area Municipal Storm Water Partnership
http://danewaters.com/management/mamswap.aspx

City Engineering Rain Garden Initiatives
http://www.cityofmadison.com/engineering/stormwater/raingardens/

Plant Dane! – funding resources for rain gardens and native plants
www.myfairlakes.com

Dane County Shoreland and Riparian Management Report
http://www.danewaters.com/management/water_body_classification.aspx
http://www.danewaters.com/YaharaLakesLegacyPartnership.aspx

http://danedocs.countyofdane.com/webdocs/pdf/lwrd/lakes/Commitment_Status.pdf

City of Madison Policy for Stormwater and Improvement of Water Quality in Lakes Mendota, Monona and Wingra
http://legistar.cityofmadison.com/detailreport/?key=16536

Final Report Clean Lakes & Beaches: A Water Quality Plan – 2005
http://legistar.cityofmadison.com/detailreport/?key=2022

Madison Beach Closures for Water Quality Problems
http://www.publichealthmdc.com/publications/documents/2006RptCard.pdf

Average Summer Phosphorus Levels in Madison Lakes
http://www.publichealthmdc.com/publications/documents/2006RptCard.pdf

Mercury and PCB levels in fish
http://www.publichealthmdc.com/publications/documents/2006RptCard.pdf

City of Madison Comprehensive Plan
http://www.cityofmadison.com/planning/comp/plan.html

Madison measures 2008
http://www.cityofmadison.com/mayor/projects/docuements/MadisonMeasures-2008.pdf

Madison measures 2010
http://www.cityofmadison.com/mayor/projects/docuements/MadisonMeasures-2010.pdf

Goal 4 – Increase Water Conservation Efficiency

Background

Madison and Dane County have abundant supplies of water that, with proper management, planning and conservation, can ensure abundant water supplies for the future. Additional benefits of water conservation include:

- improved water quality
- reduced burden on surface water quality
- reduced greenhouse gas emissions (reduced water pumping)
- increased surface water flows (less groundwater withdrawn that feeds them)

Madison citizens use, on average, about 73 gallons of water per day (based on the five-year average of 2002 to 2006). To supply these needs, the City of Madison pumps between 20 million and 54 million gallons per day (gpd) (City of Madison Water Utility Data, 2007). Dane County pumps around 50 million gpd. When groundwater is pumped at a higher rate than it is recharged, drawdown occurs. Madison's water table has dropped ~50 feet from 1900-2000. The City expects an additional 20—40 foot drawdown within the next 30 years.

In Dane County, there is a cone of depression of about 30 feet in the deep aquifer (Mount Simon Formation), caused by municipal water use. Because of this substantial drawdown, the Wisconsin Groundwater Advisory Committee has warned it could designate Dane County as a Groundwater Management Area. In its 2006 report, the Groundwater Advisory Committee recommended that Dane County be listed as a Groundwater Attention Area, which is one step below a Groundwater Management Area.

One cause of groundwater drawdown in the Dane County area is the fact that the Madison Metropolitan Sewerage District (MMSD) discharges most of its effluent to Badfish Creek, which is outside the originating watershed of the city's drinking water. Groundwater drawdown occurs because groundwater is pumped from one watershed and discharged into another.

The City of Madison's annual pumping has remained steady at about 11.3 billion gallons per year for the past 10 years. The introduction of water-saving appliances coupled with the loss of high water demand industries has contributed to the reduction in the growth of consumption.

Groundwater drawdown has caused a decrease in baseflow for many of Madison's streams and shallow springs resulting in a flow reversal drawing lake water into the groundwater. As a result, at least 28 springs in the Lake Wingra watershed have dried up.

The City of Madison Water Utility has created a Water Conservation Plan as a guidance document to maintain the current annual rate of groundwater pumping, excepting growth in new areas, provided that the recharge rates in new areas are sustainable. In order to maintain the current pumping level, however, certain measures will need to be put in place to further reduce the per capita use. Consequently, a secondary objective is to reduce the residential per capita water use by 20% by the year 2020. In order to meet the 20% goal, each person would need to decrease their daily water use by about 15 gallons, which corresponds to a residential goal of 58 gallons per day.

<u>Residential</u>

Goal: Reduce per capita residential use of water by 20% by 2020.

The 55,000 residential accounts in the City of Madison far exceed the number of commercial, industrial and municipal accounts, though representing only 41% of metered sales. In the City of Madison, the residential average daily use per capita (indoor and outdoor) is about 73 gallons per day (the average residential customer (a 2.5 person household) uses 45 CCF every six months or ~184 gallons per day). By 2020, the City of Madison is expected to have over 245,000 residents, assuming a growth rate of 1.1%. Reducing per capita residential water use by 20% by 2020 would keep total residential water usage approximately equal to, or perhaps slightly less than, current rates. The daily average use would need to be about 58 gallons per person. This is the foundation for maintaining the current annual pumping rates, which is the overall City goal. By installing all high efficiency fixtures, the daily use would drop by ~35% to 45.3 gallons per person. Outdoor water conservation will likely have the biggest impact from the residential sector.

Commercial

Goal: Promote water conservation through rebate promotions and education

Commercial accounts refer to businesses as well as multi-family housing (more than 3 units). Conservation strategies for this group includes: targeted rebates (toilets, commercial dishwashers and laundry equipment), education, ordinances (carwashes, lawn sprinklers and landscaping), and a 'water-efficient' certification program.

Industrial

Goal: Develop a water conservation plan for each industrial customer

There are 23 industrial customers in the City of Madison that account for 10% of total water use. Although a small number of customers when compared to total city users, the opportunity for water savings is significant. Water conservation efforts fall into three major categories:

- reducing water usage
- reducing water loss
- reusing water currently being discarded.

Municipal

Goal: Governmental buildings shall enact water saving programs that support the main goal of maintaining sustainable pumping levels

The municipal division comprises the governmental entities of the City of Madison, Dane County, State of Wisconsin, and federal government. All buildings owned or leased by these government entities that are serviced by the City of Madison Water Utility will be included in the Water Conservation Program.

The most important section of the City of Madison is the Water Utility itself. The following are water saving programs that could be instituted at the Water Utility:

- Emphasize and expand the leak detection program
- Install low-flush toilets, low-flow showerheads, and sink aerators
- Quantify water use by utility through better record keeping

- Installation of meters in wells
- Hydrant flushing
- Well operation and maintenance
- Use of rain barrels/ rain gardens

Perform audits of all other governmental buildings served by the Water Utility. Ordinances and/or other legislation should be established to bring governmental buildings under a water efficiency standard.

