DIVISION OF ENVIRONMENT
QUALITY MANAGEMENT PLAN

PART III:

WATERSHED MANAGEMENT SECTION
QUALITY ASSURANCE MANAGEMENT PLAN

Revision 11
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Kansas Department of Health and Environment
Division of Environment
Bureau of Water
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SIGNATURES/APPROVALS

Watershed Management Section:

(Signature, Section Chief)

2/13/15

(Date)

Bureau of Water:

(Signature, Bureau Director)

1-13-15

(Date)

Bureau of Water QA Representative:

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1/13/15

(Date)

1 INTRODUCTION

1.1 Historical Overview of Program

Nonpoint source pollution refers to pollutants that originate from pollutant sources that are widely dispersed across a watershed. Runoff from rains and snow melt is a major carrier of nonpoint pollutants but other sources include spills, individual household septic tank lateral fields, drift from pesticide applications, etc. According to Kansas Administrative Regulation 28-16-28b(oo), Nonpoint Source means any discharge not required to have a federal National Discharge Elimination System (NPDES) permit and that results in the release of pollutants to the waters of the state. This release may result from precipitation runoff, aerial drift and deposition from air, or the release of subsurface brine or other contaminated ground waters to surface waters of the state.

The term nonpoint source pollution has its roots in the 1972 amendments to the Federal Water Pollution Control Act (PL 92-500). However, nonpoint source pollution control did not receive serious national attention until the 1987 Clean Water Act amendments. These amendments established as national policy -- "that programs for the control of nonpoint sources of pollution be developed and implemented in an expeditious manner ..." and directed states to identify water quality problems caused by nonpoint pollutant sources and develop a corrective action plan.

The Kansas assessment and management plan was completed and approved by EPA in 1989. The assessment found a large percentage of Kansas surface waters suffer from nutrient impairment, bacteria, and dissolved minerals.

The Kansas nonpoint source pollution management plan is based on the following fundamental principles:

1. Waters that have water quality impairments require restorative action.

2 Waters of satisfactory quality require action to protect them from future damage.

3. All waters are considered threatened unless all pollutant sources within a watershed are using recommended nonpoint source pollution control measures.

4. If water quality problems remain after application of recommended pollution control practices, the remaining pollutants should be removed on a cost-effective basis.

5. Nonpoint source pollution planning and implementation shall be accomplished at the most local level possible.

6. Nonpoint source pollution control is to be achieved through the coordinated effort of state, federal, and local government agencies and the private sector.

The Kansas Nonpoint Source Pollution Management Plan was revised in April of 2011. The revised plan focuses on:

1 identifying water bodies which require nonpoint source pollution control to achieve water quality standards;

1. identifying categories of nonpoint source pollution which contribute to water quality problems;

2. Identify a strategy for abating nonpoint sources of pollution.

3. identifying non-regulatory or regulatory programs including enforcement, technical assistance, financial assistance, education, training, technology transfer and demonstration projects to achieve implementation of the identified abatement strategy.

4. providing an implementation schedule for the goals, objectives and strategies of the Kansas NPS pollution management plan.

5. identifying sources of assistance available to support implementation of the strategy; and

6. identifying Federal financial assistance and development programs which will be reviewed for consistency with the State nonpoint source pollution management program.

1.2 Quality Assurance/Control Objectives

Quality assurance (QA) and quality control (QC) activities conducted within KDHE's water pollution control program are intended to ensure that all monitoring and analytical data are scientifically valid, defensible, and of known and acceptable precision and accuracy. The Watershed Management Section staff generally do not collect water quality data in the field; however, many grant recipient project cooperators do collect water quality and other quantifiable data. According to the Environmental Protection Agency (EPA), any EPA-funded project that collects data must have an approved Quality Assurance Project Plan (QAPP) prior to data collection. This means that all Watershed Management Section grant projects funded by Clean Water Act Section 319 funds must have an approved QAPP prior to data collection. The remainder of this document includes some information regarding QA/QC duties of various Watershed Management Section staff, but focuses primarily on QAPP requirements for 319 or State Water Plan funded projects.

2 QUALITY ASSURANCE/CONTROL ORGANIZATION

2.1 Administrative Organization

The organizational framework for the Watershed Management in the Bureau of Water is depicted in figure 2.1 below.

http://kdhenet/appnet/ops/orgchart/

2.2 Staff Responsibilities

KDHE - Bureau of Water - Watershed Management Section is the lead nonpoint source pollution control agency and is responsible for maintaining the Kansas Nonpoint Source Pollution Management Plan and associated principles and practices. The Watershed Management Section is also the lead agency responsible for coordination of Watershed Restoration and Protection Strategies (WRAPS), nonpoint source technical assistance, information and education, administering Clean Water Act (CWA) Section 319 grants, Kansas Source Water Protection Program, and Kansas Local Environmental Protection Program. As previously stated, all projects funded by CWA Section 319 fund, must have an approved QAPP prior to data collection. It is the responsibility of the Watershed Management Section Quality Assurance Officer to facilitate the development of QAPPs for applicable 319 funded projects. It is also the duty of the Watershed Management Section Quality Assurance Officer to review and approve QAPP submittals, with input from the project officer and section chief. Hard copies of approved QAPPs will be kept in the project files and will be made available to the Environmental Protection Agency (EPA) for review upon request. Additionally, information regarding QAPP receipt and approval will be entered into the Grant Reports Tracking System (GRTS) for EPA's internal use.

Section 404 of the CWA requires that the Corps of Engineers issue a permit for the discharge of dredged or fill material into waters of the U.S., including wetlands. The Watershed Management Section is responsible for issuing CWA Section 401 water quality certifications for this activity. These certifications are prepared by the Section 401 Water Quality Certification Coordinator (WQCC). These certifications stipulate water quality protection measures needed to ensure dredge and fill activities do not violate Kansas♠ water quality standards. On a complaint or random selection basis, Watershed Field Coordinators located in KDHE district offices inspect 404 permitted activities and monitor implementation of water quality protection measures stipulated by the certification. The Watershed Field Coordinator provides the permittee a written inspection report detailing the findings of the inspection and as necessary provides recommendations to address deficiencies and opportunities for improvement. Inspection reports are co-signed by the WQCC prior to issuance to the permitee. If needed, KDHE may request water quality monitoring a water quality certification condition. If monitoring becomes a requirement of the 404 permit, a Quality Assurance Project Plan (QAPP) shall be developed based on specifications provided with the water quality certification. Watershed Management Section staff will provide technical assistance for monitoring and quality assurance activities, as needed.

3 QUALITY CONTROL CRITERIA AND PROCEDURES

3.1 Monitoring Site Selection Criteria

The Watershed Management Section will work with grant project cooperators to develop monitoring site selection criteria on a site-specific basis. The following is a description of general monitoring site selection criteria to be applied to specific grant projects.

The selection of stream monitoring sites is based on several factors including type and purpose of sample, representativeness, ability to document the location of the sampling site, prevention of sample contamination, accessibility, and safety. Monitoring sites are typically located just above the mouth of headwater or lower order streams in order to assess the water quality impacts of nonpoint source (NPS) pollution loading within a given watershed or sub-watershed.

The selection of groundwater monitoring sites is based on several factors including type and purpose of sample, gradient and distance from known or suspected contamination, representativeness of the sample, accessibility, landowner permission, and safety.

3.1.1 Stream Sampling Sites

Map reconnaissance should be conducted prior to arrival in the general area of the site. Field staff should familiarize themselves with general terrain, major waterways, road networks, unique topographical features, and other man-made objects that may influence environmental monitoring. Based on the map review, a detailed field observation should take place to verify map information.

Upon completion of the first two steps, and supplied with the project goals and objectives, monitoring site selection can proceed. Factors that may influence site selection include: accessibility, relationship to known or suspected sources of pollution, relationship to other influencing contaminated locations, availability of media to sample, location of existing sampling sites, and potential safety hazards.

The point of collection should be readily accessible. The point of collection should be easily described, as field staff other than the designated sample collector may be needed to collect samples in the event the designated sample collector is unable to perform his/her duties.

Site selection for composite sampler(s) installation should follow the same general criteria in that the samples must be representative of the portion of the watershed which is to be studied, and the site must be easily accessible and at a location that can be documented. The sampling device and battery should be housed in a lockable metal box and chained to a tree or post for security purposes, and in the event of a flood. The suction line and liquid level actuator and/or bubbler line should be enclosed inside PVC pipe, to protect against flooding and vandalism damage.

The PVC pipe should be anchored to the stream bank and bed with steel posts. The sampling device

and associated equipment should be located a sufficient distance from transportation corridors such that public access to the equipment is minimal.

3.1.2 Groundwater Monitoring Sites

The following factors are generally included in the well selection process: purpose of sampling and type(s) of contaminants being investigated, groundwater gradient and distance from known or suspected contamination, representativeness of the sample, accessibility to well, depth to groundwater, depth of screened interval, distance to a public water supply or irrigation well, landowner permission, and safety. Well candidates with previous water quality information will be given additional consideration. Groundwater monitoring wells should be purged of at least three well casing volumes of water prior to sampling to ensure a sample that is representative of the surrounding aquifer.

3.1.3 Lake Monitoring Sites

The following factors are generally included in selecting a lake monitoring site: purpose of sampling and type(s) of contaminants being investigated, location of existing monitoring sites, accessibility, water depth, seasonal variations in lake stratification, water body designated uses, distance from sources and/or tributaries, landowner permission, and safety.

3.2 Sampling Procedures and Sample Custody

3.2.1 Stream Samples

Stream sampling procedures may vary based upon specific project needs; however, grab samples should be collected in general accordance with SOP No. SCMP-001, which accompanies the QA management plan for the Watershed Planning Section stream chemistry monitoring program. Composite samples should be collected in general accordance with SOP No. RRMP-001, which accompanies the QA management plan for the BOW rainfall runoff monitoring program.

3.2.2 Stream Assessment

Watershed Management is developing/conducting training regarding completing stream assessments with KDHE IT Magellan handheld assessment units. An SOP will be developed and attached to the QMP when completed.

3.2.3 Groundwater Samples

Groundwater sampling procedures may vary based upon specific project needs; however, groundwater samples should be collected in general accordance with SOP No. GQMP-005, which accompanies the QA management plan for the Watershed Planning, Monitoring and Assessment (WPMAS) groundwater chemistry monitoring program.

3.2.4 Aerial Assessment

Aerial Assessment methodology is being developed with KDHE's IT department. Once finalized, aerial assessments will be completed gathering cropland and livestock landuse information. An SOP will attached as soon as it is developed.

3.3 Analytical Procedures

Analytical procedures used by project cooperators are generally field laboratory tests. These analytical procedures can be grouped as titration, colorimetric, or ion selective electrode analysis. Safety procedures should be followed precisely when handling reagents used in these test procedures, particularly the strong acids and bases used in dissolved oxygen sample preparation and titration. Analytical procedures for field laboratory tests are test or equipment specific. Project specific QAPPs should include an inventory of field laboratory tests and equipment, calibration requirements, standard operating procedures, and maintenance requirements.

