5. Goals and Objectives

The WMA developed the following set of goals and objectives through a series of meetings during the summer of 2014. The goals were developed based on input received from area residents during listening sessions held around the watershed and were built around an understanding of the watershed formed by the assessment work described in earlier chapters of the plan.

5.1. Increase people's awareness and understanding of the individual connections and efforts within the watershed

Two elements of this goal are to raise awareness of watershed issues AND for that awareness to be translated into action. Residents, businesses and landowners will become familiar with the concept of what a watershed is and will understand how land uses and practices within the watershed effects streams.

Increasing awareness of watershed issues; namely, how our actions on the land affect the character of our waters, is a fundamental goal of the watershed management plan. Creating an informed community and empowering residents to become stewards of the watershed is the foundation of a successful watershed management organization. The ability to affect change within a watershed is most powerful when it originates from local residents.

While the planning process began to introduce the concepts of watershed management to local officials and residents in the area, there is still a need to increase the basic understanding of watershed dynamics. This begins with the basic concept that, while the creeks in the area are severely degraded they do present an opportunity to be a valuable asset to the community. Without this core understanding, it is difficult to convince people that action is needed. Building on this concept, the next step is to make the connection between the actions we take and the affect those actions have to the creeks. Finally, it is critical to illustrate that there are things that can be done in the watershed to improve the quality of the creeks.

Education/Outreach Objectives

Objective 1.1 Conduct an on-going marketing campaign to raise awareness of watershed problems, causes, possible remedies, opportunities, organization goals, and cooperative initiatives being undertaken

Objective 1.2 Develop a watershed stewardship ethic among landowners, producers and managers, business owners, residents and local government

Objective 1.3 Enhance awareness of recreation activities and opportunities along the creek

Water Quality Objectives

Objective 2.1 Achieve a 29% reduction in Total Phosphorus based on the Iowa Nutrient Reduction Strategy

Objective 2.2 Achieve a 41% reduction in Nitrogen based on the Iowa Nutrient Reduction Strategy

Objective 2.3 Meet the Iowa E. Coli bacteria Standard

Objective 2.4 Determine existing turbidity levels and develop goal for improving turbidity and clarity within the streams of the watershed

Objective 2.5 Monitor the condition of water quality in the watershed to detect trends and to evaluate the success of watershed management activities

5.2. Improve water quality in the watershed.

Ultimately the goal is to improve water quality in the watershed so the streams can be safely used by residents and visitors. The main water quality constituents of concern are fecal bacteria, sediments and nutrients which lead to algal blooms. Improving water quality within Squaw Creek is the cornerstone of the watershed management plan. The WMA developed several specific objectives by which they will measure progress towards achieving this goal. The implementation portion of the watershed management plan contains a detailed strategy for meeting these objectives.

The rationale behind the specific numerical objectives for this goal is based on observed conditions (monitoring data) from the watershed and either the Iowa Chapter 61 Water Quality Standards or the specific reduction level identified in the Iowa Nutrient Reduction Strategy.

For phosphorus the objective is to achieve a 29% reduction in phosphorus loading from the watershed. This level of reduction is based on the Iowa Nutrient Reduction Strategy which establishes this as the goal for non-point source (watershed) load for the state. The outcome of this load reduction in terms of water quality in the creek can be estimated using the average existing concentration of total phosphorus in Squaw Creek at the monitoring station at Lincoln Way in Ames which is ~ 300 µg/. The 29% reduction in watershed phosphorus loading would result in an in-stream TP concentration of approximately 213 µg/. A comparison of that resultant concentration with alternative standards is shown in Table 5-1.

For nitrogen the objective is to achieve a 41% reduction in phosphorus loading from the watershed. This level of reduction is also based on the Iowa Nutrient Reduction Strategy which establishes this as the goal for non-point source (watershed) load for the state. The outcome of this load reduction in terms of water quality in the creek can be estimated using the average existing concentration of nitrate-nitrogen in Squaw Creek at the monitoring station at Lincoln Way in Ames which is 6.8 mg/. The 41% reduction in watershed loading would result in an in-stream nitrate-

nitrogen concentration of approximately 3.8 mg/. A comparison of that resultant concentration with alternative standards is shown in Table 5-1.

For *E. coli* bacteria the objective is to meet the Iowa Chapter 61 Water Quality Standard of 126 organisms/100ml expressed as the geometric mean of growing season measurements. This is a public health based standard and accordingly applies to all streams that have recreational use or simply have human contact.

Turbidity measurements have not been taken to an adequate level in Squaw Creek to allow for a concrete determination of existing conditions. Transparency measurements have been collected historically but a correlation to turbidity is not available. There is not a state standard or a reduction strategy developed for turbidity at this time. As a consequence, the objective for turbidity is to determine the existing levels and develop a goal or improvement (existing turbidity levels are assumed to be high based on visual observation).

The specific objectives were developed through discussion with the WMA Board members. Several alternative objectives representing a range of standards were considered. The State Standards and Nutrient Reduction Strategies were selected as the most reasonable, defensible levels. The range of standards that were considered for phosphorus and nitrogen are shown in Table 5-1.