Vision:
All buildings are designed and retrofitted so that occupants don't use more water than is regenerated; and what they do use in cleaned and reused. Water use and withdrawal is lower than recharge within the region.

Subgoals:
- At a minimum, maintain the current annual rate of groundwater pumping, based on an average of five years (2002-2006), while reducing residential per capita water use by 20% below current levels by the year 2020.
- Preferably, reduce the current annual rate of groundwater pumping, based on an average of five years (2002-2006), while reducing residential per capita water use by 35% below current levels by the year 2020.
- Ultimately, groundwater withdrawal rate not to exceed replenishment rate, including anticipated new population growth. .

Baseline:
In 2007 MWU pumped 11.392 billion gallons of water and used 22.287 million kilowatt hours (kWh) of electricity to pump that water. In 2007 it took an average of 1,956 kWh to pump 1 million gallons of water. A May 2004 Focus on Energy Report assigns a statewide emissions factor of 2.216 pounds of CO_2 per kWh. That equates to 4,334.5 pounds of CO_2 produced for every million gallons of water pumped.

Opportunities:
- Less expensive for the utility to invest in water efficiency than increased supply

Threats:
- Increasing population (600-800 households/year) creates a growing demand for groundwater. In addition to direct pumping of groundwater humans have also impacted aquifers by decreasing the surface area available for recharge. Severe drawdown in a deep aquifer may pull water out of shallow aquifers, which in turn can affect springs and surface water bodies.
- Most residents simply do not realize how much water they use at home or what they can do to reduce their consumption.
- Current health code regulations hinder adoption of many innovative reclaimed/reuse practices and/or technologies.

Recommended actions to reduce the gap between the baseline and the vision:

- Create an incentive program for individuals and businesses to use less water, including replacing or upgrading plumbing fixtures. Create a new toilet rebate program that would offer incentives to replace old, inefficient toilets with high-efficiency models
- Capture and filter hydrant flushing water
- Capture rainfall and stormwater runoff for non-potable water use to help ensure future supply, and to prevent pollutants from entering surface water
- Increase use of native plants that are adapted to local climate conditions and can withstand seasonal droughts.
- Implement grey water reuse systems.
- Implement a conservation rate structure with inclining rates based on different levels of water use (higher rate charge when water use exceeds a predetermined level)
- Perform residential water audits to analyze all water-using appliances and systems
- Require buildings to annually benchmark their water consumption using a free online tool provided by US EPA.
- Education and outreach. Work with SustainDane to publicize and promote the water conservation kits and rain barrels they provide. Promote the EPA's WaterSense labeling program. Locally promote 'Green*Plumbers'*, a national accreditation program that educates plumbers on new, water-saving techniques and general water conservation.
- Investigate the conversion of water meters to provide more frequent billing information (quarterly and potentially monthly billing). Convert current meters to "pulse" meters in buildings with significant water use and provide real time monitoring information to building users.
- Enact outdoor water usage restrictions to maintain pumpage below a preset daily amount

Possible actions from "Top Five Ideas" (move any up to "recommended"? Delete some?)

- We need to not penalize but reward positive actions of developers (For example if you provide a green roof on your project, we will give you park and recreation tax credits) (TFI)
- Make it simpler to provide proven alternatives to rigid code requirements, as long as safety is not compromised. For example, if you put in a bioretention area for your parking lot there should be an offset in your water bill for providing permeable surfaces. (TFI)

Resources:
Madison Water Utility
http://www.cityofmadison.com/water/sustainability/

Madison Water Utility toilet rebate program
http://www.cityofmadison.com/water/in theHome/toiletRebate.cfm

Madison Water Utility Conservation and Sustainability Plan (adopted by Common Council
http://legistar.cityofmadison.com/detailreport/Reports/Temp/1111200982839.pdf)
The plan can be found here:
http://www.cityofmadison.com/water/documents/ConservationPlan_71708.pdf

City of Madison Comprehensive Plan

http://www.cityofmadison.com/planning/comp/plan.html

Dane County Comprehensive Plan
http://www.daneplan.org

Goal 5 – Increase Solid Waste Diversion From Landfill

Background
Madison became the first city to start curbside recycling when it began collecting newspapers in 1968. Since then, the City of Madison has engaged over 97 percent of its residents to separate 18 items from their garbage and divert over 51 percent of its waste stream from the landfill. In 1999 Madison's solid waste diversion rate was 52.3 percent.

The City of Madison has established a goal of 65 percent landfill diversion for the year 2010. Streets staff believe that it will be possible to reach the goal by utilizing existing programs combined with an aggressive public education campaign aimed at waste reduction and increasing recycling. This educational effort may cost $50,000 to $60,000 per year, but would result in decreased landfill tipping fee costs. The overall expansion of existing recycling programs is therefore not expected to result in any significant cost increases and may actually reduce costs to the City.

Curbside Recycling
City of Madison Streets Division manages the collection of household refuse and yard waste for the Madison area. The City of Madison provides curbside collection of trash and recyclables to 62,000 households and approximately 500 small businesses. Larger multi-family and commercial buildings contract with private haulers. In 2005 the City began using an automated collection system for recycling. The refuse collection system was fully automated in 2007.

The Streets Division hauls its solid waste to the Dane County landfill, located at 7102 US Highways 12&18 on the city's southeast side. The county landfill has a projected life expectancy of 12 years and is expected to be available until 2015--2020. No other landfills are being considered as a successor to the Dane County Landfill at this time. There are closed landfills and underground storage tanks within the City limits. The Engineering Division serves as a warden of these facilities, protecting the adjacent residents and properties in compliance with environmental regulations.

From a county-wide perspective the amount of waste delivered to the Dane County landfill has increased by approximately 36% since 2000. Increases in materials that are recycled or reused were also reported during the past decade but still only compose an estimated 23% of the average waste produced.

Yard waste is composted at three different sites located in Madison, Westport, and Verona. Household refuse does not include recyclables, vehicle batteries, animal waste, and household hazardous waste. Recyclables are collected under a separate "Single Stream Recycling" program initiated in 2005. All recyclables, paper, cardboard, glass, plastic, and metal cans are mixed together and the mixed recyclables are separated at a special processing center. To process the recycled material, the City contracted with Recycle America Alliance (RAA). Given the capital costs involved for trucks and carts, this program is expected continue through 2015 without

significant change. Vehicle batteries are returned to battery dealers. Animal waste is to be flushed or buried in the home owner's yard. Household hazardous waste is disposed of at Clean Sweep, a disposal site for hazardous waste operated jointly by the City of Madison and Dane County.