3.4 Internal Procedures for Assessing Data Precision, Accuracy, Representativeness and Comparability

3.4.1 In House Audits

The chief of the Watershed Management Section (WMS), in conjunction with the designated Quality Assurance officer, is responsible for assuring that all data derived from all WMS sponsored sampling/monitoring projects are of sufficient precision, accuracy, representativeness and comparability to meet project objectives. All water quality data are given close scrutiny by the quality assurance officer, in consultation with Section Chief. All data are reviewed with existing sampling conditions kept in mind. This is particularly relevant with runoff event samples, in which contaminant concentrations can vary widely between samples depending upon conditions at the time of sampling. Data that cannot be reconciled with available knowledge of site and sampling conditions are considered invalid, and will not be used in any subsequent reports.

3.4.2 Instrument Calibration and Standardization

Instrumentation used in field sampling activities varies based on project specific needs. All project specific QAPPs should include a list of field equipment/instrumentation to be used, calibration procedures, and appropriate standards to be used during calibration procedures. Factors that affect instrument calibration frequency may include: ambient air temperature, instrument accuracy, sample matrix interference, and number of samples collected.

3.4.3 Procedural Blanks, Duplicate Measurements and Spiked Samples

Procedural blanks, duplicate measurements and spiked samples are used in quality control programs to ensure that samples have not been contaminated and that analytical methods are accurate; however, many grant projects do not require this level of quality control. The need for procedural blanks, duplicate samples, and spiked samples will be determined on a project specific basis, based primarily on project goals, data usage, and data quality objectives (DQOs).

At the discretion of the Chief of the WMS or the Bureau Director, blind reference samples, spiked with known concentrations of one or more parameters, may be submitted to KHEL and used as a general indicator of the overall accuracy of the data reported by the laboratory.

The following is a summary of recommended procedures for using blanks, duplicates, and spikes samples.

The possibility of sample contamination during sample preparation, storage and analysis is assessed through the use of procedural blanks, prepared with ASTM Type I-quality water and subjected to the same treatment as the rest of the samples collected as a result of the project. Under this protocol, blanks are utilized in the following manner:

(a) The concentration of a given parameter is calculated by subtracting the reported blank concentration from the reported sample concentration.

(b) Should the blank concentration exceed the sample concentration, a corrected concentration normally is not included in the data file; however, should the sample concentration be less than the minimum detection limit (MDL) of the analytical method, the concentration is recorded as such regardless of the blank concentration.

(c) Should the blank concentration be less than the MDL, the sample concentration is recorded without modification.

The possibility of sample contamination from sample containers is assessed through the analysis of container blanks. Five percent of the sample collection containers are selected at random, partially filled with ASTM Type I-quality water, sealed, and stored for a 48-hour interval. The resulting container blank is analyzed to determine levels of impurities leached from the container walls. If detectable levels of impurities are observed, two grab samples are collected at a selected location each time. Data generated by the duplicate sampling effort are used to assess the chemical variability of the sampling and analysis activities. These data provide a basis for quantifying any statistical uncertainty.

3.4.4 Preventative Maintenance

For all grant projects utilizing field sampling equipment or laboratory sampling equipment, a preventive maintenance program should be maintained to ensure that all field sampling and laboratory equipment is maintained in good condition and is in a state of readiness.

3.4.5 Safety Procedures

Safety procedures for handling field sampling and laboratory equipment must be followed carefully. Safety hazards include handling strong acids, strong bases, and toxic reagents. Materials to be sampled also present safety concerns, particularly sewage with its potential for infection. A listing of the hazards likely to be encountered and safety precautions necessary is included in Appendix C.

3.5 External Procedures for Assessing Data Precision, Accuracy, Representativeness and Comparability

3.5.1 Onsite Audits

Bureau of Water programs may, at the discretion of the Division QA Director, division director, or the granting agency, be required to participate in periodic QA/QC audits conducted by an independent third party. Audit findings, and corrective actions implemented in response to such findings, shall be reported to the bureau director and Division QA Director and addressed in detail within the annual program evaluation.

3.5.2 Inter-laboratory Sample Comparison Programs

If needed, KDHE may split samples with a project cooperator and compare sample results with those generated by Kansas Health & Environment Laboratory(KHEL). Comparison between laboratory results shall be reviewed by the program manager or unit chief and passed on to the section chief for inclusion in an annual QA report. Consistent finding of disparities greater than 10% shall be cause for implementation of corrective action procedures.

3.6 Corrective Action Procedures

WMS projects should include corrective action procedures to address equipment malfunction, sample contamination, and staff performance problems. Corrective action procedures should identify the person responsible for identifying problems and provide a course of action for correcting the problem. The following is a summary of KDHE BOW corrective action procedures which may apply to WMS projects.

3.6.1 Equipment Malfunction

Field equipment under BOW control is subject to corrective action procedures detailed in the appropriate Standard Operating Procedure. Any deficiency in performance discovered during routine use or during an internal or external performance audit is recorded and filed, and reported to the Section Quality Assurance Officer. The Quality Assurance Officer (QAO) is responsible for appraising the scope and seriousness of the problem. Within manufacturer's guidelines, the QAO may elect to service the instrument or return the instrument to the manufacturer for repair or replacement.

The QAO is responsible for identifying any effects the equipment malfunction may have had on the quality of data collected. Data that have been influenced by equipment malfunction are reviewed by the QAO and the WMS chief. Based upon their determination of data accuracy, the data will either be flagged within the data set as questionable, or deleted from the data set.

3.6.2 Sample Contamination

If an obvious error is made in the field during sample collection, the sample is discarded in an appropriate manner.

3.6.3 Staff Performance Problems

If a member of the project or field staff have difficulty with a given work procedure, an effort is made by the QAO to identify the scope and seriousness of the problem, identify any data affected by the problem, and recommend corrective action. All effected data are either deleted from the file or flagged within the file, at the discretion of the QAO. Possible corrective actions include further in-house or external training for the employee, a reassignment of work duties, or modification of the work procedure.

3.7 Data Management

WMS project QAPPs should include data management information. This information may include: field data recording sheet information, computer storage, data entry, data entry quality control/corrective action, statistical analysis, reporting requirements, and data storage time schedules.

For KDHE sampling activities, completed sample analysis reports from KHEL are delivered by inter-office mail to the WMS Quality Assurance Officer for review, then routed to the appropriate WMS project manager for data review and validation. The data are checked for conspicuous oversights or dubious results. If problems are noted in the data reports, corrective action procedures are initiated in accordance with Section 3.6. Each analysis report is electronically filed at the laboratory; hard copies are filed in the appropriate WMS file. All data are stored on file for a minimum of five years.

3.8 Quality Assurance Reporting Procedures

WMS project QAPPs should include quality assurance reporting procedures. These procedures should describe the flow of QA/QC information among project personnel and identify specific reporting responsibilities.

The WMS QAO is responsible for informing the section chief of project QA/QC status and of any QA/QC needs within the WMS program. The QAO is also responsible for maintaining adequate communication with KHEL with regard to program QA/QC concerns.

In addition to these routine communication requirements, the BQAO prepares an annual program QA/QC status report which is routed through the bureau director to the Division QA Director. This report contains the following types of information:

a) status of QA project plan;

b) description of data accuracy, precision, completeness, representativeness and comparability;

c) discussion of significant QA/QC problems, corrective actions, progress, needs, plans and recommendations;

d) results of internal and any external system or performance audits;

e) summary of QA/QC-related training performed since the last QA/QC status report; and

f) any other pertinent information specifically requested by the bureau director or the Division QA Director.

3.9 Field Investigations

WMS staff or KDHE District Office Watershed Field Coordinators (WFCs) may conduct field investigations for a variety of reasons. These may include non-point source pollution complaint investigation, CWA Section 404 Permit compliance, and construction storm water NPDES permit compliance.

Many public complaint investigations involve failing onsite waste water systems. Field investigations of failing onsite wastewater systems should follow Standard Operating Procedure NPS-001: Determining a Public Health Hazard or Nuisance from Improperly Managed Domestic Wastewater (see Appendix A). Occasionally, field staff will collect water samples during complaint investigations. SOP NPS-001 includes a protocol for collecting grab samples from surfacing domestic wastewater effluent.

CWA Section 404 Permit compliance inspections should follow Standard Operating Procedure NPS-002: Conducting CWA Section 404 Permit Field Investigations (see Appendix B).

Construction storm water NPDES permit investigations should be conducted in accordance with KDHE Bureau of Water Industrial Program requirements.

4 RESOURCES AND TRAINING

4.1 Supervisory Expectations

The quality of the environmental monitoring data gathered by BOW is strongly influenced by the level of staff training, experience and preparation. The Bureau QA Representative will work with the Section Chiefs and Program Managers to address the training needs of staff. To broaden the experience level of staff, supervisors also are expected to provide occasional opportunities for any interested employee to participate in activities outside his/her daily work routine (e.g., interprogram cross-training opportunities). Such activities must be within the general scope of the employee's classification specifications and conform to the orientation and safety training requirements presented in sections 10.3 and 10.4, below.

4.2 Continuing Education Opportunities

Methods employed in the collection and analysis of environmental data are subject to continual refinement. Occasional conceptual or technological breakthroughs (e.g., satellite-based global positioning technologies; geographical information systems) may rapidly antiquate existing SOPs and require extensive training or retraining on the part of staff. Continuing education courses offered by some colleges or vocation educational institutions may fulfill these training needs. Staff participating in such courses may be reimbursed by the Division provided the subject matter is within the general scope of the employees' position descriptions, funds for training have been set aside within the budget of the beneficiary program, and participation is otherwise allowable under prevailing agency training and travel policies.

4.3 New Employee Orientation

Supervisors, including program managers, shall ensure that all new employees, or recent transfers from other programs, or cross trainees receive a thorough indoctrination into the QA policies and procedures of the division, office and program. Part I of the QMP, together with the present document and applicable program-level QAPPs and SOPs, shall be required reading on the part of all new employees. After reading these documents, each employee shall sign an affidavit indicating that he/she has read the appropriate QA documentation. The signed affidavit shall be routed through the immediate supervisor and the Bureau QA Representative to the Division QA Officer. Apart from QA considerations, supervisors shall ensure that new employees participate in orientation seminars offered by the KDHE Personnel Office. Where appropriate, supervisory seminars offered by the Department of Administration shall be included in the training curriculum. The Bureau QA Representative will monitor compliance with new employee orientation and training requirements.

Critical safety procedures shall be thoroughly reviewed before any new employee engages in a potentially hazardous field or laboratory duty. New employees must demonstrate a satisfactory understanding of safety considerations before they are required (or permitted) by their supervisors to participate independently in any potentially hazardous activity (see section 10.4, below).

All employees participating in environmental monitoring activities shall review Part I of the QMP, this document, and applicable program-level QAPPs and SOPs at least once each year. Upon completion of this review, each employee shall sign an affidavit indicating that he/she has read the appropriate QA documentation. The signed affidavit shall be routed through the immediate supervisor, the Section Chief, and the Bureau QA Representative to the Division QA Officer. This document review requirement shall be incorporated into the employee's written job expectations and factored by the immediate supervisor into the employee's annual performance evaluation.