Table 5-1 Range of Standards/Criteria for Nutrients

Existing Condition @ USGS Gage Lincoln Way		Iowa Nutrient Reduction Strategy	MN State Standard	EPA Ecoregion 25th percentile	Draft Iowa State Criteria	EPA Ecoregion Average
Phosphorous	300 µg/L	213 µg/L	150 µg/L	118 µg/L	100 µg/L	76 µg/L
Nitrogen	6.5 mg/L	3.8 mg/L	NA	3.3 mg/L	NA	2.18 mg/L

A monitoring plan has been developed for the watershed and can be found in Section 7 Monitoring Plan. The plan will allow the WMA to evaluate trends in water quality and to assess the effectiveness of their efforts.

5.3. Reduce the effects associated with altered hydrology (heavy flows, diminished base flow) within the watershed.

The goal is to restore a more natural flow regime (magnitude, frequency, duration, timing/seasonality & rate of change) by reducing hardscape/urban connectivity, storing water in appropriate places within the watershed and increasing shallow groundwater recharge. Restored hydrology will result in less erosive, destructive flows within the stream and will increase the natural base-flow within the stream during times of draught. Property loss due to erosion and sedimentation will also be reduced.

This WMA goal focuses on addressing heavy flows and diminished base flows that occur in the stream because these are the conditions that limit recreational use of the creek, diminish aquatic habitat, and cause property damage.

The goal is to restore a more natural flow regime. In general terms, natural hydrologic systems display less extreme conditions than those of altered watersheds. Altered hydrologic systems are typically described as "flashy". Streams respond very quickly and dramatically to storm events. Even minor storms cause increases in stream flow. Watersheds with natural hydrology have more tempered responses to storm events. In a natural watershed rainfall typically soaks into the ground, is stored within the soil and is taken up by vegetation rather than being shed off the land and into the stream. As a result, more water moves within the soil either moving vertically into the groundwater aquifer or flowing laterally to slowly contribute base flow to the stream.

While quantifiable objectives have not been developed, the following describes the desired changes in hydrologic conditions for the watershed.

The magnitude of high flow rates will be lessened over time. Magnitude refers to the maximum flow rate within the stream. While we have no control over the severity of rains, the stream response to a given storm event is a function of the health of the watershed. Reducing the magnitude of streamflows is important as these flows result in the most

Hydrology Objectives

Objective 3.1 The watershed will continue to provide ample clean water to replenish local aquifer/drinking water supplies.

Objective 3.2 Critical groundwater recharge areas within the watershed will be identified and protected

Objective 3.3 Peak streamflow rates resulting from small, common rainfall events (2 year peak discharge rates) will be reduced from current conditions

Objective 3.4 Peak streamflow rates resulting from large rainfall events (100-year peak discharge rates) will be reduced from current conditions

Objective 3.5 Shallow groundwater recharge of streams in the watershed will be increased

Objective 3.6 Restore hydrology and consistent baseflow to the creek and its tributaries

damage to streambanks and the greatest threat to property.

It is common practice to use the 100 year storm event when evaluating "large" storm events. The WMA acknowledges that the type of watershed improvements contemplated by this watershed management plan will have limited impact on these very large storm events. During these types of events, most of the watershed is saturated, meaning that most of the storage has been taken up and all runoff flows directly to the stream. However, the types of practices that the WMA is encouraging will have a combined positive affect on the hydrology of the watershed and, given enough adoption could eventually improve the watershed response to extreme storm events.

Critical flow rates (those flow rates that cause most damage within the stream) will occur less frequently. As with the magnitude of high flow rates, a healthy watershed will dampen the stream response for storm events which will result in less frequent damaging steamflows. In addition to the magnitude and frequency, the duration for which a stream is at critical flow rate is an important consideration and is tied to the health of the watershed.

The stream response to small rainfall events is a common measuring stick used in watershed management to gauge the health of the watershed. Small rainfall events are typically defined as any rainfalls that are less than 2-year storms. These storm events are important from a water quality standpoint because they account for the vast majority of runoff on an average annual basis. In some areas as much as 95% of the storm related flows can be attributed to storm events under the 2 year event.

Restoring the natural hydrology of the watershed will also replenish the shallow groundwater flow that is important in maintaining stream baseflow. Reestablishing the balance between surface and shallow groundwater flows can minimize the periods when the larger streams have no flow and help maintain flow for longer periods of time for streams that are intermittent or ephemeral. Lack of reliable flow has been identified as one of the primary stressors to aquatic life in Squaw Creek.

In addition to restoring the flow of water within the shallow groundwater system, a healthy watershed will also help to replenish the local aquifer. The interaction between surface and groundwater is extremely complex, particularly so in the Squaw Creek Watershed. Throughout the Squaw Creek corridor there are areas where water from the creek is being lost to the aquifer and other areas where groundwater is being discharged into the stream.

The importance of maintaining a healthy supply of drinking water cannot be overstated. In many areas around the region drinking water supplies are at risk due to excessive pumping, inadequate recharge or as a result of polluted surface water.