Clean Sweep

The Dane County/City of Madison Household Hazardous Waste Collection Program is a collaborative effort between Public Health Madison & Dane County and Dane County Department of Public Works. The Dane County/City of Madison Clean Sweep Facility is located on the north end of the Dane County Highway Garage property at 2302 Fish Hatchery Road in Madison. The facility operates seasonally, receiving materials only during the months of May through October. Clean Sweep customers have requested that the program be expanded from a seasonal to a year-long operation. This would require the construction of a new facility, as the current facility is inadequately equipped to receive, store and ship waste in winter weather.

The program provides opportunities for City and County residents to safely dispose of hazardous waste. Fees collected in the form of tipping fees at the Dane County Landfill are the primary source of funding for the Dane County/City of Madison Clean Sweep Program with grants and user fees collected from business customers providing additional funding sources. The key financial facts from 2008 include:

- Net program costs totaled $355,829 in 2008, a 13% increase from 2007
- Waste disposal costs totaled $258,791 in 2008, a 12.6% increase from 2007 due to annual disposal cost increases and a larger volume of waste received

Overall, customer counts increased 24 % in 2008 (11,294), yet the total volume of waste received was only slightly larger than volumes seen in 2007. The volume of waste handled in 2008 was the most ever in the program's history. The program's rapid growth rate, growing fiscal demands, future funding uncertainties, and public expectations for expanded service levels present a real management challenge for Dane County and the City of Madison in coming years.

Since opening a permanent collection facility in 1993, the program has evolved to consist of four basic elements or service offerings. These services include:

- Household Hazardous Waste (HHW) collection services - Provides a permanent collection facility and satellite collection events offering free disposal of household hazardous waste to any household unit within Dane County.

- Agricultural Waste collection services - Helps farmers and agricultural businesses to dispose of unwanted, unused, damaged or banned hazardous chemicals, including pesticides.

- Very Small Quantity Generator (VSQG) waste collection services - Assists businesses that are very small quantity generators of hazardous waste by providing a convenient and cost-effective hazardous waste disposal alternative.

- Product Exchange - Facilitates reuse of paints, chemicals and other household products which are delivered to the collection facility in a useful condition.

In 2008, Clean Sweep managed 944,575 pounds of waste over 104 days of operation, averaging 9,082 pounds of waste per day, a slight increase over 2007. The Clean Sweep program served

5.30% of the estimated 212,919 households in Dane County in 2008, up from the 2007 estimate of 3.27%.

Zero Waste

Zero Waste is a philosophy and a design principle that includes recycling but goes beyond recycling by taking a 'whole system' approach to the flow of resources and waste through human society. The Zero Waste International Alliance broadly defines Zero Waste as:

> "A philosophy and visionary goal that emulates natural cycles, where all outputs are simply an input for another process. It means designing and managing materials and products to conserve and recover all resources and not destroy or bury them, and eliminate discharges to land, water or air that do not contribute productively to natural systems or the economy."

Unlike the current system of *managing* waste, Zero Waste seeks to *eliminate* waste wherever possible by encouraging a systems approach that avoids the creation of waste in the first place. A Zero Waste systems approach turns material outputs from one process into resources for other processes. The Zero Waste philosophy would move Madison towards a more sustainable future, minimize the need for landfills, reduce the production of green house gasses, and reduce other discharges to land, water, or air associated with waste. It involves planning for appropriate facilities, inclusion of recycling bins in all multi-family dwellings and commercial facilities, and attraction of industries that reuse, repair or recycle components of the solid waste stream back into nature or the marketplace.

The U.S. Environmental Protection Agency (EPA) has determined that "Source reduction and recycling can reduce greenhouse gas emissions at the manufacturing stage, increase forest carbon sequestration, and avoid landfill methane emissions." For every ton of waste buried in municipal solid waste landfills, about 71 tons of manufacturing, mining, oil and gas exploration, agricultural, coal combustion and other wastes are produced along the way. If materials are buried in a landfill or burned in an incinerator, industry must extract and process new virgin materials to make new products.

Food Waste

The Dane County landfill receives approximately 200,000 tons of material every year, of which 30,000 tons is food waste. Diverting food waste from business, schools, hospitals and homes to a digester would significantly extend the life of our current landfill and produce greater amounts of sustainable energy. In December 2009, Dane County announced it is launching a feasibility study to explore benefits and costs of converting waste food into biogas that could be combusted in generators and turned into electricity or converted into natural gas.

County staff is working closely with Madison as part of the city's current effort to evaluate how much food waste is generated within the city and the costs associated with collecting the food waste separate from other sources of waste. County staff will also work with other communities in the region to assess the feasibility of collecting their food waste for the digester.

Vision:

Madison and surrounding municipalities have eliminated waste and pollution in the production, use, storage, and recycling of materials.

Subgoals:

- City of Madison – 65% landfill diversion by the year 2010 with continued progress towards the goal of Zero Waste
- 70% recycling of construction, demolition, remodeling debris on construction projects
- Permit well-managed home composting in subdivisions and condominium plats.

Baseline:
EPA estimates the national average total recycling diversion rate is 32%. This number includes curbside recycling as outlined above, industrial recycling and other sources.

The City of Madison recycling and composting programs diverts over 57% of its waste from the landfill. In spite of that success, the Streets Division still sent 46,815 tons of waste to the landfill in 2007.

For reference:
Construction Waste must be diverted from landfills to the following levels:

Material	*Minimum Diverted (by weight)*
Metals	*95%*
Paper and Cardboard	*95%*
Soil, and biomass	*100%*
Rigid Foam, carpet & insulation	*90%*
All others – combined weighted average	*80%*

-Living Building Challenge V1.2 2007

Opportunities:
- Landfills placed on farmland permanently convert the land resource into a depository for waste, resulting in a loss of land for agricultural production
- Materials sent to landfill represent a waste of resources and transfer the liabilities associated with the disposal of these materials to future generations.
- While the diversion of materials from landfill disposal itself carries a cost, the cost of landfill disposal will continue to increase with no economic return, whereas the recapture of these materials can create new jobs in reuse, dismantling, recycling and composting industries in the City of Madison.