4.4 Safety Considerations

Field and laboratory staff that participate in environmental monitoring programs encounter potentially hazardous situations on a frequent basis. In addition to the routine possibility of automobile, boating or equipment accidents, employees may encounter slippery surfaces, toxic substances, fire or electrocution hazards, infectious microorganisms, vicious animals, belligerent persons, or other threatening situations. Injuries or illnesses resulting from such situations may lead to substantial human suffering and, from a QA/QC perspective, deprive monitoring programs of the services of a valuable employee for an extended period of time.

Although it is not possible to predict every conceivable risk that may arise during the course of work, supervisors must ensure that those risks faced by staff on a recurring basis are addressed in the SOPs and are discussed during employee training. No employee shall be compelled by any supervisor (or coworker) to operate automobiles, boats or equipment that are known to be defective and unsafe. No employee shall be compelled by any supervisor (or coworker) to perform unusual or hazardous physical activities that are beyond the scope of the employee's position description. Rather, the supervisor shall consult with higher administrative staff to confirm whether the work or action is necessary and identify the appropriate employee (or outside consultant) for the task.

Field and laboratory staff are expected to abide by the safety protocols contained within the QAPPs and SOPs and to integrate safety considerations into all aspects of their work. To the extent possible, BOW shall routinely budget for ongoing safety training expenses (e.g., cardiopulmonary resuscitation and first aid training fees). Nonsupervisory employees are expected to bring potentially unsafe practices or situations to the attention of their program manager. In turn, the program manager shall evaluate the practice or situation and either take the appropriate corrective action or, in complicated circumstances, seek the advice of the Section Chief or higher level supervisor. Major corrective actions (those warranting changes in an SOP) shall be implemented by staff only upon approval of the Section Chief, and the Bureau QA Representative.

5 COMPUTER TECHNOLOGY

5.1 Computer Hardware and Software

All purchases of computer hardware and software must be approved in advance by the KDHE Office of Information Systems (OIS) and abide by the purchasing requirements described in the KDHE guidance notebook *Purchase Procedures and Payment Process.* Anti-virus software approved by OIS shall be installed and utilized on all WPS lap-top and desktop computers and any agency minicomputers and mainframe systems used for storage, retrieval, transfer, backup, and/or analysis of environmental data.

5.2 Data Entry Requirements

WMS utilizes the Kansas Clean Water(KCW) System, and Microsoft Excel spreadsheet, and the EPA Grants Reports and Tracking System, for applying for and tracking Section 319 and State Water Plan Funded nonpoint source pollution control projects. Data is entered by the applicant or recipient from the website. Data entered is monitored by the system for accurate entry for most components. Project officers are responsible for review and approving of reports which includes checking of the accuracy of the data as it is entered. A federal grants tracking system developed and implemented by EPA (GRTS) stores information pertaining to Section 319 funded activities. Affidavits of expenditures are reviewed for accuracy in expense reporting and adequate matching funds. Reviewers include project officers, program managers and the administrative specialist prior to processing payment request to the payment office EPA has internal QA/AC incorporated into the system. Additionally, Headquarters and Region 7 EPA personnel prepare occasional queries to for complete and accurate information. Any needed corrections or additions are then reported to KDHE WMS for revision of the GRTS entry fields. Persistent or recurring problems shall be reported to the EPA and section GRTS representative for determination of necessary corrective actions. KCW problems will be reported to the KCW section administrator.

APPENDIX A

STANDARD OPERATING PROCEDURE NPS-001

DETERMINING A PUBLIC HEALTH HAZARD OR NUISANCE FROM IMPROPERLY MANAGED DOMESTIC WASTEWATER

Standard Operating Procedure: Determining a Public Health Hazard or Nuisance From Improperly Managed Domestic Wastewater

Kansas Administrative Regulation 28-5-6 stipulates that all domestic wastewater shall be discharged to an approved sewage collection system or an approved lagoon, septic system, or alternative system. Domestic wastewater means all waterborne wastes produced at family dwellings in connection with ordinary living including kitchen, toilet, laundry, shower, and bath tub wastewater. County and city health officials or representatives of the Kansas Department of Health and Environment may be called upon to investigate complaints involving the discharge of sewage from onsite wastewater systems. During the investigation, county, city, or State officials must determine whether or not domestic wastewater is managed so that:

1) quality of surface and groundwater is protected for drinking water, recreation, aquatic life support, irrigation, and industrial uses;
2) a breeding place or habitat will not be created for insects, rodents, an other vectors that may later contact food, people, pets, or drinking water;
3) wastewater will not be exposed on the ground surface where it can be contacted by children and/or pets, creating a significant health hazard;
4) State and federal laws and local regulations governing water pollution or wastewater disposal will be met; and,
5) nuisance conditions or obnoxious odors and unsightliness will be avoided.

The following is a general standard operating procedure for determining a public health hazard or nuisance from improperly managed domestic wastewater.

Making Contact With The Property Owner

State or county staff may be called upon to investigate a complaint regarding an onsite wastewater system. Many times the person reporting the complaint will not leave their contact information; however, if possible, it is valuable for the investigator to speak directly with the person reporting the problem to get additional information regarding the location and type of problem being reported. Often the investigator has only been given the general location of the problem. In this case, the investigator should visit the county appraisers office to get the property owners contact information. The investigator may wish to drive by the location to see if any evidence of a problem can be seen from the road. The investigator should then contact the land owner by telephone or letter to arrange a date and time to do a site visit. If a potential emergency exists, most county codes contain a “right of entry” statement that allows an inspector to enter the property to investigate, without the property owner being present.

Conducting The Site Visit

During the site visit, it is important for the investigator to interview the landowner and obtain as much information regarding the onsite wastewater system as possible. This information may include: type of system; age of system; installation contractor name; system maintenance information (date of last pumping/inspection); name of system pumping company; number of persons in household; water usage habits; and drainage problems (both inside the house and in the yard). This information can help define if a problem exists and can expedite a solution to the problem.

After interviewing the property owner, the investigator should do a walkthrough of the property and household to look for evidence of onsite wastewater system failure or improper operation. The following is a list of things to look for during the walkthrough. If any of the following conditions are observed during the site visit, there may be a potential health hazard.

Straight pipe discharge into a ditch or stream is common in some rural communities in Kansas. Straight pipe discharge to the waters of the State is illegal. According to Kansas Administrative Regulation 28-5-6, all domestic wastes from sanitary fixtures located in any dwelling, shop, school, or other building used as a home or meeting place for humans shall be discharged into a public sewer system approved by the Kansas Department of Health and Environment, or into a private sewer system approved by the Kansas Department of Health and Environment or the appropriate local authority. Toilet paper in ditches outside homes and buildings can be a good indication that a straight pipe discharge is present nearby. This would also be an indication that wastewater has not gone through a septic tank.

System backup can occur when a system is blocked and wastewater from the household will not drain properly. Evidence of system backup may include staining around toilets and sinks and slow draining sinks, toilets or other plumbing.

System breakout is the discharge or ponding of septic system effluent on the ground surface above or near the absorption field. This effluent should have a noticeable odor and may have a grayish or blackish appearance. System breakout may indicate that the absorption field is blocked or not sized correctly to handle the household's wastewater treatment and disposal needs. Lush vegetation growing over the absorption field can sometimes be indicative of system breakout.

Mechanical damage to a system may occur for a variety of reasons. Steel tanks can corrode and develop leaks or collapse. Baffles inside septic tanks can corrode and break off, causing solids to enter and block the absorption field. Driving over the absorption field can cause damage to the piping and trenches. Tree root systems growing in the absorption field can also cause piping or trench to become clogged and ineffective.

Design flaws can also render an onsite waste water system ineffective. High groundwater levels or low lying areas above the absorption field may cause the system to fail. Locating the system too close to an existing stream, property line, or water well can increase the likely hood that a health hazard is present (consult local county sanitary codes or, in the absence of local county sanitary codes,*Bulletin 4-2: Minimum Standards for Design and Construction of Onsite Wastewater Systems*, for applicable separation distances). Also, the system may simply be undersized to handle the wastewater disposal needs of the household.

Lack of maintenance can cause a septic system to fail. On average, a septic tank should be pumped out and inspected every three to five years. Failure to pump out the system can cause solids to enter the absorption field and clog pipes and infiltration trenches. Lagoons must also be maintained. Sludge on the bottom of the lagoon should be pumped in order to preserve storage capacity. Property owners must also construct and maintain a fence to prevent access to any lagoon.

Lack of separation distance between onsite wastewater systems and adjacent water resources may cause a health hazard. Adequate separation distances must be maintained between the system and any nearby water resources including underlying groundwater aquifers or perched seasonal water table, lakes, streams, and wetlands. Specifications outlined in Kansas Department of Health and Environment Bulletin 4-2 address system location and separation distances. Separation distances specified in local county sanitary codes may be more restrictive than those outlined in bulletin 4-2.

Effluent Sampling

On occasion, field staff will collect a sample from surfacing domestic wastewater effluent to determine if a health hazard exists, or if there is a violation of water quality standards. All effluent samples will collected using the following protocol:

The following describes the proper procedures for the collection, preservation, and transportation of samples from failing onsite wasterwater systems or related discharges.

It is difficult to anticipate site conditions prior to inspecting an onsite wastewater system. An inspector should be prepared to collect samples to help determine if a public health hazard exists. Samples may be collected from effluent surfacing above a septic tank, absorption field, saturated soils above the absorption field, or from a straight pipe discharge into a ditch or stream.

EQUIPMENT;

General.

- Non- talc disposable Latex gloves
- Safety glasses
- Sample bottles (below)

- Small stainless steel bucket and funnel
- Small stainless steel trowel or shovel
- Cooler with ice
- Camera
- Alconox or similar anti-bacterial solution for equipment decontamination
- De-ionized water for rinsing sampling equipment or hands
- Hand sanitizer solution
- Plastic tub and brush for washing sampling equipment
- Towel
- Rubber boots
- Sample information forms, including chain of custody, & labels
- An orange safety vest may be advisable if sampling near a busy roadway

For Nutrient Samples – (includes Ammonia, Kjeldahl Nitrogen, Total Phosphate) 180 ml. Square Nalgene translucent sample bottle

For Bacterial Samples – E. Coli – samples are collected in a 120ml polystyrene bottle with sodiumthiosulfate preservative. A multi-celled tray, Quanti-Tray 2000, is used toquantify the E. Coli. Tray and bottles are both purchased from IDEXX.

For Biochemical Oxygen Demand (BOD) – 1,000 ml. Cube container (plastic)

Samples of soils should be containerized in either clean plastic sealable baggies or in glass jars supplied by the laboratory.

Other tests not covered here are available for Dissolved Oxygen, Pesticides, Heavy Metals, etc. Collection methods will be similar but sample handling requirements may vary.

PROCEDURE;

General.

- Always protect your self from exposure to suspected raw sewage effluent. Wear latex gloves, safety glasses, (rubber boots if needed) when taking samples. Be careful not to splash or spill effluent onto clothing. Wash hands thoroughly with soap & water or antibacterial cleanser after grabbing and handling samples. Change and wash any contaminated clothing as soon as possible. Since ditches, lagoon banks, etc. can be slippery take care not to fall into the effluent!