An important first step in protecting the local drinking water aquifer is to identify the areas within the watershed that are recharging surface water to the groundwater system. The level of protection afforded these areas should be very high. Protection strategies would focus on the land use activities within these critical areas such as storage of chemicals, paving over for parking or siting of animal feeding operations as examples.

5.4. Increase the variety of habitat for animal and plant life in the watershed

The Squaw Creek Watershed will be recognized for its ecologically diversity.

The goal is to increase ecological diversity in the Squaw Creek Watershed. Ecological diversity includes biodiversity and habitats that maintain ecological processes and structures, regional and historical context, and sustainable cultural practices. Ecological diversity is important because the variety of habitats provide several functions and services that are important to both wildlife species and humans. Ecological integrity is increased by maintaining high quality and diverse habitats, that support many wildlife species, as well as and the people who live in the Squaw Creek Watershed.

Ecological diversity in the Squaw Creek Watershed will be increased by maintaining a landscape that has a diversity of high quality habitats that provide fundamental services that are necessary to both wildlife and humans. Ecosystem services are the processes by which the environment produces resources that we rely on and often take for granted. Examples of ecosystem services include water quality and flood control, oxygen production and carbon storage, wildlife habitat, pollination of native and agricultural plants, recreational activities, and aesthetic values.

Habitat Objectives

Objective 4.1 Stream and riparian areas will become healthy ecosystems providing habitat for a wide variety of native fish, invertebrate, plant and animal species

Objective 4.2 Key natural resources within the watershed, including wetlands and upland prairies will be identified and protected to prevent the loss or degradation of fish and wildlife habitat

Objective 4.3 Opportunities to create wildlife habitat, as well as greenways and wildlife corridors, throughout the watershed will be explored

Objective 4.4 Low impact stormwater and drainage water management approaches will be prioritized over conventional structural approaches such as riprap, impervious surfaces, and piped conveyances.

Recreation Objectives

Objective 5.1 A recreational master plan will be developed to guide siting and extent of recreational use of Squaw Creek, its tributaries and riparian zone

Objective 5.2 A viable fisheries will be established in reaches of Squaw Creek where the flow regimes are conducive

Objective 5.3 The publicly accessible riparian corridors throughout the watershed will provide passive and non-passive recreational opportunities

Objective 5.4 Appropriate riparian areas along Squaw Creek and its tributaries will be identified and managed for a recreational trail system

Objective 5.5 Appropriate reaches within Squaw Creek will be identified and managed for water-based recreational opportunities such as canoeing and kayaking.

5.5. Create outstanding recreational opportunities in the watershed

The Squaw Creek Watershed will be a recreational asset to residents of the watershed and will become a destination for visitors.

Based on input received at the watershed listening sessions the WMA adopted the goal of making the watershed a recreational asset. It is apparent that, while there is currently some recreational use of Squaw Creek, the resource is largely untapped. Squaw Creek and some of the larger tributaries have the potential to provide recreational opportunities for watershed residents and visitors. Stream based recreation in Iowa has been shown to increase quality of life for residents and to have economic value in terms of tourism.

An essential objective towards reaching this goal will be to establish a recreational master plan for the Squaw Creek riparian area. The plan would identify the areas most suitable for recreational use and would evaluate water based recreation on the stream as well as use of the riparian area for a system of trails.

Many of the current uses of Squaw Creek; canoeing, kayaking, wading and fishing, are limited due to a variety of factors described in the watershed assessment chapter of the Plan. One of the primary objectives for reaching the recreation goal is to expand the current recreational use of Squaw Creek and tributaries. This objective refers to expanding the extent to which recreational use is appropriate, and improving the character of the stream to allow greater use. An example would be to remove the dead, overhanging trees that are common in some reaches of the stream. This will need to be done in conjunction with hydrologic improvements described above, which will help to stabilize the stream banks and prevent further tree falls.

5.6. Work cooperatively to identify stakeholders and resources and facilitate partnerships to implement the watershed plan.

Building partnerships and cooperating with existing groups and initiatives are keys to successful implementation of the watershed management plan.

The individual members of the WMA each play a role in managing the watershed whether it is their own conservation efforts; like the City of Ames restoring reaches of Squaw Creek or the Boone Soil and Water Conservation District offering technical assistance on agricultural practices, or by identifying ways to incorporate watershed improvements into everyday activities.

The Squaw Creek WMA is not alone in its desire to improve conditions in the watershed. There are several regional and state-wide groups that have similar water quality improvement missions. Examples include the Iowa Rivers Revival and Clean Water Iowa. Other groups, while formed for different purposes, have common objectives. An example would be the Practical Farmers of Iowa. The WMA recognizes the importance of collaborating with these groups and taking advantage of the specific experience and insight they have. Other entities like the Iowa DNR or Region 7 EPA have funding opportunities that the WMA can tap to implement its programs.

Partnership Objectives

Objective 6.1 Identify opportunities to assist the Cities, Counties and SWCDs and other stakeholders on their watershed management and conservation efforts

Objective 6.2 Utilize existing State and non-profit watershed management and conservation related initiatives

Objective 6.3 Identify and actively pursue funding opportunities, locally and at the State and Federal level

Objective 6.4 Identify and empower local watershed stewards to build watershed management ethic at grassroots level