Threats:
- Expanding programs to reach Zero Waste goals requires additional funding. The collecting and composting of household food waste would have significant costs, requiring a third fleet of trucks the size of the present recycling fleet along with a third set of carts.
- Composting of organic materials may require the City to find funding to build and operate a composting facility

Recommended actions to reduce the gap between the baseline and the vision:
- Eliminate organics from going into landfills (food waste system, composting, etc)
- Encourage increased construction waste diversion
- City of Madison implements and expands its Zero Waste policy

- Continue to follow and participate in the Dane County food waste pilot and construct anaerobic digesters to capture energy from food waste and other organic food refuse.
- Develop sites for the storage of salvaged building materials
- Permit home composting in subdivisions and condominium plats
- Consider regulation of packaging in retail stores
- Partner with the nonprofit group RecycleBank to create a voluntary "weigh and remember" program to monitor diverson rates. The group has small devices that attach to curbside carts and can then weigh and remember the amount of recycling for households participating in this program. Give households incentives for increasing the amount of material recycled. Create a similar weigh and remember program for trash generated.
- Establish a municipal curbside pickup compost program to recycle organic matter into fertilizer for those electing not to compost at home.

Possible actions from "Top Five Ideas" (move any up to "recommended"? Delete some?)

- Ban bottled water (implications for transportation, emissions, fuel use, energy to produce bottles, waste). Reduce or eliminate bottled water in vending machines at city facilities.
- Promote fill stations (need description) in local educational establishments. Reestablish local water fountains (bubblers).
- Create markets for recycled materials (recycle fairs, green vendor expos, etc.) to help promote the use of recycled materials whenever possible.
- Significantly increase the percentage of local (source within 100 miles) construction materials used in new developments and redevelopments; both commercial and residential. Demonstrate this in public buildings (the new library!) Shoot for a goal of 50-75% locally sourced materials, including wood thinned from woodlots, trees that had to be cut down due to disease or structural instability in local parks and properties, excess product from local construction sites. We could set up an exchange/communication system so homeowners looking for "waste"/excess etc wood and other materials could find it. The ReStore is a great start, but there's a lot of useable material that never makes it there.(TFI)
- Publicly promote the City's zero waste policy at conferences, sporting events (e.g. Ironman, Camp Randall events), and community festivals. Develop waste management guidelines for the disposal of cups, bottles and organics that are part of these events.

Resources:
http://legistar.cityofmadison.com/detailreport/?key=10829http://legistar.cityofmadison.com/detailreport/?key=13638

http://www.danecountycleansweep.com/

City of Madison Comprehensive Plan
http://www.cityofmadison.com/planning/comp/plan.html

Dane County Comprehensive Plan
http://www.daneplan.org/

Goal 6 – Restore Habitat - landscaping/urban forests/invasives

Background

Madison is built among four lakes in an area of rolling topography with scattered woodlands and wetlands, and a downtown set on a narrow isthmus. It is centrally located within a growing metropolitan area. In 2004, the population of the City of Madison was estimated to be approximately 217,935. If Madison grows at a similar rate as it did over the last 15 years, a population of 228,154 can be expected in the year 2010, and 264,850 by 2030.

Hydrology

Madison is within the physiographic area referred to as the Yahara River Basin, a ground moraine area consisting of relatively flat or undulating glacial deposits formed by the glaciers from 10,000 to 20,000 years ago. The Yahara River Lakes – Mendota, Monona, Waubesa and Kegonsa – were formed about 10,000 years ago when the last glacier deposited a thick layer of glacial till on the landscape and dammed up the large pre-glacial Yahara River Valley. The Yahara Watershed – which is the land area draining to the lakes – covers 359 square miles of Dane County. The Yahara River begins just north of Dane County in Columbia County and flows south to connect the four lakes, finally joining the Rock River in Rock County. The Yahara Watershed includes some of the largest remaining wetlands in Dane County. Stream patterns in the Madison area have very low gradients. These are slow flowing streams that are usually adjoined by wetlands. Sand, silt, and muck are the predominant substrate.

Soils

Madison is in the area that was covered by the Laurentide Ice Sheet during the Wisconsin Glaciation. Most of the area is composed of sediment associated with the Horicon Member of the Holy Hill Formation. The soils formed in loess and the underlying sandy loam till, sand and gravel outwash, and stratified silt and clayey lacustrine deposits. There are areas of hydric soils, comprised of both organic material and mineral sediments, which constitute existing and former wetlands. Major management concerns have to do with erosion and sedimentation that affect water quality and long-term soil productivity. Agricultural and residential interests have significantly altered historical vegetation, and today, this landscape is primarily agricultural cropland. Remaining forests occupy only about 10 percent of the land area and they consist of maple-basswood, lowland hardwoods, and oak.

Climate

The climate in Madison and Dane County is humid continental. Prevailing weather patterns and winds from the west yield four distinct seasons with monthly average temperatures varying from 16.7 degrees in January to 71.4 degrees in July. The annual average precipitation is 31 inches; May through October has the highest rainfall total with 60 percent of the annual precipitation falling during this time period. Frost lasts from early December through late March or early April. Frost depth averages 18-30 inches.

Wetlands

In Madison, major wetlands areas are concentrated on the north side of Lake Mendota along the Yahara River and Six Mile Creek, around the perimeter of the Dane County Regional Airport, surrounding Lake Wingra, between Lake Waubesa and Lake Monona along Nine Springs Creek; and in an area south of Lake Waubesa. The far-east side of Madison bounded by US 151 to the north and I-94 to the west includes scattered areas of wetlands.

Threatened and Endangered Species and Habitats

Threatened and endangered species and habitats in the Madison area are identified through the Wisconsin Natural Heritage Inventory (NHI), a statewide inventory of known locations and conditions of rare and endangered species. The Six Mile-Pheasant Branch Creeks and Yahara River-Lake Monona Watersheds were used to identify Madison's threatened and endangered species. There are nearly 60 different threatened or endangered species and habitats living within the two ecosystems.

Environmental Corridors

The City's natural resources are primarily included within designated "environmental corridors". Environmental corridors are continuous systems of open space in urban and urbanizing areas, that include environmentally sensitive lands and natural resources requiring protection from disturbance and development, and lands needed for open space and recreation use. They are based mainly on drainage-ways and stream channels, floodplains, wetlands, steep slopes, and other resource features, and are part of a countywide system of continuous open space corridors. In Madison, environmental corridors also include lands of unique or valuable scenery or vegetation, wildlife habitat, and buffer areas that are needed between incompatible land uses. Madison's Cherokee Marsh Conservation Park is a part of the publicly owned portion of the private and publicly owned Cherokee Marsh Environmental Corridor. The corridors are also used as a basis or starting point for open space and recreation planning and acquisition.

During the last decade the total miles of bike paths/ trails in Dane County has more than doubled from approximately 86 miles in 2000 to 182 miles currently. These totals include City of Madison bike trails which grew from 32 miles in 2000 to 60 miles in 2009

Community Gardens

As of 2000, there were 24 community gardens operating in the greater Madison area. These garden sites contained approximately 1,600 individual plots and total 13.39 acres. Just over half the gardening sites were on publicly owned land, about one-quarter were on church property and one-quarter on privately held land.