- Handle sample bottles with care and not with bare hands to avoid contamination of the bottles or caps with your own skin bacteria.

- Use the stainless steel bucket (must be decontaminated) or a separate sterile sample bottle to dip into the effluent and carefully pour sample into second sterile sample bottle using the decontaminated funnel. Do not dip the sample bottle to be sent into the lab directly into the effluent.

- Take the sample(s) as close to the source of the effluent as possible, i.e., if a ■straight pipe•, at the end of the pipe if possible and flow is occurring, otherwise as close to the end of the pipe as possible. In some cases it may be advisable to avoid trespassing on private property even if the effluent source is located thereon and you may have to grab the sample from the nearest located public access or property.

- If possible you may want to interview the property owner or occupier to obtain as much information as possible regarding the onsite wastewater system as to its type, age, date last pumped, size of household, and other information that may help define if a problem exists and can expedite a solution to the problem.

- If sufficient effluent or water depth is not present, you may need to collect a saturated soil sample. Use the stainless trowel or shovel (decontaminated of course) to transfer the soil sample into a sealable plastic bag or sterile sample jar.

- Take photographs of the location and the suspected source of the effluent. If possible take photos of the actual sample(s) being grabbed. A photo including an identifying feature of the particular location and showing the person or their hands actually dipping the sample could be important if the validity or location of the sampling were ever questioned. Label photos with location, ownership, and date information for reference.

- Required information on a sample submission form is;
  - Date
  - Time of Day
  - Address or legal description of location
  - Samplers last name and first initial
  - Sample type or purpose – Nutrients, BOD, or Bacteria (FCB)

- **Equipment Decontamination**: All sampling equipment should be decontaminated prior to the start of sampling activities **and between** sampling sites. Decontamination activities should include washing equipment in an Alconox (or similar anti-bacterial) solution and rinsing thoroughly with de-ionized water

SAMPLE HANDLING;

- **Bacterial Sample**

Fill 240 ml. Bottle to neck. Securely cap bottle. Preservation requirement is Cool, 4 degrees C, or 40 degrees F. Place in cooler with ice. Store in refrigerator or with ice. Transport on ice. **Holding time is only 48 hours**.
Label or identify bottle.

- **Nutrient Sample.**
  Fill 180 ml. Bottle to neck. Cap bottle. Preservation requirement is Cool. 4 degrees C, or 40 degrees F. Place in cooler with ice. Store in refrigerator or with ice. Transport on ice. **Cool holding time up to 28 days** when acidified to pH<2 (1 ml. Of a 1:15 H2SO4 or 2 ml. of sulfuric acid solution)
  To acidify discard small amount of sample and add acid solution, securely cap bottle and shake for about 10 seconds to thoroughly mix sample and preservative. Label or identify bottle. Remember to test for ammonia as it may show a nitrogen problem that the nitrate test alone might not identify.

- **BOD Sample:**
  Fill 1,000 ml. cube container to neck. Cap the bottle. Preservation
  Requirement is Cool, 4 degrees C. or 40 degrees F. Place in cooler with ice. Store in refrigerator or on ice. Transport on ice. **Holding time ■ 48 hours**

Deliver or send samples to lab for processing. Be sure to have the lab sign and give a receipt with date and time for chain of custody purposes. This can be very important in a situation that may involve controversy.

Remember that you are handling potential disease causing pathogen laden material.

BE CAREFUL. Wash your hands, arms, face or other exposed skin thoroughly after sampling. Carefully **discard** any used latex gloves. **Change and wash** any clothing you may suspect has become contaminated as soon as possible. You may want to carry a disposable plastic bag to place rubber boots in after sampling to prevent contamination of your vehicle until you get a chance to clean off your boots (again soap & water !)

APPENDIX B

STANDARD OPERATING PROCEDURE NPS-002

STANDARD OPERATING PROCEDURES FOR CONDUCTING CWA SECTION 404 PERMIT FIELD INVESTIGATIONS

Conducting a 401 Water Quality Certification Field Investigation

A. Purpose: As stated in Section 2.2, the Watershed Management Section (WMS) is responsible for issuing CWA Section 401Water Quality Certifications for dredge, fill, levees, channel change and stream obstruction activities in the waters of the US (US Department of Army Corps of Engineers). The WMS is also authorized under K.A.R. 28-16-28f(c) to issue a similar certification. These certifications mandate water quality protection measures be implemented on-site to avoid water quality standard violations. At the discretion of the Water Quality Certification Coordinator (WQCC), WMS or district Watershed Field Coordinators (WFCs) may conduct field investigations of dredge, fill, levees, channel change and stream obstruction activities to determine compliance with CWA Section 401 Certification requirements.

B. Procedure:

a) The WQCC may determine at the time of issuance which sites will require inspection and when the inspection should occur. Inspections may occur under the following circumstances:
   i. Has received an NPDES construction stormwater permit.
   ii. Projects occurring near or in Outstanding National Resource Waters, Exceptional State Waters and Special Aquatic Life Use water as documented in the Kansas Surface Water Quality Standards [KAR 28-16-28b through KAR 28-16-28g] which includes the Kansas Surface Water Register.
   iii. Near a public water supply intake.
   iv. Origin of a complaint
   v. Attempts to meet the permitting agency project manager schedule to initiate a team inspection.

vi. Deemed to be significant impact if water quality protection measures are not implemented.
vii. Type of activity has been identified in a WRAPS.

b) The WQCC will copy the 401 Certification to the field inspector for reference at the time of issuance. This will include the name and contact information for the site visit and the permitting agency project manger. The 401Certification will include the project period limitation and a description of water quality protection measures. The 401 Certification requires that the Permittee post the water quality certification and a Water Quality Protection Plan or similar document that includes site specific water quality protection measures to be implemented, locations, etc.
c) During the field investigation, KDHE staff will ask to see the Water Quality Protection Plan and verify if appropriate water quality protection measures have been implemented. Digital photos should be taken of all water quality protection measures and other locations of concern.
d) KDHE staff conducting the investigation must document the investigation and report their findings to the WQCC. Other KDHE Bureaus or Sections may need to be copied with the report, depending on the regulatory status of the site.

APPENDIX C

STANDARD OPERATING PROCEDURE NPS-003

SAMPLE COLLECTION, PRESERVATION AND HANDLING

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APPENDIX D

STANDARD OPERATING PROCEDURE NPS-004

MANAGEMENT AND REPORTING OF DATA

I. DATA CUSTODY

The purpose of this standard operating procedure (SOP) is to establish uniform policies and procedures for maintaining an accurate written record of a sample from the time it is collected through its introduction into water quality summaries or other related reports to insure that a sample has not been tampered with or altered throughout the process.

A. The sample by definition is in custody if:

a. It is in actual physical possession of the sample collector.

b. It is in view of the sample collector after being in the collector's physical possession

c. It is locked up after being in the sample collector's physical possession.

d. It is placed in a designated secure area.

B. FIELD PROCEDURES

a. Chain -of- Custody procedures will be followed for all tests deemed to be of importance for compliance with statutes and regulations and for those which could become evidence in litigation. Samples for plant process control, field screening analyses, or other samples collected for a technical or information purposes will not need to follow chain of custody procedures. In general, those samples submitted to the KDHE laboratory <u>will</u> be subject to chain of custody procedures.

b. In order to insure adequate control and documentation of collected samples, the number of personnel handling the samples should be minimized.

c. A unique number shall be assigned to each sample for identification purposes. If a sample consists of several bottles for analysis of different parameters from the same sample, the same sample number is used for each portion of the original sample.

d. If the samples are to be shipped to other laboratories for analysis, a sample label is attached to each sample container at the time of collection.

e. Record all field measurements and other pertinent data on the field sheet.

f. Custody of the sample is initiated at the time of sample collection by insuring that the sample is in the sample collector's physical possession or view at all times, or is stored in a locked place where there could be no reasonable possibility of tampering. The sample collector is responsible for the collected samples until they are received by the laboratory or

have been appropriately shipped to the lab. The chain of custody record is initiated at the time of sample collection and a copy accompanies the samples. The chain of custody record is at the bottom of the KDHE laboratory sheet.

Signatures and dates on the sample custody sheet shall be signed in indelible ink. The sample collector shall make sure the name, date, time, exact location, sample identifiers and parameters for analysis are listed before signing off. The person assuming custody shall sign and date the custody section of the sheet in the sample collector's presence. An exception is samples delivered after hours-these must be placed in the designated sample storage area of the KDHE laboratory by the individual having custody.

II. DATA MANAGEMENT

Data received from the laboratory shall be forwarded to the Quality Assurance Officer or Chief of the WMS, Bureau of Water, or a designated project manager. The data will be examined and any unusually high values or values considered to be unreasonable will be noted and brought to the attention of the laboratory and the appropriate project manager. High values for a given contaminant or parameter may indicate a real problem, but occasionally occur as a result of a decimal error, a missed dilution at a permittee laboratory, sample collection at the wrong location or other error. Such errors should be corroborated and noted and initialed on the data reporting sheet prior to passing the information along or filing.

Significant figures must be checked to ascertain that no unusual degree of accuracy is implied by the result. For instance, BOD values expressed to thousandth of a milligram per liter.

The copy distribution list shall be reviewed to make sure the information is distributed to all who need it. A copy is routed to the appropriate file and/or electronic data base.

APPENDIX E

STANDARD OPERATING PROCEDURE NPS-005

EVALUATION OF DATA QUALITY

QUALITY CONTROL AND STATISTICAL EVALUATION OF DATA

Accuracy is a measure of how closely the analytical result or the average of a set of analytical tests approaches the true value of a parameter. Two types of error affect accuracy: systematic error and random error. An example of systematic error would be inaccuracy in a piece of laboratory equipment, for example a laboratory balance that consistently under-weighs. Random error is error from a variety of sources which cannot be totally controlled. Errors in the use of pipettes, graduated cylinders, or other laboratory equipment are examples. Random error is controlled by averaging a series of replicate analyses of a sample.

Precision measures how closely a series of replicate measurements approaches the average. It is a measure of how well results can be reproduced. A laboratory may have a high degree of precision on a given test but be inaccurate. It is necessary to control both precision and accuracy to achieve a consistency of data quality.

A number of methods are available for evaluating both accuracy and precision. However these measures do not account for errors in sampling and handling that occur prior to laboratory analysis.

A. Commercial Laboratories

Private, commercial laboratories providing water or effluent quality data to the WMS shall be certified by the Kansas Department of Health and Environment and shall follow the Laboratory Certification Section guidelines for data evaluation and quality.