Parks

The City assigns responsibility for parks to the Madison Park Commission, whose staff is a Division of the Department of Public Works. In addition to traditional parks services and facilities, the Parks Division is assigned the maintenance and operation of many other facilities and programs. The City of Madison Parks Division operates and maintains 260 parks and 6000 acres of public park areas and facilities, city forestry, median strips and greenways, Forest Hill Cemetery, Olbrich Botanical Gardens, Irwin A. And Robert D. Goodman Swimming Pool, 4 public golf courses, 13 public beaches, 18 reservable park shelters, Warner Park Community Recreation Center, public boat launches and boat storage/mooring facilities, dog parks, conservation parks, athletic facilities, and the downtown Mall/Concourse. This total excludes over 2,000 additional acres of parks, recreation areas and open spaces owned by other governmental units, the University of Wisconsin-Madison, Madison Area Technical College and public and private schools.

In Madison, classifications have been established for the smallest to the largest parkland type, with each park in a class providing similar recreation opportunities where feasible. There are also additional classifications which reflect a specific recreation opportunity or open space use.

Among these are playfield, conservation park, beach, golf course, general open space, parkway, ice arena, and other special facilities, such as a botanical complex and conservatory.

In 2002, the City of Madison adopted a Needs Assessment for Parkland, and adopted a park dedication and development impact fee ordinance to acquire that level of land and facilities to serve the population growth in new developments. Based on a population estimate of 228,154 in 2010, Madison needs to add 102 acres in these park categories, using a 2005 baseline. From 2005 to 2030 Madison should add 470 acres to serve the projected population of nearly 265,000.

In 2009, Madison was named a Tree City, USA for the 20th year. This award is given annually by the National Arbor Foundation in cooperation with the USDA Forest Service. Madison has repeatedly been awarded the Tree City, USA award due to the City's innovative urban forestry program. In 2007, 2,980 trees were planted and 2,149 trees required removal. In 2008, 1,968 trees were planted and 2,000 trees required removal. Parks' Forestry provides tree planting, trimming and maintenance for over 100,000 trees along Madison's 700 miles of city streets. In addition, the Forestry section is responsible for hundreds of thousands of trees that are located in the City's parks, golf courses, cemetery and greenways.

Neighborhood and Area Parks

These two park categories provide most of the local park needs within a half-mile radius of peoples' homes. In past plans, there was greater emphasis on providing neighborhood parks, but the emphasis has gradually shifted to favor area parks serving a half-mile radius with a wider variety of park features. These categories are expected to require an aggregate area of 1026 acres by 2010 and 1190 acres by 2030. The majority of the needed parklands can be acquired through a dedication requirement for subdivision approval or purchased by the City with funds obtained from fees charged land subdividers in lieu of land dedication. A Park Development Fee was adopted in 1992 and revised in 2002. The fee is paid by subdividers and is used to develop park facilities to serve their new developments.

Community Parks

Community parkland will total 978 acres in 2010. An additional 188 acres of new land will be needed by 2030. This acreage will largely be acquired in two new park locations, northeast and southeast.

Regional Park

A regional park, as defined by this Plan and past Madison Parks Plans, would serve all of Madison and Dane County. Although Dane County has several regional parks emphasizing natural areas, such as the Lake Farm Park-Nine Springs E-ay area at the edge of the city, a more central urban park is envisioned. It would be central, have extensive facilities, larger than our community parks, and would serve larger gatherings. Past plans have suggested that the combined ownerships of the Dane County Alliant Energy Center, Olin-Turville Park, Quann Park, and Goodman Park (formerly Franklin Field) could provide such a regional park site of 378 acres. Because regional parks, by definition, have a 30-50 mile service radius, they are more likely to be county or state owned.

Conservation Parks

In the late 1960s, the City of Madison began purchasing land in what is now Cherokee Marsh. Since formally establishing a Conservation Parks Program in 1971, the City has acquired and

manages over 1600 acres of conservation parkland. And now has 14 conservation parks. A conservation park differs in how it is managed and the purpose for which the land was acquired. The goal of the conservation park is to restore native plant and animal communities while providing education areas and opportunities for everyone.

Although there is no set combination of characteristics common to all conservation areas, most exhibit one or more of the following attributes:

- Unique plant communities, wildlife populations, geological formations, or historical sites.
- A critical ecological function, such as protecting surface or ground water quality and supply.
- Relatively undisturbed example of native biological communities.
- Location and features suitable for outdoor education programs.
- Outstanding aesthetic qualities.

To protect natural areas, visitors to the conservation park are asked to observe the following rules.

- All plants and animals are protected. Disturbance or removal requires written permission.
- Users may use designated trails only.
- Hunting, trapping and possession of firearms are prohibited.
- Bicycles and motor vehicles are restricted to entrance roads and parking lots.
- Dogs and horses are not allowed.
- Fires, picnics and alcoholic beverages are prohibited.
- Park hours are 4 a.m. until one hour after sunset.

Dog Parks

Off-leash parks:

- Brittingham Park, 401 West Shore Dr at Broom Street
- Quann Park, 1802 Expo Drive
- Sycamore Park 4517 Sycamore Park
- Warner Park, Sheridan Drive along lagoon at boat launch auxiliary parking lot

On-leash parks

- Brittingham Park, 401 West Shore Dr from Bedford to Bassett Streets
- Elver Park, 1240 McKenna Blvd.
- Demetral Park, 601 N. Sixth Street
- Hoyt Park, 3902 Regent Street along Owen Parkway
- Marlborough Park, 222 Whenona Drive
- Quarry Park, 3102 Stevens Street
- Spring Harbor Park, 5218 Lake Mendota Dr. - eastern portion
- Warner Park, 2201 Sheridan Drive, along paths and roadways only
- Yahara Parkway, 1801 E. Johnson Street, including Burr Jones Field
- Burr Jones Field, 1820 E. Washington Ave.
- Glen Oak Hills Park, 301 Glen Highway

There are areas of the city that are deficient in neighborhood park and area park space due to their long distance from existing parks. Some areas may have an adequate number of parks and

most of the necessary facilities, but still be inadequate in acreage, as noted above. Many of the deficient areas are in the central city where the land available is very limited and where redevelopment is occurring at higher densities.

Beaches

The City of Madison Parks Division has 13 beaches, 10 of which have lifeguard services. The Public Health Department monitors the daily condition of the beaches. There is a strong correlation between waterfowl populations and beach closings due to high bacteria counts. Feeding them only encourages them to stay near the beaches. Dogs are not allowed at any of the Madison beaches.