B. Contract laboratories analyzing samples for WMS projects must conform to the following general guidelines for data quality and evaluation:

1. At least 10% of a given number of samples should be for quality control purposes. At least one blank, one spike sample and one set of duplicates shall be analyzed with each sample set.
2. For accuracy determinations spiked samples shall be used. The use of spikes is preferable to the use of analysis of known standards as the spikes more nearly approach the true range of values encountered in analyzing the samples. The procedure involves the addition of a known quantity of standard to a known volume of unknown sample. Replicate analyses of both the known and the unknown sample are run and the results are compared to generate a percent recovery . Ideally , the result should be 100% but results between 90% and 110% are acceptable. The procedure for calculating percent recovery is as follows:

a. Determine the unknown sample concentration by averaging the results of replicate analyses.
b. Calculate the theoretical concentration of the spiked sample using this formula:
Theoretical Conc. = $[(C_u V_u) + (C_s V_s)] / (V_u + V_s)$

C_u = Original measured concentration of unspiked sample
V_u = Volume of sample to which the spike is added
C_s = Concentration of the standard used to spike
V_s = Volume of standard used to spike

c. Determine the spiked sample concentration by averaging the results of the duplicate analyses.
d. Divide the spiked sample concentration by the theoretical concentration. Multiply the result by 100. The result is the percent recovery.
e. For measurement of precision it is necessary to measure a series of replicate samples. The degree of precision required shall be determined at the outset of the project and incorporated onto the project QA/QC Plan. The determination of precision shall be through the use of average deviation, variance and standard deviation.

C. Stream Sampling

The SOP No. SCMP-001 developed by the Watershed Planning Section for determination of data quality in stream sampling is adopted by reference.

APPENDIX F

BIBLIOGRAPHY

REFERENCES

APHA/AWWA/WEF (1992) Standard Methods for the Examination of Water and Wastewater, 18th Edition, American Public Health Association, 1015 Fifteenth Street, NW, Washington, DC 20005.

Code of Federal Regulations, 40 CFR Part 136

Code of Federal Regulations, 40 CFR Part 503

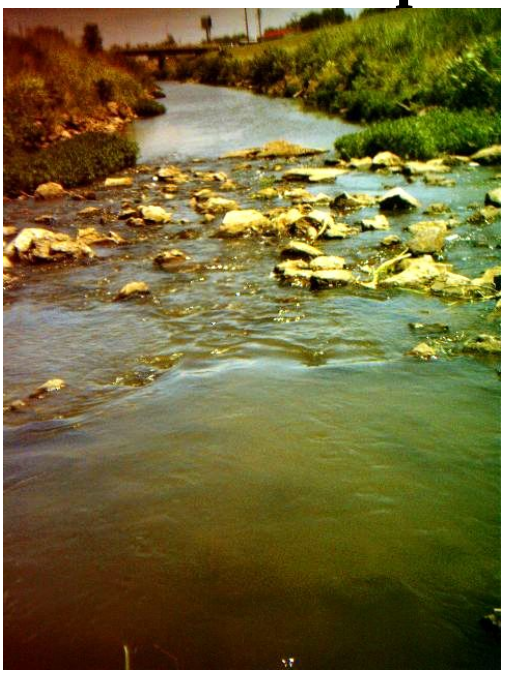
APPENDIX G

STREAM ASSESSMENT USING THE TDS RECON POCKET PC HANDHELD AND THE RIVERWORKS RAPID ASSESSMENT SYSTEM

AND

STREAM ASSESSMENTS USING THE RIVERWORKS RAPID ASSESSMENT SYSTEM (RRAS) SAMPLE QAPP

Stream Assessment using the TDS Recon Pocket PC Handheld and the Riverworks Rapid Assessment System



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Assessment Tools

This is a guide to assist with the assessment of streams using the TDS Recon Pocket PC handheld and the Riverworks Rapid Assessment System (RRAS). The Recon will use RRAS to record any information that will be collected during the assessment.

Thoughts before going into the field

1. Know where you are going. Look at maps of the stream and the roads around it to determine where you will be able to enter the stream.
2. Take precautions for the weather. Look at the forecast and radar so you can avoid any severe weather.
3. Protect yourself: Ticks and mosquitoes are common near creeks so use bug repellent. Long sleeve shirts and jeans will also help deal with bugs and plants like poison ivy. There may be an occasional copperhead, snapping turtle, or other animal that you see so keep looking and avoid interactions.
4. Wash off as soon as you finish to get rid of any bugs or poison ivy that you did come in contact with.
5. Bring a walking stick or find one in the creek to help keep your balance in the water. The stick can also be used to find out what is ahead of you under the water.
6. Keep anything extra that you are taking in a waterproof bag and put it in a place where it will not float away.
7. Make sure somebody else knows where you will be and give them an estimate of the time that you will be back. If you can bring another person with you, that would be even better. It is highly recommended that you bring a cell phone, but make sure it stays dry.
8. If you are going on other people's property then you need to get permission from them to walk in the creek. Most counties have a GIS mapping system that will show the owners of the property that you should contact. This information can be found by going to www.gispilot.com. You can use this information to contact the owners:
   a. Call the owners and tell them who you are and what your plans are. Tell them who you are doing this for and ask if they would like a report to be provided to them about the stream when this project is finished. Remember that you cannot force them to let you go on their property, and if they do not want you there then you should avoid that spot. If you have to leave a message, then tell them this information and give them your phone number so they can call with any questions. If they do not call back then you should try to avoid their property.
   b. If you need to contact a lot of people, another option could be to send the owners a postcard describing what you are doing and asking them for their permission and if they want a report. They should sign the card and send it back or call to confirm that the assessment will be ok. If your plan is for them to send the card back, then you should find a way to prepay the postage.
9. Make sure you have everything:
   a. Recon pocket PC (charged) and the touch screen stylus (pointer)
   b. GPS card (charged); Keep the GPS card in its case and attached to the lace with the stylus (pointer).

c. Any maps that you may need
d. Clothes and shoes or waders that can get wet and dirty and a change of clothes for when the assessment is done
e. Cleaning items (hand sanitizer, water, towels, etc.)
f. Anything else that may be helpful

How to use the Recon

The Recon has a touch screen so only the provided stylus should be used on the screen.

To open a new assessment:

1. Turn on the GPS card with the switch on the side of the card.
2. Turn on the Recon with the power button.
3. Tap on Start and select Programs.
4. Find the RRAS program and tap it.
5. Tap at the top left corner and select New from the drop down list.

To begin the assessment, complete the information on the first page. To type the information, tap on the blank space and a touchpad should show up. This touchpad is oriented the same as a keyboard.

Title: Give the name of the creek or some way to identify it. The assessments should be numbered to give the order that the assessments were taken in. (ex. Deer creek 3). The creek name should be the recognized map name.

Technician: Your name

Stream: Give the name of the creek again without the numbers
The names should be consistent so the information can be matched up later.

Once that is filled out, a picture of the site should be taken. These pictures should be of the part of the stream that is behind and ahead of you.

To take a picture:

1. Look under Observations and tap on Site.
2. Tap on New at the bottom of the screen.
3. If this is the first picture, a GPS page will pop up. When it does, tap Reconnect and then OK once the connection has been made. If it is not making the connection, check to make sure that the GPS card is turned on and then click Reconnect. You can make an observation without connecting by tapping Ok instead of Reconnect on the GPS page.
4. Tap on the Capture button and an image of what the picture will be taken of will be displayed.
5. Tap Capture to take the picture.
6. Tap on the image information and tap Open to add notes or tap Close to go back to the assessment.

Notes should be made regarding the direction you are traveling (upstream or downstream) and anything else that may be important. This would be a good spot to put any actions that you see or anything that you smell. Any precipitation that has occurred recently should also be noted.
At the bottom of the page is a page button that can be used to navigate to different pages. There are also arrows that can be used to go to the previous and next page. Tap the right arrow to go to the next page.
This indicator page uses the Stream Visual Assessment Protocol (SVAP) to determine the health of streams. Throughout this assessment ratings will be given to specific features of the stream according to the outlined scoring description. These scores will be recorded and averaged to give an overall rating of the stream.

Scoring

These scores are outlines so intermediate scores can be used. Use the lowest score that applies. To the right of each part is a button with an eye on it and one with a question mark. The question mark can be used to look at the predetermined rating scale and some extra tips about what to look for to score each indicator. The eye can be used to make additional observations like pictures and notes.

Channel condition:

Is the channel natural or has it been altered by people?

Natural curves No structures	Mostly natural Structures are set back away from the stream	Some straightening Dikes or levees prevent flooding	Mostly straight Dikes or levees prevent flooding
10	7	3	1

Levees and dikes are walls that keep the stream from flowing outside of its banks. Also look for pipes that could prevent flooding by draining water out of the stream when the water level rises.

Hydrologic alteration:

How often does the stream flood?

Every 1.5 to 2 years	3 to 5 years	6 to 10 years	No flooding or flooding every 1 year or less
10	7	3	1

If dams, dikes, or other structures that prevent flooding are present, then the rating will be lower. High and steep banks will also allow flooding to occur less often. Lower banks with no flood preventing structures are ideal.

Riparian zone:

How far does the vegetation go on each side of the stream based on the width between the banks?

2 widths on each side	1 width	Half of a width	One-third of the width	Less or no vegetation
10	8	5	3	1

The riparian zone around the creek should include trees as well as smaller plants that are closer together. A field of grass does not count as part of the vegetation.
Pictures are on page 22.

Bank stability:

Stable, low banks covered with vegetation	Mostly stable, low banks mostly covered with vegetation	Moderately unstable, usually high banks, some trees have fallen into the stream. The outside bends of the stream are eroding with little or no plant cover	Unstable, usually high banks, erosion can be seen, many trees have fallen into the stream. The outside bends of the stream are eroding with no plant cover
10	7	3	1

Stable banks are usually low and covered with vegetation that has roots deeply penetrating the soil. This is especially important for the outside bends of the streams.
Pictures are on pages 22-23.

Water appearance:

How clear is the water?

Clear visible 3 to 6 ft deep	Occasionally cloudy 1.5 to 3 ft	Cloudy 0.5 to 1.5 ft	Muddy Less than 0.5 ft
10	7	3	1

If the stream is not deep enough to measure the visible depth, then base the rating off of how well the bottom can be seen and make an estimate. Film like oil sheen or pollutants on top of the water or on objects lower the score. Strong odors from the water also lower the score.
Look at areas where you have not stirred up the water and made it cloudy.

Nutrient enrichment:

Are there algae in the stream?

Small amounts of algae or no algae present	Some algae on rocks under the water, water may be slightly green	Many rocks are covered with a lot of algae, green water	Rocks are covered with algae, Organic material is floating in the water, very green water, mats of algae are present
10	7	3	1

This can be determined by feeling how slimy the rocks are. Organic material may appear as dirty bubbles on top of the water. Make a note if there are areas with excessive algae. Pictures are on pages 20-21.

Barriers to fish movement:

Is there anything that may keep fish from being able to swim through the stream?

No barriers	Seasonal low water levels may limit movement	Barriers or Drop structures with a drop of 1 ft or less,	Barriers or Drop structures with a drop greater than 1 ft within 3 miles	Barriers or Drop structures with a drop greater than 1 ft nearby
10	8	5	3	1

Barriers/Drop structures could include dams, culverts, or other structures that may block the stream or keep the water level too low for fish movement. Woody debris is not a problem since fish can swim under it.
Pictures are on page 23.

In stream fish cover:

How many types of fish cover are there?