Regional beaches:
BB Clarke Beach, 835 Spaight Street
Olbrich Beach, 3527 Atwood Avenue
Tenney Beach, 1254 Sherman Avenue
Vilas Beach, 1339 Vilas Park Drive

Neighborhood beaches:
Bernie's Beach, 901 Gilson Street
Esther Beach, 2802 Waunona Way
Spring Harbor Beach, 1918 Norman Way
James Madison Beach, 1155 Olin-Turville Court
Warner Beach, 1101 Woodward Drive

Six Madison beaches are on the DNR's impaired waters list. Lake Monona impaired beaches: Bernie's, Brittingham, Esther Park, Olbrich Park, and Olin Park. There is one impaired beach on Lake Wingra: Vilas. These beaches are the focus of Yahara CLEAN efforts to reduce beach bacteria. Clean-up plans are being developed for each beach.

Brownfields

A data base complied by the City of Madison in conjunction with the Wisconsin Department of Natural Resources Bureau for Remediation and Redevelopment Tracking System (BRRTS) data base identifies 643 contaminated sites in the City of Madison. These sites are located throughout the City but are concentrated in three primary locations:

- Isthmus
- North Side (Northport Drive/Packers Avenue/Sherman Avenue) and the
- East Rail Corridor

Contaminated sites fall into the following categories:

- LUST = 576 sites (A leaking underground storage tank that has contaminated soil and/or groundwater with petroleum.)
- ERP = 67 sites (Environmental Repair Sites are sites other than LUSTs that have contaminated soil and/or groundwater.)

The City's contaminated sites database sorts the sites into one of nine geographical locations in the City.

Peripheral Area Lands

In response to sustained City and regional growth in recent decades, in 1990 the City of Madison adopted the Peripheral Area Development Plan. The City Plan Commission and Common Council adopted the Peripheral Area Development Plan (PADP) in 1990 as an element of the City's Master Plan. The Plan addresses both the need to plan for the continued orderly expansion of the City's urban area and the concern for preserving open spaces. The PADP provides the City of Madison's recommendations for land use and development in the peripheral areas beyond Madison's urban edge. The PADP includes a map that assigns peripheral area lands to one of five district classifications. A set of specific planning policies is also recommended for each of the five districts. Of the five district classifications, two discourage urban development and encourage preservation of land resources.

Permanent Open Space Districts

Permanent Open Space Districts are the recommended highest priority locations for open space preservation in the Madison peripheral area. These areas represent target locations for the permanent preservation of relatively large open space corridors. Urban development is not recommended either in the near or long term, even if the urbanized area grows much larger.

Selection of these areas was based on the principle that City and regional preservation efforts should concentrate first on those lands with special characteristics or features that make them particularly desirable or important for permanent protection in open space uses. Some of the factors considered in the evaluation are environmental protection, preservation of unique natural features, the potential for public recreational use, scenic quality, and opportunities to define an urban edge and maintain visual separation between urban communities.

The Plan recommends that detailed open space preservation plans be prepared for the Permanent Open Space Districts. These plans should specify exactly what lands should be preserved and how they should be preserved. A variety of alternative methods of open space preservation are possible, ranging from pure regulation to outright public purchase.

Agriculture/Rural Use Districts

This classification identifies lands near the edge of the peripheral area where continuation of essentially agricultural uses is recommended well beyond the long-term planning period. Concerns with urban development in rural areas include loss of agricultural land, groundwater contamination, maintaining the distinct identity of rural communities, and preservation of the scenic qualities of the rural countryside. Although considerable development has already occurred in some of these areas, additional development must be minimized if they are not to become little more than low-density suburbs with very low service levels.

Aquatic and Terrestrial Invasive Species

Aquatic invasive species (AIS) are a serious ecological and economic threat to Dane County waters. Several AIS, such as Eurasian water-milfoil, curly-leaf pondweed, rusty crayfish, spiny water fleas, Cylindrospermopsis, and common carp, are already present in Dane County waters. Other AIS, such as silver and bighead carp, hydrilla or quagga mussels, that are already in Wisconsin or surrounding states could invade Dane County waters in the future. To combat the economic and ecological problems caused by existing AIS and potential future threats, the Dane County Office of Lakes and Watersheds developed an Aquatic Invasive Species Prevention and Control Plan in June 2009 that was subsequently adopted by the Dane County Lakes and Watershed Commission and approved for funding by the Wisconsin DNR. The plan provides a

proactive response to addressing the problems caused by AIS. It is countywide in scope. The plan includes all rivers, lakes and wetlands and involves the county working together with stakeholder groups, surrounding counties and the state to prevent the introduction and transport of AIS into Dane County waters, and transport of AIS from Dane County to waters in other counties.

Purple loosestrife, buckthorn, and garlic mustard are among the terrestrial invasive species that cause problems for native plant communities, and poses a constant need for management attention in city natural resources parks.

Vision:
Madison is a network of compact, connected communities interlaced with a system of parks, natural resources with quality native plants and restorations and reduced impacts from invasive species, and recreational opportunities that enhance the quality of life for everyone.

Subgoals:

- Preserve and expand urban forest resources through a well-planned and systematic approach to tree maintenance, planting and natural area management. (Indicator: percentage of tree canopy cover).
- Develop a centrally located urban Regional Park.
- Use natural open space as a framework for enhancing other land uses, linking all parks and open spaces to the maximum extent possible.
- Integrate the park and open space system with the bike trail system and with the stormwater management system to expand trail recreation and nature study opportunities.
- Preserve open space at the City's permanent edge by utilizing intergovernmental plans, agreements and natural environmental corridors.
- Prevent additional invasive species from arriving, and control those already present.
- Redesign streetscapes and other built open spaces to incorporate non-traditional green space to create more open space.
- Identify and restore additional degraded wetlands.

Baseline:
The City of Madison Parks and Open Space Plan inventories the existing park and open space lands annually.

For reference:
Projects may only be built on previously developed sites, either greyfield or brownfield. For each acre of development, an equal amount of land must be set aside as part of a habitat exchange.