More than 7 types	6 to 7	4 to 5	2 to 3	1 or none
10	8	5	3	1

The different types of fish cover include:

Boulders/cobble – Boulders are rounded stones more than 10 inches in diameter or large slabs more than 10 inches in length; cobbles are stones between 2.5 and 10 inches in diameter.
Undercut banks – Eroded areas under the bank surface
Thick root mats – Dense mats of roots
Dense plant beds – Thick beds of vegetation like leaves
Riffles – Rough water areas with a quick current
Isolated/backwater pools – Small pools of water connected at the side of the stream
Logs/large woody debris – Fallen trees or parts of trees
Deep pools – Areas of deeper water with a slow current
Overhanging vegetation – Plants or objects hanging over the stream to provide shade and cover

The WRAPS group may determine that this indicator is not applicable to Kansas streams.

Pools:

Are there areas with deeper water than the usual depth?

Greater than 5 ft deep pools	3 to 5 ft deep pools	Less than 3 ft deep	No pools
10	7	3	1

These areas usually have a slow current and may occur anywhere in Kansas streams. They are better if the bottom of the pool can not be seen.

Insect/Invertebrate habitat:

How many types of invertebrate habitat are there?

At least 5 types	3 to 4	1 to 2	None
10	7	3	1

The different types of invertebrate habitat include:
Woody debris in the water
Submerged logs
Leaf packs
Undercut banks
Cobble
Boulders
Gravel

Each of these items needs to stay still to be counted. Leaves and debris that are floating down the stream do not provide habitat for the location being assessed.

Canopy cover:

How much of the stream is shaded when the sun is directly overhead?

25 to 90% shaded	>90%		Less than 25%
10	7	3	1

If it is about noon, then look at the amount of shade on the stream. At other times, look up and see how much of the sky is covered by the trees. If the trees do not have their leaves because of the season, then estimate the amount of cover if they did.
Pictures are on page 21.

Manure presence: (if applicable)

Is there manure or waste in or near the stream?

Livestock have access to the riparian zone	Occasional manure or waste near or in the stream	Excessive manure Untreated human waste is being discharged into the stream
5	3	1

Do not give a rating above 5. If there is not any livestock or human waste then pick NA.

Salinity: NA

Riffle embeddedness: (if a riffle is present)

How much of the gravel or cobble in the riffle is covered by smaller sediment?

Rocks are less than 20% embedded	20 to 30% embedded	30 to 40%	Greater than 40%	The riffle is completely embedded
10	8	5	3	1

Riffles with a lot of silt and sand around the cobble and gravel are less useful for habitats so they should get a lower rating.

Macroinvertebrates:

What types of invertebrates are present in the water?

Group 1 species	Group 2 species	Group 3 species	Few or none present
15	6	2	-3

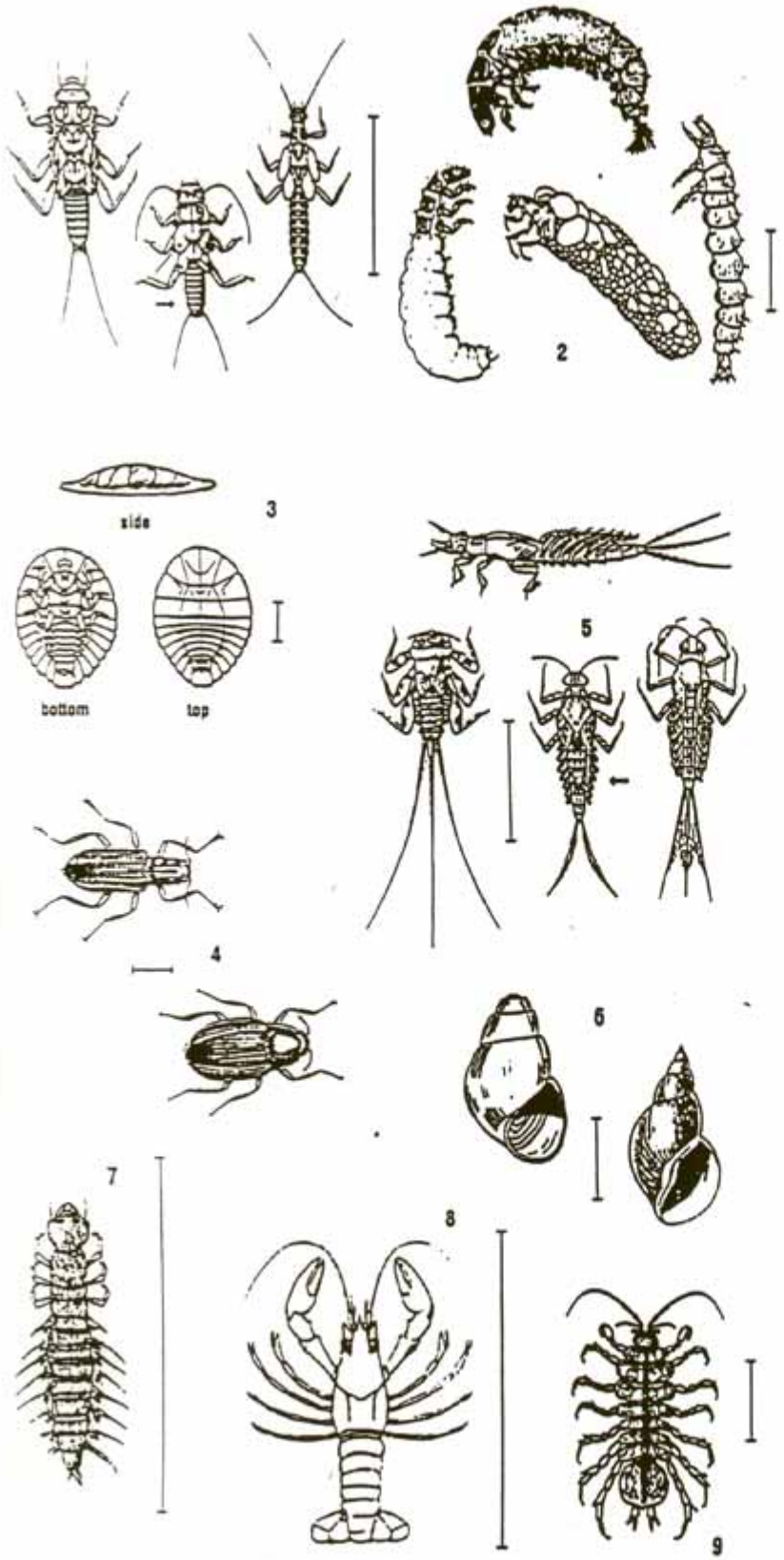
Group 1: caddisflies, mayflies, and stoneflies
Group 2: damselflies, dragonflies, aquatic sowbugs, and crayfish
Group 3: midges, craneflies, horseflies, leeches, aquatic earthworms, tubificid worms, and snails

To find these macroinvertebrates, pick up rocks that are underwater and look under them or on the bottom of the rock. The focus of this part is to find the larvae of the insects, not the insects themselves. To look for crayfish, tip the rock up so the water is flowing toward the bottom of the rock and you can see if there was a crayfish where the rock was.

Identifying the macroinvertebrates while in the field may be difficult so look at the variety. If there are not many macroinvertebrates in the area, give a lower score. If there is any type, give a 1 or above. Finding many different kinds in one area should give a higher score. Macroinvertebrates with legs usually are in Group 1 or 2 so they also raise the score. Try to describe what you see with a note.

The WRAPS Stakeholder Leadership Team will determine the usefulness of this indicator and decide whether it is necessary.

This macroinvertebrate key is from the Stream Visual Assessment Protocol at http://www.nrcs.usda.gov/technical/ECS/aquatic/svapfnl.pdf



Bar lines indicate relative size

Stream Insects & Crustaceans

GROUP ONE TAXA

Pollution sensitive organisms found in good quality water.

1 *Stonefly: Order Plecoptera.* 1/2" - 1 1/2", 6 legs with hooked tips, antennae, 2 hair-like tails. Smooth (no gills) on lower half of body. (See arrow.)

2 *Caddisfly: Order Trichoptera.* Up to 1", 6 hooked legs on upper third of body, 2 hooks at back end. May be in a stick, rock or leaf case with its head sticking out. May have fluffy gill tufts on lower half.

3 *Water Penny: Order Coleoptera.* 1/4", flat saucer-shaped body with a raised bump on one side and 6 tiny legs on the other side. Immature beetle.

4 *Riffle Beetle: Order Coleoptera.* 1/4", oval body covered with tiny hairs, 6 legs, antennae. Walks slowly underwater. Does not swim on surface.

5 *Mayfly: Order Ephemeroptera.* 1/4" - 1", brown, moving, plate-like or feathery gills on sides of lower body (see arrow), 6 large hooked legs, antennae, 2 or 3 long, hair-like tails. Tails may be webbed together.

6 *Gilled Snail: Class Gastropoda.* Shell opening covered by thin plate called operculum. Shell usually opens on right.

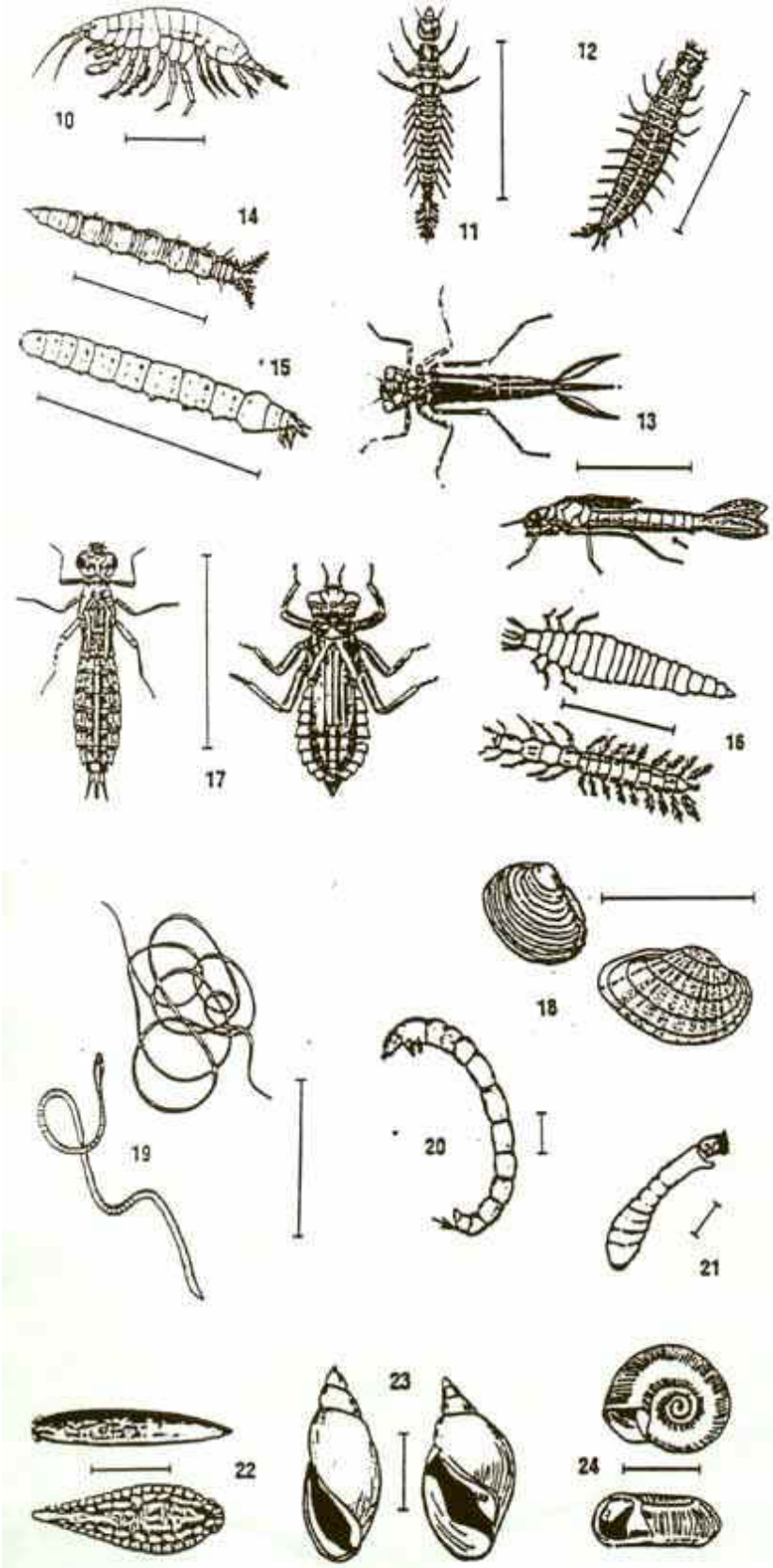
7 *Dobsonfly (Hellgrammite): Family Corydalidae.* 3/4" - 4", dark-colored, 6 legs, large pinching jaws, eight pairs feelers on lower half of body with paired cotton-like gill tufts along underside, short antennae, 2 tails and 2 pairs of hooks at back end.

GROUP TWO TAXA

Somewhat pollution tolerant organisms can be in good or fair quality water.

8 *Crayfish: Order Decapoda.* Up to 6", 2 large claws, 8 legs, resembles small lobster.

9 *Sowbug: Order Isopoda.* 1/4" - 3/4", gray oblong body wider than it is high, more than 6 legs, long antennae.



Bar lines indicate relative size

GROUP TWO TAXA continued

10 *Scud: Order Amphipoda.* 1/4", white to grey, body higher than it is wide, swims sideways, more than 6 legs, resembles small shrimp.

11 *Alderfly larva: Family Sialidae.* 1" long. Looks like small hellgrammite but has 1 long, thin, branched tail at back end (no hooks). No gill tufts underneath.

12 *Fishfly larva: Family Corydalidae.* Up to 1 1/2" long. Looks like small hellgrammite but often a lighter reddish-tan color, or with yellowish streaks. No gill tufts underneath.

13 *Damselfly: Suborder Zygoptera.* 1/2" - 1", large eyes, 6 thin hooked legs, 3 broad oar-shaped tails, positioned like a tripod. Smooth (no gills) on sides of lower half of body. (See arrow.)

14 *Watersnipe Fly Larva: Family Athericidae (Atherix).* 1/4" - 1", pale to green, tapered body, many caterpillar-like legs, conical head, feathery "horns" at back end.

15 *Crane Fly: Suborder Nematocera.* 1/3" -2", milky, green, or light brown, plump caterpillar-like segmented body, 4 finger-like lobes at back end.

16 *Beetle Larva: Order Coleoptera.* 1/4" 1", light-colored, 6 legs on upper half of body, feelers, antennae.

17 *Dragon Fly: Suborder Anisoptera.* 1/2" - 2", large eyes, 6 hooked legs. Wide oval to round abdomen.

18 *Clam: Class Bivalvia.*

GROUP THREE TAXA

Pollution tolerant organisms can be in any quality of water.

19 *Aquatic Worm: Class Oligochaeta.* 1/4" - 2", can be very tiny; thin worm- like body.

20 *Midge Fly Larva: Suborder Nematocera.* Up to 1/4", dark head, worm-like segmented body, 2 tiny legs on each side.

21 *Blackfly Larva: Family Simuliidae.* Up to 1/4", one end of body wider. Black head, suction pad on end.

22 *Leech: Order Hirudinea.* 1/4" - 2", brown, slimy body, ends with suction pads.

23 *Pouch Snail and Pond Snails: Class Gastropoda.* No operculum. Breathe air. Shell usually opens on left.

24 *Other snails: Class Gastropoda.* No operculum. Breathe air. Snail shell coils in one plane.

When everything has been scored, an average score will show at the bottom of the screen. The overall rating of the stream from the scores is based off of these ranges. <6.0 is poor, 6.1-7.4 is fair, 7.5-8.9 is good, >9.0 is excellent.

Other information

Sediment: The sediments in the stream can be found by feeling and looking at the bottom of the stream.

Bedrock- not usually found in Kansas streams
Boulder- greater than 10 inches across
Cobble- 1 inch to 10 inches
Gravel- less than 1 inch
Sand
Silt/Mud- finer than sand

There are two pages that will not be used because of the equipment that is required. (Cross Sections and Longitudinal Survey)

Velocity: Any small floating object can be used to determine the velocity of the water in the stream. Set the object in the water and find how long it takes for the object to move 10 feet. Enter 10 feet in the distance box and tap New to add that amount of time to the table so the device can calculate the velocity.

Velocity measurements should be taken a short distance away from a riffle if one is present.

Disturbances: Pictures on pages 18-19.

Vegetative clearing: Trees and other plants have been cleared from the riparian area by people for reasons such as farming and construction.
Channelization: The stream has been straightened by people.
Streambank armoring: The banks of the stream are covered by a hard surface like rocks or cement.
Streambed disturbance: The sediment at the bottom of the stream has been changed by people. This may occur under bridges where the surface has been hardened or in areas where cement chunks have been dumped in the stream.
Withdrawal of water: Water is being removed from the stream for things other than irrigation. The water could be used for drinking water or industry.
Dams
Levees- Walls that keep the stream water from flowing outside of its banks
Soil exposure or compaction: There is bare soil in the riparian zone. Compacted soil may be used for vehicle and livestock crossings. This may also be caused by livestock gatherings or structures that are nearby.

Irrigation and drainage: Water is being diverted for irrigation. Pipes or ditches that take water away are indicators.
Contaminants: Waste or chemicals are being added into the stream. Look for black or grey water and a place where the contaminant could be entering the stream.
Hard surfacing: There are hard surfaces like concrete around the stream. These could include roads and sidewalks.
Overgrazing: Livestock have eaten away most of the vegetation near the stream. Trees and noxious weeds like thistles are the main plants in the area.
Roads and Railroads
Trails
Exotic Species: Non-native species of plants are common near the stream.
Utility Crossings: Utilities like power lines and gas pipes cross the stream. This is common at bridges.
Reduction of floodplain: Levees or dikes prevent flooding of the stream.
Dredging for mineral extract: Sediments have been removed from the bottom of the stream for mineral reserves
Land grading: The surface of the land has been reshaped.
Bridges
Woody debris removal: Fallen trees or tree parts have been removed from the stream.
Piped discharge/Cont. outlets: Pipes, usually containing waste, are draining into the stream. These may also carry water from ditches. If there are pipes directly discharging human or animal waste into the stream, notify KDHE.

Finishing the Assessment

After everything has been recorded, a final picture should be taken to register the information. Any observation button can be used. Once it has been taken, click at the top left corner and select save. Begin walking a predetermined distance along the stream to the next assessment point. There should be a distance of about 500 feet between each site unless another increment is determined by a map or aerial image of the stream morphology. This distance can be measured by counting or using a pedometer to find the number of steps taken in the stream. Before entering the creek, you may want to measure the number of steps it takes to go 100 feet. If there is a big change between each assessment site then make a note of it in the previous assessment. Take a picture of the change and state how far upstream or downstream it is from the previous site. Other things to take pictures and make notes about while walking include any drainage areas, riffles, sediment changes, etc. While walking through the stream, count or estimate the amount of solid waste (trash, metal parts) that you encounter. Record the amount of trash that can be easily picked up and the amount that cannot in an observation. When the next spot has been reached, a new assessment can be opened.
The Recon can be turned off by pressing the power button at any time. It will turn back on quickly when the power button is pressed again. It may be good to turn off the Recon between sites to save power, but the Recon will disconnect from the GPS when it is turned off.

Quick Overview of the Process:

1. Open the RRAS program and open a new assessment.
2. Take pictures of the site.
3. Complete the information in the assessment.
4. Take another picture and save.
5. Walk to the next site while taking notes and pictures of any big changes.
6. Save and open a new assessment.

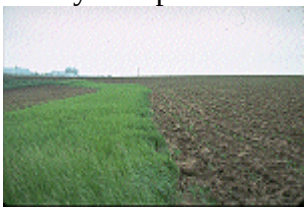
Troubleshooting

If the Recon is non responsive for over one minute, a soft reset may be needed. Hold the power button down for 4 seconds and release. Select soft reset and the computer should restart. If a soft reset is not working, then a hard reset may be necessary. First a backup should be performed by tapping Start/ Programs/ Sprite Backup and selecting "Backup Now". Hold the power and start button for 8 to 10 seconds then release when the message "Booting---->" is shown. After the system has restarted you can choose to restore the backup. A last resort is to take off the battery for over 30 seconds and then reconnect it. This may cause you to loose the information that you have just entered, but the system should work. If you are not sure of what you are doing look at the equipment guide or call KDHE.

NRCS conservation practices

While doing these assessments, you may notice that there are some problems that you would like to fix. Here are a few fixes that may help protect the streams.

Buffers- Filter strips, field borders, and grassed waterways filter out excess nutrients from the runoff water so they do not reach the streams. They also provide a habitat for wildlife.

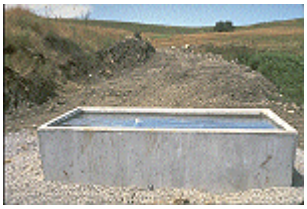


Riparian Restoration- The restoration of vegetation by waterbodies slows erosion, builds banks, and filters runoff water.

October 1993

July 1998

Livestock Management- Alternate watering and waste management systems help to keep livestock from releasing bacteria and excess nutrients from feces into the water.



Funding- Choosing to make some improvements does not have to be your own burden. There are many opportunities for funding and help with these projects.