-Living Building Challenge V1.2 2007

Opportunities:

- Current interest in rain gardens established by individuals, public and private organizations continues to grow. Through resident action and Madison's rain garden streets, there are now many more native plantings within the city. This interest can be

expanded into shoreline property owners restoring lands adjacent to the water with native buffers to trap soil carried in runoff
- Volunteer-based community park stewardship program to promote and strengthen community participation.
- Golf course greening program. Achieve Audubon Cooperative Sanctuary certification for all golf courses.
- Regulatory protection of private open space (Open Space Overlay Protection Zone)

Threats:
- Parks deficiency will continue to worsen in the central city if additional land is not secured for park space.
- Negative effects on the lakes of storm water runoff originating within the City of Madison.
- Barriers to invasives control:
    - Lack of staff and volunteers
    - Behavior change is difficult

Recommended actions to reduce the gap between the baseline and the vision:
- Develop a comprehensive urban tree program, including a tree preservation ordinance, and promote tree planting by area residents to complement municipal planting
- Use a 10-minute walking time as measure of accessibility to open space and recreation
- Redesign streetscapes and other built open spaces to incorporate non-traditional green space to create more open space
- Encourage volunteers to care for parks and facilities (model: Janesville Rotary Gardens)
- Rewrite city ordinances for new developments to increase urban habitat (tied to parking).
- Encourage development of green roofs (butterflies, bees, birds – studies on how they're increased; microorganisms in soils)
- Maximize the amount of protected lake shoreline through purchase, easement, zoning or other means as the property becomes available.
- Preserve from development stream valleys, marshes, prairies, woodlands, and scenic and historic areas by including these areas in the park and open space system when possible.
- Ensure preservation of existing school playgrounds within deficient areas. The City has no rights to school sites and may have to acquire land if schools close. The City should continue to work with Madison and other School Districts to develop joint sites with a guarantee that the open space will always remain open as parkland.
- Develop multipurpose recreation trails in park deficient areas.
- Amend the subdivision ordinance to require that developers include public access easements for multiuse trail purposes (i.e. "trail easement"), contiguous to or co-located with other required easements or buffers where possible.
- Encourage the County and State to provide parks and open space facilities near urban areas, especially when a number of political jurisdictions would make use of the facilities.
- Encourage nonprofit groups, local companies and other organizations to take ownership and become involved in the care and maintenance of the City's neighborhood parks and facilities.

- Work with the school districts in Madison and adjacent communities to provide joint school-park sites and programs wherever possible.
- Seek the cooperation of neighboring municipalities, Dane County and regional planning bodies for joint planning for permanent preservation of open spaces of regional significance.
- Adopt and enforce zoning code, land division ordinance and other regulations that protect from development environmental corridors and the natural resource features of which they are comprised, such as lakeshores, hilltops, and significant wooded areas.
- Incorporate natural and environmentally sensitive areas into the design of parks, open space corridors and recreation facilities.
- Ensure accessibility and connectivity of open spaces by: 1.) limiting walking distance to an open space to a maximum of 10 minutes; 2.) expanding usable park hours, and 3.) utilizing non-traditional open space areas (e.g. drainage ways) as greenway connectors.

Possible actions from "Top Five Ideas" (move any up to "recommended"? Delete some?)

- Significantly increase restored natural habitat along waterways, on both public and private property. Strive for habitat elements to support aquatic life, birds (not geese!), etc. Establish demonstration sites on public property. Support, with guidance and incentives, private landowners in participating. Restore wetlands adjacent to waterways as part of this. (TFI)
- The City of Madison should develop a goal of having the most comprehensive urban tree program in the country focusing on carbon emission reductions and sequestration. The city currently does a good job with an urban forestry program focused on more traditional goals, but we could be leaders in managing the entire urban forest cycle, including diverting urban wood wastes to energy production (such as the proposed biomass boilers at the UW's Charter Street Heating Plant), diverting leaves to dry anaerobic digesters or compost, and planting more trees for their urban heat island cooling and carbon sequestration benefit (as opposed to current policy of increasing the spacing of trees and the planting of fewer canopy trees). (TFI)(this is also in air category for now) ***repeats***

Resources:

Dane County Parks and Open Space Plan
http://www.countyofdane.com/lwrd/parks/planning.aspx

Dane County Wetlands Mitigation Guide
http://danedocs.countyofdane.com/webdocs/PDF/capd/Wetland_Guide_web.pdf

Dane County Comprehensive Plan
http://www.daneplan.org/

Yahara Lakes Legacy Partnership and Yahara CLEAN
www.yaharawatershed.org

Dane County Shoreland and Riparian Management Report
http://danewaters.com/management/water_body_classification.aspx

Dane County Aquatic Invasive Species Prevention and Control Plan

http://www.danewaters.com/resource/InvasiveSpecies.aspx

Nonpoint Source Control Plan for the Lake Mendota Priority Watershed Project
http://www.countyofdane.com/lwrd/landconservation/papers/Lmw.pdf

Lake Monona Priority Watershed Project Plan
Prepared by the former Dane County Regional Planning Commission

Madison's rain garden streets
http://www.cityofmadison.com/engineering/stormwater/raingardens/

Plant Dane! Program
http://www.myfairlakes.com/plantDane.aspx

Goal 7 – Improve Stormwater Management

Background

Stormwater Quality

The City of Madison's Engineering Division has been tasked with meeting the requirements of NR-151 of the Wisconsin Administrative Code. NR-151 requires that the City reduce total suspended solids (TSS) from existing urban areas by 20% by 2008 and 40% by 2013. As of October 2007 the best estimate was that the City had achieved a TSS reduction of 23%. If the goal is met, not only will the City meets its statutory requirement but it will also provide for a cleaner (less sediment) lake environment.

TSS reduction can be accomplished in many ways including street sweeping, retention ponds, greenways, proprietary devices and catch basin cleaning. It is anticipated that the methods to meet the 40% goal will require expansion of the weekly street sweeping program to other downtown areas. Further, a program to require street sweeping of private parking lots may be proposed. The Streets Division performs street sweeping to minimize street debris and to ensure attractive and safe driving surfaces. Street sweeping also reduces the water-borne particulates in storm water run-off, which impacts the quality of area lakes and other surface water. All streets get swept at least once per month. Heavily trafficked streets and streets within the Clean Streets/Clean Lakes area are swept weekly. The annual increase in material swept can be explained by increases to the miles of streets due to City expansion.

Stormwater Quantity

Lake level management has become increasingly controversial in recent years. Climate change has resulted in more frequent storm events. Flood damage has occurred more frequently. One part of the solution to these issues is to increase infiltration and reduce runoff to the lakes. Madison has paved over historic wetlands, and many residences have been built in low areas that would not be permitted today, thereby increasing the risk of those properties to flood damage.

Less replenishment of area aquifers, along with groundwater drawdown has caused a decrease in baseflow for many of Madison's streams and shallow springs, especially around Starkweather Creek and Lake Wingra. Prior to groundwater pumping, it is believed that groundwater flowed

into the Madison area lakes, but in some locations it now appears that this flow has reversed, drawing lake water into the groundwater (WDNR, 1997). As a result, research has shown that at least 28 springs in the Lake Wingra watershed have dried up.

Vision:
All storm water and building water discharge is used onsite to increase infiltration and reduce dependence on potable water, and reduce erosion and pollution of surface waters.

Subgoals:
- Restore balance Madison's water budget: involves withdrawals, runoff, water reuse, water conservation
- Increase infiltration and reduce pavement

Baseline:
Percentage Reduction in Total Suspended Solids (TSS). The NR-151 of the Wisconsin Administrative Code requires the reduction total suspended solids (TSS) from existing urban areas by 20% by 2008 and 40% by 2013. The TSS target of 40% was chosen by the WDNR as the highest standard that could in any reasonable way be met by existing urban areas with current technology.

TSS is used as the benchmark as it is required by NR-151. This is deemed an appropriate benchmark for urban areas as TSS--and to a greater extent Suspended Solids Concentration (SSC)--are the only pollutants that can be reasonably modeled and treated. The City's progress toward meeting the TSS goal is to be estimated using the Source Loading Area Management Model (SLAMM) computer model as run by Engineering Division staff. This model is currently supported by the WDNR and represents the best available technology to estimate loads of this type in a large geographic area.

For reference:
100 percent of storm water and building water discharge must be handled on-site.

-Living Building Challenge V1.2 2007

Opportunities:
- Growing interest in having water management mimicking nature; and in the culture of water as a resource prevailing over the culture of water as a nuisance.

Threats:
- Land development increases the amount of impervious surfaces, such as roofs and pavement, which contributes to flooding and surface water pollution

Recommended actions to reduce the gap between the baseline and the vision:
- Increase enforcement presence so that there is 100% compliance with existing erosion control and stormwater management requirements.
- Inspect all permanent stormwater management facilities to assure continued compliance and function
- Provide developer incentives to increase onsite stormwater detention

- Implement the CARPC Technical Advisory Committee recommendation to adopt more stringent stormwater runoff volume control standards than the one currently required under NR 151 and Dane County Chapter 14. TAC recommendation: adopt a runoff volume control standard based on the infiltration standard in Chapter 14 of the Dane County Ordinances. This would have both water quality and quantity benefits
- Go beyond the proposed NR 151 standard of 50% reduction in TSS from parking lots and roads and achieve a 60-70% reduction
- Require stricter erosion control standards for developments occurring on high phosphorus soils (e.g. requiring immediate seeding of soil stockpiles on site).
- Infiltrate storm water on public lands as a public demonstration of their effectiveness and inspire expanded use.
- Promote development of "green streets" (more permeable and that handle stormwater nearby). The City of Portland, for example, has replaced parking with rain gardens, narrowed streets and created zones of permeability. The City of Minneapolis has removed off street parking in favor of more street parking. Promote permeable asphalt.
- Provide homeowner incentives to redirect roof downspout discharges to pervious surface areas.
- Day light streams and provide natural drainage and infiltration that more closely mimics natural systems. Promote infiltration and replenish
- Consider implementation of a stormwater utility fee (Minneapolis). Based on estimated runoff generated and discharged to City's system from each property, rebates are available for actions undertaken to reduce impervious areas.
- Revise city ordinances to reduce permitted stormwater volume.
- Develop a walking or biking tour of innovative stormwater management practices
- Increase use of pervious materials
- Create micro subsurface retention ponds
- Promote more Odana golf course type facilities to increase infiltration and aquifer replenishment.

Possible actions from "Top Five Ideas" (move any up to "recommended"? Delete some?)

- Commitment to reducing urban and rural storm water runoff to improve the quality of our lakes. Would include incentives for having infiltration, permeable paving, etc. on development projects. (TFI) ***repeats***
- Provide rain barrels to residents in a program similar to recycle bin sales, so that there is a reduction in pollution runoff as well as water conservation. (TFI)
- Significantly increase infiltration in existing and new developments (beyond current standards), in order to recharge aquifers and reduce runoff. Encourage homeowners to direct downspouts to pervious areas. Require new developments to meet more stringent infiltration requirements. Madison can help reduce lake level fluctuation concerns by sending less water to the Yahara lakes. (TFI) ***repeats***
- City of Madison, working with Dane County, Madison Area Builders Association, and other municipalities should provide short courses, workshops, and other programs for installers of infiltration devices, to ensure effective practices. Audiences should include landscapers and installers.
- Establish an inspection program to require and enforce "as-built certification" of installed infiltration devices (e.g., letters of credit cannot be released until certification is provided). ***repeats***

Resources:
Dane County Comprehensive Plan
http://www.daneplan.org

Madison measures 2008
http://www.cityofmadison.com/mayor/projects/docuements/MadisonMeasures-2008.pdf

Madison measures 2010
http://www.cityofmadison.com/mayor/projects/docuements/MadisonMeasures-2010.pdf

Report of the Stormwater Infiltration Task Force of the Dane County Lakes and Watershed Commission, July 6, 2006
www.danewaters.com/pdf/2006StormwaterReport.pdf

Dane County Natural Hazard Mitigation Plan
http://www.countyofdane.com/emergency/mitigation_plan.aspx

Nonpoint Source Control Plan for the Lake Mendota Priority Watershed Project
http://www.countyofdane.com/lwrd/landconservation/papers/Lmw.pdf

Lake Monona Priority Watershed Project Plan
Prepared by the former Dane County Regional Planning Commission

Yahara Lakes Legacy Partnership and Yahara CLEAN
www.yaharawatershed.org

RECOMMENDATIONS FOR OTHER DOCUMENT COMPONENTS

For insertion in Energy & Climate:
In 2007 MWU pumped 11.392 billion gallons of water and used 22.287 million kilowatt hours (kWh) of electricity to pump that water. In 2007 it took an average of 1,956 kWh to pump 1 million gallons of water. A Focus on Energy Report from May 2004 assigns a statewide emissions factor of 2.216 pounds of CO2 produced per kWh. That equates to 4,334.5 pounds of CO2 produced for every million gallons of water pumped.

In 2007 the Madison Water Utility enrolled in the Green Power Tomorrow program with MG&E and purchased 2,265,900 kWh of Green Power Tomorrow electricity. The purchase offset electricity use at an annual cost of $22,659. The annual offset of CO_2 was 5,021,234 pounds. The conservation benefits attributable to this translate to: for every 1million gallons of water that the utility avoids pumping, the result would be a savings of $187.79 in 2007 dollars, and the prevention of 4,334.50 pounds of CO_2 being put into the air.