More information is available on the Natural Resources Conservation Service (NRCS) website www.nrcs.usda.gov/technical/water.html

Watershed links

KDHE Watershed Management Section www.kdheks.gov/nps/
Environmental Protection Agency www.epa.gov/owow/watershed/
Kansas Alliance for Wetlands and Streams www.kaws.org
Kansas Watershed Restoration and Protection Strategy www.kswraps.org
State Conservation Commission scc.ks.gov
Kansas Water Office www.kwo.org
Center for Watershed Protection www.cwp.org

Glossary:

Boulders/cobble- Boulders are rounded stones more than 10 inches in diameter or large slabs more than 10 inches in length; cobbles are stones between 2.5 and 10 inches in diameter.
Cobble- 2.5 to 10 inch rocks
Culvert- A way for water to flow under a road, usually a pipe
Deep pools- Areas of deeper water with a slow current
Dense plant beds- Thick beds of vegetation like leaves.
Dikes and levees- walls that keep the stream water from flowing outside of its banks
Floodplain- the area outside of the riparian area that will hold the water that floods over the banks.
Isolated/backwater pools- Very small pools of water connected at the side of the stream.
Logs/large woody debris- Fallen trees or parts of trees
Macroinvertebrates- animals
NRCS- Natural Resources Conservation Service
Overhanging vegetation- Plants or objects hanging over the stream to provide shade and cover
Recon- the handheld computer that will be used for the assessments
Riffles- Rough water areas with a quick current
Riparian zone- area along the side of the stream usually containing vegetation

RRAS- Riverworks Rapid Assessment System
Sediment- rock material at the bottom of the stream
Stylus- touch screen pen for the Recon
SVAP- Stream Visual Assessment Protocol
Thick root mats- Dense mats of roots.
Undercut banks- Eroded areas under the bank surface.
Velocity- speed in one direction

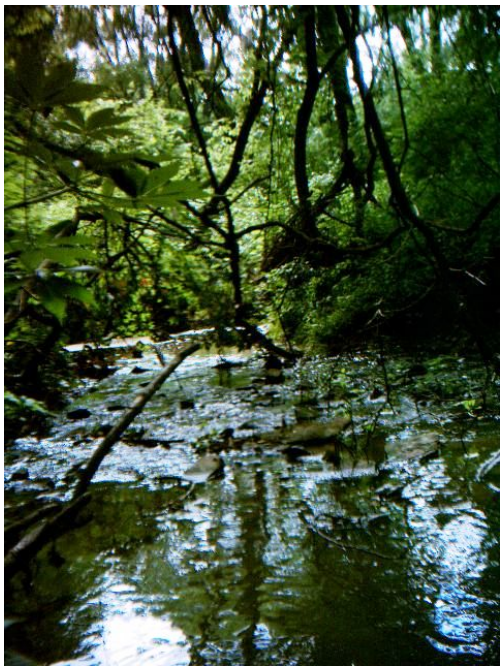
Works Cited:

Newton, Bruce, Catherine Pringle, and Ronald Bjorkland. "Stream Visual Assessment Protocol." NRCS. Dec. 1998. USDA, NRCS. <http://www.nrcs.usda.gov/technical/ECS/aquatic/svapfnl.pdf>.

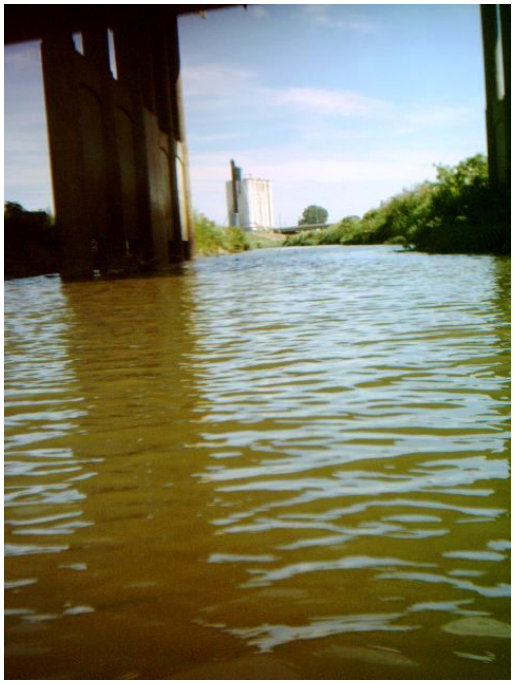
Shawnee County Conservation District. State Conservation Commission. June-July 2008 <www.sccd.com>.

Example Images

Soil exposure or compaction, overgrazing, livestock access



Hard surfacing, roads, bridges, Riffle, cobble utility crossings, streambed disturbance

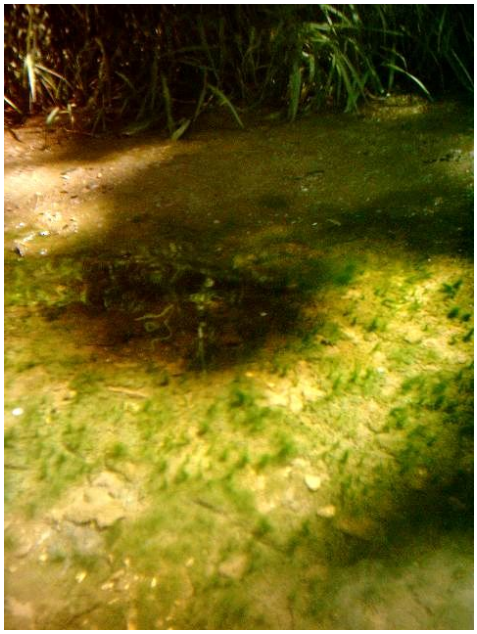


ChannelizationVegetative clearing, levees, reduction of floodplain, land grading

Streambank armoring

Piped discharge (storm sewer)

Organic material, high nutrient enrichment (lower score)



Excess nutrients (3)

Good canopy cover (10)

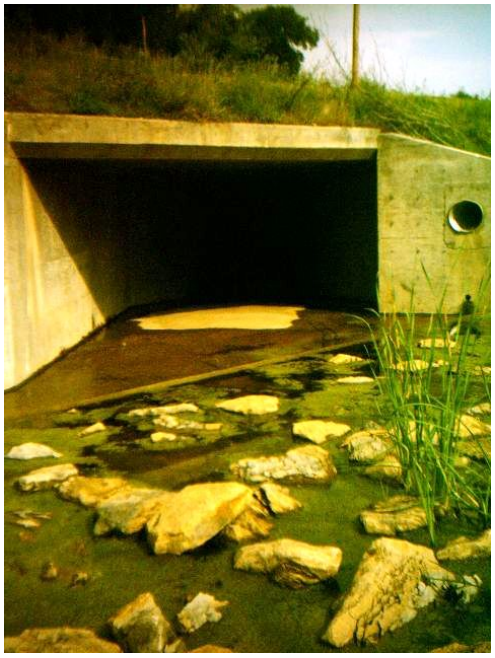
Well shaded area

Poor Riparian area (1)

Good Riparian area (10)

Poor bank stability (1-3)

Good bank stability (7-10)



Barriers to fish movement (water level isn't high enough)

Stream Assessments Using the Riverworks Rapid Assessment System (RRAS)

June-July 2008

Kansas Department of Health and Environment
Bureau of Water
Watershed Management Section

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Distribution List

Kansas Department of Health and Environment (KDHE), Bureau of Water, Watershed Management Section

Middle Kansas WRAPS Stakeholder Leadership Team (WSLT)

Project/Task Organization

KDHE's Watershed Management Section will be collecting the initial data and analyzing it to be presented to the WSLT.

Problem Definition/Background

This QAPP is being written while data collection is being done.

Monitoring sites are usually stationary and located toward the end of a stream. These sites are not able to collect information about where the changes in the stream are occurring. The assessments that will be done for this project will be of sections along the stream and its tributaries. There will be many data points so changes can be seen between them and a reason for the change can be identified. This type of assessment can also be done without a lot of equipment so people with less experience and training can perform the assessments.

This project will provide information for the Middle Kansas Wraps Stakeholder Leadership Team to help to identify areas of interest. The WSLT will also determine how the equipment will be used in future projects. A guide on how to do the assessments will also be made to educate landowners so they can perform the assessments themselves.

Project/Task Description

This project will be done during the months of June and July 2008. Assessments of streams in the Middle Kansas Watershed will be made using the Stream Visual Assessment Protocol (SVAP) and the Riverworks Rapid Assessment System (RRAS). The assessed streams will include Cross Creek, Shunganunga Creek, and the Creeks leading into Lake Shawnee.

Data Quality Objectives for Measurement Data

The collected data needs to be done as completely as possible to provide an overview of the assessed area and give the WSLT enough information about the use of the assessment tools.

Training Requirements/Certification

There is no required training or certification to complete these assessments. Knowledge of SVAP and basic computer skills are recommended. This information can be found in the users guide of the Recon Pocket PC and in the RRAS program on the PC. Additional SVAP information can be found at www.nrcs.usda.gov/technical/ECS/aquatic/svapfnl.pdf

Documentation and Records

The information that is collected during the stream assessments is recorded in the TDS Recon Pocket PC handheld using the RRAS program. Pictures, notes, ratings, and other information are recorded in this program and downloaded to another computer. This information can then be looked at and applied to the ArcGIS mapping program as well as other maps and spreadsheets.

Sampling Methods Requirements

The assessments will be taken in designated streams such as Shunga Creek, Deer Creek, and Cross Creek. The assessments are visual so no samples will be collected.

Sample Handling and Custody Requirements

Not Applicable

Analytical Methods Requirements

Analysis will be done visually at the stream. Additional analysis will be done by looking at the recorded information using computers that the data has been downloaded to. The information will be applied to spreadsheets, models, etc.

Quality Control Requirements

The assessments will be done by the same person throughout each area so there is a common perception.

Instrument/Equipment Testing, Inspection, and Maintenance Requirements

This project uses the TDS Recon Pocket PC handheld and a GPS card that is compatible with the Recon. The Recon can download information to a computer to store and process the data.

Instrument Calibration and Frequency

The same instrument is used throughout the assessment and it does not require calibration because it is recording, not sampling, the data.

Inspection and Acceptance Requirements for Supplies

This project does not have sampling equipment that needs inspection.

Data Acquisition Requirements

Aerial photos of the streams and parcel maps will be used to find places of access, routes to take, and the owners of the property containing the stream. ArcMap will be used for the aerial photos and the Shawnee County Appraisers website will provide the parcel map. The KDHE archives will provide information on past events involving the streams that will be assessed. Additional information on Cross Creek will be found in a past report by Kansas State University. This report will also be used to determine which sections should be assessed.

Data Management

The data will be stored in the computer that the information is downloaded to as well as the KDHE database R drive.

Assessments and Response Actions

I will be accompanied by watershed specialists on some of the assessments to identify and correct any mistakes that I am making.

Reports

The data will be applied to mapping programs (ArcMap), spreadsheets, and other models and reports will be supplied to the WSLT. The information will be available to the public upon request and may be put on the internet.

Data Review, Validation, and Verification Requirements

Validation and Verification Methods

Reconciliation with Data Quality Objectives

The WSLT will determine if the information collected is enough to base their decisions on.

Figures

Attribute tables are associated with the ArcMap maps. The attached attribute table is from the Cross Creek data points. The Link column of the table shows the section of the assessment that the

observation was taken in. It also shows the observation's associated item in that section. Disturbances(1).Vegetative Clearing was an observation of the Vegetative Clearing item in the Disturbances section of the assessment. The next column shows any notes that were made with each observation. The following columns provide the time the observation was taken, the GPS location, and the elevation.